Managing the university campus

Information to support real estate decisions

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Information to support real estate decisions

Proefschrift

ter verkrijging van de graad van doctor
aan de Technische Universiteit Delft,
op gezag van de Rector Magnificus prof. ir. K.C.A.M. Luyben,
voorzitter van het College voor Promoties,
in het openbaar te verdedigen op
vrijdag 4 maart 2011 om 10 uur
door

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bouwkundig ingenieur
geboren te Den Haag

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Samenstelling promotiecommissie:

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The author expresses her gratitude to all Dutch universities for supporting this research.

Cover design: Flavia Curvelo Magdaniel
Graphic design: Flavia Curvelo Magdaniel, Alexandra den Heijer
Photography: Alexandra den Heijer, Hans de Jonge, Rob 't Hart, Flavia Curvelo Magdaniel, TU Delft, Hans Schouten, Willem de Rooij, Hans van Leeuwen and DUWO. All photos, maps and material in appendices are used by permission of universities or the mentioned photographers.

Published by Eburon Academic Publishers, Delft
ISBN 978-90-5972-487-7 (paperback)
ISBN 978-90-5972-488-4 (eBook)

Eburon Academic Publishers
P.O. Box 2867
2601 CW Delft
the Netherlands
Tel.: +31 15 213 14 84 / Fax: +31 15 214 68 88
info@eburon.nl / www.eburon.nl

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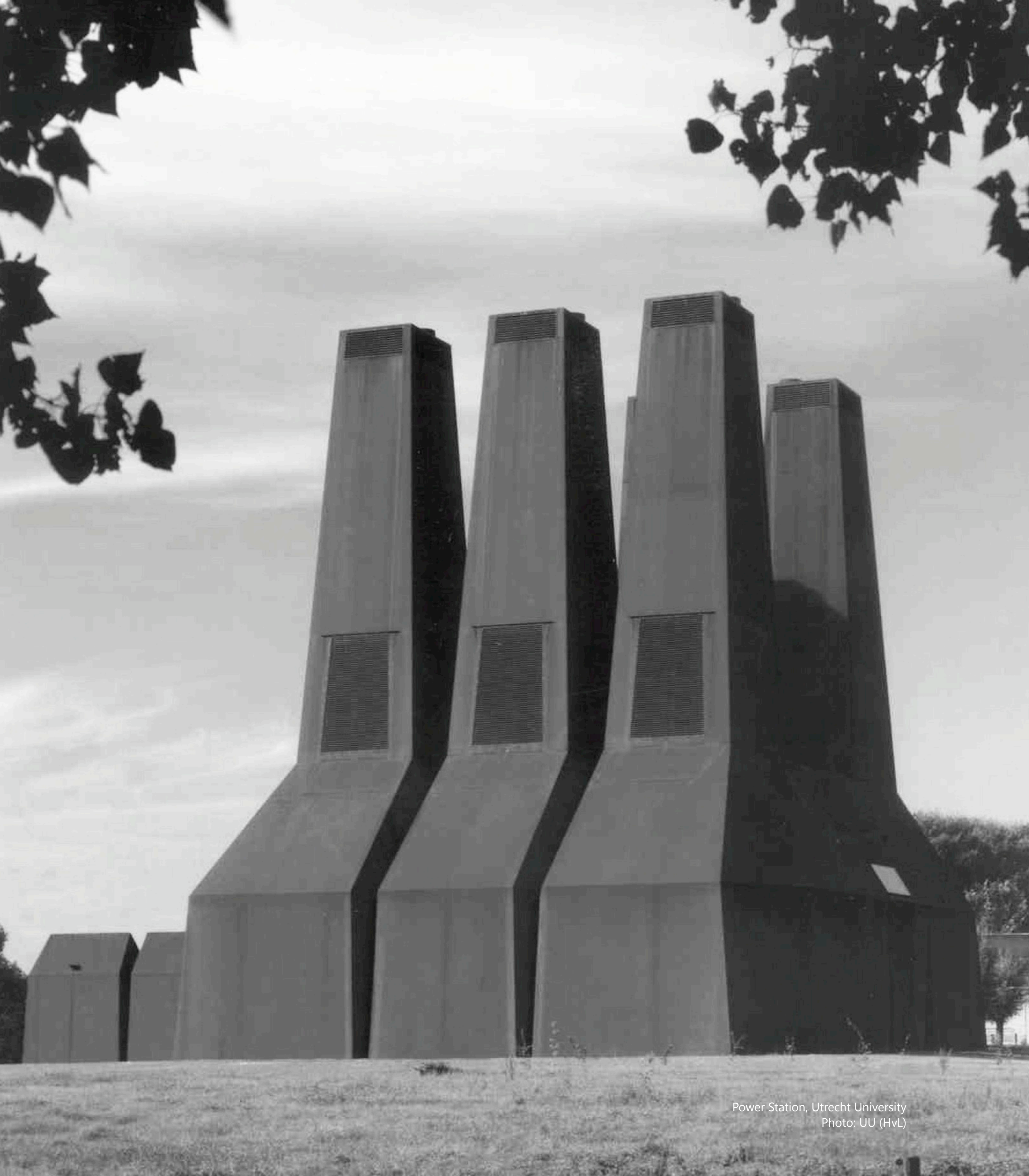


Power Station, Utrecht University
Photo: UU (HvL)

Preface

"If you think education is expensive, try ignorance". After this research I think this quote from Derek Bok, former Harvard University president (1971-1990), also applies to the campus. Managing the physical campus requires financial resources, but the campus can negatively affect all university goals if it is ignored. However, the limited public resources for universities force policy makers to choose between education, research – human resources – and physical resources. This is all the more reason to collect evidence-based management information about the added value of the campus for the university's performance.

After years of research on (management of) the Dutch university campus, this book summarizes the results of many applied studies and five years of more fundamental PhD research, adding international literature and new theories to the subject. This book is written about and for universities and the research has been supported and funded by universities – not just by my employer Delft University of Technology, but also by thirteen other Dutch universities.

This 'university-university' collaboration – the knowledge transfer between academic research and policy makers on campus – started with a project to analyse and compare Dutch campus strategies, supported by the campus managers of all fourteen Dutch universities and brought to our academic office in Delft by their chairman Frans Dekker. If he had not decided to come to us at TU Delft for the first project, this book would have been about public-private partnerships (PPP) in urban area development, which was the research subject I was considering at that time. However, this book "Managing the university campus" also includes the subject 'PPP in urban area development', with the knowledge city as an urban area, the campus being the defining part and universities, private parties and public authorities closely collaborating in this urban area development.

When I specialized in managing the university campus, I often switched perspectives: from being an academic to being a consultant to decision makers on the campus and campus facilities. From policy makers to controllers, from facilities managers to technical staff, from my academic colleagues to numerous students: they are all stakeholders in shaping the campus and they all require information to make the right decisions. Again, that reinforced the goal of this research – to provide the universities with management information – not only by identifying key performance indicators that are relevant, but also by providing the actual information with this book. Apart from the facts and figures in the main text, the appendices contain many references of campuses and projects.

While I thought my own added value to the subject had reached a peak when presenting the results of a comprehensive campus benchmark to representatives of all Dutch university boards of executives – in February 2008 – I could not have imagined what would come next. The fire burning down our own faculty building – on May 13, 2008 – subsequently illustrated what the loss of a building and workplace means to people, what challenges campus and facilities managers are facing and how creativity thrives on team work, leadership and chemistry between people. It also depended on expertise, supported with the required management information for the decision-making process that could not wait for anyone.

From my perspective – being part of the project team to relocate the faculty after the fire and being responsible for the brief – the opportunity to apply my insights about the campus of the future to our own faculty building, was an unprecedented challenge. Yet, it was another distraction from writing down all these insights in a scientific book, following the many articles and reports that I wrote for campus and facilities managers. However, finding my own colleagues and students a new home base was the greatest and most legitimate distraction of all. Practice what you preach never became more relevant. But still, the book had to be finished. And it finally is.

It has been a privilege to write a book about the campus, on that same campus, and to speak about university buildings in lecture halls of many university buildings. As an assistant professor at Delft University of Technology, researching the university campus meant researching my own working environment and my former learning environment.

While I spent much time writing at home – and mostly after office hours – my inspiration came from physical contact with students, colleagues and many visitors on campus. I cherish the serendipity, but in some stages of research processes it can distract you with the temptation of an infinite number of alternative paths and activities. I strongly believe that the physical campus will never disappear as a meeting place that facilitates social and intellectual exchange for an international community that needs a 'home away from home'. I am not so sure that the physical book will stay. To make sure this book will last – having lost a paper archive once before – I published a physical book and an eBook.

I will end this preface with my credo for the campus of the future: 'to share or not to be'. It also seems to be applicable for the university of the future and for management information, including this book. I hope this book will also contribute to knowledge exchange about campus management – in theory and practice – in an international university network.

Alexandra den Heijer
March 2011

Management summary

Chapter 1. Introduction, research questions and methodology

Ever since Dutch universities became owners of their real estate and became responsible for their own accommodation – in 1995 – campus management has become more complex and challenging, with many more stakeholders, opportunities and threats to consider. Decreasing public involvement and funding for universities puts pressure on the internal allocation of resources, weighing investments in real estate and other facilities against investments in human resources on university and faculty level. Added value of campus decisions is compared with the added value of investing in more faculty members, more students or new research programmes. This urges the need for evidence-based management information to support campus decision-making.

At the same time the university's portfolio of buildings is aging, both technically and functionally, and in need of reinvestment, while many developments cause more uncertainty in future space demand. On top of that, various stakeholders within the university make higher demands upon the added value of the campus for the performance of the university.

As a consequence Dutch campus managers have indicated that they need (better) information and tools to support their management tasks and to inform, involve or convince the various stakeholders, such as policy makers, users, controllers and technical managers. These stakeholders represent the strategic goals, the user demands, the resources and the physical aspects of the campus. Prior research shows that Dutch campus managers lack the information and tools to consider the interests of these stakeholders in a proper way or to confront them with the consequences of their proposed decisions for other stakeholder's interests or the university's overall performance. The required management information and tools should support an integrated approach to managing the current campus and accommodating the university of the future.

The problem statement above contains three assumptions, which will be elaborated and reflected upon throughout this dissertation:

- Campus management is more successful when a campus planner considers all stakeholder perspectives in the management process –covering the strategic goals, the user demands, the resources and the physical aspects of the campus– weighing benefits and costs in the broadest sense. This is referred to as 'an integrated approach to managing the campus'.
- Confronting stakeholders with the consequences of their (proposed) decisions leads to more conscious choices and improves campus management.
- Management information contributes to 'an integrated approach' and 'more conscious choices', acknowledging 'bounded rationality' (Simon 1997) and still allowing intuition and emotion in the decision-making process.

Derived from the problem statement this research has the following main research question:

"How can universities improve strategic campus management, adding value to the university's performance, conducting which management tasks and using what information and tools?". The research objective is to provide universities with a conceptual model and information – through data and tools – to improve campus management.

This research consists of three parts: (A) background information and applied theories, (B) data collection and analysis and (C) information, tools and strategies. These three parts answer eleven research questions. Figure i shows the complete research structure, containing part A, B and C and with numbers and titles that match the chapters.

Research questions have been answered by applying various research methods and techniques: literature review, web search and document analysis with an international scope and interviews, questionnaires and workshops with Dutch campus managers. The research process of the past ten years contained several research projects that have been initiated, discussed, co-financed and evaluated by the Dutch universities. This dissertation adds more literature review and merged the findings in various conceptual models and tools to support campus management.

Case descriptions, case study analysis, benchmark studies, interviews, surveys and participatory observation have been used to describe, explore and explain (developments of) the campus and campus management. During the first few years (2000-2002) the focus was on descriptive research. For the benchmark studies (2004-2010) the focus shifted to explanatory research, finding explanations of differences between universities and delivering input for strategic decision-making.

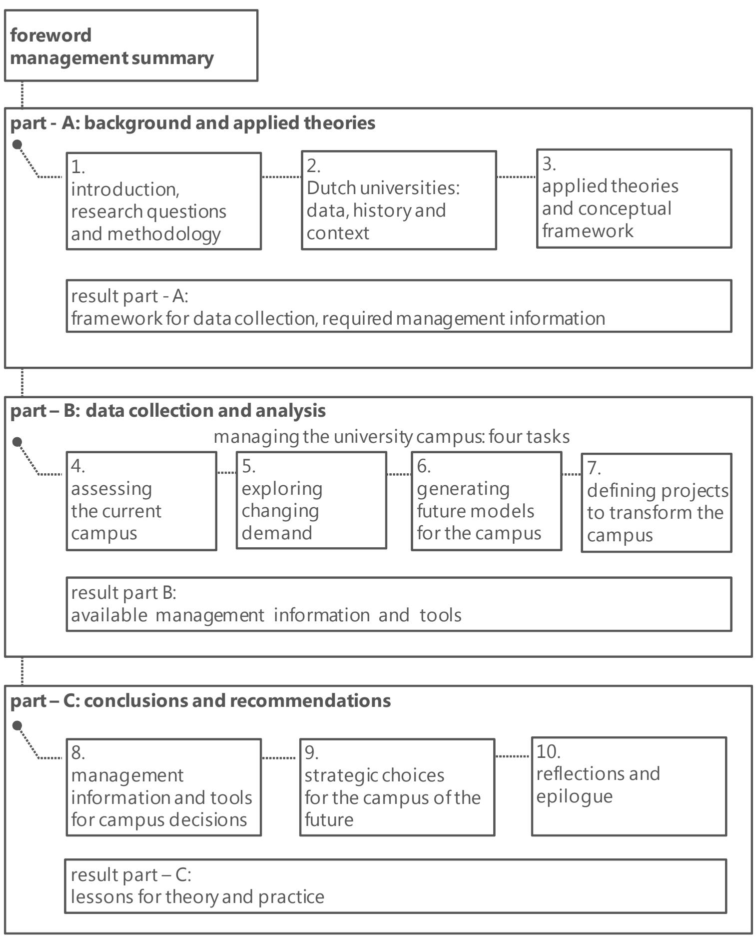


figure i: research structure, including the chapter numbers of this dissertation

PART A "Background and applied theories"

A1. What definitions are used for the most important terms in this research?

In this research university refers to academic institutions for higher education and research. The focus on Dutch universities involves the fourteen publicly funded Dutch academic institutions for research and education. The term university campus refers to all land and buildings, used for university or university-related functions, either rented or owned by the university, not necessarily on one location. Campus management is defined as the process of matching the university campus with the changing context and various stakeholder's demands, adding value to the university's performance. Consequently, a campus manager – estate manager in the UK, campus planner in the USA – is responsible for achieving this goal. Campus managers are the target group of the practical output of this research. Researchers on corporate real estate management can benefit from the theoretical insights.

Chapter 2. "Dutch universities: data, history and context"

A2. What background information about the historical and current context of (Dutch) universities is relevant?

With about 4,5 million m2 gross floor area and substantial land positions in urban areas Dutch campus managers have to deal with many opportunities and threats in accommodating the university – now and in the future – considering the strengths and weaknesses of the current campus. Considered as strengths are the universities' land positions on key locations and their cultural heritage, despite the relatively high maintenance costs of heritage buildings. The most important weakness is the technical condition of the university campus: a large percentage of the buildings dates from the fifties, sixties and seventies and requires refurbishment or replacement.

Both the flexibility between space types and the relatively short distances at the Dutch campus – and between the campus and the city – are opportunities to share more space on campus, with internal and external partners. However, the culture of individual or private territory can be an obstacle in achieving the goal to reduce floor area or total costs of accommodation by sharing space. Even though the occupancy and frequency rates show inefficient space use.

The historically tight connection between the city and the university has renewed opportunities, now that many Dutch university cities have surrounded – previously peripheral - university campuses and because some universities still own inner-city heritage buildings of at least a hundred years. This contributes to the goals to create the so-called 'univer-cities' as future models, both to support knowledge economy goals and to (re)develop lively cities and campuses.

Many of the strengths, weaknesses, opportunities and threats for Dutch universities are also applicable to international universities and other organisations than universities.

Chapter 3 "Applied theories and conceptual framework"

A3. What theories apply to managing the university campus, in general and focussing on generating management information for campus decisions?

A4. How can these theories be integrated in a conceptual framework?

This PhD research is part of the research programme Real Estate Management and - more specifically – Public & Corporate Real Estate Management (abbreviated as PREM and CREM). Therefore this research will partly build on existing theories. Core of this chapter are characteristics of current theories and how they are applicable to managing the university campus. This includes (a) theories on the relationship between real estate interventions and performance of (groups of) individuals, organisations and society as a whole; (b) theories on corporate and public real estate management (CREM and PREM), applied to campus management and (c) theories on generating management information. This literature review led to the following insights that will be used for data collection and analysis.

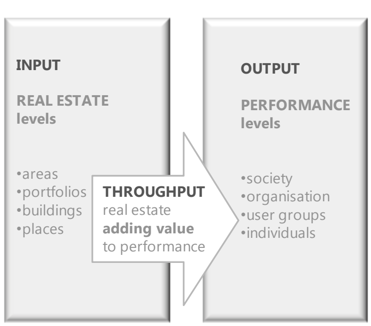
1. Theories on real estate management are based on the assumption that real estate – in quality and quantity, at different levels – influences the performance of individuals, organisations and society as a whole (see figure ii).

2. Real estate management focuses on:
   a. measuring that influence ex post (collecting data and creating references for the future)
   b. steering that influence ex ante (making decisions based on management information).

3. Managing real estate is a decision-making process:
   a. considering all stakeholders that are involved;
   b. in either supplying real estate (technical managers, controllers) or demanding real estate (users, policy makers);
   c. from strategic to operational level.

Figure iii summarizes this multi-stakeholder approach in the basic framework for CREM, with CREM perspectives and CREM variables, applied to campus management.

4. Managing is a process that can be defined as four steps to:
   a. assess the current situation;
   b. explore developments, changing demand, possible problems and challenges of the future;
   c. generate possible solutions for the future;
   d. define the road from current to future, the strategy.



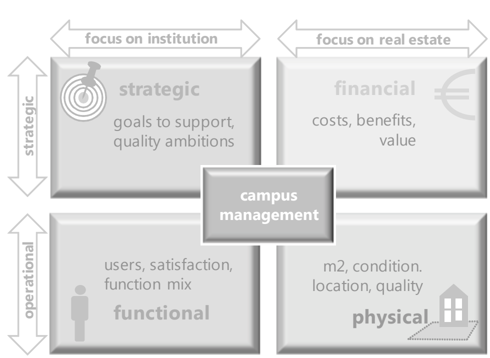


figure ii (left): basis of real estate management: real estate adding value, positively or negatively, to performance

figure iii: CREM perspectives on managing the campus: strategic, financial, functional and physical, with matching CREM variables

5. These steps are also referred to as four 'tasks' to manage real estate. Applied to the campus, this provides the following management tasks in the decision-making process (see figure iv for relations between tasks):
(1) assessing the current campus;
(2) exploring changing demand;
(3) generating future models for the campus;
(4) defining projects to transform the campus.

6. Decision makers in this process need supporting information for the various management tasks, focussing on the four stakeholder perspectives: strategic, financial, functional and physical and relating to key performance indicators (KPIs).

PART B "Data collection and analysis"

Generating more management information from four stakeholder perspectives was the overall goal of collective research projects of the last five years (2005-2010). The results in part B show that progress has already been made in using collective campus data to generate management information for individual universities.

In this part of the research the main research question is answered, focussing on both the management tasks and required management information to improve campus management. Combining the four management tasks with the research questions about management information (a,b,c) the following questions are the core of this research.

B. What management information is (a) required and (b) available and (c) what is the demand for additional information for:

B1 - assessing the current campus (task 1, chapter 4)?
B2 - exploring changing demand (task 2, chapter 5)?
B3 - generating future models for the campus (task 3, chapter 6)?
B4 - defining projects to transform the campus (task 4, chapter 7)?

Per chapter the information demand of each management task is described, illustrated with examples of available information – from the past to the present, to learn from for the future.

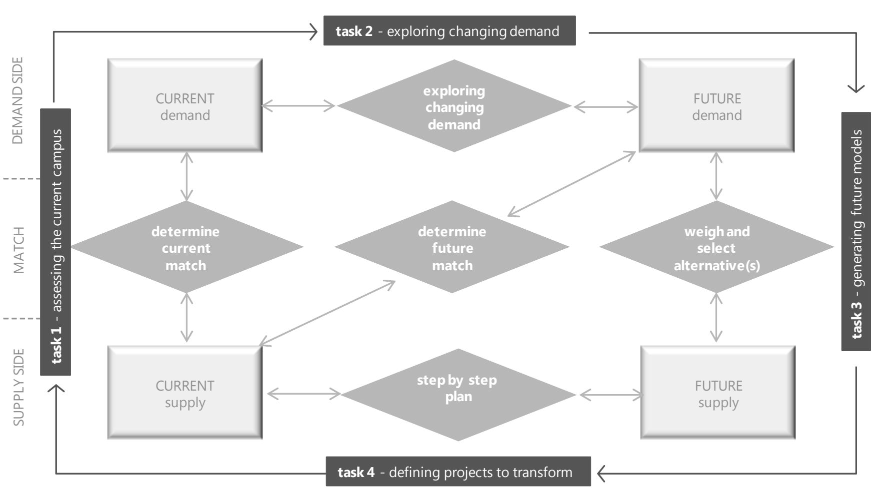


figure iv: four tasks of real estate management, applied to the campus: (1) assessing the current campus, (2) exploring changing demand, (3) generating future models and (4) defining projects to transform the campus

Chapter 4 "Assessing the current campus"

B1. What management information is (a) required and (b) available and (c) what is the demand for additional information for assessing the current campus (task 1)?

The essence of 'assessing the current campus' is to generate information about the (mis)match between 'what we have' and 'what we need or should have' currently. As introduced in the conceptual framework, this assessment can be made from four different stakeholder perspectives, covering physical, functional, financial and strategic aspects from inside and outside the university.

In the past ten years much has been done to develop (collective) tools to assess the current Dutch campus. In that process of generating management information, the cycle of 'what information do we need' and 'what information do we have' has been followed a few times, with increasing insights on the required information and what still remains to be collected.

(a) required information

Campus managers acknowledge that (a) management information should cover all stakeholder perspectives – combining multiple variables – and (b) should be collected in a format that makes comparisons between universities possible. Universities are looking for references of peer organisations for campus decisions: how many m2 per user do they have, how many euros per m2 do they spend and what goals do they want to support or what 'added values' and quality levels do they want to achieve?

(b) available information – by collecting data and applying tools

To supply the required information, a campus database has been designed and filled with data of the fourteen Dutch universities, for physical, functional, financial and strategic variables. Chapter 4 shows both the format of this database and some results, comparing different campuses on these variables. The campus database allows many queries and comparisons with similar institutions on space use and accommodation costs.

(c) demand for additional information

Even though all CREM stakeholder perspectives and variables are covered in the campus database to support assessment of the current campus, there is still much to improve in the objectivity of measuring added value, especially when this exceeds improving health and safety or efficiency goals and concerns the effectiveness goals. There is a demand for additional data on occupancy and frequency rates, user satisfaction, key performance indicators on sustainability issues and any references on the effectiveness of certain campus models or campus decisions – in terms of costs and benefits for the university. Even though many universities collect some of these data on an individual basis, there is a strong need to be able to compare these data.

For user satisfaction there is a demand for tools that do not only measure user satisfaction in absolute terms, but also relatively – asking the users to choose between different situations to specify their preferences. Campus managers confirm the importance of assessing user satisfaction, but do point out that it is also important to confront these users with the costs of their demands. This also introduces the requirement to confront each of the four stakeholders with the consequences of their needs or demands, which is especially relevant for the next management tasks "exploring changing demand" and "generating future models".

Chapter 5 "Exploring changing demand"

B2. What management information is (a) required and (b) available and (c) what is the demand for additional information for exploring changing demand (task 2)?

The essence of 'exploring the changing context and demand" is to generate information about how relevant developments influence the campus and campus management. This can be made operational by identifying trends and developments that affect organisational, financial, functional and technical or physical requirements.

(a) required information

Eventually, this task should lead to a list of programmatic requirements (demand) that can be compared or matched with the current campus (supply) to determine both the current and future match. In any case, the campus manager needs a quantitative basis to specify the future demand: (functionally) the number of users and their required mix of functions for their activities, (strategically) the required quality derived from strategic goals, (financially) the available resources and (physically) the calculated space demand, either in floor area or in capacity for different types of functions, like laboratories, lecture halls, libraries etc.

Many references on forecasting and scenarios state that planning for change is about dealing with uncertainty and requires flexibility of both the organisation and the physical environment. Therefore it is also important to find tools that engage the stakeholders in this ongoing process and in a strategic vision that is bound to change. Stakeholders need to be informed about the multi-actor complexity of campus management and the perspectives that need to be weighed.

To make an accurate estimation of future demand and required future supply, it is most important to find a way to go through this process with all stakeholders that are potentially involved with this transition. Therefore it is essential to express all developments and trends in the context of higher education and research in variables that compose the key performance indicators of these stakeholders.

(b) available information – by collecting data and applying tools

Many studies and reports explore trends and scenarios for the university of the future, but these rarely contain numbers or quantitative (ranges of) consequences. Still, campus managers do need actual data to build, maintain, sell, buy, renovate or demolish parts of the campus. As a consequence, the lack of actual data on these trends and developments makes campus managers fall back on extrapolation of current student numbers, plus or minus some percentage to calculate future space demand. They often use space demand models that contain outdated space standards, based on the campus of the past.

Exploring changing demand shows that many trends and developments primarily influence one CREM variable. But due to the fact that CREM variables are interconnected, the change in one CREM variable will have potential consequences for the others. How these other CREM variables will change, is usually dependent on strategic choices of the university's policy makers and campus managers. For example, if public funding is decreasing, the university can (a) spend fewer resources on the campus and reduce m2 or (b) share facilities with external users, collect rent and spend more on the campus to attract more students and employees. These are just two possible strategies as a response to one development (decreasing public funding) influencing one CREM variable (the available resources). In practice, campus managers take many different decisions based on the same trend or development.

(c) demand for additional information

The demand for references – how do other universities anticipate on this trend – is confirmed by all Dutch campus managers. They are very much interested in each other's strategies and the results: the future campus, which is subject of the next management task.

Chapter 6 "Generating future models for the campus"

B3. What management information is (a) required and (b) available and (c) what is the demand for additional information for generating future models for the campus (task 3)?

The essence of the management task 'generating future models for the campus' is finding a match between future demand and future supply, on different scales. On the supply side this includes future models for the (knowledge) city, the campus, the building and the places or functions within a building, like the workplace, lecture halls and libraries. On the demand side these models align with the changing goals and demands of the municipality, university, faculty and individual users on campus: students and (academic) staff members. For instance: physical models for the campus of the future should match organisational models for the university of the future.

(a) required information

In expressing demands for future models each stakeholder should be confronted with the consequences of his requirements and choices. Two examples: (1) policy makers should be confronted with the functional, financial and physical consequences of their (changed) policy on education or research, beforehand, and (2) users should be confronted with the costs of their demand, possibly by giving alternative options to spend a similar amount of resources – in salaries, lower tuition fees or extra facilities on the workplace. The goal is to generate alternative models that can be compared.

While the main focus of this research is the physical university campus with its buildings, this management task "generating future models" will zoom out to the knowledge city and zoom in to the different functions within the university buildings. Consequently, required management information focuses on all of these levels: (I) models for the university and campus of the future, (II) future models connecting the city and the campus and (III) future models connecting the buildings and the places or functions. Preferably, future models are expressed in terms of floor area, space use, underlying organisational goals and effect on financial resources, covering the four CREM perspectives.

(b) available information – by collecting data and applying tools

Over the years many models have reflected the campus of the future. Scenarios for the future of higher education are the fundaments of all university and campus models. Four different scenarios are available, illustrating four different contexts for the university of the future. These are the basis for university models like the network university, the classical or traditional university, the university college, the community college – with a regional focus – and the virtual university. Future campus models are linked to these university models and expressed in CREM variables.

The campus-city models show that, dependent on the urban setting of the campus, supplying and managing the required university functions is not necessarily a management task of the university. In practice collaboration with the municipality and regional and local parties is already quite common, especially on shared responsibility for residential, retail & leisure and related business functions.

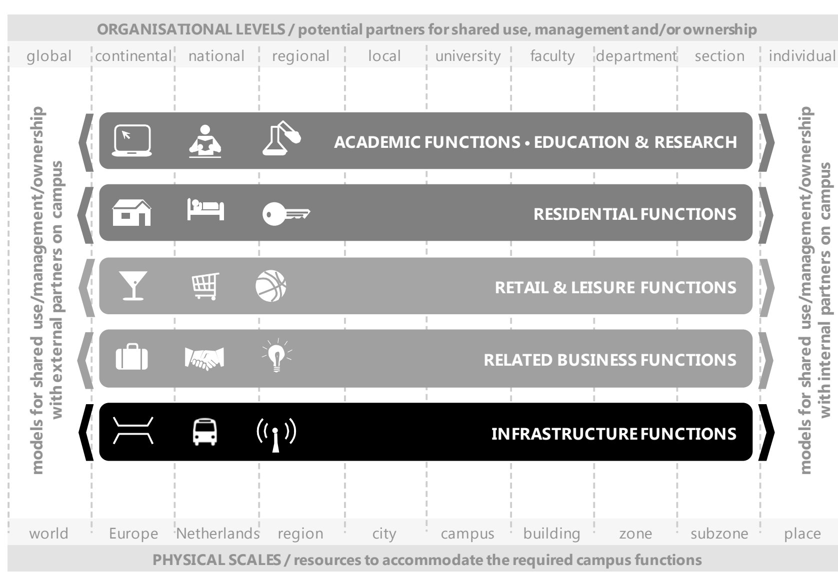
Considerations to share facilities not only take place between campus and city level, they also are increasingly relevant between campus and building level. Even within buildings future workplace models for academic offices or studio space for students reconsider the division between individual and group level: what is individual territory and what can (or should) be shared with other sections and departments? Potential partners can be found for shared use, shared management or shared ownership of the required campus functions (see figure v). However, apart from the increasing availability of future models as tools, they need to be expressed in measurable and comparable variables to support decisions of campus managers on any of these models.

(c) demand for additional information

Future models can already be found in current practice. Analyzing new concepts and recent projects on uniform variables is essential and recommended – to learn from successful concepts and to prevent copying less successful concepts. Future models should be explicit on all CREM variables - floor area, number of users per m2, resources and goals to support. Ultimately, the management information on each of these models should answer the following questions:

- What do policy makers want to achieve with this model, aligning with the university strategy (goals, achieved by adding value)?
- For how many and what types of students and employees, also considering users of related organisations and visitors (users)?

figure v: an important step of composing future models is to determine what to share – in use, management and/or ownership – on which organisational level and on which physical scale



- For what percentage of the university's financial resources (euros)?
- With which types of concepts (users per m^2 per function)?
- With what quality level (also expressed in required investment level, in euro per m^2)?

Paradoxically, the next management task – defining projects by analyzing projects from the recent past – will supply answers to many of these questions about the future, which confirms that the future campus is shaped by looking at the future as well as learning from the past.

Chapter 7 "Defining projects to transform the campus"

B4. What management information is (a) required and (b) available and (c) what is the demand for additional information for defining projects to transform the campus (task 4)?

The fourth task of campus management is defining projects to transform the current campus into the future campus. In theory and ideally, this requires information about both the current campus and the future campus in the same CREM variables.

(a) required information

When defining a new project campus managers are often required to specify the project in terms of input and output: how many resources are involved and how does it contribute to the university's performance indicators? This is also referred to as 'making a business case' of a campus decision. This requires a specified input in CREM variables, also to be able to compare data and generate management information with other universities. However, it is equally important to be explicit about the presumed contribution to the university's performance (ex ante) and to evaluate decisions in time (ex post). Preferably, analysing many comparable projects would generate new standards for investment level and space use, related to different goals and ambitions. Connecting investment levels to quality ambitions and space standards to specific concepts for education and research can help campus managers to choose the most suitable references to define their projects.

(b) available information – by collecting data and applying tools

Since 2005 Dutch campus managers supplied data for a project database. Anno 2010 the database contained thirty-nine projects of all types (appendix II). The resulting database of campus projects is a source of management information, not just by comparing the data of similar projects, but also by assessing the space use of all buildings combining office and education space or the investment level of all new laboratories. The available information generates references for future models on different building and space types.

(c) demand for additional information

The enthusiasm about the applicability of the database as management information for campus decisions has led to periodically adding new projects to the database, preferably on current trends like implementing sustainable concepts and new concepts for the academic workplace. The new inventory of projects is scheduled in 2011. With more projects, more management information can be generated on new space standards, new concepts and better sense of current replacement costs of the campus buildings, derived from the range of investment levels related to project types and quality levels.

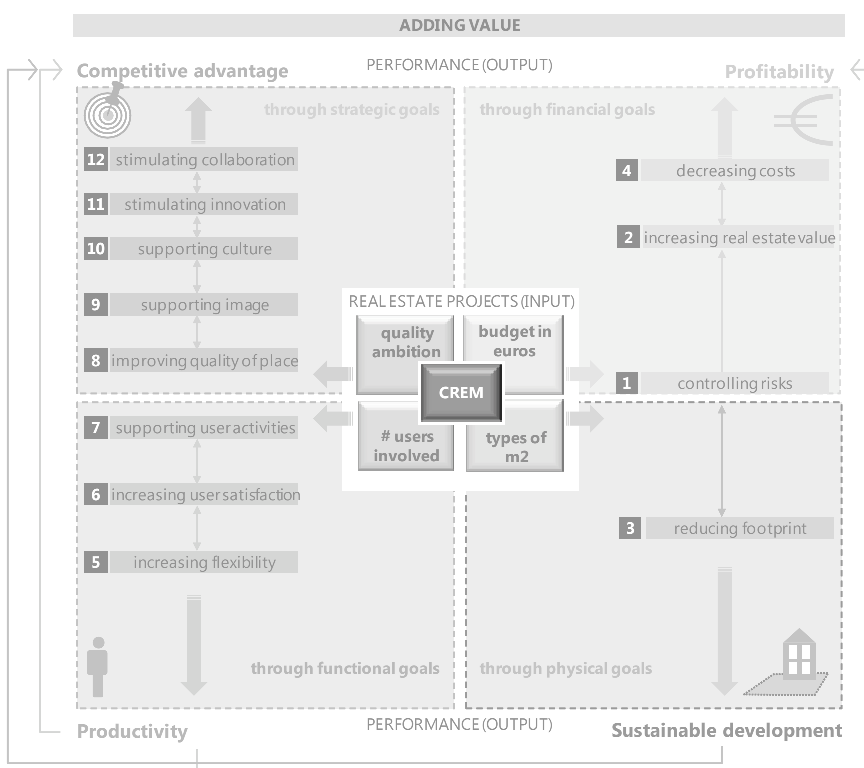
Apart from assessing new projects on current trends, campus managers plead for adding evaluations to the projects that are already in the database, in order to find answers to the following questions: in which degree have the goals been achieved, to which extent is the building used as planned, how satisfied are policy makers about the effectiveness and efficiency of new concepts and how satisfied are the users? The process of adding value, as illustrated in figure vi, can be used as a tool to define a project, making a business case that compares the input with the presumed output. The arrows in the throughput can be different for each project.

Conclusions of PART B

The process of campus management covers all four tasks that were described in the four chapters of part B, even though it does not necessarily start with task 1 "assessing the current campus". In practice, many processes start with task 4 "defining projects": a faculty needs more space, a new laboratory is needed to keep up with international research challenges or a building is in bad condition and needs to be refurbished or renovated. However, most campus managers acknowledge that these projects should be assessed in terms of changing future demand (task 2) and new visions on the campus (task 3). Defining projects also means assessing them on their contribution to the future campus model.

Starting the campus management process with task 4 "defining projects to transform the campus" is therefore followed by generating information about the current campus (task 1), changing demand (task 2) and models of the future campus (task 3) in the same CREM variables. This also emphasizes the cyclical character of the management process.

figure vi: defining campus projects (ex ante) and evaluating past campus decisions (ex post), using the process of adding value – connecting real estate decisions (input) through real estate goals to performance criteria (output)



PART C Overall "Conclusions and recommendations"

The last two research questions explore whether the insights from part B can add to new theories, management information, tools and strategies for campus management and as far as these insights can be generalized to real estate management in general.

Chapter 8 "Management information and tools for campus decisions"

C1. What insights from practice can be added to theory on campus management?

Dutch campus management in practice identified – and ranked – the types of decisions and their presumed added value on the performance of the university. Insights on both the performance criteria and the ways of adding value are merged into an improved model as shown in figure vi.

Improved models for adding value to performance

Adding to previous research the hierarchy of adding value is connected to the different stakeholders – indicated in figure vi with the matching colours of the CREM stakeholders – and linked to the four main performance criteria of a university: profitability, productivity, competitive advantage and sustainable development. The latter was added because of the explicit sustainability (CO_2 emission) goals that the collective universities agreed upon.

While neither the performance criteria nor the ways of adding value are university-specific, this improved model for adding value to performance could also be applied to other organisations. However, these organisations might give different rankings to the performance criteria, giving for instance profitability a higher priority than sustainable development or the other way around.

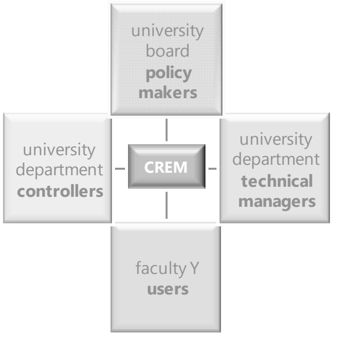
In figure vi the process of adding value is demonstrated in terms of input, throughput and output. This figure shows that real estate decisions connect to performance criteria through real estate goals that are connected to different stakeholders. This is a tool to use, either before taking a real estate decision to make a business case (ex ante) or after implementing a real estate decision (ex post) to make a post-occupancy evaluation.

CREM model with multi-layer stakeholders

Analysing the fourteen Dutch university cases showed that the CREM model with the four stakeholders has multiple layers: the original one that identifies policy makers, controllers, users and technical managers on university level, one on faculty or school level and one on comparable stakeholders outside the university. The general types of stakeholders in the CREM model imply that this multi-layer character is not an exception to the rule and can therefore be added to CREM theory. Figure viii (on page 24) shows the layers of stakeholders that are relevant to campus management, derived from literature and international practice and acknowledged by the Dutch campus managers.

The goal to generate management information of all four stakeholder perspectives for campus decisions, can either be projected on tools like the databases and conceptual models or on the organisational form that is required to support a campus decision. Consequently every project team needs representatives with (mandates of) all CREM stakeholders. With complex campus projects that involve multiple actors, this project team (see figure vii) can also have different layers. These project teams can be active in all tasks of campus management: assessing the current campus (from different perspectives), exploring changing demand (brainstorming about the demands of the university of the future), generating different campus models and defining projects.

figure vii: the input from four stakeholder perspectives is not only favourable for management information, but also for representatives within project teams, on all levels of campus decisions



The insights from practice for campus management can be summarized by the following statements, reflecting on the assumptions:

- Campus management requires a multi-stakeholder approach, confirming assumption 1
- 'Multi-stakeholder information' could improve campus management by contributing to more conscious campus decisions, confirming assumptions 2 and 3
- This research provides universities with models and information that can deal with the complexity and support the multi-stakeholder approach.

Following these assumptions, the following conclusions can be drawn:

1. The campus management process can be organised in four main tasks: (1) assessing the current campus, (2) exploring changing demand, (3) generating future models and (4) defining projects to transform the campus.
2. The four tasks of the campus management process represent a cycle, to use both as a planning cycle (ex ante) and as an evaluation cycle (ex post).
3. Most KPIs require evidence-based knowledge (management information) about the added value of new functional concepts and campus models.

Answering the following research question outlines the findings about the required management information for campus decision.

C2. What information - supplied by databases and tools – can support campus management in the Netherlands and elsewhere?

The performance criteria profitability, productivity, competitive advantage and sustainable development can be transformed into key performance indicators and relevant variables to collect. Figure viii gives a summary of the required information, linked to campus management. This management information is the basis for tools and databases, like the campus database in Appendix I and the campus project database in Appendix II. Even though the management information in figure viii is applied to the campus, further research should explore to what extent the stakeholder perspectives and performance criteria can be applied to real estate management in general. Findings from practice about generating management are listed below:

4. Most required management information focuses on the relation between real estate decisions (input) and performance (output), operationalising 'adding value'
5. The model to assess the added value of real estate decisions can be used ex ante, to make business cases of proposed projects or ex post, to evaluate projects
6. Real estate goals in the adding value model can be connected to four CREM perspectives and related performance criteria
7. Campus management includes multiple levels (city, campus, building) affecting many stakeholders inside and outside the university and their performance criteria
8. Campus management information should connect the input variables of four CREM perspectives and the key performance indicators of four different output criteria on levels within and outside the university.
9. Campus management theory provides key performance indicators based on a sound set of definitions for benchmarking universities.

10. It is useful to collect and share management information in a (larger) network of universities, because many professional networks of campus managers have tested systems to benchmark campus management.

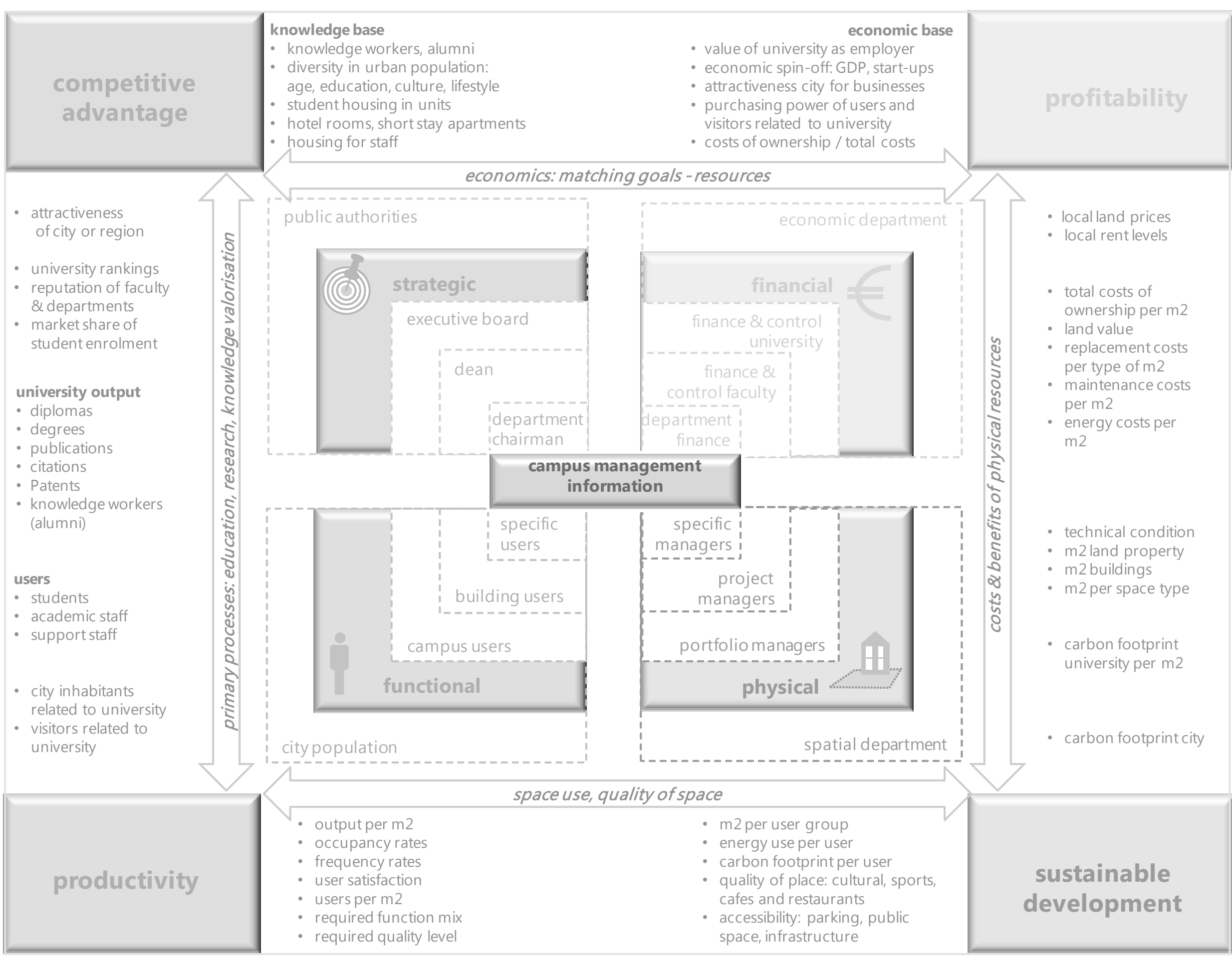
Chapter 9 "Strategic choices for the campus of the future"

C3. What strategic choices are universities faced with for the campus of the future?

Finally, the strategic choices that universities are faced with have been derived from twelve trends on the current campus, in the strategies, future models and international literature.

- Less space for individual territory and more space to share.
- Trade quantity for quality – towards less floor area, more intensively used, with more quality.
- Place independency – caused by ICT developments – allows students and employees to study and work at the most meaningful places - the best place to work.
- New life for old, heritage buildings – revaluing the old instead of creating the new, also linked to sustainability goals and the trade of quantity for quality of space.
- Reducing the footprint on campus – setting the example for a new generation.

figure viii: key performance indicators (KPIs) for campus management, summarized and linked to four performance criteria and CREM perspectives



- The campus is (becoming) a city:
  - strategically: the campus has become a market place in knowledge;
  - financially: the campus should have a higher floor productivity (more users, output per m^2);
  - physically: less private space (individual territory) and more public space (for everyone);
  - functionally: less mono-functional and more multi-functional space (to intensify space use).
- The campus is used for branding of the university.
- Partners institutions in higher education and related businesses are willing to share space use, management tasks and ownership, also caused by less favourable economic circumstances.
- Available (student) housing has become vital for the competitive advantage of university.
- Related businesses are increasingly important for the valorisation, innovation and employability.
- Retail & leisure will safeguard quality of life, as a vital foundation for a successful knowledge city.
- Infrastructure is connecting all functions and becomes increasingly important, this includes accessibility and parking.

In line with the four stakeholders approach of campus management, the strategic choices represent campus decisions that consider the combined effect on university performance criteria: competitive advantage, profitability, productivity and sustainability goals. Some of these strategic choices involve the whole campus, some are related to specific building types or required functions. The strategic choices are posed as questions, using "we" to emphasize the collective nature of the decision-making process for the campus of the future.

All choices are interrelated: the condition of buildings and ecological footprint – both technical aspects – are linked to the university goals, the support of users is linked to the percentage of university resources spent on the campus. Ultimately, the cases on both project and campus level are the basis of making these interrelated variables more explicit and measurable. The reference databases in the appendices (campuses in I, projects in II) show many examples that can be used as management information to support these strategic decisions.

However, for every strategic choice or campus decision it is important to make a business case, to be explicit about both the benefits and the costs, using the key performance indicators (KPIs) to determine the affect on the university's performance (see chapter 8) and collectively considering if the benefits justify the costs. Finally, all recommendations are summarized, based on this research.

1. Choose a selection of the basic university models (A-B-C-D) characterised by competition versus collaboration, exclusive versus shared use, large versus small, open versus closed and physical or virtual – or combine these models for different parts of the university
2. Develop and manage the campus as a city – in close collaboration with the urban authorities.
3. Express university values in private and public space – to inspire and build a community.
4. Reconsider the old buildings before considering new and and intensify the use of meaningful buildings by increasing productivity to cover the costs.

5. Reduce the footprint in favour of quality, scarce resources and sustainable development

Consider partnerships for shared use, ownership or management of the campus of the future:

6. for academic functions (education and research) and their supporting functions;
7. related business functions: incubators, services for the university on business and science parks;
8. residential functions, like student housing, short-stay facilities and hotels for (international) students and professors;
9. retail & leisure functions – restaurants, (espresso) bars, sports and cultural facilities;
10. and infrastructure functions, like public transport and accessibility with cars, including parking.

Answering the main research question

Main research question: How can universities improve strategic campus management, adding value to the university's performance, conducting which management tasks and using what information and tools?

Research objective / intended result: Provide universities with a conceptual model and information – through data and tools – to improve campus management.

This research provided a range of conceptual models, tools and databases to support campus management by identifying and connecting:

- the four main management tasks of campus management: assessing the current campus, exploring changing demand, generating future models and defining projects to transform the campus;
- the four stakeholder perspectives that need to be identified and connected in campus decisions: strategic, functional, financial and physical and the matching variables: goals, users, euros and m^2;
- and the three relevant levels for campus decisions - campus in city, building on campus, function in building.

Management information is supplied for key performance indicators (KPIs) that are derived from the performance criteria productivity, profitability, competitive advantage and sustainable development, adding value to the university's current and future performance. Applying these frameworks to other public or private organisations that manage large real estate portfolios, could be subject of further research on managing real estate in general.

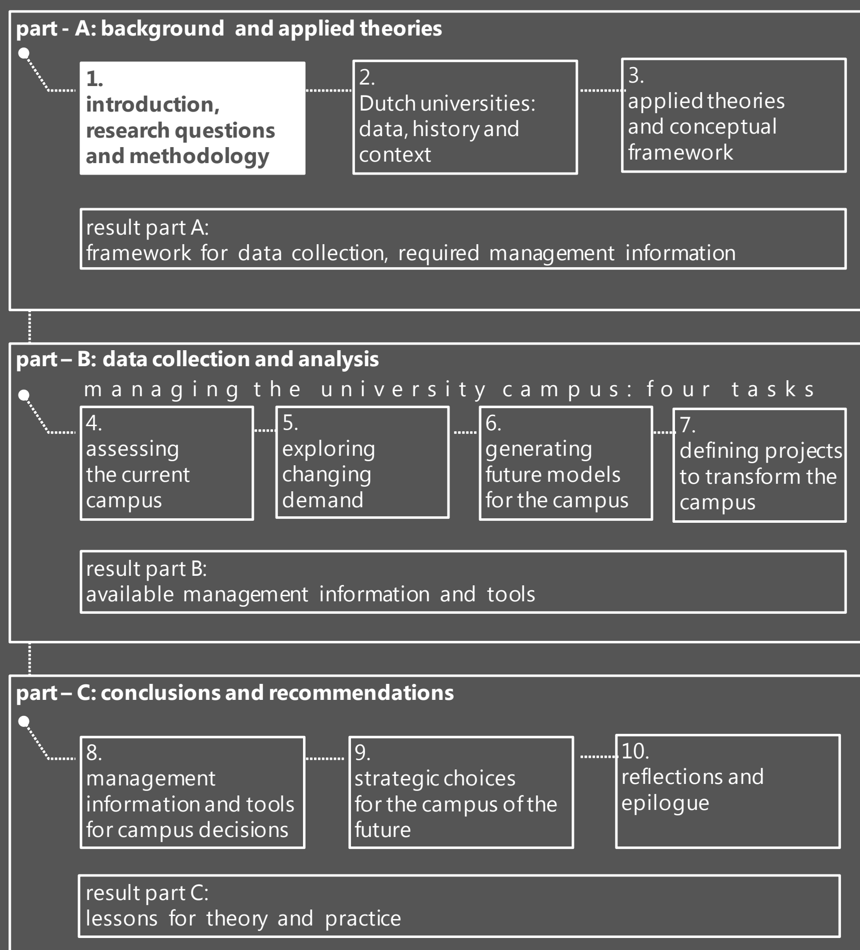
Further research on managing the campus could also focus on collecting more references of innovative adopting definitions, frameworks and tools, from other networks of universities, but also from other sectors with similar real estate portfolios or management issues. Not to generate more information, but to collect more reliable and comparable data that support campus decisions to accommodate the university of the future, starting today.

Photo: DUWO

Part A
background and applied theories


Photo: DUWO

Chapter 1
Introduction, research questions & methodology



1 Introduction, research questions and methodology

1.1 Reasons for this research

For a researcher on managing the physical environment it is tempting to start close to home or to work. In the late nineties, at Delft University of Technology (TU Delft), evolving theories on managing real estate needed more case studies to test hypotheses and feed evidence-based concepts (De Jonge 1994; Krumm 1999; Van Meel 2000). Driven by various developments the research group Real Estate Management at TU Delft started to shift from private to public real estate (Evers et al. 2002; Van der Schaaf 2002). Incorporating societal and institutional goals in real estate strategies – exceeding business economics and financial goals - was the next step on the research agenda. These are all good reasons to focus on educational facilities in general and universities specifically, matching with scientific goals that were set by the department of Real Estate & Housing. However, in this case, the research questions came from practice, which illustrates the societal relevance.

[1] Before that moment researchers of the department of Real Estate & Housing had already been involved in campus (research) projects for individual university campus managers, including from their own university.

Around the year 2000 the chairman of the association of Dutch campus managers (HOI) came to Delft University of Technology for the first collective research project on Dutch university campus management [1]. All fourteen publically financed Dutch universities joined forces and set the collective research agenda. At that time the universities had been owners of their campuses – both land and buildings – for five years, since 1995. Common issues of research interest were coping with uncertainty, needing more insight in costs and benefits and dealing with the demands of different stakeholders on the campus. The question was whether campus managers could learn from each other in the complicated process of managing their campuses.

Budget cuts, increasing costs and higher ambitions call for collective solutions

Anno 2010 universities have ambitious campus plans, acknowledging the strategic value of the campus for their institutional goals, but they have less and less resources available for the university and – consequently – the campus. As a result there are two potential scenarios that contain threats: (scenario 1) the universities will postpone the necessary investments in their campuses; in time, satisfaction and productivity of students and academics will decrease – or worse – talented students and professors will choose for (other) universities with better facilities, both affecting the main goals of the university negatively and (scenario 2) the universities will invest in their campuses and the resulting substantially higher capital costs will cut the budget for education and research with similar consequences as scenario 1. To avoid both scenarios Dutch universities have joined forces to find innovative campus (management) solutions.

Source: “Economic risks of aging knowledge infrastructure”, April 2010.

That question is still very relevant. Probably even more relevant after almost fifteen years of relatively autonomous Dutch campus decisions – successful and less successful – within an increasingly dynamic context that brings more uncertainties and more stakeholder goals to meet than ever. Campus managers increasingly acknowledge that campus decisions can positively and negatively affect the organisational performance. Recent strategy documents show that institutional goals also include reducing the ecological footprint of the institution, supporting the university’s image with state-of-the-art facilities or attracting talented knowledge workers with a lively campus that is effectively connected to the qualities of the city and the regional network. Key words are ‘adding value’ to institutional goals and increasingly to goals that exceed the level of the university and concern the local, regional and national knowledge economy (Van den Berg et al. 2005; Den Heijer et al. 2006a), with a growing emphasis on universities and their campuses for their key role in the knowledge city. This brings threats and opportunities at the same time: campus decisions can also have a negative influence on all these goals: the risk of ‘adding negative value’. Text boxes in this section emphasize both opportunities and threats.

For both Dutch campus planners and researchers at Delft University of Technology the research questions were important enough to continue collaborating on this subject. This led to many reports on common issues, financed by and in full cooperation with all Dutch universities (De Jonge et al 2000, Den Heijer 2002a, 2002b, 2002c, Den Heijer and De Vries 2004, 2005, Den Heijer 2007a, 2007b). Theories on public and corporate real estate were applied and knowledge from (international) practice gradually added new knowledge to these theories. To make these empirical cycles more explicit, the results of all prior research projects on this subject were input for this PhD research project. This book is the final result of the PhD research process.

In the next section (1.2) the problem area is introduced, giving background information on this subject as a preview of the next chapters that will elaborate on all issues that are mentioned. In section 1.3 the problem statement, research goal and research questions are formulated. At the end of this section the research questions are linked to the chapters of this book, explaining the structure of this dissertation . In section 1.4 the choices for a research approach are made explicit, including the selected paradigms and the interpretation of results from former research . In section 1.5 definitions that are used for this research are summarized. Some definitions are elaborated in this section, others in the next chapter about theories on managing the university campus.

1.2 Problem area

This research started with full collaboration of Dutch universities and with an increasing availability of data on Dutch campus management. In the past fifteen years there have been many changes around the Dutch university campus. Developments within and outside the universities have changed qualitative and quantitative demand for space: different processes and goals require a different campus. At the same time a large part of the existing campus is aging: more than 50% of all Dutch campus buildings has been built in the sixties or seventies (Den Heijer 2007a). These and more buildings need reinvestment or at least reconsideration. Other research (Den Heijer 2007b) shows that the current replacement values are very high whereas the available resources for Dutch universities are decreasing. Policy makers are faced with decisions about either investing in education and research or in the improvement or replacement of aging buildings, weighing the added value of both investments to the institutional goals. That requires more insight in the added value of the campus for the university, evidence-based as much as possible.

Exploring literature by international researchers and browsing websites of networks of international universities provided a list of similar problems, challenges, trends and campus strategies. Campus managers all around the world are faced with similar developments as those in the Dutch situation, which makes the problem area certainly not typically Dutch. Publications of international organisations of campus managers mention similar threats and challenges (MITPO 1999; HIS-GmbH 2004; APPA/CfAR 2006; AUDE 2006; Norris and Poulton 2008; Akademiska_Hus 2010) and also link these challenges to national goals to stimulate the knowledge economy. In the United States for instance the threats for the campus and – consequently – the university were already described more than twenty years ago from an institutional perspective, in the report "The Decaying American Campus: A Ticking Time Bomb" (Rush and Johnson 1989).

Expanding the VU campus in Amsterdam

In the next decade the VU campus will be transformed to a place to meet for science, education and business. The ambitious plan includes an additional 250.000 m^2 gross floor area (gfa) for educational facilities, offices, housing and sports facilities. There is extra attention for (improving) the quality of public space and sustainability. The municipality of Amsterdam, the academic hospital and private parties will work together on realizing this campus vision. The transformation process will also be a challenge, while most of the existing buildings will be demolished or extensively renovated.

Based on VU campus vision and www.vu.nl, January 2010.
More information can be found in appendix I

Internationally, this subject concerns numerous higher education institutions (HEIs). With more than hundred million students in higher education institutions all over the world – a number that is rapidly increasing (OCW 2010a)– there is a vast amount of campuses, university buildings and workplaces to manage. OECD countries enrolled about 50 million students in 2006 (OECD 2009). Southeast Asian countries enroll another 16 million in 6.500 HEIs, while China adds 6 million students with over 2.000 universities and colleges. India has the third largest system of higher education in the world (SEAMEO 2009).

Sources monitoring the future of education (OECD 2008) confirm that 200 million students will attend higher education institutions worldwide in 2025. Especially numbers in China and India growing very fast. Globalisation trends show that many Asian students do – and will increasingly - apply abroad. The university campus will have to be flexible enough to accommodate a population that is less predictable in size and more diverse in character.

The importance of the campus for the university's performance – positively or negatively influencing production, attractiveness and competiveness in an international market for knowledge workers – is confirmed by networks of campus managers all over the world, by rapidly growing universities as well as universities that struggle with decline or quality issues (Wiewel and Perry 2008; Perry 2009).

need for management information: data and tools

Apparently, many campus managers around the world deal with the same issues. Some have more resources available to manage, others have inherited an even more aging campus with technical and functional problems. In many countries universities themselves own their properties, for instance the United States, United Kingdom, Ireland, Belgium and Norway. In some other countries they rent their buildings from a third party, mostly public or publicly owned, like in Sweden, Germany, Austria and Switzerland. In the Netherlands ownership of the campus was transferred from the national government to the Dutch universities in 1995. That transfer of ownership introduced both opportunities and threats, and many new tasks for Dutch campus managers. This research gave an opportunity to observe this process and provide this process with management information, with many feedback loops and in close collaboration with the Dutch campus planners in the last ten years.

Singapore – attracting talent by investing in state-of-the-art campuses integrated with the city

In many Asian cities universities are competing for the best professors and students, in global competition. An example is Singapore and its Management University that aims at growing more than 200% (from 2006) on their inner city campus. These universities even aim at offering not only the student a diploma at a highly ranked institution, they also offer housing and a job for the partners of talented professors and students.

They assume that the benefits for the regional and national knowledge economy will exceed the costs of these facilities and services by far. This type of university and campus strategy is a benchmark for ambitious universities anywhere else.

Based on www.smu.edu.sg and presentation John Worthington "Ivory towers or city quarters?" (Worthington 2009).

Focusing on the Netherlands, this research shows that – fifteen years after the transfer of ownership – Dutch campus management has been professionalized within every university, given the various perspectives they connect in their strategies – covering functional, technical, financial and organisational aspects – and the progressively available management information. There are many differences in their specific contexts but they share many common issues and they all have to take the interests of many stakeholders into account, both within and outside the university.

Prior research (Den Heijer and De Vries 2004b) showed that campus managers did not have the appropriate tools to analyze and integrate these stakeholder's interests in the decision making process or to make these stakeholders more aware of the consequences of their demands. The proposed solution – by campus managers – was to generate management information to communicate with each of these stakeholders. For instance, campus managers want to be able to discuss the financial implications of user demands or new educational concepts with deans and representatives of students and staff members. They also want to discuss the consequences of new laboratories or more effective use of office space with policy makers and controllers. But for all these debates and decisions they do require management information to be reliable and convincing: facts and figures to elaborate on the possible consequences of decisions ex ante, before they are taken.

Accordingly, management information should include the interests of various stakeholders and covering various levels of impact. The demand for (tools that supply) management information has been the basis of the research projects, which are components of this dissertation.

Summarizing, five developments are key topics of this PhD research:

- the deteriorating technical condition and functional state - and its impact on the universities' resources and institutional goals;
- the shift in responsibility and stakeholders' interests to include in campus decisions, including stakeholders outside the university and societal goals, like reducing the ecological footprint;
- the increasingly complex context, uncertainty and changing demand;
- the role of the university in the knowledge economy and – physically - the (potential) role of the campus in the city or region;
- the lack of management information and tools that consider the interests of various stakeholders and cover different levels of impact when preparing campus decisions.

The next chapters will elaborate on these five developments and cover both practical and theoretical issues of managing the university campus.

Facilities expenditure is substantial part of university budget

In Australasia, the tertiary education sector has assets with a replacement value exceeding $22 billion and spends over $500 million annually on maintenance and operations. The sector also spends about a billion dollars annually on new construction and refurbishments. Put into perspective, the facilities expenditures totals 15 percent of the entire tertiary education institutional budget. These numbers are provided by The Australasian Tertiary Education Facilities Management Association (TEFMA) is an independent association of facilities managers operating in the tertiary education sector of Australia, New Zealand, Hong Kong and Singapore. All universities and polytechnics in Australia and New Zealand are TEFMA members.

source: www.tefma.com, June 2009

1.3 Problem statement and research objective

Prior research on this subject, with much input and feedback from Dutch campus managers, has led to the problem statement for this research.

problem statement

Ever since Dutch universities became owners of their real estate and became responsible for their own accommodation – in 1995 – campus management has become more complex and challenging, with many more stakeholders, opportunities and threats to consider. Decreasing public involvement and funding for universities puts pressure on the internal allocation of resources, weighing investments in real estate and other facilities against investments in human resources on university and faculty level. Added value of campus decisions is compared with the added value of investing in more faculty members or new research programmes. This urges the need for evidence-based management information to support campus decision-making.

At the same time the university's portfolio of buildings is aging, both technically and functionally, and in need of reinvestment, while many developments cause more uncertainty in future space demand and various stakeholders within the university make higher demands upon the added value of the campus for the performance of the institution.

As a consequence Dutch campus managers have indicated that they need (better) information and tools to support their management tasks and to inform, involve or convince the various stakeholders, such as policy makers, users, controllers and technical managers. These stakeholders represent the strategic goals, the user demands, the resources and the physical aspects of the campus. Prior research shows that Dutch campus managers lack the information and tools to consider the interests of these stakeholders in a proper way or to confront them with the consequences of their proposed decisions for other stakeholder's interests or the university's overall performance. The required management information and tools should support an integrated approach to managing the current campus and accommodating the university of the future.

The problem statement above contains three assumptions, which will be elaborated and reflected upon throughout this dissertation:

- Campus management is more successful when a campus planner considers all stakeholder perspectives in the management process – covering the strategic goals, the user demands, the resources and the physical aspects of the campus – weighing benefits and costs in the broadest sense. This is also referred to as 'an integrated approach to managing the campus'.
- Confronting stakeholders with the consequences of their (proposed) decisions leads to more conscious choices and improves campus management.
- Management information contributes to 'an integrated approach' and 'more conscious choices', acknowledging 'bounded rationality' (Simon 1997) and still allowing intuition and emotion in the decision-making process.

Derived from the problem statement this research has the following main research question:

- How can universities improve strategic campus management, adding value to the university's performance, conducting which management tasks and using what information and tools?

The research objective is to provide universities with a conceptual model and information – through data and tools – to improve campus management.

1.3.1 Research questions

To answer the main research question this research has been divided in three parts: part A "input", part B "data collection" and part C "output".

Part A "input" – the basis of this research

The first step in answering the main research question is elaborating on the terms that are used in the problem statement, research objective and main research question. This determines the basis for this research.

A1 What definitions are used for the most important terms in this research?
A2 What background information about the historical and current context of (Dutch) universities is relevant?
A3 What theories apply to managing the university campus, in general and focussing on generating management information for campus decisions?
A4 How can these theories be integrated in a conceptual framework?

In this research "managing the university campus" the most important terms are either related to the subject – 'university' and 'campus' – or to the verb 'managing'. Background information on the (Dutch) university and definitions 'campus' are introduced in the next chapter. Management terms will be derived from the theories in chapter 3, setting the definitions for campus management, the most important management tasks and the required management information for adding value to the university's performance. At the end of part A the most important components of this research are summarized in a conceptual framework for the data collection in part B.

Part B "data collection" – the core of this research

In this part of the research the main research question will be answered, focussing on both the management tasks and required management information to improve campus management. The four most important management tasks – defined in part A – determine the structure of the chapters in part B: (I) assessing the current campus, (II) exploring the changing context and demand, (III) generating models for the future campus and (IV) defining projects to transform the campus. For each of these management tasks the same research questions about management information will be answered: (a) what management information is required to perform this management task, derived from theory, (b) what information is available to support this management task, generated by what tools over the years and (c) what is the demand for additional management information? Combining the management tasks with the research questions about management information the following questions are the core of this research.

What management information is (a) required and (b) available and (c) what is the demand for additional information for:

B1 assessing the current campus (chapter 4);
B2 exploring changing demand (chapter 5);
B3 generating future models for the campus (chapter 6);
B4 defining projects to transform the campus (chapter 7)?

Focus of these questions is the Dutch university, but insights and tools from universities abroad will also be used to answer these questions. The management information that still needs to be collected, will be summarized in part C. The same goes for all other insights that add to new theories, tools and strategies for campus management.

Part C "output" – management information, tools and strategies for campus management

The following questions explore whether the insights from part B can be generalized and add to new theories, tools and strategies for real estate management in general.

C1 What insights from practice can be added to theory on campus management?
C2 What information - supplied by databases and tools – can support campus management in the Netherlands and elsewhere?
C3 What strategic choices are universities faced with for the campus of the future?

Part C ends with conclusions and recommendations for policy, practice and further research and with a reflection on this research in an epilogue.

1.3.2 Research structure

The questions A1, A2 and A3 will be answered in chapter 2 and 3 of part A.
The questions B1, B2, B3 and B4 are subject of the chapters 4, 5, 6 and 7 in part B.
The questions C1, C2 and C3 are answered chapters 8 and 9.
The research structure is illustrated in figure 1.1 with the chapter numbers.

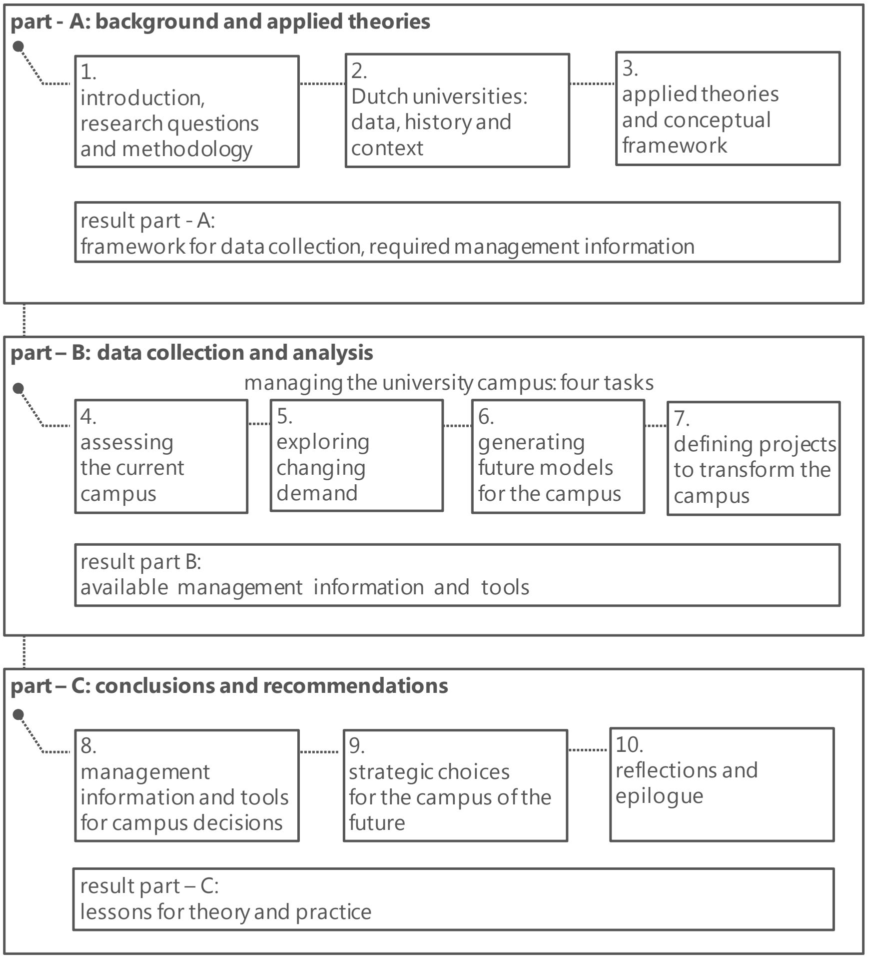


figure 1.1: research structure, including the chapter numbers and subjects of part A, B and C

1.4 Methodology

For the research design it is necessary to be explicit about the foundations of this research. Since the process of finding answers to some of the questions already started in 2000, it should be clear that this not only done beforehand, but also in retrospect. Therefore, this will also reconstruct what implicit assumptions led to choosing the methods and techniques for former research projects.

1.4.1 Incorporating prior research

The research process of the past ten years contained many research projects that have been initialized, discussed, co-financed and evaluated by the Dutch universities. Various methods and techniques were applied to describe, explore and explain (developments of) the campus and campus management. Case descriptions, case study analysis, benchmark studies, interviews, surveys and participatory observation are just some

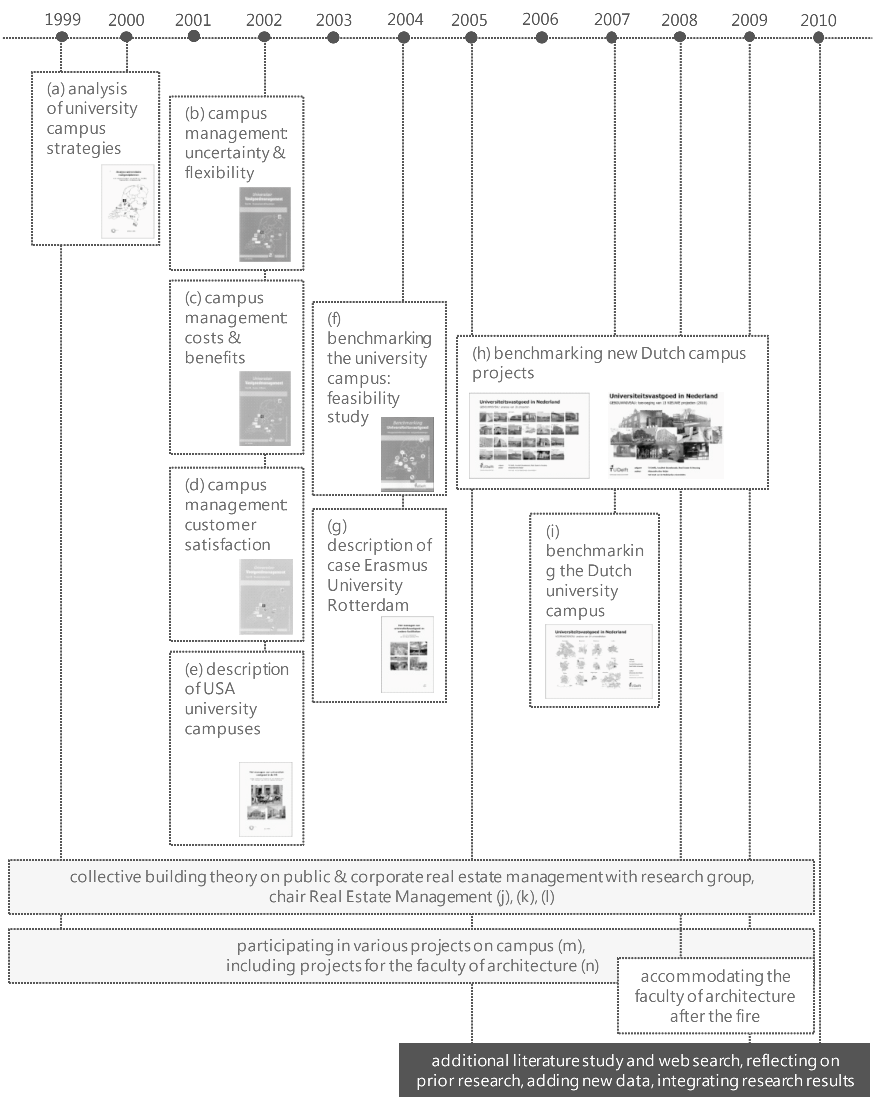


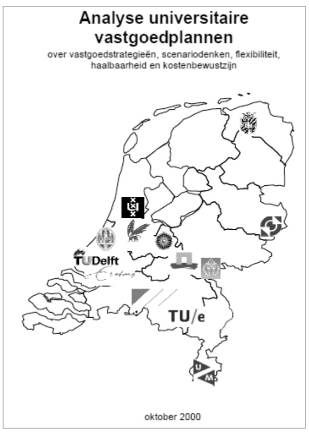
figure 1.2: prior research and other projects as input for this publication

examples. During the first few years (2000-2002) the focus was on descriptive research. For the benchmark studies (2004-2009) the focus shifted to explanatory research, finding explanations of differences between universities.

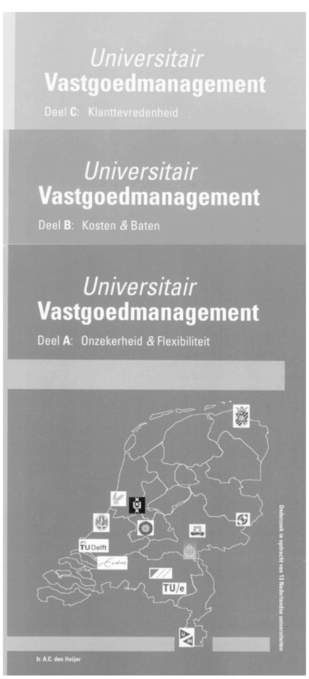
Literature review and document analysis were integral parts of all prior research projects. Due to the fact that 'real estate management' is a relatively 'young' discipline, this PhD research can generally be characterized as exploratory research.

This section contains short descriptions of each of the prior research projects, including an indication of which methods and techniques were used and the most important findings. The results of these projects are used for answering one or more research questions. More information about the research questions, methodology, results and publications can be found in appendix VIII.

(a) analysis of university campus strategies (De Jonge et al. 2000)



This first research project involving all Dutch universities was mainly qualitative research, trying to find common issues in the campus strategies that were written around the year 2000. This study on 'campus management in practice' did use some insights from CREM and PREM theory (De Jonge 1997; Dewulf et al. 1999; Krumm 1999) to formulate research questions on aligning university and campus planning, the use of scenarios, applied forms of flexibility, notions about costs and benefits and creating cost-consciousness about campus matters within the university. Five in-depth interviews with campus managers added to the insights from the analysed documents. Additionally, campus maps and data of floor area in relation to number of students and staff numbers were collected, giving universities an overview of all campuses and a basic comparison of space use. It appeared to be a very useful study for all universities, because – despite the specific situations and different local contexts to act within – they did have more common campus (management) problems to solve than they expected. There seemed to be more to learn from each other than expected before this project.



(b, c, d) campus management (Den Heijer 2002a; Den Heijer 2002b; Den Heijer 2002c)

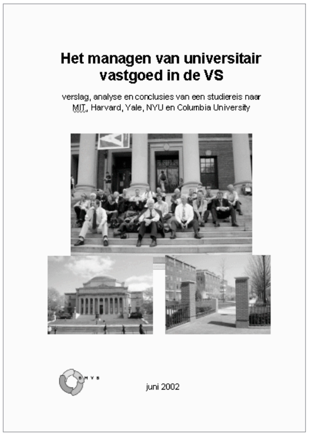
The enthusiasm about the lessons learned just from comparing the campus strategies on a few issues in the former project led to a rather broad research project on campus management, in which many issues of the first project were elaborated on and compared with campus management at universities abroad and public real estate management at the Dutch Government Building Agency ("Rijksgebouwendienst" in Dutch), also referring to evolving theories on public real estate management (Evers et al. 2002; Van der Schaaf 2002). Qualitative research included in-depth interviews with all Dutch campus managers and interviews with key informants on various issues that the universities collectively determined. This research included a more extensive benchmark on space use, but also revealed the problems of benchmarking: lack of common definitions and the relative value of measuring space use without measuring costs or underlying goals. This conclusion was the first step towards the problem statement of this PhD research that was stated in the previous section.

The results of this research were published in three different reports, covering many different issues on campus management and illustrating the broad perspective of campus managers. Report A (Den Heijer 2002a) focused on all trends and developments that universities were facing at that time – of which many are still relevant – and the scenarios for the changing context of Dutch universities. The results are the basis of chapter 4 of this research. The many uncertainties emphasize the need for flexibility.

A range of flexible solutions was added to report A "uncertainty & flexibility" to give campus managers some tools to cope with uncertainty.

Report B (Den Heijer 2002b) focused on "costs & benefits", introducing the need for comparative analysis of campus data of all fourteen Dutch universities. International examples of extensive benchmark studies among universities were used to illustrate the potential benefits for each university. Some of the results of these studies already generated some management information that Dutch universities lacked at that stage, like total costs of (campus) ownership and various indicators for efficient space use. This report has laid the foundation for focusing this research on generating management information to improve campus management.

Report C (Den Heijer 2002c) focused on customer satisfaction, identifying different groups of users within the university: students, employees and visitors. Interviews among Dutch campus managers showed that post-occupancy evaluations and surveys among users of the campus were either not extensive enough or not conducted at all. Campus managers indicated that they needed this management information for their campus decisions, but they also knew that it was very hard to find the right methods and techniques to get an objective view on the campus. When not (personally) confronted with the impact on the university's resources, users would state that they never had enough space of enough quality with enough ICT facilities to support their work. Giving them alternatives to choose from already generated more valuable management information. This conclusion emphased the need for an integrated approach to campus management, which is elaborated on in chapter 2.



(e) description of university campuses in the USA (Den Heijer 2002d)

This project did not start out to be an explicit research project: it was a visit with all Dutch campus managers to five American universities. The visits turned out to be very informative and the problems and solutions highly relevant. This was reason enough for a report that described the cases of MIT, Harvard, Yale, New York University and Columbia University. After the visit weeks were spent on completing the dataset per university, making it an evolving case study research project. Per case the report contained basic information about university and campus, new projects, science park development and the (fragile) relationship with the local community and municipality, making plans for expansion of the campus. The report also included input from all Dutch campus managers, summarizing "the lessons learned" from these USA cases for campus management in the Netherlands, taking into account the differences in context. Visiting two US conferences on campus management and more individual campuses in 2006 – including interviews with campus managers – enriched these results with more topical information on trends and developments in campus management. The results will be used in part B of this research, adding insights, management information and tools from abroad to each of the four management tasks.

(f) benchmarking the university campus: feasibility study (Den Heijer and De Vries 2004b)

The benchmark of the research project in 2002 showed that benchmarking on just two variables – space use or building costs per square meter – did not supply enough information for campus management. In fact, it provides benchmarks that could easily be misinterpreted by policy makers, using the lowest building costs or space use as a standard without noting the context of these numbers or possible consequences for user satisfaction or university goals to support. Campus managers agreed and wanted a study of information demand for campus decisions on the one hand and information supply in their organisations on the other hand. Within this quantitative research project theories on benchmarking were studied (Den Heijer and Van der Schaaf 2002) and benchmarking processes at other organisations were compared and assessed (Den Heijer and De Vries 2004). All Dutch universities filled out questionnaires, resulting in an overview of information demand and information supply, This not only exposed that definitions had to be accentuated, but also confirmed that information about users, satisfaction and goals to support was lacking. All campus managers agreed that this type of information is essential to make 'optimal decisions', weighing the adding value for the organisation and the costs. This was the next step in building theories of campus management. The results can be found in chapter 3.

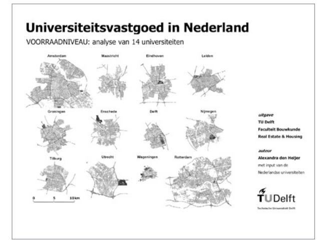
(g) description and analysis of the case Erasmus University Rotterdam (Den Heijer 2004a)

In 2004 the opportunity was given to apply and test the developed theory on campus management at Erasmus University Rotterdam (EUR). For three months, two days per week, a workplace was offered to me at the EUR facilities department to observe the campus management process, attending many meetings with other stakeholders within and outside the university: policy makers, users – both students, faculty members and deans – and financial planners and controllers. This comprehensive form of participatory observation, in combination with in-depth interviews and document analysis, was an exceptional opportunity to witness decision making on the campus from operational to strategic level. The description of that case study could be combined with similar research at four other universities, conducted by a Master student (Bank 2004; Bank and Den Heijer 2004). Theories on managing the campus, and the required management information, were tested during this research and new insights were used to improve the theories. Lessons learned from conducting the management tasks in practice are used for part B of this PhD research.

(h) benchmarking new Dutch campus projects (Den Heijer and De Vries 2005; Den Heijer 2007b)

Following the conclusions of earlier benchmark research this project was initiated to provide universities with references of new buildings, not just registering building costs in relation to project types, but also in terms of supported goals and number of users to accommodate. More than a year was spent to accentuate the definitions and the data collection format – using focus groups of university staff member who are responsible for campus information management. The first dataset of twelve new buildings was validated in at least two rounds before the data were published in a report. Photos of interior and exterior and floor plans were considered valuable information for interpreting the other building data. The report was published in 2005 (Den Heijer and De Vries 2005). Positive reactions on the management information in this report immediately led to the unanimous intention of Dutch campus managers to add more projects to the database. The second dataset contained fourteen – more diverse – buildings. The result was a database with 26 buildings, described 'why' (goals), 'for whom' (users), 'what' (m^2) and 'for how much' (euros). The intention of this database was not only to generate management information for new projects, but also to keep track of buildings, evaluating decisions of the past. In 2007 (Den Heijer 2007a) an extensive report was published, containing profiles of all of these buildings and drawing conclusions from the data. More recently, in 2009, twelve new projects were added to the database, resulting in a database with 38 projects that illustrate new developments and concepts at Dutch universities. Conclusions and references from this database will be used in part B of this research, especially in chapter 6, but also to illustrate trends in shaping the campus of the future.

(i) benchmarking the Dutch university campus (Den Heijer 2007a)



Parallel to the benchmarking project for new university buildings a project started benchmarking the whole campus, using a similar data collection format that described university and campus management goals, resources spent, students and staff members to accommodate and floor area data on many different issues: types of space, land property, age of the buildings, technical condition etc. The descriptions of all 14 campuses can be found in appendix I. Acknowledging that the current campus is mainly a result of decisions of the past, a questionnaire was sent out with questions about campus management. This included questions about the available and required tools for campus decisions , see appendix VIII. The answers are used for part B of this research.

Again, problems in this project arose with the use of definitions. A few rounds of data checks and validation were required, also involving different respondents within one university to meet the triangulation standards. Half of the respondents returned the data sheet and questionnaire by mail. The other respondents needed help to find the right data – applying the correct definitions – or just couldn't find the time. The data of these universities were collected using in-depth interviews with at least two respondents per university – taking at least three hours per university – gathering the missing data and answering the questions about campus management. In retrospect this last method was not only more efficient for both researcher and respondent, but also gave more opportunity for discussion. This gave more insight in the campus management processes at those universities. After the interviews the response of this campus benchmarking project was 100%. Results of comparative analysis can also be found in part B – especially in chapter 4, describing the current Dutch campuses – and in chapter 5, identifying the most important developments and decisions in campus management and the required tools to support them.

(j-k-l) contributions of related research projects

Project (j) represents a series of projects that researchers at Delft University of Technology conducted at the Government Buildings Agency, abbreviated as GBA (Den Heijer 1999; Dewulf et al. 1999; Evers et al. 2002), building theory on public real estate management and matching tools that are references of other organisations in part B of this PhD research. Project (k) is a collective project of researchers in Delft, building theory on designing accommodation strategies, linking organisation and real estate (De Jonge et al. 2007). Highlighted in this collective project was the PhD research (l) that was conducted by De Vries (De Vries 2007) on the relation between real estate interventions and an organisation's performance. This project is most relevant for this research for two reasons: because of its contribution to corporate real estate management (CREM) theory and because it was applied to Dutch institutes for higher professional education[2], providing excellent data to compare with those of universities. Theoretical insights are used in chapter 3.

[2] Institutes of higher professional education are called "hogescholen" in Dutch.

(m-n) participatory observation of projects on campus

As a person researching the campus it was natural to be part, as an internal expert, of committees and project teams shaping the campus at Delft University of Technology (TU Delft) and rethinking the accommodation of the Faculty of Architecture. For the own university, this included projects (m) to decide on the overall campus strategy and on implementing new concepts on campus. For the own faculty, this included projects (n) from operational to strategic level, being part of the internal committee that advised the faculty's facility manager. By participatory observation practically every type of campus decision could be studied, while being part of the decision making process. Over the years it has been obvious that campus and facility managers need references – about costs, space standards and the effectiveness of concepts – for nearly every decision, to communicate with the different stakeholders that are dealing with. Policy makers, controllers and user groups either ask for references of other universities or supply them as possible solutions. This emphasized this objective of this research.

figure 1.3: contribution of prior research to answering research questions in this PhD research (overview)

	research question	**A1**	**A2**	**A3**	**A4**	**B1**	**B2**	**B3**	**B4**	**C1**	**C2**	**C3**
		definitions	back ground	applied theory	frame work	current campus	change demand	future models	define projects	info demand	tools to use	campus strategy
	answered in chapter	**1**	**2**	**3**	**3**	**4**	**5**	**6**	**7**	**8**	**8**	**9**
	research Den Heijer for Dutch universities											
a	analysis of campus strategies • five interviews • document analysis					x	x	x				
b	uncertainty & flexibility						x				x	x
c	costs & benefits					x			x		x	x
d	customer satisfaction • thirteen interviews • document analysis • web search international networks					x						
e	description of USA cases • document analysis, web search							x			x	x
f	benchmarking: feasibility • thirteen questionnaires • survey on benchmark studies			x		x			x		x	x
g	description case EUR • participatory observation • document analysis			x		x	x					
h	benchmark new buildings NL • data analysis 39 projects	x						x	x		x	x
i	benchmark university campuses NL • data analysis 14 campuses • fourteen questionnaires	x		x	x	x	x			x	x	x
	related research and projects											
j	former research at GBA • participatory observation • analysis information systems			x		x			x			
k	book CREM strategies			x								
l	PhD research De Vries			x		x						
	related projects											
m	case TU Delft • document analysis, various studies • participatory observation					x	x	x	x			
n	case Faculty of Architecture • space use surveys, various studies • participatory observation					x	x	x	x			

Finally – the Faculty of Architecture case – turned out to be a special project to test new concepts for the future campus and to apply campus management tasks in practice, under extraordinary circumstances. The fire that destroyed the faculty building on May 13, 2008 and the project to relocate the faculty that followed, offered the most unusual opportunity to implement insights of this PhD research before it was finished. Numerous articles have been written about the process and lessons learned (see appendix VI). In figure 1.3 all (research) projects are linked to one or more research questions. More information about goals, research questions, methodology and results of most of these projects can be found in appendix VIII.

literature review and web search

The literature review that was included in the methodology of almost every prior research project, will be used as input for all research questions, with additional literature study. More theoretical insights that led to the conceptual framework for this research, will be dealt with in chapter 3.

For more practical questions of prior research, web search was very effective in finding many international references. More specifically, when searching for tools to support campus management – by generating management information – international networks of campus professionals were very useful (see table 1.1). They not only emphasized the problem statement of this research in many of their publications, they also collectively work on the solution. The network of Dutch university campus managers – HOI (see text box) – could learn much of international networks of universities.

Many countries have associations of campus managers, facilities managers and executives at universities. For OECD countries for instance, the Centre for Effective Learning Environments (CELE) gathers knowledge and cases. CELE acknowledges that evidence of the impact of facilities on university performance is hard to quantify. This is one of the most important reasons for campus managers to join forces: they all need this type of evidence – and successful references - to justify investments in their campuses. American associations like SCUP and APPA and British associations like HEFCE and AUDE are conducting research on their collective campuses. They publish many reports on common issues and they conduct annual benchmark studies on various topics, generating much management information for individual universities. More information about these professional knowledge networks can be found in appendix IV.

country / countries	network of universities or HEIs - Higher Education Institutions	network of campus managers
Netherlands	VSNU association of universities	HOI association of campus managers
United States	NACUBO – business officers	SCUP – society for college & university planning APPA – facilities managers for educational facilities
United Kingdom	HEFCE – Higher Education Funding Council England	AUDE – Association of University Directors of Estate
Nordic countries	NUAS – Nordic Association of University Administrators	organised separately in Norway, Sweden, Denmark, Finland and Iceland
Germany	HIS – Hochschul-Informations-System GmbH	
OECD countries	IMHE – institutional Management Higher Education	CELE - Centre for Effective Learning Environments

table 1.1: networks of campus professionals as important sources for this research

HOI – network of Dutch university campus managers

The network of Dutch campus managers – Huisvestingsoverleg Instelling (HOI) in Dutch – has been very important for this research, both as the client of many prior research projects and as a valuable source of data. All fourteen publicly funded Dutch universities are represented in HOI. The fourteen members of HOI are directors of real estate or facilities departments at their universities. An additional member represents VSNU, the association of Dutch universities that is linked to the Ministry of Education, Culture & Science (OCW in Dutch).

When Dutch universities became owners of their real estate, in 1995, HOI became more important as a professional network. Before 1995 the campus managers joined forces in IOB (Interuniversitair Overleg Bouwinvesteringen in Dutch) to prepare, compare and judge campus projects to negotiate with the government, the owner of the campus at that time.

How the collected data of all of these sources are used, will be explained where this is most relevant for answering the research questions. This will be accompanied with a reflection on the value of these data and the used research methods and techniques. Equally important for interpreting the data is the position of this research in scientific disciplines, the perspective of the researcher and the researcher's assumptions that determine the philosophical foundations that are elaborated upon in the next subsection.

1.4.2 Scientific assumptions, position and perspective

Any researcher's choice of a particular research design is necessarily framed by the researcher's own assumptions about both 'the nature of reality' and 'how one can come to apprehend it' (Groat and Wang 2002). Groat and Wang use the term 'system of inquiry' to describe these sets of assumptions, also referred to as 'paradigm'. Within this system of inquiry a researcher can still choose various research strategies and tactics, respectively methods and techniques.

In order to determine what 'system of inquiry' is applicable in this PhD research two questions have to be answered: one about the nature of reality, the ontological assumptions, and one about the relationship of the researcher to the research object, the epistemological assumptions.

ontology – nature of reality

Starting point for answering the question about the nature of reality is the spectrum of a subjective versus an objective approach to reality. When researching the university campus some elements of that reality can be described objectively like floor area and costs, if the tools and uniform standards are available to do this. But even the availability of these tools doesn't guarantee reliability. There are people involved to register these data and that introduces subjectivity and the risk of mistakes. In response to this, triangulation of data can be used to add to the 'truth value'. As soon as making 'the right decision' becomes an issue in this research – weighing the interests of various stakeholders – the notion of reality becomes even more subjective. The reality of the campus – how different users (can) experience the same physical infrastructure in a totally different way – moved the ontological assumptions towards 'reality as a social construction'.

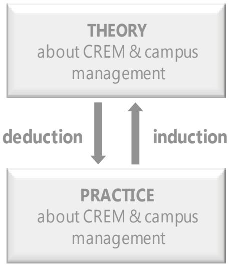
epistemology – nature of knowledge

For the epistemological assumption, 'the relationship of the researcher to what is being researched', a similar process was applicable. Researching the university campus as a researcher being part of a campus introduces the risk of subjectivity. At the same time, researching this subject in close cooperation with the group of Dutch campus managers guaranteed an interactive link between researchers and those who are researched. During the process the campus managers adopted theories and knowledge of earlier presentations and publications. Some of the conceptual models that were designed over the years appeared in the campus strategies. In the most extreme form this even led to 'self-fulfilling prophecies', when universities used the campus management recommendations of prior research in their new campus strategies.

During the past ten years of research on this subject, the empirical cycle was applied and completed quite a few times: observation in practice, induction to theory (hypotheses), deduction in verifiable predictions, testing and evaluation (De Groot 1961; Priemus 2002). In figure 1.4 a basic model for the empirical cycle (De Leeuw 2001) is applied to this research: theory and practice of campus management and CREM, corporate real estate management in general, not just applied on the university campus.

In the research structure the empirical cycle can be found between chapter 2 and 7, using existing theories in chapter 2 for deduction, supplying a conceptual framework for data collection in all chapters of part B and using the insight from these chapters for induction, adding to new theories in chapter 7.

figure 1.4: induction and deduction as two steps of the empirical cycle (De Leeuw 2001), applied to this research



primary focus on the naturalistic paradigm

Combining the assumptions of ontology and epistemology the choice for a 'system of inquiry' would be primarily on the naturalistic paradigm as defined by Groat and Wang (2002). This paradigm is also known as interpretative, constructivist and qualitative. The naturalistic paradigm allows multiple, socially constructed realities and an interactive link between the researcher and participants, acknowledging the fact that the researcher is part of the system that is being researched. This also matches the experiences of prior research about management and integrating stakeholder's perspectives, concluding that it is not possible to have a value-free objectivity.

For various parts of this research the postpositivism paradigm could also apply. Especially when focusing on the physical part of this study – the measurable variables of (managing) the university campus. For this part there are thoroughly tested methods available that can describe 'a reality that can be known within some level of probability' (in the postpositivism paradigm), whereas 'a reality that can be fully known' in the positivist paradigm would be overstating the truth value of the collected data. In the epilogue of this book a reflection on the system of inquiry will be presented.

position in scientific disciplines: architecture from a management perspective

The subject of this PhD research – "Managing the university campus" – can be positioned between many different scientific disciplines and approached from many different scientific perspectives. On the next page figure 1.5 shows, in dark grey, the most relevant scientific disciplines, in light grey, the combined or specified disciplines for the built environment and, in red, the applied fields and subjects for this PhD research.

As a researcher working at a Faculty of Architecture and having a degree in Architecture, with a specialization in management of the built environment (current Master track Real Estate & Housing), the focus of this PhD research is the physical campus from a management perspective.

The university campus as an object of this PhD research can be viewed on different scales: the campus as an (urban) area, the university building(s) and the spaces within university buildings, like academic workplaces, studio space and libraries. On each scale other (aspects of) scientific disciplines are relevant. Management as a subject can have many different focuses. This PhD research focuses on management information or – more specifically – on improving management by supplying better information, about the university campus on different scales. This management information has different dimensions, matching the various scientific disciplines that are relevant for the university campus.

Ultimately, the overall goal of better (campus) management is supplying the physical environment and the management systems that meet the university's goals. If this overall goal is achieved can only be measured, when both the campus and the university's goals are expressed in measurable variables. Theories from the scientific discipline real estate management are used to establish that (in chapter 3).

scientific field "real estate management", connecting many other disciplines

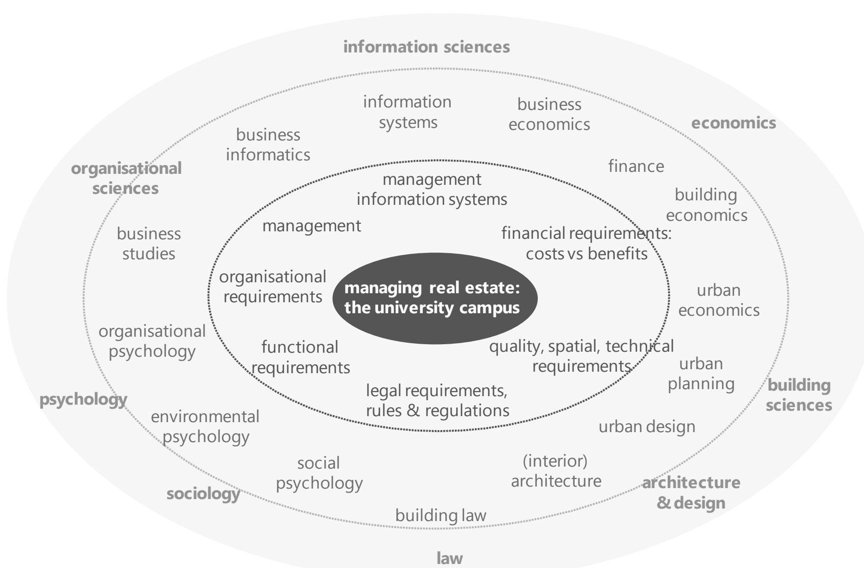
This PhD research is part of the research programme "Real Estate Management", conducted within the department of Real Estate & Housing that also covers applicable scientific disciplines like building economics, building law, urban economics and management information systems. This department is part of the Faculty of Architecture, covering building sciences in general and urban planning, design, (interior) architecture and environmental psychology as relevant specialisations for 'managing the university campus'. Within Delft University of Technology, the Faculty of Technology, Policy & Management represents most of the other relevant scientific disciplines (see figure 1.5), with a focus on organisational sciences.

The richness of this organisational context is used for this PhD research, while – in the end – improving (the management of) the built environment is the overall objective. This PhD research will therefore end with more practical results like strategies for campus managers and guidelines for designers. Again, this emphasizes the position of the researcher, influencing architecture from a management perspective. The definitions in the next section reflect this position.

1.5 Definitions

Internationally there are (slightly) different definitions for 'campus', 'campus management' and even 'university'. Therefore it is important to make the definitions of this PhD research explicit. The most important terms in this dissertation and in the title "Managing the university campus" or in the subtitle "information to support real estate decisions" are summarized in the table next page.

figure 1.5: relevant scientific disciplines for "Managing the university campus" (grey), combined (black) and applied to the subject of this PhD research (red)



term	definition, as used in this research	more information
university	academic institution for higher education and research	this section
Dutch university	one of the fourteen publicly funded Dutch academic institutions for research and education; in international comparisons these universities are known as research universities	this section/ chapter 2
university campus	land and buildings, used for university or university-related functions, either rented or owned by the university, not necessarily on one location	this section
campus management	matching the university campus with the changing context and various stakeholder's demands, adding value to the university's performance	chapter 3
campus manager	person responsible for campus management at a university, in this research mostly the campus director or his/her replacement	chapter 3
university's performance	the university's productivity, profitability and competitive advantage; this research also adds to sustainable development	chapter 3
management information	information about key performance indicators (KPIs) and answers to relevant questions for certain management tasks or supports decisions	chapter 3
tool	any instrument that is helpful in supplying management information: databases, models, websites, applications, organigram project team, brainstorms etc.	chapter 3
data	facts, figures, opinions or other (research) findings used as a basis for reasoning, discussion, or calculation	chapter 3

table 1.2: definitions as used in this PhD research

The used definitions of 'university', 'Dutch university' and 'campus' are introduced below. The other definitions are derived from theories on managing the university campus and can be found in the next chapter.

definition "university"

In this PhD research, the "university" refers to an academic higher education institution that not only offers educational programmes, but also conducts scientific research. The Dutch system for higher education distinguishes academic institutions ("universiteiten" in Dutch) and institutions for higher professional education ("hogescholen" in Dutch, also referred to as 'polytechnics' in English). When mentioning 'higher education institutions' – abbreviated to HEIs – both types of institutions are included, when mentioning 'universities' only the academic institutions are included, also referred to as as 'research universities' in international literature (VSNU 2009; Nuffic 2010). The Dutch education system is summarized in appendix III.

focussing on the 'Dutch university'

Central in this research are Dutch universities, referring to the fourteen publicly funded Dutch academic government-approved institutions (VSNU 2010b). Besides these fourteen universities, there are a number of approved institutions, including five offering theological courses, one offering a degree course in humanism, and Universiteit Nyenrode (the Netherlands Business School); these institutions are not included in this research. The University Colleges in Amsterdam, Maastricht, Utrecht and Middelburg are included, because they are part of one of the fourteen universities (Roosevelt College in Middelburg is an auxiliary branch of Utrecht University). More background information about Dutch universities can be found in the next chapter.

figure 1.6: Dutch universities, names, locations and used abbreviations (based on Dutch university names)

#	University name	abbreviation
1	Erasmus University Rotterdam	EUR
2	Leiden University	LEI
3	Radboud University Nijmegen	RU
4	University of Groningen	RUG
5	Delft University of Technology	TUD
6	Eindhoven University of Technology	TUE
7	Maastricht University	UM
8	University of Twente	UT
9	Utrecht University	UU
10	University of Amsterdam	UvA
11	Tilburg University	UvT
12	Vrije Universiteit Amsterdam	VU
13	Wageningen University (and Research Centre)	WU
14	Open Universiteit	OU

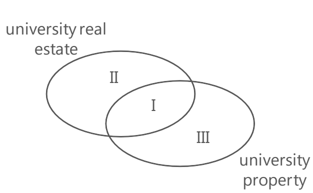
In the chapters of part B of this research many aspects of the Dutch university campus will be assessed. The data will be presented in tables and charts, using abbreviations based on the Dutch names of the universities, see figure 1.6. The alphabetic order of the Dutch university names determined the numbers of the universities. An exception is made for Open University that got the fourteenth position because of many deviant characteristics.

definition "university real estate"

Real estate is defined as both buildings and land (De Jonge et al. 2008). This definition is consistent with most dictionaries (Oxford, Merriam-Webster) that identify land and buildings, fences, wells and other site improvements that are fixed in location – immovable. In international practice the term "real estate" often refers to 'commercial real estate', but in this research the term "real estate" includes all types of buildings and land.

Consequently, 'university real estate' is defined as both the university buildings and the land, used by the university. Used buildings could either be owned by the university or rented from another real estate owner. It is therefore necessary to introduce another term that includes all buildings that are owned by the university: "university property" is defined as land and buildings that are owned by the university. University real estate is defined from the "use" perspective, university property from the "ownership" perspective.

figure 1.7: link between definition university 'real estate' and 'property'



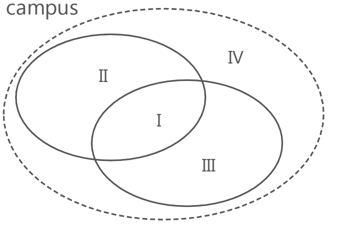
The figure on the left shows two collections of buildings – university real estate and university property – that overlap. This results in three sets of university buildings – analogue: parcels of land – that can be distinguished: (I) buildings that are both used and owned by the university, (II) buildings that are used and not owned by the university, but rented from other private or public real estate owners, (III) buildings that are owned and not used by the university, but for instance let out to related businesses.

This research will include all three sets of buildings. Campus management concerns all of these buildings that are related to the university, either because of space use or because of property issues, or both.

definition "university campus": functionally and managerial

The "campus" even contains more than these three sets of buildings, which makes it harder to define, but better resembles the reality of campus management and the campus of the future. Referring to "the university campus" instead of "university real estate" or "university property" introduces an even broader perspective than use or ownership: use for university-related functions.

figure 1.8: the university campus includes land and all buildings that are either owned or used by the university (I, II, III) and that are used for university-related functions (IV)



Examples of university-related functions are student housing, space for related businesses and retail & leisure facilities. These functions are increasingly important to achieve university goals. Therefore their buildings are an increasingly important part of campus management.

definition "university campus": spatially

The university campus is often associated with a greenfield campus (outside the city) or a campus that is isolated from the urban setting (sometimes even gated). In this research the university campus is defined as the sum of locations with predominantly university or university-related functions. This definition allows a collection of inner-city university buildings to be called an inner-city campus, even though the borders are not that clear. The evolving definition is also illustrated in the textbox below.

Analogically to the unclear borders of the campus, managing an inner-city campus has unclear borders in terms of the types of stakeholders – owners, users, policy maker and beneficiaries – who have to be involved in campus decisions. However, many Dutch universities still have or want to have city campuses, or are likely to have city campuses when cities grow (see chapter 2).

Evolving definitions of "campus"

noun (plural: campuses)
- the grounds and buildings of a university or college
- the grounds of a school, hospital, or other institution

ORIGIN late 18th century (originally U.S.): from Latin campus 'field' (see camp).

source: New Oxford American Dictionary

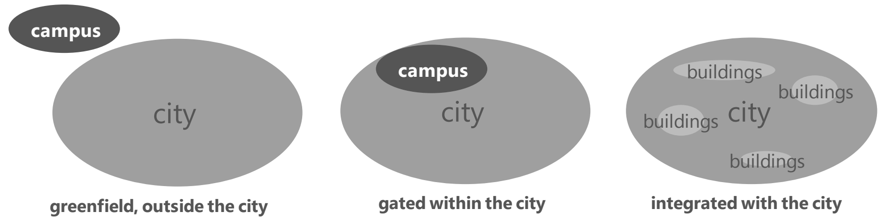
A campus is traditionally the land on which a college or university and related institutional buildings are situated. Usually a campus includes libraries, lecture halls, residence halls and park-like settings. The definition currently defines a collection of buildings that belong to a given institution, either academic or non-academic.

The word first was adopted to describe a particular urban space at the College of New Jersey (now Princeton University) during the early decades of the eighteenth century. Some other American colleges later adopted the word to describe individual fields at their own institutions, but "campus" did not yet describe the whole university property. A school might have one space called a campus, one called a field, and another called a yard.

The meaning expanded to include the whole institutional property during the twentieth century, with the old meaning persisting into the 1950s in some places. Sometimes the lands on which company office buildings sit, along with the buildings, are called campuses. The Microsoft Campus in Redmond, Washington, as well as hospitals use the term to describe the territory of their facilities. The word "campus" has also been applied to European universities, although most such institutions are characterized by ownership of individual buildings in urban settings rather than park-like lawns in which buildings are placed.

source: Wikipedia, June, 2009

figure 1.9: three different spatial configurations of the campus



While the term "campus" used to be exclusively used to indicate university land and buildings, more and more types of institutions use the term "campus" to refer to their territory. The terms 'corporate campus' and 'high-tech campus' (Hoeger and Christiaanse 2007) do refer to one specific location, while in this research "the university campus" can refer to more than one location.

Summarized: the "university campus" in this research refers to location(s) of the university or the collection of university and university-related buildings that are either used or owned (or both) by the university and have a role in achieving the institutional goals.

"university campus" and "university facilities"

The university campus is one of the most strategic university facilities, because of the (relatively) long life cycle of buildings, the long-term impact of campus decisions and the capital-intensive character of campus investments.

In general and formally, "real estate" is part of "facilities" which can also include interior elements, ICT, office materials, audiovisual tools and other physical supplies in buildings or on land that ensure functionality of the built environment by integrating people, place, process and technology. (NNI 2001; IFMA 2010). Contrary to "real estate" many other facilities can easily be moved and have much shorter lifecycles in supporting the primary processes of the users – individuals, organisations or groups in society. That is one of the reasons why managing facilities has many tasks of an operational character and managing real estate has tasks that are more strategic of nature – because of the high costs and the long-term impact – requiring long-term visions of the potential users and involvement of policy makers and controllers. Nevertheless, real estate management can also be part of facilities management. Consequently, campus management can be part of the department of facilities management on campus.

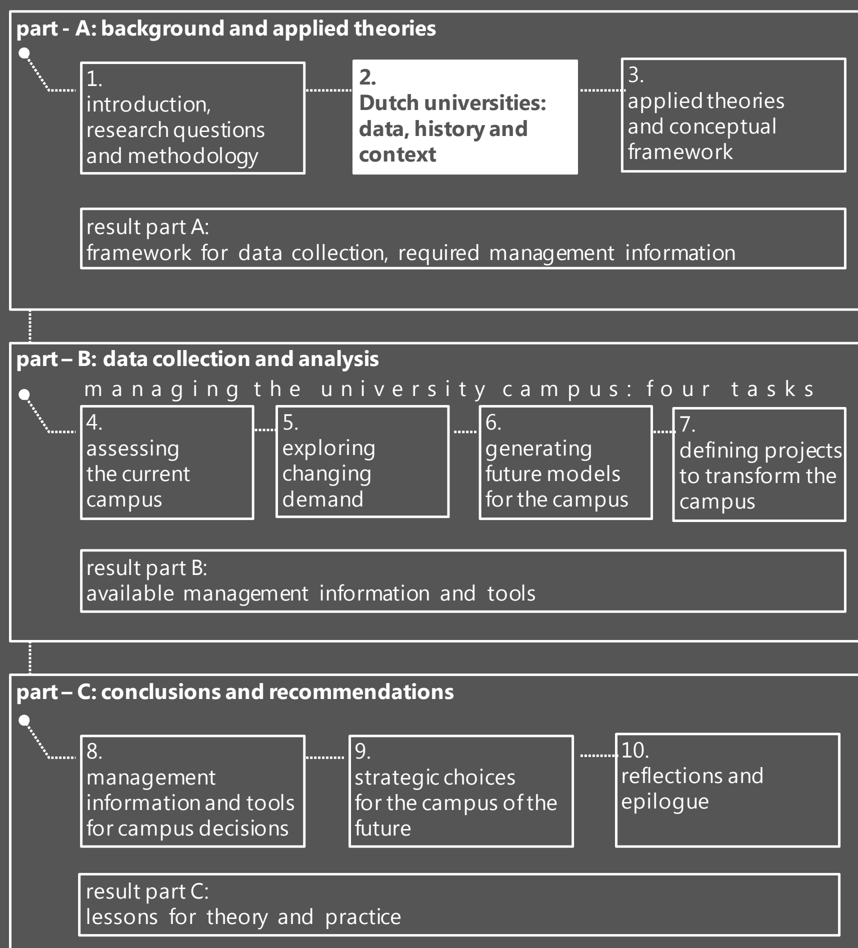
definition "campus management"

For this research "campus management" is considered the collection of strategic management tasks to match the university campus with the changing context and various stakeholder's demands, adding value to the university's performance. The 'strategic' character of campus management exceeds the operational and tactical tasks that are required to support the university's primary process on a daily basis. However, the strategic management task do very much affect the primary process and require management information of all stakeholders on operational and tactical level.

This research identifies four main tasks in managing the university campus: assessing the current campus, exploring changing demand, generating future models for the campus and defining projects to transform the campus. Part B of this research collects and analyses data of these four tasks of managing the university campus (chapter 4 to 7). Chapter 3 will elaborate on campus management definitions.

Agnietenkapel, University of Amsterdam
Photo: UvA

Chapter 2
Dutch universities: data, history and context



2 Dutch universities: data, history and context

In this chapter the following research question will be answered: "What background information about the historical and current context of (Dutch) universities is relevant?". This chapter will subsequently present basic facts and figures of Dutch universities (section 2.1) and their campuses (section 2.2). The next two sections will elaborate on past developments that shaped the current campus (section 2.3) and on current developments that influence the future campus (section 2.4). This chapter ends with an overview of strengths and weaknesses of the Dutch campus and opportunities and threats for campus management, a SWOT analysis in section 2.5.

2.1 Dutch universities – facts and figures

Central in this research are Dutch universities, referring to the fourteen publicly funded Dutch academic government-approved institutions, also called 'research universities' to distinguish them from the roughly forty Dutch institutions for higher professional education [1]. Thirteen of the Dutch universities focus heavily on research as well as education, ensuring that every student is instructed in a research-intensive environment. They accommodate more than 210.000 students (2007) and about 46.000 employees (2007), of which more than 25.000 are academic staff (VSNU 2007) [2]. The 'fourteenth' university is the Open University, a distant learning university with an enrolment of 24.000 students that follow at least one course at the university, and 700 employees, including 320 academic staff members. The exceptional learning concept and campus setting, described in chapter 5, make Open University (OU) a special case. The information about OU is either left out of the aggregated information on Dutch campuses or highlighted in comparative analyses as a benchmark of a different – possibly future – university and campus model.

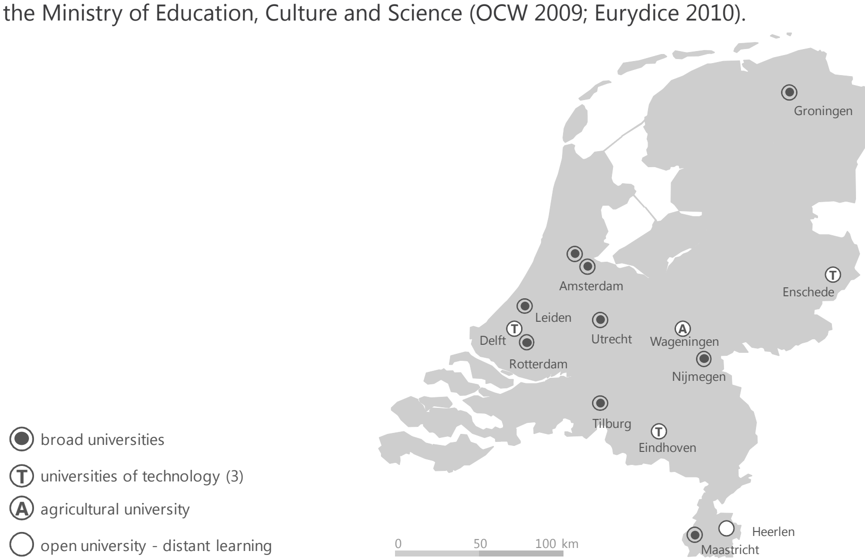
[1] These institutions for higher professional education are called 'hogescholen' in Dutch, 'Hochschule' in German and referred at as 'colleges' in the USA, but they also use 'university' in English.

[2] Since 2007 enrolment has increased to more than 235.000 students in 2009 and staff numbers have risen to about 42.000 fte in 2009 (VSNU 2010b)

Nine universities teach and carry out research in a broad range of disciplines spanning seven sectors: Economics, Health, Behaviour and Society, Science, Law, Engineering and Technology, and Language and Culture. Three – the technical universities in Delft (TUD), Eindhoven (TUE) and Twente (UT) – focus predominantly on engineering and technology. Wageningen University (WU) provides courses and generates knowledge in the field of life sciences and natural resources [3] and is the only university that is financed by the Ministry of Agriculture, Nature and Food Quality. All other universities are financed by the Ministry of Education, Culture and Science (OCW 2009; Eurydice 2010).

[3] www.wur.nl, 2007

figure 2.1: locations of 14 Dutch universities in the Netherlands



The universities vary in size, with enrolments ranging from around 4,700 (Wageningen) to nearly 30,000 (Utrecht), see table 2.1. The average Dutch university has more than 16.000 students, 3.500 staff members (head count), equivalent to 3.000 fulltime jobs, making the average part time factor 84%. About 56% of all staff is academic staff and the ratio of students to academic staff is 10. Although this 'average institution' does not exist, the Radboud University of Nijmegen (RU) comes closest to matching this profile. Around that average profile there is quite a range in the ratio students per academic staff (faculty) member: 4 students / fulltime equivalent (fte) in Wageningen, having many researchers among their academic staff and mostly resembling a research institute at one end of the spectrum and 23 students per fte in Rotterdam, at the other end of the spectrum, which can be explained by the relatively large schools of Economics, Law and Business with extensive teaching methods for large groups of students. But the ultimate benchmark for extensive teaching is the 'virtual' Open University with a ratio of 89 students per fte academic staff. This ratio is based on the enrolment of 24.000 students, of which only six to seven thousand are so-called full curriculum students (data based on an interview with OU in 2007). The other students could just be enrolled for one course; this puts the very high students/staff ratio into perspective.

Some international references do not differ that much from the Dutch range. In terms of students per fte faculty the following numbers were found for academic year 2007-2008 (Salmi 2009): 8 at Harvard University, 11 for Stanford University, 19 at University of California, Berkeley, 6 at University of Cambridge, UK and 6 at Massachusetts Institute of Technology (MIT) [4]. Note: these numbers can only be compared, if the division of research and educational tasks of the average faculty member is similar.

There are also differences in the ratio support staff members per academic staff member, varying from 0,6 to 1,0. Some universities might seem to have more overhead than others, but these figures are hard to compare without information about – for instance – outsourcing of tasks and the (extra) costs. Background information on various other aspects is essential to assess the university performance and the same goes for the campus.

[4] This selection of international references represents the top 5 of the Academic Ranking of World Universities (ARWU) in 2008 en 2009, see www.arwu.org.

table 2.1: enrolment and staff at 14 Dutch universities (academic year 2007/2008, source www.vsnu.nl)

The numbers in this table are all expressed in data of academic year 2007/2008 to be able to compare them internationally and with the financial data and the campus data of ultimo 2007.

		student	staff		staff	staff	ratio	supp-fte/	students/	head count	head count
		enrolment	academic -fte	supporting fte	total fte	head count	parttime	acad-fte	acad-fte	academic	supporting
EUR	Rotterdam	19 500	840	650	1 490	1 760	85%	0,8	23	1 150	780
LEI	Leiden	17 600	1 840	1 470	3 310	3 970	83%	0,8	10	2 110	1 900
RU	Nijmegen	17 400	1 490	1 430	2 930	3 530	83%	1,0	12	1 780	1 800
RUG	Groningen	23 800	1 720	1 580	3 300	3 900	85%	0,9	14	1 960	1 920
TUD	Delft	14 400	2 580	1 850	4 430	4 990	89%	0,7	6	2 810	2 070
TUE	Eindhoven	7 100	1 630	1 020	2 650	2 960	90%	0,6	4	1 690	1 150
UM	Maastricht	12 000	1 540	1 280	2 820	3 340	84%	0,8	8	1 680	1 530
UT	Enschede	8 000	1 380	950	2 340	2 630	89%	0,7	6	1 480	1 150
UU	Utrecht	29 200	2 890	2 350	5 240	6 360	82%	0,8	10	3 240	3 080
UvA	Amsterdam	27 100	2 190	1 620	3 810	4 600	83%	0,7	12	2 570	1 930
UvT	Tilburg	11 500	800	590	1 390	1 800	77%	0,7	14	920	760
VU	Amsterdam	19 300	1 780	1 450	3 240	3 970	82%	0,8	11	2 130	1 720
WU	Wageningen	4 700	1 250	1 020	2 270	2 610	87%	0,8	4	1 310	1 240
total		211 400	21 930	17 280	39 210	46 420				24 820	21 020
average		16 300	1 690	1 330	3 020	3 570	84%	0,8	10	1 910	1 620
OU	Heerlen	24 000	270	330	600	730	82%	1,2	89	320	390

Quality of the Dutch institutions measured by international rankings

Dutch universities can be characterised by their relatively similar quality level in education and research. This can be demonstrated by the two most influential ranking systems: the Academic Ranking of World Universities (ARWU) of Shanghai Jiao Tong University (SJTU) in China and the QS World University Ranking (QS WUR), formerly connected to the Times Higher Education Supplement (THES). Even though there are respectively four and two Dutch universities in the top 100 (Van Vught 2009, see table 2.2), almost all Dutch universities are in the top 500. In comparison 25% of German universities and 38% of UK universities are in the top 500. An international comparison of highly ranked universities can be found in table 2.3. This also confirms the relatively equal and high quality of both research and education at the Dutch universities. Dutch universities have traditionally opened their doors to large groups of students from all social backgrounds, with the government lowering the threshold to study with student grants. To differentiate the quality many Dutch university colleges have been initiated in the past ten years – in Middelburg, Utrecht, Maastricht, Amsterdam and Leiden/The Hague – to differentiate quality and offer selective, broad Bachelor programmes to small(er) groups of students.

table 2.2: the collective Dutch universities score relatively high in two different world university rankings – ARWU (Shanghai) and QS WUR (Van Vught 2009)

country	ARWU Shanghai - SJTU		QS WUR Times
	top 500	top 100	top 100
EU	194	26	35
US	152	55	32
Japan	31	5	6
China	30	0	2
Denmark	4	2	2
Germany	40	5	4
Finland	5	1	0
France	23	3	2
Netherlands	12	2	4
Sweden	11	3	2
UK	40	11	18
Norway	4	1	0

Almost all Dutch universities are in the top 500, which is not the case for most other countries. In comparison 25% of German universities and 38% of UK universities are in the also confirms the relatively equal and high quality of both research and education at the Dutch universities. To differentiate the quality many Dutch university colleges have been initiated in the past ten years – in Middelburg, Utrecht, Maastricht, Amsterdam and Leiden/The Hague – to differentiate quality and offer selective, broad Bachelor programmes to small(er) groups of students.

More information about the criteria of both ranking systems can be found in the next chapter, because these criteria represent important performance indicators at universities all over the world.

table 2.3: International comparison of 'highly ranked universities". Source: World Bank report 2009, based on all university websites

SJTU 2008 ranking	THES 2008 ranking	university	annual expenditures (US$)	student enrollment	expenditures per student (US$)
1	1	Harvard University (United States)	$ 3.170.650.000	29.900	$ 106.041,81
2	17	Stanford University (United States)	$ 3.265.800.000	19.782	$ 165.089,48
3	36	University of California, Berkeley (United States)	$ 1.700.000.000	32.910	$ 51.656,03
4	3	University of Cambridge (United Kingdom)	$ 1.470.940.000	25.465	$ 57.763,20
5	9	Massachusetts Institute of Technology (MIT) (United States)	$ 2.207.600.000	10.220	$ 216.007,83
6	5	California Institute of Technology (United States)	$ 2.287.291.000	2.245	$ 1.018.837,86
7	10	Columbia University (United States)	$ 2.690.000.000	23.709	$ 113.459,02
8	12	Princeton University (United States)	$ 1.196.570.000	6.708	$ 178.379,55
9	8	University of Chicago (United States)	$ 1.497.700.000	14.692	$ 100.100,25
10	4	University of Oxford (United Kingdom)	$ 1.081.350.000	23.620	$ 45.781,12
11	2	Yale University (United States)	$ 2.100.000.000	11.851	$ 177.200,24
19	19	University of Tokyo (Japan)	$ 2.286.974.741	29.347	$ 77.928,74
24	24	Swiss Federal Institute of technology (Switzerland)	$ 1.076.734.500	13.999	$ 76.915,10
24	41	University of Toronto (Canada)	$ 1.060.000.000	71.202	$ 14.887,22
45	48	University of Copenhagen (Denmark)	$ 1.023.804.249	31.098	$ 32.921,87
47	67	University of Utrecht (Netherlands)	$ 925.697.362	27.175	$ 34.064,30
51	n/a	Karolinska Institute (Sweden)	$ 550.449.908	7.932	$ 69.396,11
55	93	University of Munich (Germany)	$ 501.296.087	22.236	$ 22.544,35

2.2 The Dutch university campus

2.2.1 Floor area, ownership, type of use and land property

Together the thirteen universities own as much as 4,5 million square meters gross floor area and more than 1200 hectares of land property, see table 2.4. Their collective campuses contain an estimated 1200 buildings. Of this gross floor area (gfa) about 60% is 'usable floor area' (ufa), which excludes space for horizontal and vertical circulation, installation and construction. This percentage is not much different from the standard that is used in Dutch government office buildings (Rgd).

The floor area represents all buildings that are managed by the university. This ranges from about 120.000 to 680.000 square meters The universities own most of these buildings: the maximum percentage of rented space at current campuses is 11%, at University of Amsterdam. For the total portfolio of Dutch university buildings the percentage of rented buildings is only 3%. Apparently, universities do currently not seek the flexibility in a mix of owned and rented space.

Beside the subdivision in rented and owned space the floor area – managed by the university – can also be classified in terms of use, on a general level: used for the primary processes [5], let out to other organisations – that pay rent to the university [6]– or vacant. Erasmus University Rotterdam is on top of the list when it comes to letting out space to other organisations. The three universities of technology let out at least 10% of their floor area. The vacant space is not just space that has currently no user: it can also include space that is temporarily under construction. The vacancy rate of the total portfolio of university buildings is just 4%, acceptable as a rate that is necessary to allow reconstruction and internal relocation. But this is just the vacancy percentage on a general level. The floor area that is in fact 'used by the university' is often 'vacant' as well: during parts of the year, parts of the week and parts of the day.

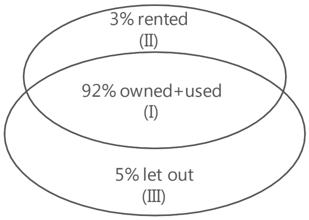
[5] including all supporting – secondary – processes that support the primary goals of education and research

[6] This does not include faculties and institutes within the university that may pay some form of rent or compensation for the floor area they use

table 2.4: the physical campus in m2 (Den Heijer 2007a), data delivered by campus managers in 2007

		floor area in m^2			ownership		use			land	
		gross	usable	% usable	% owned	% rented	% used	% let out	% vacant	hectares	% vacant
EUR	Rotterdam	171 000	103 000	60%	100%		79%	16%	5%	16	
LEI	Leiden	395 000	220 000	56%	97%	3%	87%	3%	9%	81	38%
RU	Nijmegen	290 000	174 000	60%	100%		94%	5%	1%	40	
RUG	Groningen	390 000	241 000	62%	93%	7%	97%	2%	1%	120	
TUD	Delft	544 000	314 000	58%	100%		84%	12%	4%	162	33%
TUE	Eindhoven	337 000	226 000	67%	100%		85%	10%	5%	85	
UM	Maastricht	183 000	99 000	54%	93%	7%	96%	2%	2%	24	21%
UT	Enschede	212 000	133 000	63%	94%	6%	73%	11%	16%	138	
UU	Utrecht	683 000	388 000	57%	97%	3%	91%	4%	5%	302	5%
UvA	Amsterdam	406 000	252 000	62%	89%	11%	96%	1%	4%	37	
UvT	Tilburg	121 000	72 000	60%	100%		87%	9%	4%	20	
VU	Amsterdam	320 000	173 000	54%	97%	3%	97%	2%	1%	14	
WU	Wageningen	410 000	260 000	64%	100%		97%	2%	1%	186	
total		4 462 000	2 655 000							1 225	
average		343 000	204 000	60%						94	
OU	Heerlen	21 624	14 487	67%	100%		96%	4%	0%	6	

figure 2.2: managing the Dutch university campus categories I+II+III



Summarized, the 4,5 milion m2 gross floor area of the Dutch campus consists of 3% rented floor area from other parties and 5% let out floor area to other parties (see figure 2.2). Of the residual 92% that is both owned and used by the university roughly 4% is vacant. Campus management involves the full 100%, either owned or (just) used.

The campus consists of buildings and land. Land property is an important asset for campus management. Within the framework of zoning plans ownership at least gives the university some autonomy and flexibility in planning the campus of the future. But not all footprints of the university buildings are on land property of the university. Land property of the current campus ranges from 14 hectares (Amsterdam-VU) to more than 300 hectares (Utrecht).

The value of the land property has increased over the years, because of the scarcity of land and urban growth. Over the years the substantial land positions have become important or integrated parts of cities. It is tempting for the university – in times of scarce resources – to sell the land and leave the city. This can be a threat for both the university and the city, neglecting the attractiveness of the city to students on one side and the economic spin-off and vitality of the university for the city on the other side.

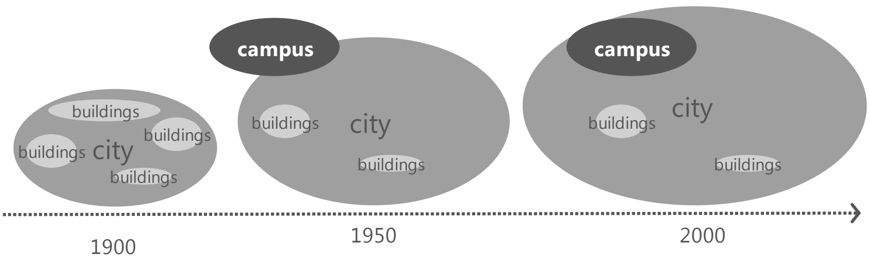
2.2.2 Location and age distribution of the campus

Over the years Dutch universities have changed from small institutions, physically fully integrated with urban tissue, but exclusively accessible to an intellectual elite, to large institutions that are open for the masses, but with extensive spatial consequences that required a campus on the edges of the (inner)city. The locations of buildings and land property still show the physical signs of this transition. In figure 2.3 this transition is illustrated in three stages that have built the current campus, roughly linked to a timeline that matches the age distribution that can still be identified when researching the campus anno 2007.

The first stage shows locations of university buildings that accommodate the elite institutions before and in the first decades after 1900. The second stage illustrates the large campus developments on the edges of the cities in the fifties, sixties and seventies. Some of the universities left the inner city buildings over the years to intensify the use of the new campus. The third stage represents the current campus and shows that the city has grown over the years.

Many campuses on the edges of their cities have become part of urban fabric, again. With increasing land values as a resulting opportunity and more involvement from local government as both an opportunity – adding value to mutual goals – and a possible threat, interfering with campus planning and making decision making processes more complex.

figure 2.3: example of development stages that built some of the current Dutch campuses

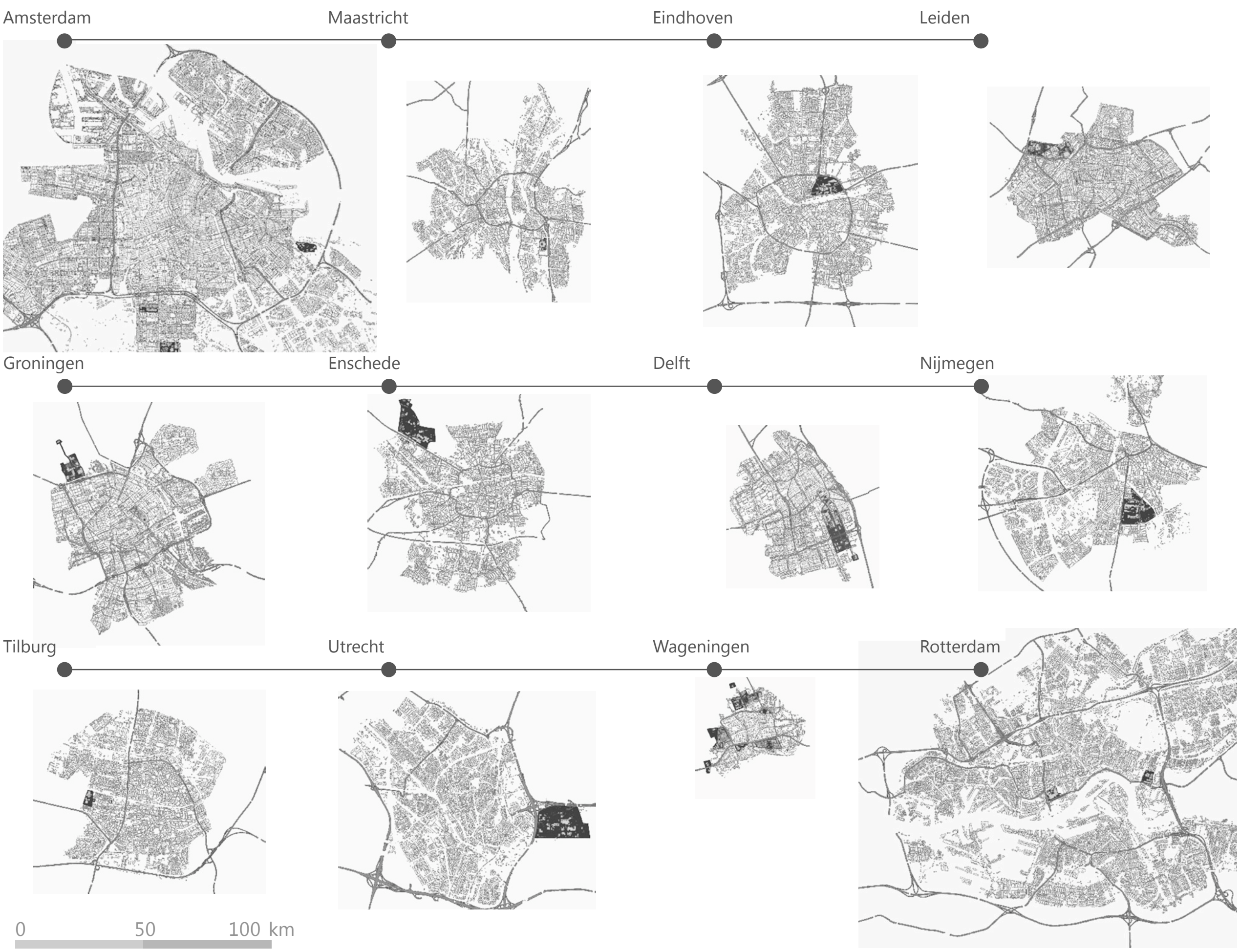


Before looking at the city maps, it is important to realize that there is more than 400 years age difference between the oldest Dutch university (LEI, founded in 1575) and the youngest universities (UM, 1976 and OU, 1984). In table 2.6 on page 63 all founding years of Dutch universities can be found, also in comparison with some international universities.

The age of the institutions explains which universities are most likely to have old inner city university buildings and which universities (only) have large campuses on the edge of cities, see table 2.5 and the maps of all university cities, with the locations of the campuses – land and buildings – in figure 2.4.

All 'old' universities still have inner city buildings, where the middle age group (1800-1950) have left most or all of their inner city building, focusing on their campuses elsewhere. The exception to the rule is the University of Maastricht (UM) that is a young university with old inner city buildings. Apparently the city and the university joined forces to match the accommodation demand of the university and with available characteristic inner city buildings.

figure 2.4: university cities
- land property
- buildings
note: Amsterdam has two universities
(Maps developed by Harald Mooij)



The majority of the universities still manage nineteenth century or early twentieth century buildings, which is illustrated in table 2.5. And even though some universities have relatively large parts of their campuses in the inner city (UU and UM), it is also interesting to put this in the perspective of the total amount of Dutch university buildings. Less than seven percent of all university buildings of the current campus was built before the 1940s. However, these old buildings are a very characteristic part of the campus, by the university population and by the city population, because they are often part of the inner city and the city's cultural heritage.

Looking at the absolute numbers the majority of Dutch university buildings was built in the sixties and seventies. The top five of contributors to this number are TUD – with 320.000 m^2 gross floor area – VU, UU, UvA and TUE (200.000 m^2 gfa). But relatively VU is on the top of the list, with more than ninety percent of their buildings from the sixties and seventies.

The age distribution of campus floor area emphasizes that the campus of today is shaped by the past. Consequently, every campus strategy for the future is 'limited' by 'what is'. This is also referred to as the so-called 'path dependency'. How past developments have shaped the current campus, is subject of the next section.

2.3 Past developments that shaped the current Dutch campus

2.3.1 Founding years of Dutch universities

The current campus is shaped by decisions of the past. Therefore it is relevant to determine how far back these decisions go. In table 2.6 the founding years of all Dutch universities are shown, including some international references that were selected on ranking, fame or age. The oldest universities include Bologna (1088), Paris (1150), Oxford (1167), Cambridge (1209) and Salamanca (1218). Depending on the criteria for becoming a "university", Bologna and Paris concur for the title of the oldest still existing university . The oldest university of the Nordic countries is Uppsala (1477) in Sweden.

table 2.5: age distribution of university buildings at all fourteen universities (Den Heijer 2007a)

	EUR	LEI	RU	RUG	TUD	TUE	UM	UT	UU	UvA	UvT	VU	WU	OU
	%m2	%m2	%m2	%m2	%m2	%m2	%m2	%m2	%m2	%m2	%m2	%m2	%m2	%m2
< 1900		4%		5%			16%		15%	4%				
00s		1%		2%										
10s			1%	4%	3%				3%					
20s				2%									2%	
30s		1%											2%	
40s					0%									
50s		5%		1%	15%	11%							18%	
60s	30%	27%	27%	9%	28%	45%		47%	20%		20%	50%	16%	
70s	7%	14%	23%	36%	37%	16%	14%	34%	19%	64%	33%	41%	28%	
80s	9%	34%	8%	21%	4%	4%	29%	5%	16%	18%	13%		10%	66%
90s	27%	5%	3%	12%	7%	8%	19%	13%	11%	10%	24%	2%	20%	21%
> 2000	27%	8%	39%	8%	7%	17%	21%	1%	16%	4%	11%	7%	4%	13%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

The definition of a university: an institution of higher education and research, which grants academic degrees at all levels (bachelor, master, and doctorate) in a variety of subjects. The word 'university' is derived from the Latin "universitas magistrorum et scholarium", referring to "community of teachers and scholars" (source: Encyclopaedia Britannica), 'universitatum' emphasizing the whole intellectual community in which students are full members. Because awarding of academic degrees for advanced studies was historically a European custom, and the modern definition of a university includes the ability to grant degrees, the oldest institutions of higher learning that have always satisfied the modern definition of a university were in Europe (Wikipedia 2010), see figure 2.6.

The oldest Dutch universities are founded in the sixteenth and seventeenth century – Leiden (1575), Franeker (1585-1811), Groningen (1614), Amsterdam (1632) and Utrecht (1636) – and their current campuses still show signs of pre-twentieth century periods. A brief history of the European university can give some context of decisions of the past.

2.3.2 Generations of universities

In many publications on the history of the university (Pedersen 1998; Ruegg 2004; Wissema 2005) three important periods are distinguished: (1) the Medieval university, (2) the Humboldt university and (3) the 'Third generation university'. The publication "A history of the university in Europe" (Ruegg 2004) adds the Renaissance university between (1) and (2). These periods are mainly important because of the major changes in the context, the impact on the primary processes of education and research, and – consequently – on the campus in terms of both land and buildings. In other words, variables like number of students, types of space, required floor area and suitable locations are influenced by these changes. This section describes these periods in brief.

table 2.6: founding years and ages of the current fourteen Dutch universities and some international references (Den Heijer 2002d; Den Heijer 2007a), based on websites of universities

note: some universities like Bologna and Oxford do have a teaching history before their official founding years: Bologna in the tenth century and Oxford in the eleventh century.

university	city	founded in	age in 2011 (in years)
LEI	Leiden	1575	436
RUG	Groningen	1614	397
UvA	Amsterdam	1632	379
UU	Utrecht	1636	375
TUD	Delft	1842	169
VU	Amsterdam	1880	131
EUR	Erasmus	1913	98
WU	Wageningen	1918	93
RU	Nijmegen	1923	88
UvT	Tilburg	1927	84
TUE	Eindhoven	1956	55
UT	Twente	1961	50
UM	Maastricht	1976	35
OU	Heerlen a.o.	1984	27

university	city	founded in	age in 2011 (in years)
references USA			
Harvard	Cambridge	1636	375
Yale	New Haven	1701	310
Columbia	New York City	1755	257
NYU	New York City	1832	180
MIT	Cambridge	1861	150
references Europe			
Bologna	Bologna, IT	1088	923
Paris	Paris, F	1150	861
Oxford	Oxford, UK	1167	844
Cambridge	Cambridge, UK	1209	802
Salamanca	Salamanca, E	1218	793
Uppsala	Uppsala, S	1477	534

thirteenth to fifteenth century: the Medieval University

With the Universities of Bologna, Paris (later Sorbonne), Oxford and Cambridge as examples – also see figure 2.5 – the Medieval university is still very much on the current map of higher education. “Many of the medieval universities in Western Europe were born under the aegis of the Catholic Church, usually as cathedral schools or by papal bull as Studia Generali. In the early medieval period, most new universities were founded from pre-existing schools, usually when these schools were deemed to have become primarily sites of higher education. Many historians state that universities and cathedral schools were a continuation of the interest in learning promoted by monasteries.” (Origin of universities, retrieved through Wikipedia 2008)

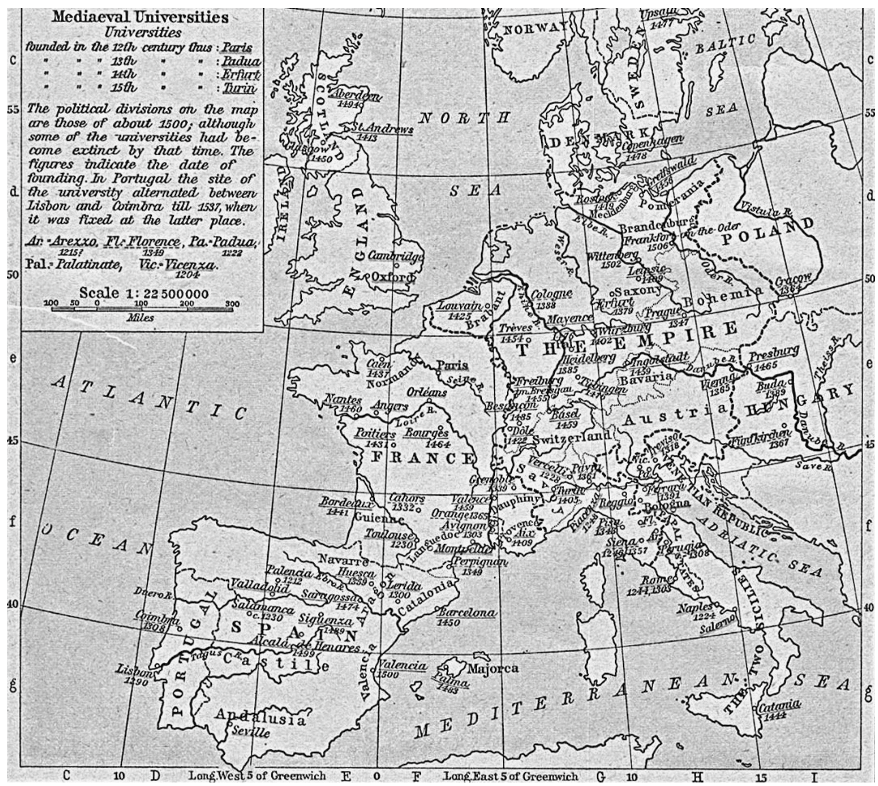


figure 2.5: map of Medieval universities (source: Historical Atlas by William R. Shepherd, 1923 edition)

figure 2.6: classroom around 1350, painted by Laurentius de Voltolina in Bologna (retrieved through Wikipedia 2007)

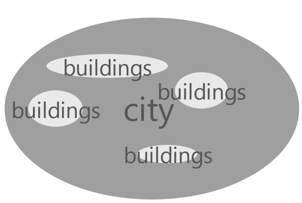


figure 2.7: locations of Medieval university in the city

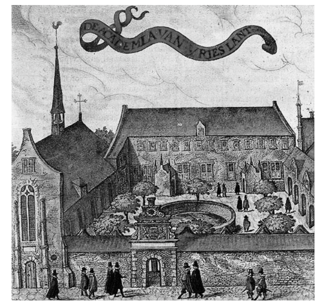
Main goal of the Medieval university (Wissema 2005; Van der Zanden 2009) was enlightenment and encouraging obedience to God. The university functioned as a status symbol for the cities they were located in. The source of income for these university cities made the university a popular phenomenon that spread fast over Europe. Education was the primary task of these universities. Research – as we know it today – was not included in their primary processes. Educational processes were often accommodated in monasteries. Faculties were flexible organisations (‘matrix organisations’ before the term existed) of staff members and students and focused on Theology, Medicine, Law or Arts. Universities were relatively autonomous – with their own jurisdiction – and worked with flexible staff, internationally renowned professors that attracted students from across the country’s borders. These professors moved from one institution to the other and so did students. Latin was the official language at universities, making communication easy between members of different institutions.

With the universities being a status symbol for their cities – accommodating the elite – it was clear that the buildings supported that image. Place certainly mattered and the buildings for the educational processes also served as meeting places, being part of the urban tissue (see figure 2.7 for locations university in city at that time).

fifteenth and early sixteenth century: transition period and Renaissance university

The Dutch universities of Leiden and Franeker were part of a new era of universities of the fifteenth and sixteenth century that were no longer founded by the universal, national or religious powers, but by territorial states. These new political powers needed an educated workforce to develop and build their political and church administration (Van Rooden 1985).

figure 2.8: University of Franeker "De academia van Vrieslant" in 1622 (author unkwown, Wikipedia 2010)



The first generation university aimed at education. Books were rare and hand-written and knowledge was concentrated in the minds of the teachers and handed down to the students verbally. Students were examined viva voci, orally. When the printing press was invented in 1440, this caused a revolution in the production of books, and more importantly, the rapid spread and development of thinking in the sciences, arts, and religion through the transmission and later, translation of texts. The scarcity of written material decreased with printing, copies could be made, and it certainly helped to make the second generation national universities possible, with their extended libraries in their national languages (Downer 2004; Van der Zanden 2009). Students no longer needed to travel, many local universities started to offer the same programs, which also caused both an abundance and redundancy of knowledge. Consequently, this also required similar resources – including university buildings – in many different places, which ultimately resulted in the current network of universities.

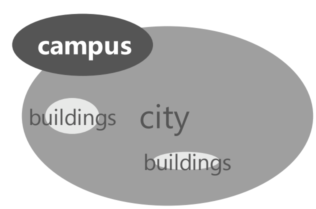
sixteenth to twentieth century: the Humboldt University

The Humboldt University originated in the Renaissance. This type of university is named after Wilhelm von Humboldt, a Prussian diplomat who was founder of linguistics, enlightenment philosopher and Minister of Education. He also founded the Humboldt Universität Berlin (1810) [8]. With the Humboldt University the focus had moved from education to research, also aiming at integrating both (Wissema 2005; Van der Zanden 2009), and basing theories on facts and empirical studies. This model fully flourished in the Age of Reason, acknowledging the value of rationality in research. The independence of the Humboldt University had advantages for research, but specialization, customization to local communities and using the local language – instead of the lingua franca – hindered exchange of knowledge and the mobility of professors and students. Humboldt universities – that had a much larger scale than medieval universities – attracted local students and professors, becoming national institutions with international students being exceptions. Because of the local status and market universities hardly competed for students and staff.

[8] Some sources (History of Universities in Europe, Cambridge University Press) mention four generations of universities with the Renaissance university between the Medieval and the Humboldt university (Wissema 2005). At least for the purpose of this study distinguishing three generations is sufficient.

In terms of organisation these universities were collections of mono-disciplinary subjects that in time were split up into more specialized subjects that became autonomous tracks. Professors were appointed for management tasks – including the role of the dean – and the influence of students on university decisions had declined. Universities transformed from small, elite medieval institutions to large institutions for the masses. Not just educating a new generation of leaders, but giving a large group of students the skills to play various roles in society. Finally when this model entered the sixties of the twentieth century, four developments were threatening the success of the model and were drivers for change (Wissema 2005): (1) the explosive increase in student enrolment from 1960,

figure 2.9: locations of the Humboldt university in the city



(2) the demand for multidisciplinary research, (3) the far-reaching specialization and (4) the emergence of public research institutions.

These developments had many consequences for management of the university, especially the steep rise in student enrolment (see figure 2.10), causing an equal rise in the costs and leading to more public involvement. Financing specialized disciplines meant more involvement in and control over the processes for education and research. Fragmentation of disciplines did not make this easier. Management tasks within the university became fulltime jobs and were separated from the academic staff. This led to a new hierarchy within the university – similar to hospitals and other organisations with highly educated people executing the primary processes – with managers deciding on priorities in the work of professionals and the mix of resources to achieve the institutional goals. One of these resources is the campus, both buildings and land.

Accommodating the large institutions at most Dutch universities led to building new campuses on the edges of cities in the late sixties and early seventies (see figure 2.9). The faculties were housed in separate buildings and much land was reserved for further growth, creating large-scale campuses. With the still increasing student population – during planning and construction periods – some of the new buildings were already too small, before they were finished. Some of the older universities still maintained inner-city buildings. Another reason to move the campus to the edge of the city was the increasing demand for laboratory space and the safety issues of the labs that put restrictions on locating these functions in residential areas.

figure 2.10: student enrolment at Dutch universities from 1950 to 2008 (CBS 2010)

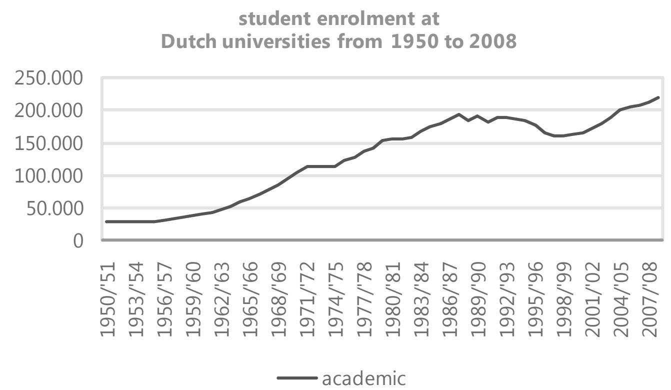
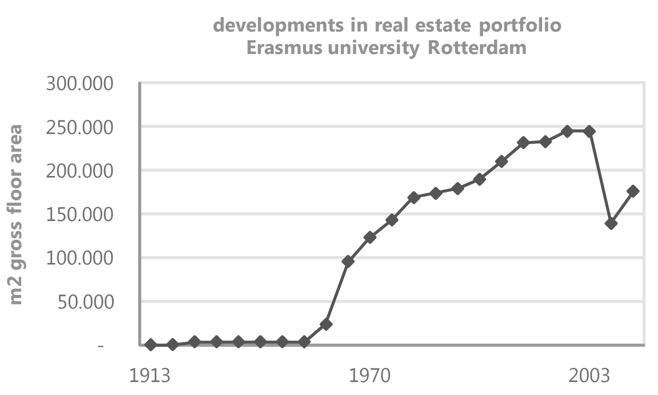


figure 2.11: Exemplary development of Dutch university real estate portfolios from 1900 to 2004 , (Den Heijer 2004a), based on campus data EUR



An example in figure 2.11 shows the explosive growth in terms of floor area in the 1960s and 1970s. This of course matched the enormous growth in student enrolment in that same period. In case of Erasmus University Rotterdam all the new buildings were located on the new campus Woudestein (see appendix I). The reduction of floor area just after 2000 is caused by an organisational change. The academic hospitals and – in some cases – (part of) the buildings of the medical faculties were no longer managed by the universities.

However, the technical characteristics of the Dutch campus are not very unique for the Netherlands, for example: in terms of age of the buildings. The campus of Harvard University did also grow rapidly in the 1960s and 1970s (www.harvard.edu, 2010, see figure 2.12). Similar patterns can be recognized at many universities, like MIT (Simha 2001).

Gradually the developments threatening the success of the Humboldt university required a new model of a university that would handle the threats and be more flexible for opportunities.

late twentieth and twenty-first century: the Third Generation University

Technological developments causing place independency for many tasks of the education and research processes, English becoming the new 'lingua franca' and the economy changing into a knowledge economy are only a few changes in the context of the current university. These developments have shifted the goals, functions, resources and (ideal) places of the university of the future. Many universities are searching for the ideal form to challenge these developments, which are also the basis of the 'third generation university' (Wissema 2005), a valorization-oriented network university with both physical and virtual spaces to exchange knowledge and increasingly an open market place with various partners.

In Europe the first decade of the twenty-first century can be characterized by the objective to create European Higher Education Area (EHEA) without borders by the year 2010 (Wissema 2005, Van der Zanden 2009). In 1999 the 'Declaration of Bologna' was signed by twenty-nine European ministers of higher education to introduce the uniform Bachelor-Master system at their universities, to use ECTS as European Credit Transfer

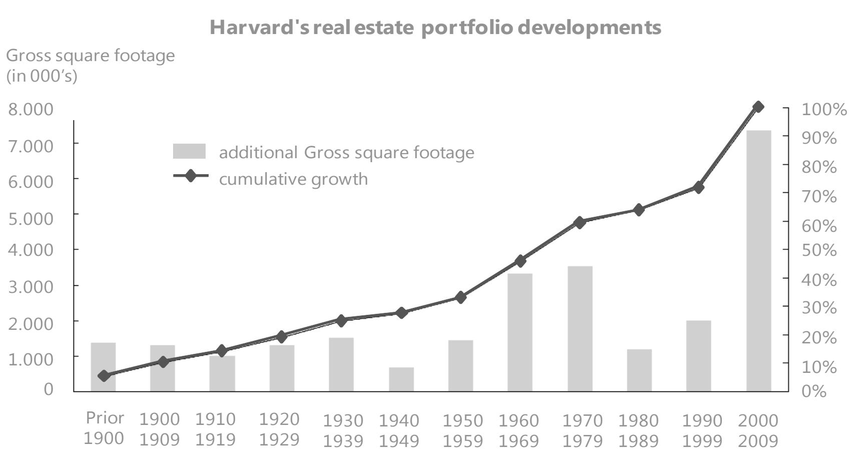


figure 2.12: Harvard's real estate portfolio, developments in more than a century – from before 1900 until 2010 (Harvard 2010)

System to encourage mobility between European universities. Conditions were sound accreditation systems and other tools to assure the quality of teaching and research. The principle objective of a better network of European institutions was to increase Europe's competitiveness in the field of higher education (Van der Wende 2001). Nonetheless, the most critical success factor was to match this objective with enough resources. According to Westerheijden (CHEPS) so far – in 2010 – the mobility numbers are not satisfactory yet: just 4% relative growth in exchange numbers (NRC 2010). Accreditation of each other's courses and ECTS is still a problem at many universities and Bachelor and Master programmes often do not offer enough 'space' for exchange. In 2009 the European ministers agreed on increasing this percentage to 20% in 2020.

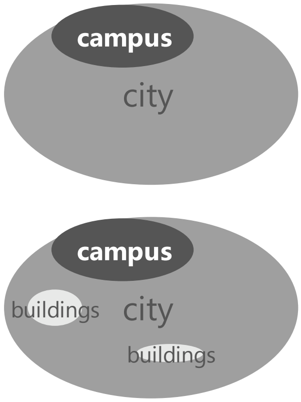
In a the second initiative, in 2000, the council of ministers created a European Research Area (ERA) aimed at networks of excellence, a European research council, and European countries committing to spending up to 3% of their gross domestic product (GDP) on research.

In 2010 the network approach is still relevant for the university of the future. Similarly, the campus can be a node in a physical network, both as one area of concentrated functions or as a collection of locations with different functions spread over a city (see figure 2.13). Both models are apparent in Dutch practice.

summarizing the three generations of universities and their effect on the university campus

In his PhD research "The facilitating university" Van der Zanden uses the term "Scholasticism" for the first generation university, "Enlightenment" for the second generation university and "Sustainability" for the third generation university, see figure 2.14 (Van der Zanden 2009). Van der Zanden's typology and the development stages that built the current Dutch campus can be summarized in characteristics that can be used as lessons for campus management:

figure 2.13: locations of the Third Generation University in the city – two alternatives as found in current practice – the starting point for the twenty-first century campus



1. The first generation Medieval University was education oriented, has Latin as lingua franca, which enabled international exchange and stimulated mobility of students. The focus on oral dissemination introduces the classroom or lecture hall and the importance of face-to-face contact, in university buildings and in the public areas in the city. University buildings are usually church property and mixed with other urban functions.

2. The second generation Humboldt university was more research oriented. The invention of the book press facilitated the distribution of knowledge to large numbers of students and researchers, who could spread this knowledge in their own language. This process allowed the mother tongue as common language on campus. Students no longer needed to travel, many local universities offered the same educational courses and conducted research in the same scientific areas, which also caused both an abundance and redundancy of knowledge and – consequently and at a much later stadium – of universities and university buildings. University buildings increasingly became government property – public real estate. When student numbers increased, faculties grew rapidly and research facilities were both space demanding and requiring locations isolated from housing and other urban functions, the university moved toward the periphery of cities.

3. The current third generation university (3GU) – a network university – is increasingly valorisation oriented, focussing on knowledge transfer, also to explore alternative funding options. This 3GU has English as lingua franca, which – again, like the first

generation – enables international exchange and stimulates mobility of students. The difference is that students, professors and researchers can also use ICT to access and exchange knowledge. However virtual the network university can be, the challenge in the twenty-first century is to bring structure to the enormous amount of available knowledge and to find relations between different scientific fields. This highlights an important task of the professor and researcher of this type of university. This might even plead again for face-to-face contact to discuss and focus. Many European campuses are university property and university policy makers are revaluing the relation with the regional and local economy, also because of the budget cuts in national flows of funds, which is subject of the next subsection.

Clearly, the campus of today is shaped by the past. The path dependency of campus strategies – having to deal with a historical situation – has advantages and disadvantages. The advantages are the land positions of universities in inner cities and the cultural heritage buildings in their campus portfolios, even though these buildings also have some disadvantages in terms of high maintenance costs.

The heritage of past developments is the substantial amount of buildings of the 1960s and 1970s. With faculties and schools having 'their own buildings' it is potentially very difficult to implement models for facility sharing, whereas the network character of the twenty-first century university, the budget cuts and the need to reduce the footprint and CO_2 emission are reasons for sharing more facilities, with parties within and outside the university. This tendency to share also adds to the goals of sustainable development that are increasingly part of the institutional strategy of universities. Sustainability goals and future university models that contribute to a 'greener' campus will be elaborated upon, in respectively section 2.4 and chapter 6.

2.3.3 The changing context of financing the Dutch university and the campus

In line with the developments in the context of the second generation 'Humboldt university', the Dutch government also increased its spending on education and, between 1960 and 1975 in particular, universities grew by leaps and bounds. The expansion of the student finance system helped to make a university education attainable for a much larger group of students (Eurydice 2010). In that period university land and buildings were (still) government property. That changed in 1995 when ownership was transferred to the institutions themselves. This subsection summarizes the changes in the budgeting system for the campus and describes the current finance system for the Dutch university.

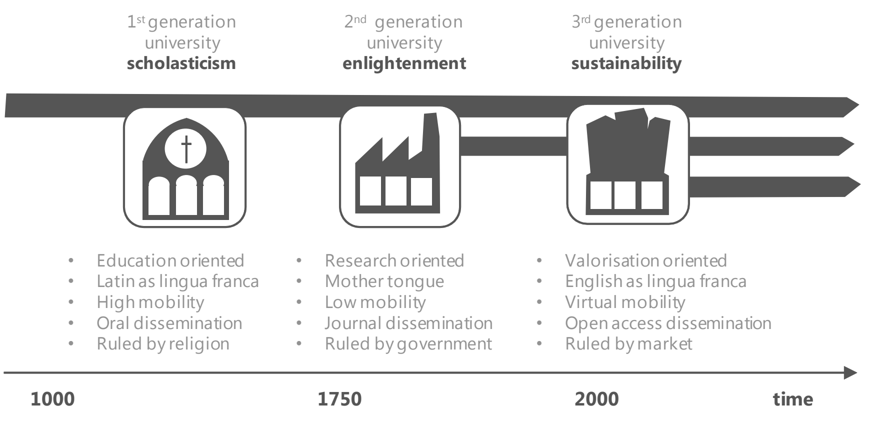


figure 2.14: university of the future – characteristics of three generations of universities (Van der Zanden 2009)

from 1960: financing the growth of the campus

In the period of enormous growth the government was financing many new buildings, adding floor area to the university campuses. With the universities only maintaining the existing campus and the government deciding on investments in new buildings, the campus budgeting system did only have a maintenance component. This was based on the floor area that was used by the university. A disadvantage of this system was that it gave no incentive for efficient use: less floor area just meant fewer resources. This system changed in 1988.

1988: budgets based on space demand ('WORM')

In search of standards for space use 'WORM' [9] was introduced as a tool for programming new buildings and assessing the current campus. WORM was a space demand model for universities and it included standards for educational space, office space and laboratory space. From 1988 the budget for the campus was based on this calculated space demand, independent of the actual 'space supply': the floor area in use of the university.

[9] WORM is an abbreviation for "Wetenschappelijk Onderwijs Ruimtebehoefte Model" in Dutch, which can be translated as higher academic education space demand model. WORM calculated the required floor area as output with student numbers as input. The model contained space standards and student-staff ratios for different types of faculties.

1993: budgets based on both input and output ('HOBEK')

For WORM student enrolment was the main variable: how many students have to be accommodated? In 1993 the output – the number of diplomas – was added to the system 'HOBEK' [10] (Jongbloed and Salerno 2003), next to the enrolment of first year students, covering both ends of the pipeline. Financing based on output was introduced to shift the attention from accommodating the university population – students and staff – to supporting the performance of the university, measured in the quantity and quality of the output.

[10] HOBEK is an abbreviation for "Hoger Onderwijs Bekostiging" in Dutch, is a funding model based on both input and output, which preceded PGM "Plaats Geld Model" that was mainly based on input.

1995: transfer of campus ownership to the universities

Before 1995 universities competed for public resources to finance new construction projects. Projects were judged on necessity and were assessed using standards for space use and investments levels. On January 1, 1995 the Dutch government decentralized the responsibility for the campus ('IVH'[11]). From that moment on universities were responsible for both maintaining the existing campus and investing in new construction projects.

[11] IVH is an abbreviation for "Integrale Verantwoording Huisvesting" in Dutch, referring to the transfer of campus ownership to the research universities in 1995

In retrospect the timing of this transfer – at the start of a period in which the buildings of the sixties and seventies needed reinvestments – was advantageous for the government. From that moment on universities themselves had to prioritize.

To put this in international perspective: universities in many countries own their university buildings and land. Examples are the United Kingdom, the United States, Belgium, Ireland and Norway. However, there are also universities that rent their buildings from other organisations in Germany, Austria and Switzerland. These organisations are mainly public or - in case of Sweden and Akademiska Hus – private with 100% public shareholders. More international references can be found in table 2.7.

Both ownership and rent have advantages and disadvantages, according to the universities (MITPO 1999). Universities that own their campuses emphasize their autonomy in campus decisions (De Jonge et al. 2000), while the rental model can have the advantages of centralized knowledge on managing the campus (Akademiska_Hus 2010). Nevertheless, renting the university campus from a private party with commercial goals is generally considered undesirable (Den Heijer 2007a), because of the relative uncertainties on the demand side – student enrolment, changing organisations and space demands for education and research – and the higher risks these generate, leading to higher required interest percentage. However, it could be interesting to share management tasks with external, commercial real estate managers.

1995-2010: the financial threats of campus ownership

Since 1995 universities have taken many opportunities of their campus ownership. However, the threats of campus ownership have also been apparent in the past fifteen years. The threat of not being able to finance the campus of the future and the backlog maintenance of today have been on the agenda of (collective) campus managers, university boards and the associations of universities (VSNU).

In 1999 a committee investigating the university assets and the required resources to keep them functional (Commissie-Koopmans 1999) concluded that the universities were hundreds of millions short to finance the necessary campus investments – expressed in Dutch guilders at that time, but it was still hundreds of millions, expressed in euros. And even though government and university could interpret 'necessary investments' differently, the gap between the required resources and the actual budgets was too large to ignore. Nevertheless, the universities did not receive additional funding apart from an incidental financial injection of 40 million euros, for all universities and spread over the period 2002-2005 (source: VSNU 2010) to cover the costs of the most urgent projects, for instance solving health and safety issues on campus.

As a consequence necessary investments for the campus are financed with resources for education and research. The lump sum budget system leaves the assessment of investments within the university to university management. An advantage of this

country	ownership campus	references and sources
Netherlands	universities	HOI - association of campus managers VSNU - association of universities
United States	universities	SCUP – society for college & university planning APPA – facilities managers for educational facilities NACUBO – business officers
United Kingdom	universities	AUDE – Association of University Directors of Estate HEFCE – Higher Education Funding Council England
Sweden	Akademiska Hus	Akademiska Hus
Norway	universities	NUAS - Nordic Association of University Administrators
Denmark	universities	NUAS - Nordic Association of University Administrators
Finland	shared between universities and three companies	Government established property investment companies for (1) Helsinki, (2) Espoo (Aalto – University Properties) and (3) the rest of the Finnish universities
Germany	Länder	HIS – Hochschul-Informations-System GmbH Länder is German for state or federal state
Austria	BIG	BIG stands for Bundesimmobiliengesellschaft, that manages and owns a portfolio of 21 Austrian universities
Switzerland	government	
Belgium	universities	VLIR - association of Belgian universities
Ireland	universities	
Australia, New Zealand, Hong Kong, Singapore	universities	TEFMA - Australasian Tertiary Education Facilities Management Association for Australia, New Zealand, Hong Kong, Singapore
South-Africa	universities	HEFMA - the Southern Africa Higher Education Facilities Management Association

table 2.7: ownership of university campus in different countries (see appendix IV for sources and websites)

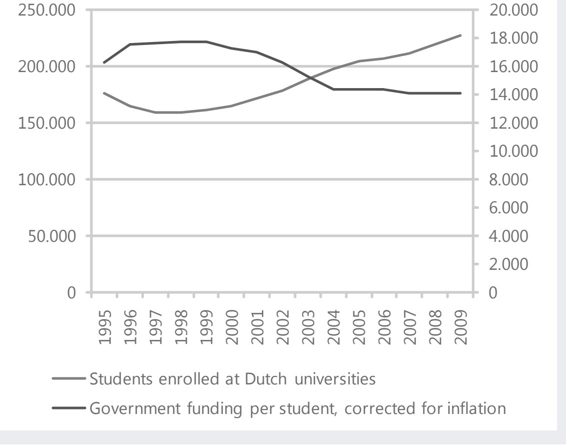
system is that universities are forced to thoroughly evaluate every project and weigh the benefits against the benefits of alternative investments, for instance in educations and research projects. This could encourage efficient use of space and creative solutions to get extra resources. But it could also endanger the primary processes if necessary projects remain undone and the bad condition of the buildings starts to influence the performance of the university. On top of that the Dutch association of universities (VSNU 2006) observed a decline in state funding (see figure 2.15), putting even more pressure on decision makers. They have to weigh the costs of not investing in the campus against the costs of not investing in education and research.

Document analysis and web research of international associations of universities, campus management or facilities management confirm that this is not just a Dutch problem. In the USA this funding problem even goes back more than twenty years in "The Decaying American Campus" (Rush and Johnson 1989). Documents of English universities state (AUDE 2006) both the national importance of universities and their campuses and the age profile and technical state of their campuses.

Decline in state funding of Dutch universities and their campuses since 1995

Since 1995, state funding of education and research has fallen from 0.76 per cent of gross national product (GNP) to 0.62 per cent. One consequence of this is that the government's annual education spending per student has declined by €800 over the period 1995-2005 from €5,650 to €4,850. With more than 200,000 students in the system, this means that simply keeping their funding stable has meant finding more than €160 million from other sources. And similar huge investment is required in research, where state funding has fallen from 0.39 per cent of GNP to 0.29 per cent since 1995. Keeping overall research spending up to the 0.39 per cent level means covering a shortfall of approximately €500 million – the same amount as the Chang Committee on "research dynamisation" calls for in its report, Investing in Dynamism (VSNU 2006). Other sources reveal a decline in state funding of 33% since 1981 (source: VSNU)

figure 2.15: developments in student numbers (left, blue line) and state funding (right, red line), in the period 1995-2009 (based on data of VSNU in 2010)



The two graphs in figure 2.15 show that while student numbers increased – and they still do – the state funding per student decreased (corrected for inflation).

The association of Dutch universities (VSNU) – supported by committees (Koopmans in 1999, Gerritse in 2009) – has stated the following in a collection of reports:

(a) At the time of the transfer of ownership there was already a gap between the resources the Dutch universities needed and the resources they got for the campus (about € 77 million annually), based on the age of the Dutch campus and the necessary investments for replacement and reinvestment

(b) The ministry of Education indicated that the annual gap was € 40 million (more than 50% extra), the VSNU calculated a gap of € 60 million (more than 75% extra, on the € 77 million that the universities received collectively).

(c) Even though the amounts differ, the ministry and VSNU at least agreed on the funding problem for the university campus.

The deficit was acknowledged in the beginning of the period of campus ownership (1995) and has increased ever since because of more strict safety and security demands, rising student expectations, more emphasis on ICT, higher replacement costs shorter depreciation periods of investments, because of shorter functional lifecycles of installations and interior, which also have become a larger part of the total investment in university buildings (Den Heijer 2002b; COTF-organization 2006; Den Heijer 2007a; Den Heijer 2007b).

On top of that, the credit crunch of 2008 and the following economic crisis have made it harder to obtain loan capital from the banks, despite the triple-A-rating of Dutch universities (HOI 2010)

For funding of the educational tasks of universities a formula is used for allocating the central government grant among the universities (the 'first flow of funds'). This formula was adjusted in 2000 to place more emphasis on performance-based criteria. Under the Performance-based Funding System (PBM), 50% of the teaching component of the central government grant is now allocated on the basis of the number of degree certificates awarded, compared to 10% previously.

Payments for accommodation and funding for specific activities are covered by the central government grant. The universities are free to spend these funds as they wish, in keeping with their statutory tasks. Negotiations on the pay and conditions of university personnel were decentralised in 1999. Payments are also made from the central government grant for the universities to the academic hospitals. Tuition fees form an additional source of income for the universities (see figure 2.16).

University research is funded from three different sources (Eurydice 2010):

- *first flow of funds*
  the central government grant (OCW), which includes an amount for research;
- *second flow of funds*
  funding for specific projects from the Netherlands Organisation for Scientific Research (NWO);
- *third flow of funds*
  grants, education contracts and research contracts for third parties: the latter consists mainly of funding from national and international government agencies and organisations, and research funded by non-profit institutions; the private companies accounts for around 15% of this category of funding

As a 'fourth' flow of funds many universities – internationally – are increasingly dependent on the gifts of alumni. This culture has added to the billion dollar endowments of universities like Harvard, Yale, MIT and Columbia University. Some of these universities like MIT also have real estate investment departments – for portfolio management – but they do not invest in their own campus. However, in the past years the endowments of many universities were diminished as a result of the credit crunch (2008) and the world-wide economic crisis (2009). Not only alumni and private parties are less inclined to donate money to their alma mater, but these funds were also invested on the stock market and (commercial) real estate market that suffered from the same recession.

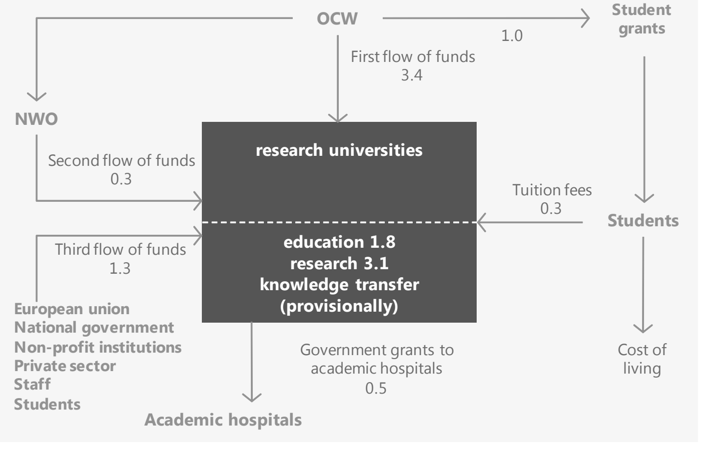


figure 2.16: funding of Dutch research universities, based on CFI figures 2007 (OCW 2009) in billions of euros

Also considered as a non-monetary form of funds is the number of emeritus professors that are still adding to the performance criteria of the university. The same goes for alumni who play a voluntary role in education and research projects, to support their alma mater. It should be noted that especially these endowments tend to be labelled for physical resources and university facilities. The culture of naming a university building after its sponsor is already visible on many campuses, including Stanford university, which has both buildings and lecture halls with names of companies or private persons – usually famous alumni – who donated money to the university.

An international comparison of public and private expenditure on higher education – indicated as tertiary education – is illustrated in figure 2.17. This chart show huge differences in the ratio public-private funding and also demontrates the percentage of the tuition fees that students pay. These also differ from country to country.

Another international comparison in figure 2.18 shows large differences in the percentage of the gross domestic product (GDP) that countries spend on education and research at universities. In the Netherlands tertiary education equals the higher education sector – academic (research) universities and institutions for professional higher education. The fact that the percentage of the USA is twice the percentage of many other countries,

figure 2.17: distribution of public and private expenditure on tertiary education, red-brown is household financing, like tuition fees of students (OECD 2009)

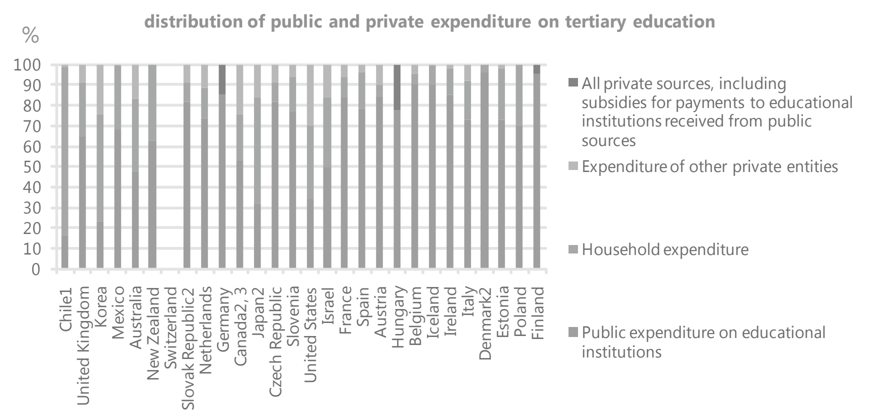
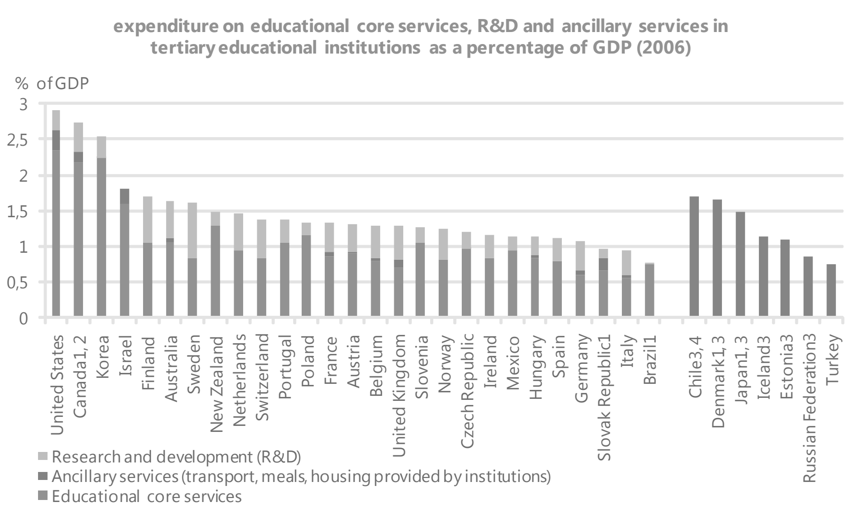


figure 2.18: expenditure on tertiary education as a percentage of the counties' Gross Domestic Product (OECD 2009)



including the Netherlands, also puts the public-tuition-private ratio of figure 2.17 in perspective. It means that in absolute numbers, the public expenditure of the USA on higher education can still be compared to the Netherlands. It also means that higher tuition fees and more private funding cause the high GDP percentage of the USA.

As stated earlier in this chapter, in 2000, the council of ministers of European universities 2000, created a European Research Area (ERA) aimed at networks of excellence, a European research council, and European countries committing to spending up to 3% of their gross domestic product (GDP) on research. In 2010 universities of many countries are still lobbying for more public and private resources to achieve that goal and to finance the university of the future.

summarizing the financial context of the campus

More resources for universities can mean more resources for the campus, at least potentially. Nonetheless – and in practice - "less public funding" usually means less resources available for the campus, while many developments and backlog maintenance at most universities require more resources. Apart from lobby processes to increase public funding, private funding and tuition fees the financial context of the Dutch campus has become more complex, due to technical, functional and strategic developments. Examples are more strict safety and security demands, rising student expectations (COTF-organization 2006), more emphasis on ICT, higher replacement costs, shorter depreciation periods of investments (Den Heijer 2002b; Den Heijer 2007a; Den Heijer 2007b).

On top of that, the credit crunch of 2008 and the following economic crisis have made it harder to obtain loan capital from the banks, despite the triple-A-rating of Dutch universities (HOI 2010). Attracting new sources of income, of stakeholders that benefit from the university in any way, will be an important task in financing both the university and the campus of the future. In the next section economic developments indicate that there are many opportunities.

2.4 Identifying developments that will influence the future campus

From 1950 onwards, more and more people in the Netherlands have been participating in higher education. From the mid-1990s, spectacular growth has been seen. In 2020 the research universities (WO) will have some 40% more students compared to 2007 (OCW 2010a). By 2010 total enrolment is predicted to exceed 300.000 students. Figures from the Ministry of Education indicate that in the period 2020-2030 this number will stabilise at a level of 325.000 students – also derived from demographics and predicted enrolment is primary and vocational education (OCW 2010b), see figure 2.19. Other figures with both the historical and predicted enrolment of all Dutch higher education institutions can be found in appendix III.

While historically the size of the campus has often followed the trends in student enrolment, the current context could make policy makers and campus managers decide otherwise. The urge to reduce the footprint, the budget cuts and relatively low occupancy rates of some space types on campus are factors in these decisions. The chapters of part B will elaborate on these issues and the considerations for campus managers.

Student enrolment is an important influence on the future campus, but there are many more. This section identifies many trends and developments that influence either requirements for the campus or the context of campus management. It also attempts to

Economic crisis keeps students at university

When choosing between unemployment or staying another year at the university for additional courses, the decision is not hard to make in these economically rough times.

Many universities experience both higher enrolment figures and longer studying periods for the current generation of students.

source: Financieele Dagblad, 2009

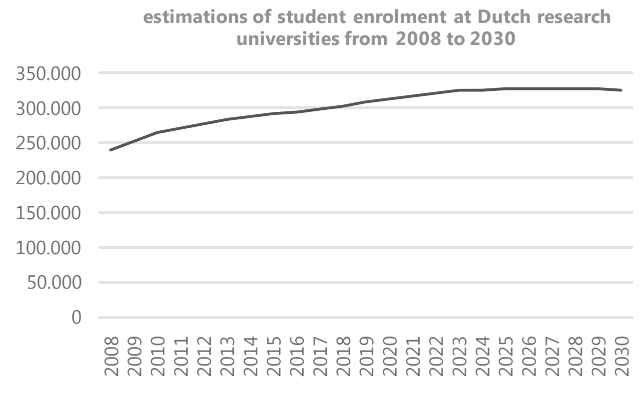
find a hierarchy in these trends and developments and elaborate on their impact on the campus. The trends that are summarized in this section are derived from demographic, economic, technological, socio-cultural, ecological and political developments. These trends are increasingly interrelated and influence different campus variables at the same time. Predicting what the university of the future – and campus of the future – will be like has become more and more complex.

Among many others Marginson and Van der Wende state that in global knowledge economies, higher education institutions are more important than ever as mediums for a wide range of cross-border relationships and continuous global flows of people, information, knowledge, technologies, products and financial capital (Marginson and Wende 2007). Apart from the opportunities this brings to recruit form a much larger populations, there are also many threats, including a net brain drain out of national systems in the EU. This is significant both in terms of loss of researchers to the English-speaking world – especially the United States – out of Europe altogether and also the internal transfer of research capacity from Eastern Europe to the Northwestern European nations. These dimensions can also intersect in unpredictable and varying ways (Marginson and Wende 2007). What will the university of the future be like and what type of campus will match? Part B of this research will elaborate on scenarios and future models.

Focusing on the Netherlands, demographic developments in the Netherlands used to be a good indicator for future student enrolment, but under influence of the economic developments, internationalization goals and changing academic systems (Bachelor-Master structure) these relative certainties of are also replaced by uncertainties because of mobility of students.

Despite the availability of estimated student enrolment as illustrated with a trend line in figure 2.19 the complexity of predicting the number of students and employees to accommodate is acknowledged by all campus managers (Den Heijer 2002a). It was also illustrated recently – for academic year 2009/2010 – when more than 25% more students applied at Dutch universities. Immediately, accommodation problems arose, both within university buildings and in the student housing market. While some news media linked this percentage to the economic recession, others – like the Association of Dutch universities VSNU – pointed at other trends that already started before the credit crunch in 2008. Appendix IV shows international enrolment numbers.

figure 2.19: estimated enrolment numbers at Dutch research universities in period 2008-2030 (OCW 2010b)



The university of the future has many uncertain aspects, but will also be the product of strategic choices. In 2002 a comprehensive study was conducted to identify possible trends and developments that shape the university and campus of the future, having thirteen interviews with campus managers (Den Heijer 2002a). In 2007 an update was made (Den Heijer 2007a) with questionnaires.

The next pages contain three key trends that will influence management of universities and campuses, according to international references that will be elaborated: (1) knowledge economy and the crucial role of universities, (2) the network university – universities as nodes in a network and (3) the green campus – sustainable development and reducing the carbon footprint. More developments and their impact on the campus can be found in chapter 5 "exploring changing demand".

2.4.1 Knowledge economy and the crucial role of universities

In many countries economy has changed its focus from agriculture and industry to services and knowledge, see figure 2.20. This macroeconomic development brings more uncertainties because of its relatively place independent processes. Apart from this macro-economic change, the EU has formulated an ambition – in the Lisbon agenda (2000)– to be the most competitive and dynamic knowledge economy in the world by 2010. The member states agreed to work towards healthy government finances, economic growth, knowledge economy and innovation, full employment and conservation of the natural environment. The knowledge economy is much less restricted to a particular area than the agrarian or industrial economy; it is a network economy (Castells and Himanen 2002). This means that in the knowledge economy businesses and knowledge institutions function – and must function – more and more as hubs in a network.

Specialisation is necessary because the competition is global. With the whole world as the labour market for knowledge workers, there are many alternatives. Globalization of individuals is the current trend after globalization of countries and companies (Friedman 2006). Research shows that young potentials – including the creative class – prefer to live and work in cities with a liberal political climate, extensive cultural facilities and other young potentials. Knowledge workers attract other knowledge workers (Florida 2002; Luijten 2005). The same goes for knowledge institutions and knowledge-intensive activity.

Research conducted by Van den Berg into European cities in the knowledge economy (Van den Berg et al. 2005) has shown that to become or continue to be a knowledge city a city must have seven basic elements: a knowledge base, an economic base, quality of life, accessibility, urban diversity, urban scale and social equity. These elements will be made operational for future campus models in chapter 6. In addition to these basic elements Van den Berg also mentions the organisational capacity to successively attract knowledge workers, create knowledge, apply knowledge and develop growth clusters. For these four activities – with economic growth as the objective – a city must join forces with the existing knowledge institutions and businesses: the knowledge base and the economic base respectively.

The presence of a university does not only strengthen the knowledge base, but the vitality of the student population and the employment that a university generates can also add value to the economic base, quality of life and urban diversity. Research in the United States illustrates the economic spin-off of a university within a region and the benefits of university-community collaboration (Wiewel and Knaap 2005). This is confirmed by other sources focusing on the European context (Perry and Wiewel 2007). In the Netherlands many university cities increasingly acknowledge the value of

The Global University City Index

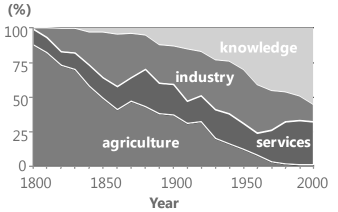
This index highlights those cities (> 2 milion inhabitants) where there is confluence between their size, liveability and connectedness, the number of excellent universities within their bounds and sustained investment in education and research.

These cities are home to knowledge workers and research clusters that make them a significant driving force of the knowledge economy. Worldwide these cities are few in number. Currently they are predominantly in the developed world drawing on long relationships between the city, industry and the academy and an associated history of investment. This picture can be anticipated to change as cities and universities in the developing world collaborate for mutual benefit.

source: www.rmit.edu.au

global rank	university city	country
1	London	UK
2	Boston	USA
3	Paris	France
4	Tokyo	Japan
5	Melbourne	Australia
6	Sydney	Australia
7	New York	USA
8	Chicago	USA
9	Baltimore	USA
10	St Louis	USA
11	Atlanta	USA
12	Washington DC	USA
13	Los Angeles	USA
14	Hong Kong	China
15	San Francisco	USA
16	Berlin	Germany
17	Singapore	Singapore
18	Seoul	Korea
19	Kuala Lumpur	Malaysia
20	Shanghai	China

figure 2.20: radical change working population in OECD countries from 1800 to 2000 (OECD 2005)



the university and align their planning processes with campus planners. An example is the Economic Development Board Rotterdam (EDBR), including their programme "Knowledge city", connecting goals and resources of the regional government, private institutions and higher education institutions.

For attracting knowledge workers the municipality and knowledge institutions can join forces. The role of the university as a provider of jobs in a city – not just knowledge workers, but also many jobs in the supporting service sectors – is often underestimated. Universities are usually one of the bigger or biggest employers in the city, have a spin-off in the form of new enterprises and attract other knowledge-intensive organisations (Wissema 2005; Wissema 2009). Whether the knowledge workers and potential knowledge workers also live, shop or spend time and money in other ways in the same city depends on the policy of both the city and the knowledge institutions. How much attention is paid to student housing, housing for permanent and temporary staff and – not unimportant in attracting highly-trained workers – premises for highly-trained people who want to set up new enterprises? With the world as a labour market, a highly-trained person has many alternatives.

In the Netherlands there are no cities with more than one million inhabitants. Nonetheless, the network of cities in the Randstad area could be considered a megacity with about 7 million inhabitants. This emphasizes the network approach that is required in the Netherlands to be able to compete with other large knowledge cities or regions.

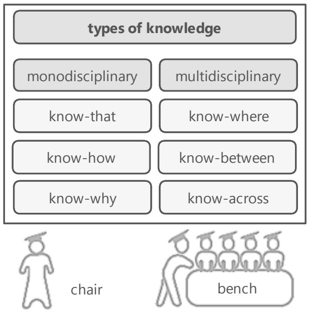
Opportunities & threats for the campus:

+ more attention for the university and campus as crucial factors in the economic system
+ possibly more resources as a result of this attention, if research can calculate what the added value of a knowledge worker is (KENCES 2009)
- more dependent on other parties for university and campus strategies

The network approach is not limited to country borders. The trend of the network university gives opportunities to collaborate with both regional partners and international universities.

2.4.2 The network university – universities as nodes in a network

figure 2.21: education and research changing from mono-disciplinary individual tracks to multi-disciplinary group processes (Van der Zanden 2009)



Defined earlier as the third generation university, the network university comprises education, research and knowledge transfer towards related businesses and society. The network can both be identified within the university and between universities and other parties.

Within the university there have been relatively autonomous faculties and sections that are increasingly inclined and stimulated to collaborate on multi-disciplinary and inter-disciplinary subjects (see figure 2.21). This is encouraged by cross-disciplinary research questions from practice and society and by more focused research programmes of the university: limited number of subjects and an urge to specialize and to join forces.

The network between universities, public and private parties is not the only network that universities are strengthening. Developments like globalization and technological change add to the mobility of students and staff, including the most promising students and the most excellent staff. This represents both an opportunity and threat to any country, city and institution. On all of these levels there is a choice to be made between competition and collaboration.

To some extent a combination is also possible. While the higher education institutions with the top rankings are more likely to emphasize competition – to maintain their high rank – many others are choosing to collaborate in a network, to join forces and to facilitate the mobility of students and staff. The so-called network university is the result. For management of the university campus many challenges can be found in both types of networks: networks that connect partners on one location, from the scale of a community to the scale of a region and networks that connect partners with similar primary processes, both in education and research, and with opportunities to share resources, including facilities.

networks in the Netherlands

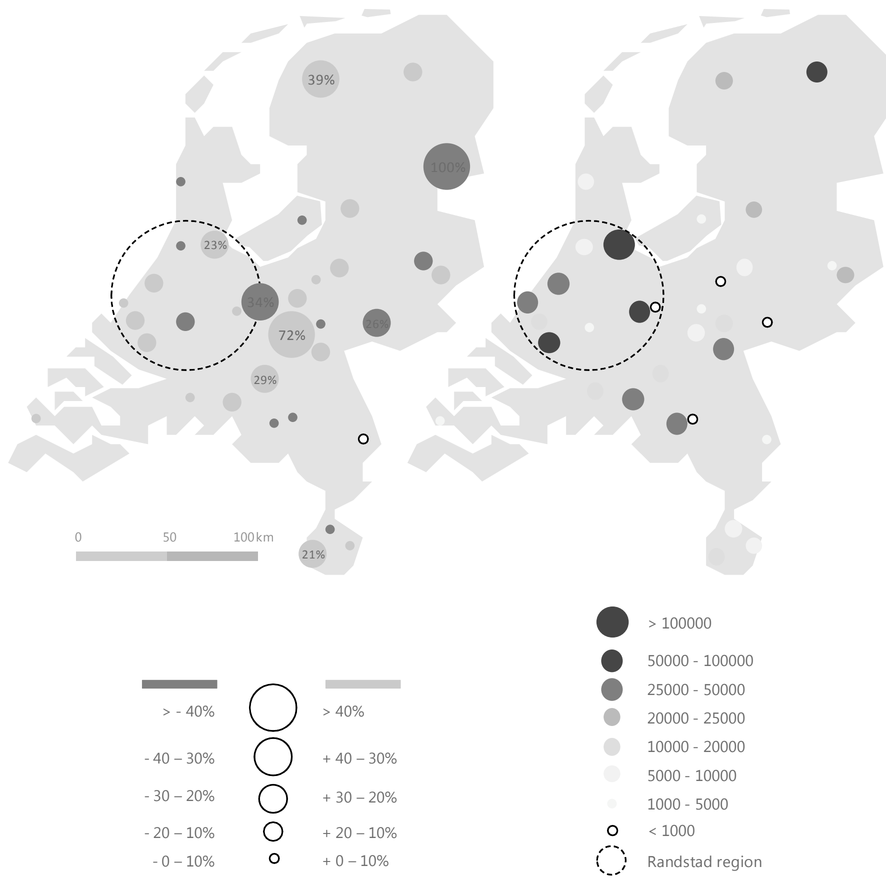
On many levels choices have to be made between competition and collaboration. The map of the Netherlands in figure 2.22 shows in which cities the student population of higher education institutions (HEIs) is accommodated in the Netherlands; this map also includes students at universities of applied sciences. The distribution of students across the Netherlands results in clusters with potential for the knowledge economy. In many clusters this potential has already been successfully used in activities and translated into economic growth. Various studies have referred to examples as Wageningen (around the university campus) and Eindhoven (university campus and High Tech Campus).

To attract the knowledge workers the cities have to invest in a suitable environment. The distribution of students in the Netherlands – the short distances – can be one of the advantages for a strong network of knowledge cities. But if Dutch cities and institutions of higher education do not join forces, they become more and more competitors in strive for the same students. For developing knowledge cities both HEIs and cities are nodes in a network. Challenges arise when looking at the scale of regions, countries and even continents. Compared to international knowledge cities Dutch university cities have a smaller scale and a shorter distance between them (see figure 2.22). This emphasizes the opportunity to scale up from knowledge city to knowledge region.

The map figure 2.22 shows that the total number of students at Dutch HEIs has increased with 13% in the period of 2005-2009, reaching a total of about 635.000 students. Roughly 50% is located in the "Randstad region" (Randstad is the name for the network of cities in the most populated region in the west of the Netherlands with Amsterdam, Rotterdam, The Hague and Utrecht as main nodes). With 230.000 students enrolled at research universities and more than 400.000 students at universities of applied sciences the landscape of HEIs is spread over many university cities. Amsterdam being the largest city of the Netherlands also has the largest student population, accommodated eleven different HEIs.

The relatively short distances between the institutions, especially in the West, the "Randstad", should not be a problem. Even the European scale offers so many opportunities for sharing, not (just) for efficiency reasons, but as an effective solution for the global student who wants to make the learning experience a diverse and multicultural one. It is usually the culture of wanting - or rather 'being used to' – exclusive use of the campus buildings that is an obstacle. But it is important to know what the opportunity costs of this culture are, considering investing the same resources in the primary processes.

figure 2.22: students in higher education institutions (HEIs) distributed across the Netherlands, in 2009 (right) and changes in period 2005-2009 (left); source data from websites VSNU (Association of Universities in the Netherlands) and HBO-raad (Netherlands Association of Universities of Applied Sciences), based on previous research (Den Heijer and De Vries 2007) and updated by the same researchers in 2010; note: Randstad region has 40 km radius on the maps



networks in Europe

In his recent book (2008) Florida states the importance of mega-regions in the economic development and mentions the “Am-Brus-Twerp” (see figure 2.23) – referring to Amsterdam, Antwerp and Brussels as important components – as Europe largest mega-region, housing nearly 60 million people and producing nearly 1,5 trillion dollars in economic output, the fourth largest mega-region in the world (Florida 2008).

The network university is not just limited to other universities or higher education institutions. Increasingly, the university is part of a network of related businesses, young entrepreneurs, public parties and more.

Opportunities & threats for the campus:

+ sharing facilities can stimulate (international) collaboration, adding to university goals
- open networks can affect the (exclusive) identity of a university
+ sharing facilities, including expensive research infrastructure, also to reduce facility costs and the footprint of the university

The latter is in line with the trend of the green campus, which is increasingly acknowledged by many campus managers. This can be derived from the many publications and conferences on this subject that can be found on campus management network websites (see appendix IV for international network organisations and their websites).

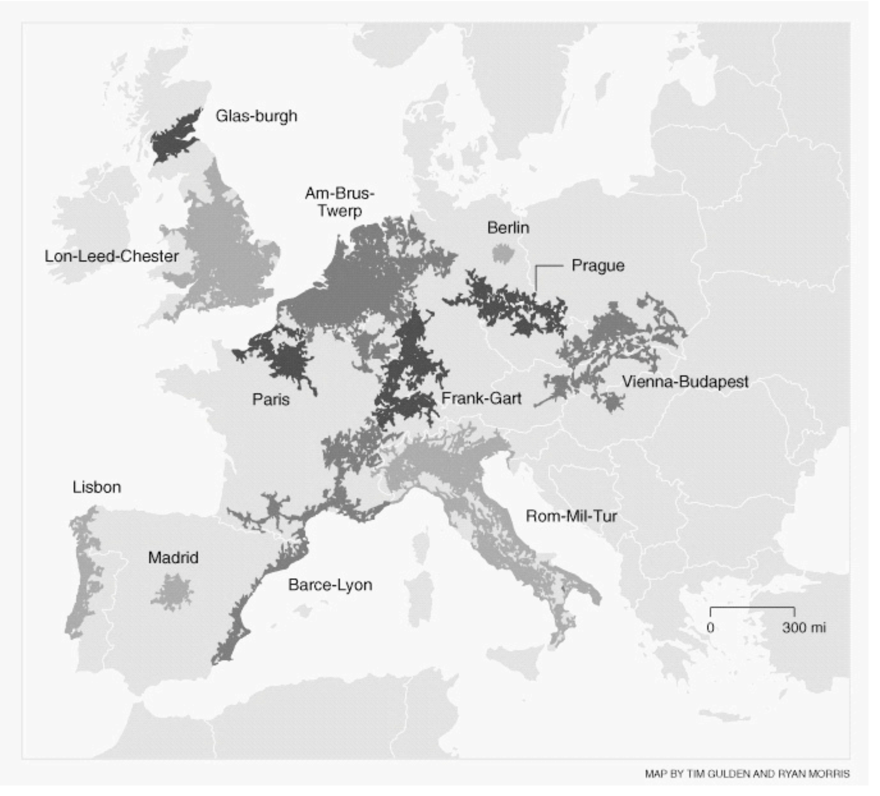


figure 2.23: Europe's largest mega-regions (Florida 2008), www.creativeclass.com/whos_your_city Map by Tim Gulden and Ryan Morris

2.4.3 The green campus – towards a sustainable university

With climate issues getting more and more attention and higher education institutions signing collective agreements on 'greening the campus', campus managers are increasingly integrating environmental issues in their campus strategies. Not just technical solutions but also ways to change the behaviour of users on campus, both students and staff members.

Ironically the current (2009) economic recession helps in making campus users and policy makers realize that resources are scarce and expensive to realize and maintain. Functions on campus that have low occupancy and frequency rates – some laboratories, part of the office space and some educational facilities – can be shared between groups, faculties and even universities. In the current economic and environmental context, users of these spaces are easier to convince than a few years ago – and before.

Internationally, 'greening the campus' appears in many campus plans and strategies (APPA, SCUP, AUDE). The "Sustainable Campus" already indicates that the scope is not limited to energy efficiency alone, but also examines how the energy reduction objective relates to other sustainability ambitions. Higher education is considered a special sector because it is important to connect sustainable innovation in research with sustainable solutions on campus, to set a good example to all the students. They will not only take the experience home but also to their future employers. Many will end up in leadership positions, also deciding on sustainable issues. A change of 'mind set' among the users of the campus is a goal of implementing sustainable concepts as well.

Dutch universities committed to 30% energy reduction in period 2005-2020

During 2008 the third long-term-agreements on energy efficiency have become effective in the Netherlands. These are the so-called MJA3 agreements, following earlier versions of MJA, an abbreviation for the Dutch "MeerJarenAfspraak". The MJA agreements have been signed by forty-six sectors. Higher education represents two of these sectors: research universities (WO) and universities of applied sciences (HBO). The participating sectors have agreed to make efforts to realise energy efficiency progress of an average of 30% in the period 2005-2020 and 50% before 2030. For higher education all fourteen (academic research) universities and a group of universities of applied sciences have signed the agreement.

Agreements on energy efficiency in higher education go back to the mid-nineties. These multi-annual agreements were signed for the Ministry of Economic Affairs, represented by the agency "Agentschap NL" (previously known as SenterNovem). Agentschap NL guides all sectors in the process of creating visions and implementing sustainable strategies. The current MJA agreement is more comprehensive than the previous versions and is connected to the Dutch governmental programme on sustainable development ("Schoon en Zuinig" in Dutch, which can be translated in "clean and efficient").

source: Agentschap NL 2008, edited (Den Heijer et al. 2010; TU Delft 2010)

Higher education is a sector with relatively many people involved: students, employees and a lot of visitors. A sustainable campus is dependent on the collaboration of these campus users: are they willing to change their behaviour to achieve energy efficiency goals? At the same time, sustainable solutions on campus can influence the behaviour of these users outside the campus – at home or at their other employer's offices – now and in the future. In time students will be decision-makers themselves, or policy makers on sustainable development. On top of that, visitors expect innovative solutions of universities with world-class reputations on subjects that are related to sustainability. This is all the more reason to aim at 'changing the mindset' of the campus users in the process of creating a more sustainable campus.

Opportunities & threats for the campus:

+ supporting environmental goals (collective goal to reduce 30% energy in 2020, source: SenterNovem 2009)
+ creating more environmentally-conscious users of the campus – if sustainable solutions are visible to or known by the users
+ more support among users for facilities sharing to reduce the ecological footprint of the university

Changing the mindset of all user groups – students, employees, visitors – by implementing sustainable solutions or by setting a good (visible) example with innovative technology is an extra objective for the sector higher education, apart from the CO2 reduction and energy efficiency targets for 2030.

2.5 Conclusions

This chapter elaborated on the following research question: "What background information about the historical and current context of (Dutch) universities is relevant (for managing the university campus)?". Table 2.8 on next page summarizes the answer to this question in strengths and weaknesses of the Dutch campus and opportunities and threats for campus management of the future. Most of the aspects are elaborated on in chapter 4 "Assessing the current campus" and output of many research projects that preceded this dissertation.

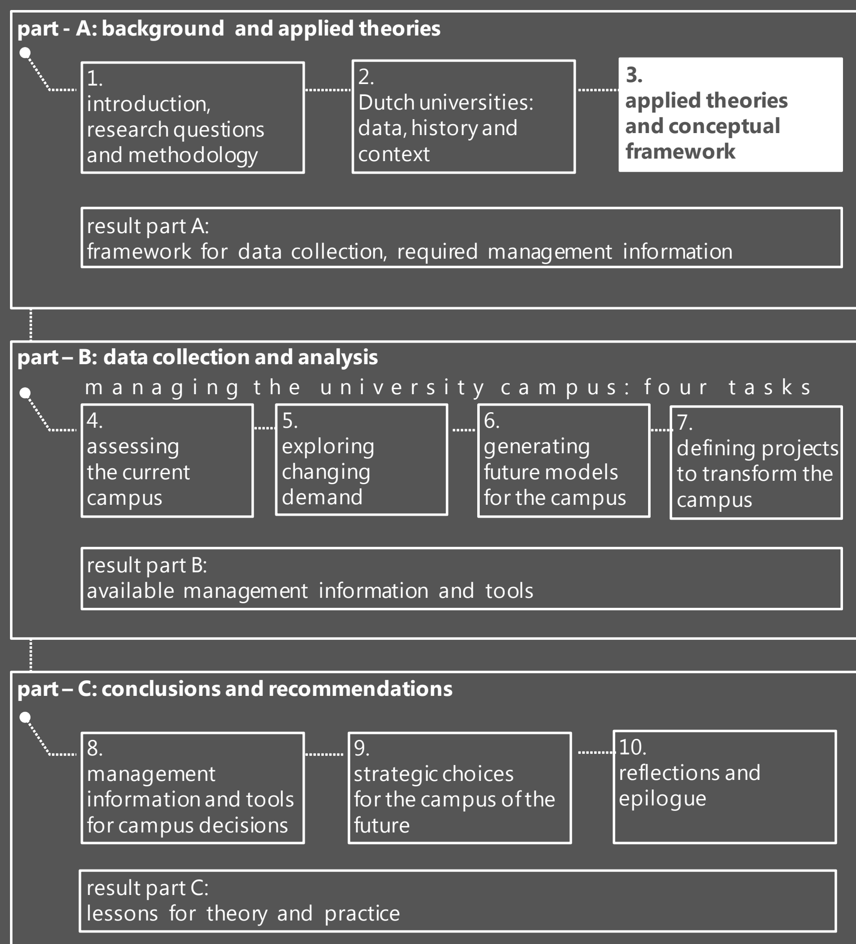
table 2.8: summarized characteristics of the current campus (management) in the Netherlands

strengths	weaknesses
• land positions in urban area • concentration of university function, short distances, close to economic centres • characteristic buildings, cultural heritage • large office-like floor area that is flexible for different types of use	• technical condition of a part of the buildings, backlog maintenance • high percentage of buildings from the sixties and seventies • low occupancy and frequency rates • high energy costs / ecological footprint • lack of synergy between city and university (in sharing resources and planning processes)

opportunities	threats
• increasing student numbers (prognosis until 2020): opportunity to intensify use of campus and to reduce the footprint per user • cultural heritage buildings and land positions can be key resources in supporting 'corporate identity', in global competition for knowledge worker • similar function types for students and employees extend the possibilities for flexible use of space • functional use of horizontal circulation space for informal meetings: potential to create meeting places • renting out (temporarily) vacant space, extending opening hours and using the evenings to accommodate more demand can be solutions that generate revenue, avoid peak hours or evade extra space demand • branding the university by promoting the green campus / CO_2 neutral (practice what you preach in class, for universities of technology etc.) • more urban stakeholders involved can generate more resources if campus plans are adding value to mutual goals • focus on knowledge economy: (inter)nationally, regionally and locally • European collaboration in competition for talented students & knowledge workers • financing from government (economic & innovation, on output of university) • broader market for attracting students • place independency of many processes • flexibility in possibility to work at home (students & staff) • practice what you preach on sustainability (in education & research), also marketing "the green campus" / CO_2 neutral etc • 'univer-city': sharing resources and planning processes between city and university	• higher investment levels for new buildings and for renovating buildings • aging campus buildings • lack of resources for university, more pressure on budget for campus • too optimistic financial prognoses based on current – too low – depreciation (capital costs) in the books • value campus for the university hard to determine • complex curricula and inflexibility of staff can cause 'peak hours' in the use of scarce resources: periods of very intensive and very extensive use • the campus is competing with city, accommodating many 'urban' functions on campus – hotels, student housing, retail, bars, restaurants and related businesses; not always creating synergy between city and university • lack of resources for university, more pressure on budget for campus • more involvement from local government, interfering with campus planning and making decision making processes more complex • educational processes with • (more) uncertainty in student enrolment • more (global) competition brings many more competitors for education (enrolment of talented students) and research (funding for research programmes) • uncertainty in public funding (also dependent on student enrolment) • lack of resources for university, more pressure on budget for campus • potentially higher energy use – caused by rising expectations of campus users (climate, comfort, luxury, resulting in a larger footprint per user) • value university and campus for a city is hard to determine (and opportunity costs are clear)

Student life, Leiden
Photo: DUWO

Chapter 3
Conceptual framework



3 Conceptual framework

3.1 Introduction

In this chapter the following research question will be answered: "What theories apply to managing the university campus, in general and focussing on generating management information for campus decisions?" This PhD research is part of the research programme Real Estate Management and - more specifically – Public & Corporate Real Estate Management (abbreviated as PREM and CREM). Theories and insights on these disciplines are the core of this chapter.

Which aspects of these theories are most applicable, can be determined by analysing the main research question: "How, conducting which management tasks and using what information and tools, can universities improve campus management, adding value to the university's performance?". Key issues are 'management tasks', '(management) information and tools', 'adding value' and 'university performance', beside the main goal 'improving campus management'. The theories that are introduced in this chapter, should contribute to make these issues more operational or measurable. Eventually, these findings and insights add to the conceptual framework that will be used for the data collection in part B.

Literature review starts with the foundation of the real estate management theories: the presumed impact of real estate on performance, both positively and negatively. After that, PREM and CREM theory is specified in terms of processes, stakeholders, decisions and required information and is applied to the campus as the management object. Finally, some theories on generating management information are used to link to key performance indicators – derived from the university's performance criteria – to collecting relevant data about campus decisions.

This is illustrated in the following question that relates to the three parts of the literature review:

- what are the characteristics of current theories and (how) are they applicable to managing the university campus? This includes:
- the relationship between real estate interventions and performance of (groups of) individuals, organisations and society as a whole;
- corporate and public real estate management (CREM and PREM), applied on campus management
- generating management information for campus management.

The resulting theories are elaborated in the next sections. The last sections of this chapter will be used to summarize the theoretical insights and describe the conceptual framework – composed by applicable components of theories – that will be used for data collection in part B of this research. After part B, new insights from applying these theories to practice will be used for part C, closing the empirical cycle.

3.2 Literature review

Literature review for this research consists of three parts that are connected and have a specific order. The logic of this connection and order will be demonstrated in this section and introduced below.

1. Theories on the relationship between real estate interventions and performance (adding value)

The assumption in theories on real estate management is that real estate – or the physical environment in general – influences the performance of (groups of) individuals, organisations or society as a whole. If it did not, why manage it? Research shows that it is not easy to determine a positive influence and that it is easier to illustrate a negative influence. Some of this research is also based on empirical material in educational environments, making it extra relevant for this research. But the bottom line is: determining a relation between interventions in the physical environment and performance is the critical basis of any research on determining 'added value'. Therefore theory on this subject is the start of this literature review.

2. Theories on corporate and public real estate management (CREM and PREM)

Theories on real estate management in general focus on adding value to the performance of the owner(s) and / or the user(s) of the built environment. More specifically, public or corporate real estate management usually aims at adding value to both the owner and the user, because their goals are mostly interrelated. These PREM or CREM theories aim at a specific type of organisation - the owner/occupier of real estate. Examples are (semi-)public or private organisations, like governmental organisations, multinational companies, health institutions or educational institutions. Adding value is accomplished by matching the supply of space with the demand for space, on various scales and with different scopes in time. Management tasks include activities that range from rethinking the total real estate portfolio and refurbishing one part of a building.

The complexity of CREM is dependent on the goals of the real estate owner. CREM research in the last fifteen years illustrates that organisations that manage their own real estate add value in different ways, go through different development stages and focus on different goals, also depending on the position of the real estate organisation and the priorities of the institution itself. Because universities match the profile of this type of owner/occupiers of real estate, the PREM and CREM theories are most relevant to this research.

Prior research at universities in practice confirms that PREM and CREM theories are applicable for managing the university campus. Testing the theoretical frameworks of CREM on Dutch campus managers (Bank 2004; Den Heijer 2004a; Den Heijer and De Vries 2004b) already indicated that the types of goals, stakeholders, decisions and required tools are similar. In this chapter an introduction of CREM theory will further elaborate on these similarities.

3. Theories on campus management and generating management information

While specific theories on campus management are usually derived from campus planning theories that have a spatial focus, the combination of these theories with CREM theories that cover more stakeholder perspectives, is useful for this research. Much research has been conducted by associations of campus planners – estate managers and facility managers in higher education institutions, providing practical methods and tools. Most research is linked to theories for institutional management, real estate management and corporate real estate management. This makes it a logical and valuable component of the literature review.

When management processes are explicit and stakeholder perspectives are specified – after explaining CREM theory – types of decisions and required management information can be specified. Most research that is used to complete the framework applies management theories to complex problems that are related to planning physical resources or focuses on the design approach, integrating different stakeholder perspectives in the process of continuously looking for optimal solutions. These sources supply (applied) theories on generating management information that help to make CREM and campus management theories operational for the empirical part of this research.

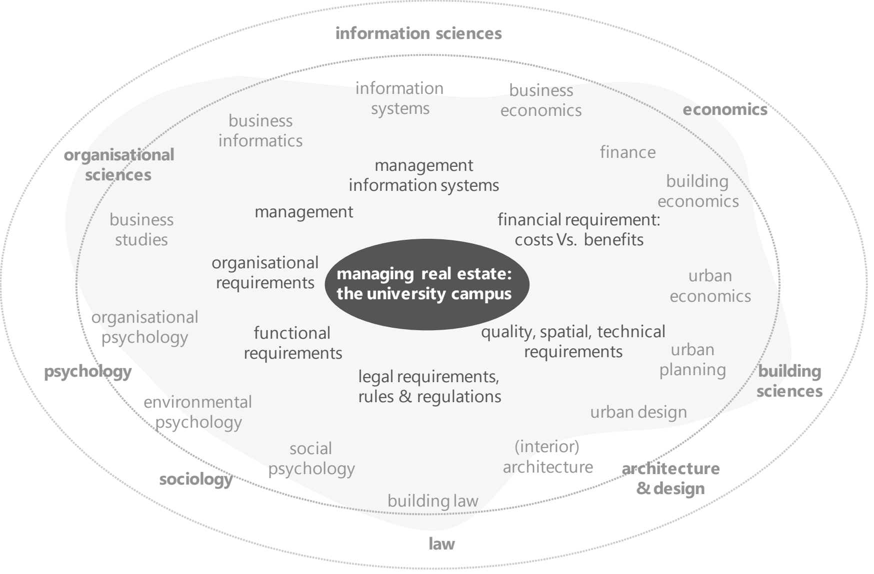
The multi-stakeholder approach of "managing the campus" connects many scientific disciplines. This broad perspective forces to focus on literature that applies theories to real estate management and that supplies frameworks and models that are or can easily be applied to managing the university campus or literature that delivers management information on changing requirements for the university campus or campus management. The literature review is concentrated on the grey area as indicated in figure 3.1.

The broad approach shows when combining applied literature from – for instance – social psychology, business economics and urban economics, environmental psychology. The most applicable theories, insights and models are subject of the next sections and will be summarized at the end of this chapter.

3.3 The impact of real estate on performance – exploring added value

The basis of real estate management is the presumed added value of real estate on performance, either negatively or positively. If real estate had no impact on performance, no society, organisation or individual would spend resources on it . This provocative proposition might have an economic undertone, but 'performance' refers to more than financial results and goals. It could also refer to achieving social goals – happiness and well-being of individuals – goals of non-profit organisations or environmental goals of society. The same goes for a university. Their buildings and campus should contribute to, align with or at least not hinder the institutional goals. And these university goals are not primarily financially oriented. Goals for effective primary processes are central.

figure 3.1: the grey area in the figure of relevant scientific disciplines for managing the campus – as introduced in chapter 1 – determined the multi-disciplinary and the applied character of the literature review



Real estate management aims to achieve a positive added value to performance. To make this more explicit, this section elaborates on 'performance' and on 'added value' linked to real estate. The latter starts with identifying the different functions of real estate.

functions of real estate

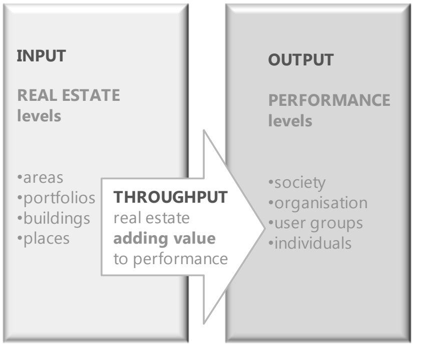


figure 3.2: basis of real estate management: real estate adding value to performance

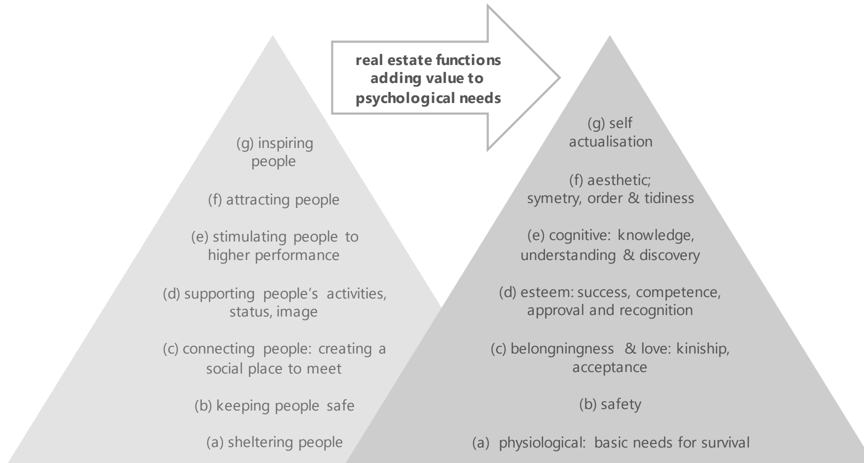
The most basic function of the physical environment is sheltering people and their belongings. In other words, if a building does not have this function, users will confirm the negative impact on their performance. Sheltering people is one of the utility functions that are distinguished by the architect Norberg-Schulz (Van der Voordt and Van Wegen 2005): 'A building creates an artificial climate, protecting people against the influence of weather, insects, wild animals, enemies and other environmental hazards. The building also provides a functional framework, within which human activities can be carried out. These activities are socially determined, and so give buildings a social meaning. A building can also represent something cultural – perhaps something religious or philosophical'. Van der Voordt and Van Wegen distinguish physiological, spatial, social, symbolic and economic aspects in the functions of real estate (Van der Voordt and Van Wegen 1991).

Next to sheltering people and their belongings, a building enables – or should enable - human activities. Accommodation needs to stay functional over time, supporting the activities of the users. Technically, in time it wears out due to climate factors, use and material ageing. Economically, the life of a real estate object is limited by the return it generates, which is particularly influenced by the evolution of the real estate market at the location of the object. As long as the benefits of an object exceed the cost, the real estate object will be kept. The functional life of a real estate object depends on the (changing) requirements of the accommodated function and the ability of the object to adapt to those new requirements or – more general – to new functions. (...) On the level of society, real estate reflects the values of society and it facilitates and constitutes changes. Real estate is very important within a country's economy. Real estate is a country's most extensive capital good, and creating, changing and maintaining the stock of real estate is an important economic activity (De Jonge and Den Heijer 2008).

From these functions different aspects of real estate can be recognized: technical, functional, financial, economic, cultural, social and ecological. To find a structure in these aspects the impact of real estate on performance will be discussed on two levels: (a) the impact on individuals, linking to psychology theories and (b) the impact on an organisation and society, linking to business economics theories. By doing this 'adding value' will be made operational for the conceptual framework of this research.

3.3.1 Impact of real estate on individuals: hierarchy of needs

Psychology theory describes the hierarchy of individual needs. To describe these needs the need-satisfaction theory of the American psychologist Abraham Maslow (1954), transformed to user needs in by Blyth and Worthington (Blyth and Worthington 2001) see figure 3.3. The classification of human needs can be a useful tool for determining perceptual qualities that need to be realised. After all, the degree of satisfaction is largely determined by the extent to which the environment fulfils general and individual needs. Maslow distinguishes between five types of needs. He differentiates five needs figure 3.3: cumulative functions of real estate (left) linked to Maslow's hierarchy of needs (right)



or motivators for actions. As we can see it begins simple: humans first needs are: (a) physiological needs: eat, drink, breathe, sleep etc., (b) people have a need for safety (against (extreme) temperatures, sickness etc., (c) the social needs, amongst others: need for contact, (d) esteem needs, to be valued and respected and (g) self-actualisation. Between the latter two he places (e) cognitive needs – the urge to know and understand – and (f) aesthetic needs: striving towards beauty and the perception thereof.

According to Maslow, there is a certain degree of hierarchy: people will initially try to satisfy their primary needs (a, b), and only once this has been accomplished in an adequate manner will they endeavour to satisfy higher needs (c, and higher) Maslow 1954 . This hierarchy is recognized by Dutch campus managers in cumulative quality levels for the campus and its buildings (Den Heijer and De Vries 2005).

This theory explains the way individuals act when a certain need is not (or partly not) satisfied. Accommodation is a fundamental need that provides shelter and safety. As soon as a particular basic quality of accommodation has been fulfilled, other needs such as social contact and self-actualisation become more important. In countries with a high standard of living, the focus is often shifted to higher needs. However, the focus sometimes remains on lower needs, and consumerism also occurs. Young, well-educated employees in particular, consider a properly functioning working environment and an attractive salary to be self-evident. This easily leads to new, higher needs such as appealing architecture and modern gimmicks, or satisfying the need for respect, autonomy and self- actualisation via the physical working environment (Van der Voordt and Van Wegen 1991; De Jonge et al. 2009).

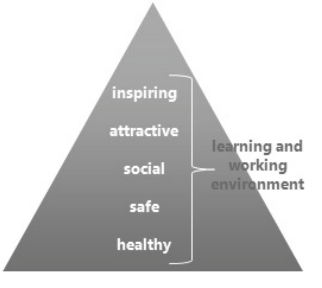
This aligns with one of the major trends that international campus managers acknowledge (COTF 2006, see chapter 5): rising student expectations. Campus managers from all over the world expect this development to have a high impact on campus management practice. Research shows the same pattern, not only in general but also when students are already part of an institution (Cain and Reynolds 2006): students at an institution gradually become more critical of both the institution and the institution's facilities.

For knowledge workers – the university's (potential) employees – globalization is likely to have a similar effect on the expectations level. With more knowledge institutions to choose from – and the type of work being similar – the atmosphere on campus, the amenities of the city and the quality of the workplace are getting more weight in the decision (Van den Berg 2005, Kenney et al 2005). Aligning with Maslow's pyramid, an indication of the relation between the individual needs and the built environment is given below (Van der Voordt 2004). In this translation for real estate 'aesthetic' and 'cognitive' needs are combined into self-actualisation:

- *physiological needs – health*
  In working environments, the extent to which these needs are satisfied can be determined, for example, by asking personnel for their opinion on comfort levels, the layout (furniture ergonomics and ICT) and how they perceive the indoor climate with regard to temperature, light, sound, fresh air and the prevention of draughts.
- *safety needs*
  In addition to a physical need for protection against extreme temperatures, illness and accidents, there is also a psychological need for safety and security. Privacy also contributes to a feeling of safety and security.
- *social needs*
  People want to belong to something, which is why it is important that the work they carry out and their working environment facilitate social contact, both formal and informal.
- *esteem needs*
  In the workplace, this is reflected in the need for esteem, titles, job promotion opportunities and an environment that fits in with the acquired position.
- *self-actualisation*
  The working environment must facilitate opportunities for personnel to develop their abilities as best they can.

These five cumulative needs have served as the basis of discussions among Dutch campus managers about measuring quality for the first benchmark study (2005), expressed in cumulative qualities of a learning and working environment: healthy, safe, social, attractive and inspiring (see figure 3.4).

figure 3.4: Maslow's hierarchy of needs translated into space requirements



These qualifications turned out to be useful for benchmarking, even though it is quite subjective to judge whether a building is attractive. To make it easier for campus managers to assess their campus (buildings), these qualities were also linked to the university's ambitions for the campus. Introduced were three cumulative levels: 'plain & efficient', 'social meeting place' and 'inspiring & representative'. The purpose of distinguishing these three levels was making communication about a variable like quality of space more operational. This applies to the campus in general and to campus buildings specifically. Labelling buildings or floor area on campus, using these three levels, created a common language on quality issues (Den Heijer 2007a; Den Heijer 2007b). Results of this data collection and analysis can be found in part B.

3.3.2 Impact of real estate on organisations and society: goals and resources

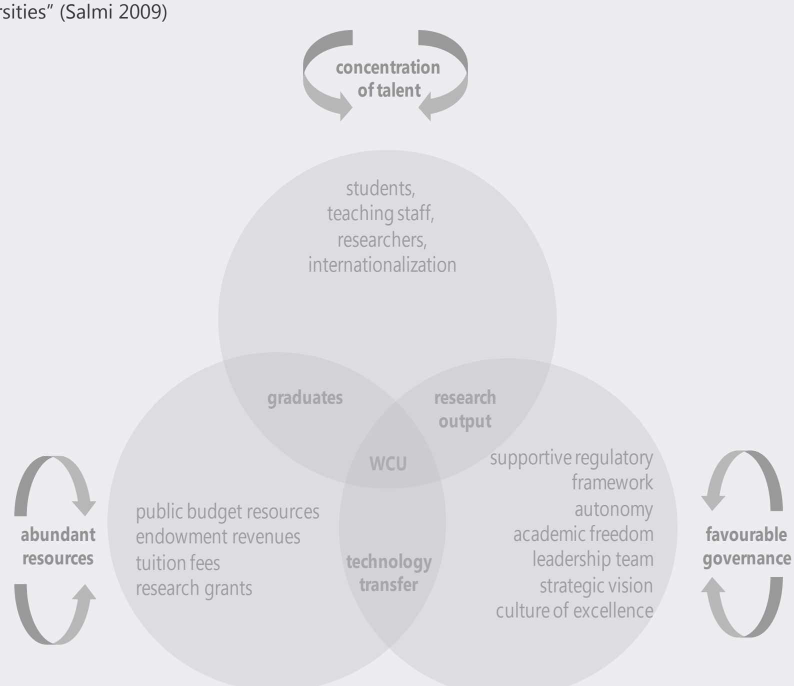
While psychology theory describes the hierarchy of individual needs, business economics theory identifies the hierarchy of organisational goals. With education and research being the university's core business and adding value to societal goals increasingly getting more attention in university strategies, frequently mentioned organisational goals of Dutch universities are attracting excellence to achieve or maintain a high ranking in international comparison, to stimulate internationalization in education and research, to add to sustainable development, to encourage community building and increase knowledge transfer (VSNU 2010b).

Key characteristics of world-class universities

A world-class university:
- has an international reputation for its research;
- has an international reputation for its teaching;
- has a number of research stars and world leaders in their fields;
- is recognized not only by other world-class universities but also outside the world of higher education;
- has a number of world-class departments (that is, not necessarily all);
- identifies and builds on its research strengths and has a distinctive reputation and focus (that is, its “lead” subjects);
- generates innovative ideas and produces basic and applied research in abundance;
- produces groundbreaking research output recognized by peers and prizes (for example, Nobel Prize winners);
- attracts the most able students and produces the best graduates;
- can attract and retain the best staff;
- can recruit staff and students from an international market;
- attracts a high proportion of postgraduate students, both taught and research;
- attracts a high proportion of students from overseas
- operates within a global market and is international in many activities (for example, research links, student and staff exchanges, and throughput of visitors of international standing);
- has a very sound financial base;
- receives large endowment capital and income; has diversified sources of income (for example, government, private companies sector, research income, and overseas student fees);
- provides a high-quality and supportive research and educational environment for both its staff and its students (for example, high-quality buildings and facilities/high-quality campus);
- has a first-class management team with strategic vision and implementation plans;
- produces graduates who end up in positions of influence and/or power (that is, movers and shakers such as prime ministers and presidents);
- often has a long history of superior achievement (for example, the Universities of Oxford and Cambridge in the United Kingdom and Harvard University in the United States);
- makes a big contribution to society and our times;
- continually benchmarks with top universities and departments worldwide;
- and has the confidence to set its own agenda.

Source: (Alden and Lin 2004) in The World Bank, “The challenge of establishing world-class universities” (Salmi 2009)

figure 3.5: characteristics of a world-class university / WCU (Salmi 2009)



All these goals add up to a complex system of performance indicators. Research of The World Bank on the challenge of establishing world-class universities attempted to define what distinguishes world-class universities (WPU) from 'regular universities' (Salmi 2009). The key characteristics are – obviously important - highly qualified faculty, excellence in research, quality of teaching; high levels of government and nongovernment sources of funding and international and highly talented students. Added by many sources (Altbach 2004; Khoon et al. 2005; Niland 2000, 2007) are academic freedom, well-defined autonomous governance structures – very relevant for this research – well-equipped facilities for teaching, research, administration, and (often) student life. This research also acknowledges the increased importance of the international reputation of the university and the university's contribution to society and the problems that arise when trying to measure this (Salmi 2009). In the textbox on the previous page the key characteristics are summarized in a list and in figure 3.5.

With 'abundant resources', 'concentration of talent' and 'favorable governance' being three pillars that are dependent, the development of universities can either be in an upward or downward spiral.

Many universities are aligning their strategies with the criteria that international ranking systems apply to determine their annual list of the world's best universities. Assessing the ranking methodology of the two most influential ranking systems (ARWU) of Shanghai Jiao Tong University, China, and the QS World University Ranking (QS WUR) - formerly connected to the Times Higher Education Supplement (THES) – shows quite different components with different weights.

ARWU weights the following criteria with indicators and weight:
- Quality of Education: alumni of an institution winning Nobel Prizes and Fields Medals (10%),
- Quality of Faculty: staff of an institution winning Nobel Prizes and Fields Medals (20%) and highly cited researchers in 21 broad subject categories (20%),
- Research Output: papers published in Nature and Science [1] (20%) and papers indexed in Science Citation Index-expanded and Social Science Citation Index (20%) and
- Per Capita Performance: per capita academic performance of an institution (10%), makes a total of 100%.

[1] For institutions specialized in humanities and social sciences such as London School of Economics, N&S is not considered, and the weight of N&S is relocated to other indicators (source: ARWU 2010).

QS WUR ranks the universities using six indicators (QS-WUR 2010): Academic Peer Review (40%), Employer Review (10%), Faculty Student Ratio (20%), Citations per Faculty (20%), International Faculty (5%) and International Students (5%). This ranking differs from the more research-focused ARWU ranking and recognizes more contextual variables and the input of other stakeholders, like academic peers (more than 9000 responses in 2009) and employers (more than 3000 responses in 2009). The proportions of international students and faculty emphasize the value of diversity of backgrounds – scientifically and socially – in research and education. This ranking acknowledges more of the network character that universities increasingly have. These performance indicators for universities – of today and of the future – are a basis for many strategic plans. For this research the performance indicators can be used to determine how the campus and university buildings can contribute.

In her dissertation De Vries distinguishes ten ways in which real estate can contribute to organisational goals (De Vries 2007), elaborating on the 'seven ways of adding value' in earlier CREM theory (De Jonge 1994) and linking them directly or indirectly to profitability, productivity or competitive advantage (see figure 3.6). Resulting are ten interrelated ways of adding value, also called real estate goals or objectives, which are listed and illustrated below, merging the insights of different sources (De Jonge 2006; De Vries et al. 2008; Lindholm 2008; De Jonge et al. 2009) and previous campus research (Den Heijer and De Vries 2005; Den Heijer 2007a; Den Heijer 2007b):

1. *increasing real estate value:* all real estate interventions that aim at resulting in a higher potential (market) value of land and buildings, for instance by making buildings rentable or marketable to a third party, suitable for external (paying) users or by acquiring land on valuable locations in the real estate market increase;

2. *controlling risk:* this can mean controlling financial risks, for instance by being able to easily adjust the size and characteristics of the real estate portfolio following changes in the organisation – a form of financial or organisational flexibility; it can also mean controlling technical and functional risks by carefully monitoring the technical condition to make sure primary processes are not hindered; an example is to achieve or maintain the minimum quality for a use permit ("safe and healthy workplace"); in the end, controlling technical and functional risks is also about controlling financial risks by lowering the chance of production loss;

3. *decreasing costs:* these 'costs' are not (just) referring to real estate costs, but could also refer to overall costs or personnel costs, when a new concept adds to higher production or a lower percentage of absence; decreasing costs can be achieved by a variety of real estate interventions of which the most obvious strategy is reducing floor area;

4. *increasing flexibility:* this is related to controlling risks if it concerns financial flexibility or flexible use of facilities by many types of users that enables an organisation to solve a problem in the real estate portfolio without hindering the primary processes; this includes real estate interventions that implement more standardized space or more flexible multi-functional or multi-user concepts without individual territory or exclusive use for certain groups; flexibility can also involve technical aspects: the adaptability of spaces – to easily transform the size or function of spaces;

5. *supporting user activities* (replacing 'increasing production' of De Vries 2008): optimally supporting the activities of users is usually aimed at increasing production – adding to the productivity of the organisation – but it can also be used to satisfy the users and make them more loyal to the organisation, or prevent them from changing employer or move to organisations with better facilities;

6. *increasing (user) satisfaction:* some real estate interventions are exclusively aimed at increasing user satisfaction – adding quality or facilities to the workplace, quickly responding to their changing demands or choosing locations that are favourable to the users – which is extra important in a (labour) market with many competitors;

7. *supporting image:* this involves all real estate interventions that either support the image to the current users or to external parties – or potential employees, customers or clients. Either way, these interventions are usually linked to the organisations primary goals in terms of "practice what you preach" – for instance, emphasizing the innovative, creative, sustainable or exclusive character of an organisation, ultimately adding to the competitive advantage;

8. *supporting culture:* closely related to 'supporting image' this is more related to the internal users: building community or stimulating interaction between certain

user groups, for instance before or after a reorganisation process; this also relates to matching the (use of the) real estate portfolio with the (new) organisational or corporate culture;

9. *stimulating collaboration:* this includes all real estate interventions that stimulates encounters between different users or user groups, aligning with organisational goals to work on cross-disciplinary products, both within buildings and between buildings; an example can also be increasing occupancy and frequency rates in combination with reducing the footprint per user;

10. *stimulating innovation:* 'innovation' in primary processes can be achieved by stimulating planned and unplanned encounters between users – combining 'stimulating collaboration', 'supporting culture' and interventions that create the place to meet, scheduled or accidentally – adding to 'serendipity', unintentionally making discoveries or finding new solutions by the interference of others.

In theory, every corporate real estate (and campus) decision can be related to at least one of these goals. In part B of this research, past campus decisions and strategies for the future will be assessed on these ten components of 'hierarchy of adding value'.

Parallel to this research – using the same theoretical basis – Lindholm and Luoma connected many real estate decisions on operational levels to either profitability or revenue growth, by relating them to similar ways of adding value, referred to as 'real estate strategies' (Lindholm and Luoma 2008). Their examples of real estate decisions 'increasing employee satisfaction' are seeking locations convenient to employees, quickly responding to real estate requests, providing a pleasant working environment, functional workplaces and desired amenities. In her doctoral thesis Lindholm (2008) implemented a model of strategic mapping from balanced score card methodology (Kaplan and Norton 2000) to show how real estate strategies can lead to profitability growth and/or revenue growth and thereby maximize the wealth of shareholders (Lindholm 2008a; Lindholm 2008b)

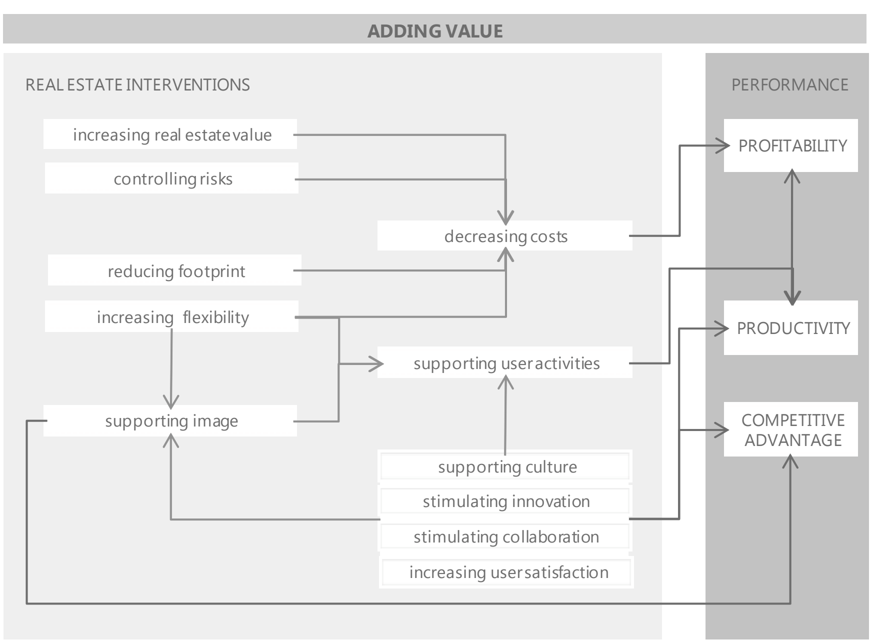


figure 3.6: adding value through a hierarchy of real estate goals, linked via profitability, productivity and competitive advantage to the overall performance of an organisation (De Vries 2007) which is edited and used as input for this research

Elaborating on Lindholm's research Jensen developed a FM value map, based on a literature review and inductive reasoning from an analysis of thirty-six cases in an explorative empirical study of FM best practice in the Nordic countries (Jensen 2009; Jensen 2010). This FM value map links various resources (facilities and activities, the input) to provisions, basic products and additional offerings (the output). The impact on the core business includes satisfaction, cost, productivity, reliability, adaptation and culture and the social, economical, spatial and environmental surroundings – the outcomes. An international working group started a joint process of exploring and testing the FM Value map, including insights from other research (De Vries et al. 2008; Smit 2008) and lessons from disciplines like business-to-business marketing (Van der Voordt 2009; Jensen et al. 2010). This research conforms the importance of a managerial focus on adding value, taking into account the different needs and interests of various stakeholders.

However, in practice it is very hard to find evidence that real estate decisions actually do add to profitability, productivity or competitive advantage. De Vries used data of forty-six institutions for higher professional education ('hogescholen' in Dutch, university of applied sciences) to find a relation between real estate decisions and organisational performance (De Vries 2007; De Vries et al. 2008). Results showed that some relations are likely or plausible, sometimes convincing, but mostly not very strong. Changes in other production factors do also play a large role in affecting profitability, productivity or competitive advantage. The effect of real estate can rarely be isolated, while it is very hard to keep the other production factors unchanged. Ironically, proving the negative effect is much easier. Neglecting the working environment can have a clear negative effect on satisfaction and production, especially when the quality affects the basic needs of employees.

real estate as one of five resources

Corporate real estate (CRE) is often referred to as the fifth resource (Joroff et al. 1993; De Jonge 1994; Krumm 1999) that can not be isolated from the other four: capital, human resources, information (and communication) and technology. In contributing to organisational performance real estate is just one of the five resources potentially adding value. De Vries also concludes that these ways of adding value may reinforce each other, but can also neutralise each other's effect or – in the worst case – have a combined negative effect (De Vries 2007; De Vries et al. 2008).

The organisational model of figure 3.7 can be applied to universities, which is illustrated in table 3.1 and table 3.2, with specific interpretations of input, output, stakeholders and performance.

For a university the resource 'capital' represents the sum of public and private funding - and the endowment if applicable – 'human resources' refer to both academic and supporting staff and 'ICT' to the information or knowledge resources. Technology and the campus are closely connected not only in laboratories, but also in practically every workplace that requires both a network and a computer. This illustrates that these resources are interdependent.

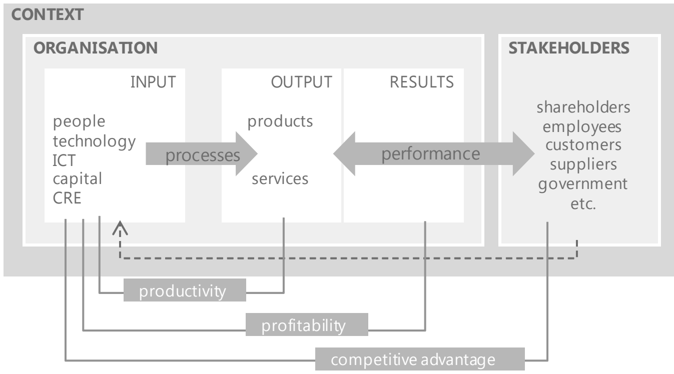


figure 3.7: theoretical model of an organisation, in terms of input – linked to resources and processes – and output, linked to performance: productivity, profitability and competitive advantage (De Vries 2007)

INPUT	OUTPUT	STAKEHOLDERS
academic staff	publications: scientific & professional	society
support staff	revenue contract research	government (for funding)
funding	revenue contract education	local/regional government
tuition fees		
knowledge	graduates	students
	diplomas, credits for courses	employees – academic
students		employees – support staff
	ecological footprint, CO_2 emission	alumni
ICT on campus		
real estate: land and buildings	revenue from rent	(future) employers of alumni
	revenue selling/leasing real estate	(potential) research partners
		(potential) partners for education,
	(potential) knowledge workers	research or secondary processes
	knowledge	policy makers and parties within
	innovative products	and outside the university
	economic spin-off	

table 3.1: input, output and stakeholders of the university-matching the model of figure 3.7

table 3.2: key performance indicators (KPIs) for the university, based on De Vries and completed with sustainability indicators and previously introduced characteristics of world-class universities

Key performance indicators (KPIs) to measure a university's performance			
productivity	**profitability**	**competitive advantage**	**sustainable development**
• publications per academic fte • output per m^2 • students per m^2 • employees per m^2 • energy costs per m^2 • total costs of ownership as % of total costs (or turnover) • etc.	• revenue minus costs • solvency • liquidity • environmental goals • position on innovation index • citation score • (economic) value of alumni • increased real estate value	• international rankings • market share of students • quality of alumni • student satisfaction • alumni satisfaction • employee satisfaction	• energy use per m^2 • energy use per user • CO_2 emission per m^2 • CO_2 emission per user • energy labels of buildings • footprint in m^2 per user

defining indicators to measure performance

Derived from prior research on higher education institutions (De Vries 2007) performance has three components: productivity, profitability and competitive advantage. These components are elaborated below.

For a university 'productivity' refers to the output expressed in diplomas, publications and revenue, in relation to the input. Since real estate – or corporate real estate in this case – is one of the input factors, ratio on productivity could also include students per m2, total costs of ownership as a percentage of turnover or output per m2. These so-called key performance indicators (KPIs) could also be determined for profitability and competitive advantage (see table 3.2).

Key performance indicators for profitability and competitive advantage relate to direct financial results and distinctiveness to distinguishing characteristics of universities that attract more (talented) students or faculty members. Note that employee satisfaction is more important as a competitive advantage when the labour market enables employees to find another job easily. The assumption is that employee satisfaction results in loyalty to the institution as an employer. In case of a university, satisfied students will eventually be the ambassadors of their 'alma mater' as alumni. These alumni can not only ensure the network of a university, but also be a pool of potential (guest) professors, related businesses, employers or clients for research.

Since the university is a key partner in the knowledge economy – as a producer of knowledge and knowledge workers, as an important employer in the regional economy and as an important factor in attracting other economic activity (Van den Berg et al. 2005; Wiewel and Perry 2008) – profitability and competitive advantage reach a level that exceeds the university organisation. The consequences of this development for the most important KPI to measure, will be discussed in part C, after the data collection and analysis of this research.

the need to benchmark KPIs

De Vries (2007) concludes that determining the effects of a real estate intervention is not possible out of its context and that the effect of corporate real estate is too closely related to the effect of other resources. Consequently organisations should focus on applying the right mix of interdependent resources (input) for achieving different goals in different contexts (output). With so many variables and interdependencies it is no wonder that management of (corporate) real estate is considered very complex and campus managers are in need of comparative information – references of similar organisations - on all KPIs.

This need for references on KPIs is one of the reasons why many organisations are likely to share their knowledge on this subject with their peers. For many sectors only joining forces can assure enough comparable data that generates management information for the whole group. Among universities this also led to the willingness to share knowledge, generate collective management information and submit the required data for the last five years of research.

However, benchmarking KPIs with similar organisations requires uniform use of standards and definitions. This is one of the most important steps to take in generating management information. Apart from wanting to benchmark KPIs with other organisations, a sound set of performance indicators can also be used to measure the performance of one organisation at different moments in time: for the current and future university and campus. Following the transition of KPIs over time and trying to find patterns and relations cannot only help (management) practice, but also (management) theory on the relation between changes in real estate and performance.

searching for evidence on the relation between real estate and performance

In many publications – among which (CABE 2005; De Vries 2007; De Vries et al. 2008; Lindholm and Luoma 2008) – relations between real estate interventions and performance are made plausible, based on many cases. Interviews with Dutch campus managers (Den Heijer 2002) and surveys (Den Heijer 2007a) confirm these relations with many examples that student numbers rose after investments in a more attractive learning environment. But in many researches it is very hard to find proof. Dutch campus managers also emphasized that questionnaires among students can illustrate the gap between stated and revealed preferences in choosing a university or faculty or in weighing alternative interventions in their learning environment. Campus managers think that influences on student and employee satisfaction are therefore preferably found with a combination of questionnaires and observing behaviour of users on campus (Den Heijer 2002c).

International research on the impact of facilities on student choice of universities states that facility factors – where provided to a high standard – are perceived as having an important influence (Price et al. 2003). Most of the research projects on this subject do not base their conclusions on business economics theory, but on expert opinion, questionnaires among students and enrolments figures. A survey with more than 16.000 respondents from 46 institutions across the USA and Canada is one of these projects (Cain and Reynolds 2006). Even though the respondents indicated that academic issues were at the top of their list, the researchers conclude that the campus and its facilities do play a role in the decision process, but are not necessarily a deciding factor. In some cases students rejected universities as their potential place to learn for missing, inadequate or poorly maintained facilities. The latter also emphasizes that the negative influence (dissatisfier) can be made more explicit than the positive influence (satisfier). This phenomenon is apparent, when focussing on individuals: the psychology of their behaviour that is not always conscious. For uncovering this type of subconscious behaviour, questionnaires alone are insufficient. This again refers to the difference between stated and revealed preferences. This emphasizes the importance of weighing the value of satisfying individual needs with the accompanying costs.

connecting individual needs to organisational goals

With the output of universities being knowledge and (potential) knowledge workers, human resources are the most important asset of universities. For the university's productivity it is essential that they are able to perform their tasks. Their activities demand (capital for) information sources, technology, both ICT and laboratories and a working environment. This mix of resources should enable students and staff members to produce output for the university.

Focussing on the working environment, there are many activities to support for both students and staff members. In their article about the new academic workplace Gorgievski and Van der Voordt mention various activities that have to be supported in an office environment (Gorgievski et al. 2010): administrative, management related and general deskwork, conduction of confidential conversations with students and colleagues, informal conversations with colleagues, teaching small groups of students, filing information, making telephone calls, coordinating tasks and reading literature. The working environment in the broadest sense should be functional for these activities. This includes the university policy to facilitate or allow some of these activities taking place at home or elsewhere.

Essential in supporting these activities is finding a balance between accommodating interaction and concentration. In his article Haynes states that if the office environment is to act as a conduit for knowledge creation and knowledge transfer, then offices need to allow both collaborative work and individual work to coexist without causing conflicts between the two (Haynes 2007). In his research he links the physical environment to the behavioural environment – balancing interaction and distraction – and states that the latter is even more important in office productivity. In finding new models for the academic workplace his insights should be used (see chapter 6 and 7).

In this research 'functionality' is defined as the quality and mix of spaces that satisfy the needs of individuals within an organisation and support their activities optimally. The functional perspective on the university campus focuses on creating a working or learning environment with a mix of space types for the different activities - conducting research, communicating with each other, doing administrative tasks, teaching students or studying for a degree – and a quality level that suits the purpose of these activities.

Investments in improving the functionality of the campus can add to the organisational performance, but the benefits should be weighted against the costs of the necessary physical interventions that add to functionality. The organisational perspective has a broader scope, considering both collective and individual needs, weighing costs and benefits of the alternative solutions, when combined with the financial perspective. The organisational perspective even zooms out to goals outside the university, adding to societal goals like sustainability and economic development of the region of the university.

Summarised, in this research the functional perspective focuses on the individual (space) needs and the organisational perspective covers collective ambitions and needs derived from the organisational goals. Aggregated from operational to strategic level, the individual needs are also represented in the collective, organisational goals. Functionality can be measured in variables like user satisfaction, number of users per m2 and occupancy and frequency rates. The next sections will illustrate that campus managers have many variables – from many perspectives – to connect in managing the university campus.

3.4 Theories on Corporate & Public Real Estate Management (CREM & PREM)

The relationship between real estate and performance is the most important foundation for real estate management. Organisations want to manage this relationship to create a positive added value or to avoid a negative influence on their goals (see figure 3.8).

Their primary processes demand a certain quality and quantity of real estate – adding to functionality for individuals and to organisational goals, considering the financial consequences and changes in time.

Theories on real estate management in general focus on the match between demand for and supply of space. In this research the most important performance level is the organisation, but zooming in on (groups of) individuals or zooming out on societal level is also relevant (figure 3.8). Perspectives are different dependent on the goals of the real estate owner: public parties or private parties, investors or owners that are also occupiers.

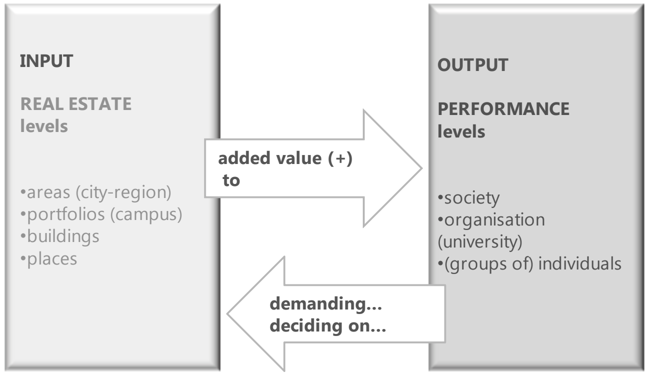


figure 3.8: goal of real estate management: deciding on real estate in order to create a positive added value to performance

Within the subject of real estate management, various specializations exist (De Jonge et al. 2009). Portfolio management , also referred to as real estate management from an investor's point-of-view, mainly focuses on financial goals. Corporate Real Estate Management (CREM) – real estate management by parties that are both owners and occupiers of their real estate – focuses on the performance of the organisation (benefits) in relation to the resources that are spent on real estate (costs). Public Real Estate Management (PREM) adds public goals to the equation of matching demand and supply of space. For campus management both theories on CREM and PREM apply, but CREM theories will be used primarily, due to the increasingly important economic goals of universities and growing dependency on private funding.

CREM was initially defined as the range of activities undertaken to attune corporate real estate optimally to corporate performance' (Dewulf et al., 2000). But the term 'corporate' might be exclusively associated with profit – as the only goal – whereas many institutions have more diverse goals. Because of its relevance to semi-profit and non-profit organisations like government buildings agencies (Evers et al. 2002; Van der Schaaf 2002), hospitals and educational institutions, the definition gradually changed into a more general, broader definition: "CREM is the range of activities undertaken to optimally attune the institution's accommodation to organisational performance" (Jonge et al. 2007, forthcoming). PREM can then be defined as a specific form of CREM, from the perspective of a public organisation and focussing not only on economic goals but also on societal and political goals.

In practice CREM is a continuous process of matching supply – corporate real estate – and demand, derived from the institutional goals and the primary processes (user goals). Real estate objects are subject to deterioration. Technically they wear out due to climate load, use and material ageing. At the same time the functional life of a real estate object depends on the changed requirement of the accommodated function and the object's ability to adapt to those new requirements or – more general – to new functions (De Jonge et al. 2009). However, any activity undertaken in improving the performance of corporate real estate will have impact on the organisation's resources and needs to be assessed in terms of (potential) benefits and costs on the organisational level. Ultimately, matching supply and demand – and CREM – has an economic basis.

There are two main questions: (a) what types of actions or decisions can be distinguished in the management process and (b) who decides if the match between demand and supply is satisfactory? The latter can be rephrased in the types of stakeholders that are involved in the CREM process. These questions will be answered in the next two subsections.

3.4.1 The management process of accommodating an organisation

Managing real estate is a continuous process with implicit or explicit considerations about the match between supply and demand. The framework in figure 3.9 demonstrates that match in time.

Key in the framework are four 'coordination moments': (1) between current demand and current supply, (2) between future demand and current supply, (3) between future demand and future supply and (4) from current supply to future supply.

These could also be referred at as steps or management tasks in an iterative process of finding the match that adds most to organisation's performance. The framework could be applicable to a period of at least five years, making it a method for corporate real estate – or accommodation – strategies. But it could also be applied to a period of less than a year, making it an operational model for short-term space management. Applied to the campus, the four management tasks can be referred at as (see figure 3.9 for numbers):

1. Assessing the current campus *(to determine the current match)*
2. Exploring changing demand *(and determining the future match)*
3. Generating future models for the campus *(to match future demand and supply)*
4. Defining projects to transform the campus *(to the future campus)*

The complexity of real estate management is determined by the scope – the whole campus, one university building or the floor area that is used by one department – and by types of perspectives to involve in the decisions. Does a real estate manager just match the technical requirements on the demand side with the technical performance on the supply side, managing (just) the technical match? Or are functional aspects, like the right quantity and quality of space, also integrated? The same goes for financial and organisational aspects that are linked to certain stakeholders. This introduces the next question: who decide(s) if the match between demand and supply is acceptable or satisfactory?

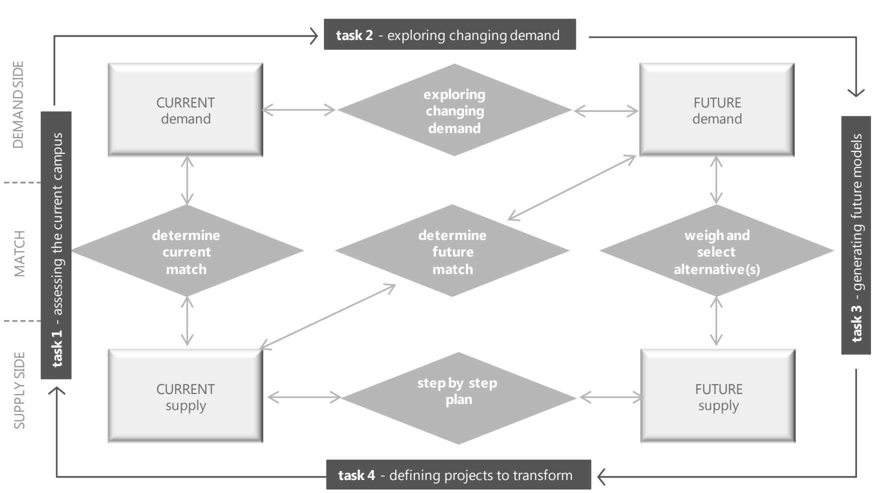
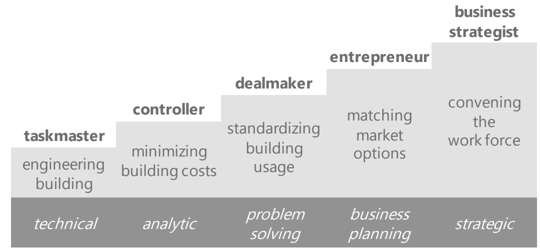


figure 3.9: framework matching supply and demand of space, now and in the future (De Jonge et al. 2009)

3.4.2 Evolutionary stages of stakeholders involved in the management process

Managing corporate real estate has gradually changed from monitoring the technical condition of buildings and reducing costs to effectively supporting primary processes and adding value to institutional goals (Joroff et al. 1993; De Jonge 1997; Krumm 1999; De Jonge et al. 2007; De Vries 2007). In five evolutionary stages Joroff described the changing role of corporate real estate management, see figure 3.10.

figure 3.10: corporate real estate competency shifts (Joroff et al. 1993)



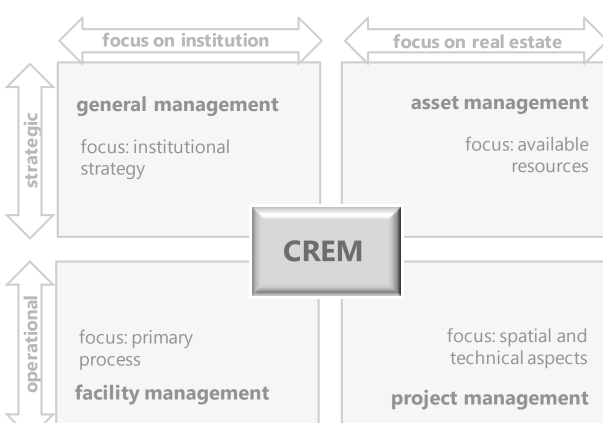
The taskmaster (1) has a technical focus, supplying the corporation's need for physical space, engineering buildings. The controller (2) has transparency and cost minimisation of real estate as primary goals and an analytical approach, looking for information about real estate and trying to benchmark real estate in order to control it. The dealmaker (3) solves real estate problems in ways that create financial value for the business units, or departments; the dealmaker no longer specifies the building in the way its internal clients want, but tries to more or less standardise building use in order to get a flexible deal in its internal market. The entrepreneur (4) operates like an internal real estate company, proposing real estate alternatives to the business units that match those of the firm's competitors. It tries to match the real estate with the business plans of the units and the market options. Finally, the business strategist (5) anticipates business trends and monitors and measures their impact. The business strategist tries to contribute to the value of the company as a whole by focusing on the institutional mission rather than on real estate. Joroff's model is additive by nature: it adds perspectives and variables to integrate in the decision making process. The existing operational basis is extended with more strategic issues linked to the results of the corporation.

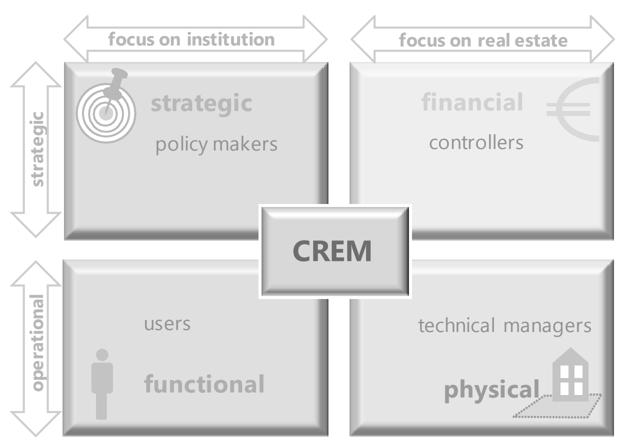
Over the years CREM theory (De Jonge 1997; Krumm 1999) elaborated on the different stakeholder perspectives to connect, distinguishing four quarters: either focusing on institution (demand side) or real estate (supply side) on the horizontal axis and either focusing on strategic or operational level on the vertical axis (see figure 3.11).

In the past years (Den Heijer 2005, De Jonge, et al. 2009) this CREM model has gradually been changing in a conceptual framework that identifies four types of stakeholders and matching perspectives (see figure 3.12).

figure 3.11 (left): CREM model (De Jonge 1997; Krumm 1999) edited

figure 3.12 (below): stakeholders are linked to the four perspectives on CREM (Den Heijer 2008)





This CREM model still reflects the definition of corporate real estate management as a matching process between demand and supply, with activities from operational to strategic level and the overall goal to optimally attune real estate to an institution's performance. These four perspectives will be applied to campus management in the next section.

3.5 Theories applied on Campus Planning & Management

CREM theory – of all real estate management theories – turned out to be most applicable to campus management theory (Bank 2004; Bank and Den Heijer 2004; Den Heijer and De Vries 2004a). Other specific theories on campus management are usually derived from campus planning theories that have a spatial focus . The combination of these theories with CREM theories can add value to the conceptual framework of this research. In addition to this much research has been conducted by associations of campus planners – estate managers and facility managers in higher education institutions, providing practical methods and tools. Most research is linked to theories in institutional management, real estate management and corporate real estate management (Tierney; Dober 1963/1996; Hewitt 1997; OECD (Organisation for Economic Co-operation and Development) 1999; Chace 2003; Daigneau 2003; Panaretos 2005; Ruben 2005). This makes it a logical and valuable addition to the literature review.

3.5.1 Applying CREM theory to campus management

Campus management is defined as "the range of activities undertaken to optimally attune the university's accommodation to the university's performance". In this research 'the university's accommodation' is referred at as the campus, both land and buildings. Similar to CREM theory, campus management integrates four perspectives. In table 3.3 the four CREM perspectives are applied to the university campus and linked to their main focus, stakeholders in general and relevant representatives of these stakeholders on multiple levels within and outside the university.

Zooming in on the stakeholders, perspectives and main variables, many different aspects are relevant in the decision making process. The practical relevance of these aspects for campus management has been determined in prior research, involving all Dutch campus managers (Den Heijer and De Vries 2004b; Den Heijer 2005).

The most important aspects per perspective are mentioned below:

- *physical perspective* – the quantity and quality of current and future campus, including location characteristics, types of spaces, condition and age of the buildings
- *functional perspective* – the number and types of users that have to be accommodated, the satisfaction about the current campus, occupancy and frequency rates
- *financial perspective* – cost of campus investments, resources that are spent on real estate and the value(s) the campus represents
- *strategic perspective* – main variable: (institutional) goals - how and to what extent are institutional goals on education, research, human resources and valuation of knowledge supported, achieved or obstructed with the current real estate portfolio?

Matching the CREM model of the previous chapter, figure 3.13 shows the basic framework for campus management, connecting four perspectives to the variables they represent in managing the university campus.

This framework – with its stakeholders, perspectives and aspects – is the basis for the required management information for campus decisions.

perspective	focus	stakeholder (in general)	representatives (specific)
physical	the physical campus: land and buildings, their technical condition and legal requirements	**technical managers**	project managers technical campus staff (campus) architect
functional	fitness for use: quantitative and qualitative, space use, user demands and user satisfaction	**users**	students faculty / academic staff support staff visitors
financial	value, resources, costs (€): impact on the university resources, opportunity costs, current replacement costs	**controllers**	planning & control dept.
strategic	adding value to institutional goals: for education, research, attracting students and staff, human resource management and knowledge valorisation	**policy makers**	board of executives deans policy makers within the university policy makers outside the university (other) decision makers • on education, research, HRM and valuation of knowledge • on the role of the university (campus) in the regional economy (knowledge city & region) • on sustainability: green campus

table 3.3: four perspectives on the university campus

The term 'campus management' in figure 3.13 can also be replaced by the 'campus manager' that has to connect all the stakeholder perspectives in both the management process and management decisions. Accordingly, campus managers need to involve these stakeholders in various steps of the decision making process, either passively, informing them about the consequences of various alternatives, or actively, making them participants in defining the brief and selecting solutions. But whatever participation form they choose, for campus decisions they will need more decision support information from the different perspectives to weigh different alternatives on various variables.

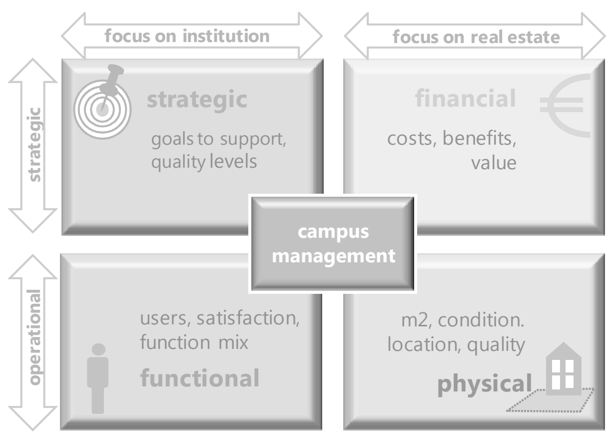


figure 3.13: basic framework for campus management, connecting four perspectives and various aspects

more complexity in campus management, more transparency and information required

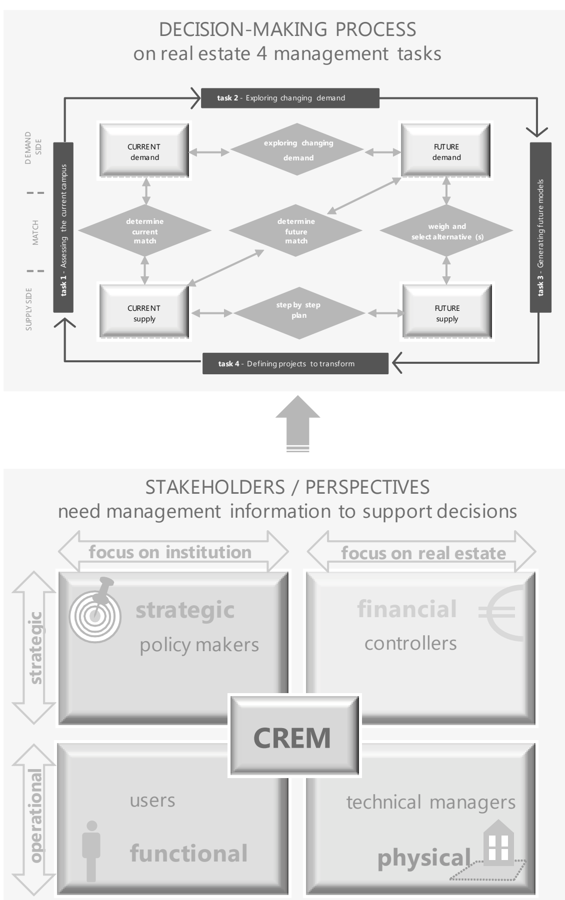
Prior research shows that Dutch campus managers all agree that their decision making process involves these types of stakeholders, perspectives and variables and that adding value to the university's performance is the ultimate objective (Den Heijer and De Vries 2004a; Den Heijer 2007a). While the latter is endorsed internationally (Kenney et al. 2005), it has made campus management much more complex. Not only does it add more variables to the comparative assessment for every campus decision, it also brings more stakeholders to the campus management process.

Perspectives of technical managers and controllers, focusing on real estate, are connected with perspectives of users and policy makers focusing on the primary processes of the institution. Campus managers are not just confronted with the physical campus and the costs, values and available resources, but also with changing goals from policy makers and changing demands from students, academic and supporting staff. Specific literature on campus planning confirms:

"Those effected by (campus) planning outcomes should be involved in the (campus) planning process" (Dober 1963/1996)

Involving all these stakeholders in the process demands more transparency in decision-making and means more performance criteria to consider and to support with management information. The research goal is to develop methods and tools to support the collective process of campus decision-making. The underlying goal is to emphasize the shared responsibility for campus management and to avoid that the different stakeholders will only focus on maximizing their own variables without considering the others. It is for instance important that users are aware of the financial consequences of their demand and the fact that these resources might alternatively be invested in their primary processes. Management information and tools could give them incentives to find the optimal solution – balancing costs and benefits – instead of the maximum solution from one perspective.

figure 3.14: CREM stakeholders and perspectives projected on four management tasks



stakeholders and management tasks connected in campus management

In CREM theory two questions are posed:
(a) what tasks can be distinguished in the management process and (b) who decides if the match between demand and supply is satisfactory? As an answer to question (b) the CREM model with stakeholders and perspectives was introduced. As an answer to question (a) the framework can be applied, with the following management tasks: (1) assessing the current campus, (2) exploring changing demand, (3) generating future models for the campus and (4) defining projects to transform the campus.

In figure 3.14 the two components are combined, illustrating that – according to theory – each management task should integrate CREM stakeholders and perspectives. This is the basis of the conceptual framework for the data collection and analysis in part B of this research.

Before insights on generating management information are added, it is interesting to describe how decision-making at universities has changed over the years, to emphasize the importance of management information in the current era.

3.5.2 Different eras in decision-making and the increasing importance of KPIs

In international literature on campus management "planning for change" at universities of today is considered very different from the previous eras (see table 3.4). Decision-making has changed from less participatory, administrative and incremental, political to more influenced by external parties and private resources (Norris and Poulton 2008). While their publications focuses on universities in the United States, the current era that is characterized by globalisation, makes their findings relevant for universities all over the world. By definition, every university is affected by the competition that globalisation brings. The pressure of less public and more private resources is also acknowledged by many universities in other countries that are either in the process or already being confronted with less government support for higher education (OECD 2010).

According to Norris and Poulton "Higher education has evolved from a culture of reporting to a culture of evidence to a culture of measuring and improving performance" (Norris and Poulton 2008). When describing the nature of decision-making Norris and Poulton emphasize that 'dashboarding', key performance indicators and accountability increasingly affect decision-making.

In the United States, the United Kingdom, Australia and Sweden this awareness of the importance of key performance indication has already resulted in annual reports and benchmarks with peers. In Anno 2010 they have extensive reports available to assess their current campuses, to identify merging trends and to support new projects with reliable references. Examples are Facilities Performance Indicators (APPA 2010) and Campus Performance Indicators (SCUP 2010) in the USA and Estate Management Statistics (AUDE 2010) in the UK. In Sweden annual reports are published that collect data on key performance indicators of all Swedish campuses, including a "Sustainability report" with many KPIs on energy use, CO_2 emission and sustainable awareness of users (Akademiska_Hus 2010). All of these sources emphasize that there is more pressure on generating management information in this era than ever before.

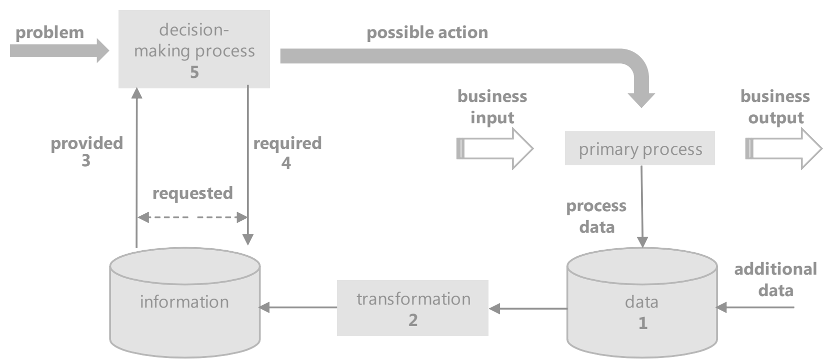
table 3.4: eras in planning and decision making on campus (Norris and Poulton 2008), edited

era	characterisation by Norris and Poulton (2008)	relevant for campus management information
1950s	age of authority	• less participatory, administrative fiat
1960s	age of developing quantitative techniques	• dispersal of power, political influence • incremental decisions to deal with rapidly increasing student enrolment
1970s	age of pragmatic application	• planning as a staff function
1980s	age of strategic redirection	• enhanced use of decision support systems
1990s	age of new paradigms for universities	• service-oriented approach • competitive forces grow
2000s	age of globalization, sustainability and performance improvement	• external stakeholders gain influence • more pressure on resource generation (which introduces more external stakeholders) • transnational universities (network) • greater emphasis on executing and refining strategy (planning for change) • need to demonstrate value on investment

3.5.3 Generating management information

Now that management processes are explicit, management tasks and stakeholder perspectives are specified, the required management information can be specified. Most research that is used to complete the framework, applies management theories to complex problems that are related to planning physical resources or focuses on the design approach, integrating different stakeholder perspectives in the process of continuously finding optimal solutions (Lohman 1999), (Van Loon et al. 2006). These sources supply theories on generating management information that make CREM and campus management theories operational for the empirical part of this research. This section presents a framework for generating management information and provides some insight on applicable methods (Flyvberg 2008) and on how to deal with so-called 'contested information' (De Bruijn 2008) which is highly relevant, because of the arguable relation between real estate and organisational performance stated earlier in this chapter .

figure 3.15: framework for generating management information (Lohman 1999) edited



the process of generating management information

Management information should support a decision-making process that influences the primary processes and the performance of an organisation. The process of generating management information requires data. What makes this process cyclic is the fact that the (main) sources of data are the same processes that the information should support.

This cyclic process is illustrated in figure 3.15 (Lohman 1999). The numbers 1 to 5 represent the flow to generate management information, but to determine what kind of data is required the order is from 5 to 1. The starting point is the primary process: the 'business output' or performance indicators – like diplomas and publications in case of a university. The other elements are briefly introduced using the models and frameworks of this chapter. In the next section Lohman's framework will be applied for this PhD research, using all elements that were introduced in this chapter.

- Decision-making process (5): The output of an institution justifies a mix of input – resources like capital, personnel, information & communication, technology and real estate – and the specific decision-making process for the campus is aimed at finding an optimal contribution of the campus to these processes and the output.
- The required information (4) is derived from the management process steps introduced earlier and stakeholder perspectives that need to be connected in these steps – according to CREM theory.

- But the provided – or available – information (3) will determine the demand for additional information, referred to as 'requested' in Lohman's framework.
- For generating this information data has to be transformed (2) to information. From the CREM theory the model is a basic tool – with four variables connected to four stakeholders
- The data (1) should then have the same structure as the CREM model. Dependent on the databases that are available at universities, additional data should – and has been – collected. This will be demonstrated in part B of this research.

Lohman also argues that poor data can have a substantial effect on the effectiveness of the decision-making process and - as a result – on the performance of an organisation. He states that data may be incomplete, incorrect, missing, inaccurate and inaccessible. This introduces the subject of the quality of data.

contested information and generating comparable data

With the quality of data determining the quality of management information, theories on so-called 'contested information' (De Bruijn 2008) are highly relevant. Campus decisions – like many decisions on the physical environment – are vulnerable to 'strategic behaviour' of stakeholders who want to maximize their benefits at the cost of others or to inexperienced or (too) optimistic stakeholders who hope to believe the most positive scenario. What generates more risks for real estate decisions is that (a) it is hard to predict the added value of investments beforehand and (b) substantial resources are involved. On 'contested information' (De Bruijn and Leijten 2008) the following is stated: "It seems reasonable to assume that no proper decision-making can take place without the right information. The reality tends to be different, however. (...) If information is unable to play its disciplining role, decision-making will degenerate into a free fight between proponents and opponents of a project. In such a free fight, information can freely be ignored or the wrong information can be used to discipline the decision-making. On the one hand, there is no 'truth' and the decisionistic approach (...) is too simple. Much crucial information is 'contested' at the time of decision-making. It is controversial, disputable and difficult to measure objectively or even non-existent. On the other hand, researchers should seek information of the best possible quality."

In determining the optimal mix of resources to achieve a goal optimizations depend on a large number of variables, which cannot be measured objectively. After the data collection and analysis these statements will be used to determine the value of the specific campus management information. This also goes back to the paradigm choice: truth to be measured or social construct (see chapter 1).

Prior research at universities (Den Heijer 2002b, Den Heijer, De Vries 2004b, Den Heijer 2005) emphasises the lack of references each university has to cope with for making campus decisions – for instance about investment levels of new university buildings – and the strong demand there is for collective references. This links to theory on 'reference class forecasting' (Flyvbjerg 2008). On 'reference class forecasting (Priemus et al. 2008) the following is stated: "Despite the enormous sums of money being spent on transportation infrastructure, surprisingly little systematic knowledge exists about the costs, benefits, and risks involved (...) Despite studies, it has so far been impossible to give statistically satisfying answers to questions about how accurate traffic and cost forecasts are for transportation infrastructure projects. Solution: establishing a sample of recently implemented transportation infrastructure projects that is sufficiently large to permit statistically valid answers to questions of accuracy." While infrastructure projects are usually very unique cases and finding suitable references is hard, practice shows that in real estate there are at least some comparable organisations with similar projects."

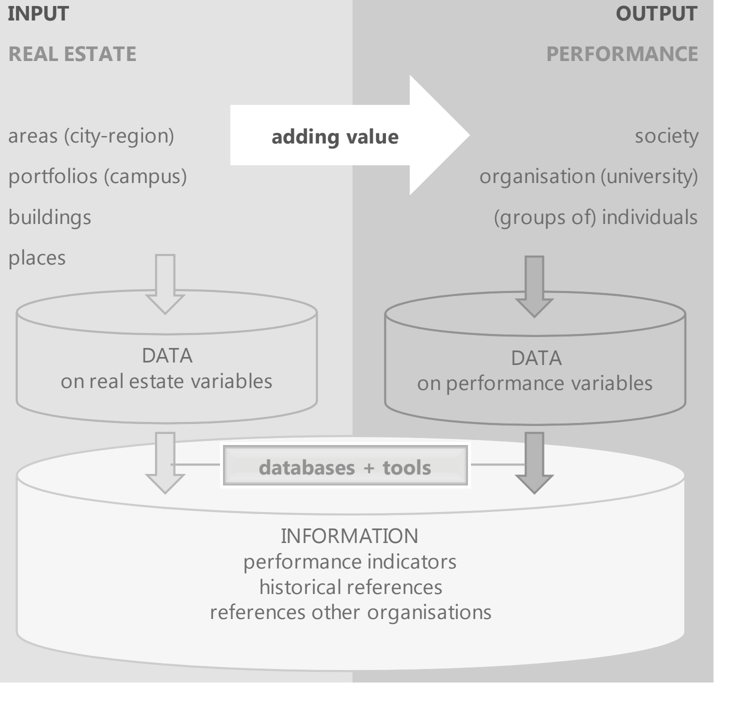
This pleads for joining forces with similar organisations to collectively use a reference database, which is done increasingly in many real estate sectors and among campus managers abroad. The more unique projects are – like relatively unique infrastructure projects and highly specialized laboratories – the more value an international reference database can have. Reference databases on campus level and on project level are some of the tools that will be described in part B of this research. Again, the reliability of data and a well-defined format are essential for the quality of this type of management information.

real estate adding value to performance: basis data collection

In figure 3.16 the relation between real estate and performance is the starting point for generating management information. Data on performance variables on the output side and data on real estate variables on the input side need to be collected to generate performance indicators. The same goes for historical references of, for example, five or ten years ago.

Requirements to include references of other organisations are comparability and reliability. When suppliers of data are also beneficiaries of databases and management information, they are more inclined to pay attention to a reliable input. Still, the quality of reference databases is as good as the quality of the input and the responsibility of the (collective) supplier of data.

figure 3.16: 'real estate' adding value to 'performance' is the basis for collecting data to generate management information



3.6 Summarizing theoretical insights

This research connects the most relevant components of this chapter: the relation between real estate and performance (section 3.3) and managing that relation with a decision-making process of four management tasks, integrating four CREM perspectives and involving the accompanying stakeholders (section 3.4 and 3.5). This requires management information that is supplied by databases and tools, making use of references based on current and historical data on real estate and performance – of organisations with similar primary processes or real estate – on multiple levels (section 3.6).

In this last section the most important statements are listed to answer the research question that was posed in the introduction of this: "What theories apply to managing the university campus, in general and focussing on generating management information for campus decisions?" These following statements match the components that will be used for data collection and analysis.

1. Theories on real estate management are based on the assumption that real estate – in quality and quantity, at different levels – influences the performance of individuals, organisations and society as a whole.

2. Real estate management focuses on:
   a. measuring that influence ex-post (creating references for the future);
   b. steering that influence ex-ante.

3. Managing real estate is a process in which decisions are made:
   a. considering all stakeholders that are involved
   b. in either supplying real estate (technical managers, controllers) or demanding real estate (users, policy makers)
   c. from strategic to operational level.

4. Managing is a process that can be defined as four steps to:
   a. assess the current situation;
   b. explore possible problems and challenges of the future;
   c. generate possible solutions for the future;
   d. define the road from current to future, the strategy.

5. These steps are also referred at as four 'tasks' to manage real estate. Applied to the campus, this provides the following management tasks in the decision-making process:
   (1) assessing the current campus;
   (2) exploring changing demand;
   (3) generating future models for the campus;
   (4) defining projects to transform the campus.

6. This management process can span a period of less than a year (operational level) and a period of more than ten years (strategic level).

7. Decision makers in this process need supporting information for the various management tasks, focussing on the four stakeholder perspectives: strategic (goals), financial (euros), functional (users) and physical (m^2).

8. Decision support information forms the bridge between:
   a. existing theories on the link between real estate and performance and

experiences from the past and from comparable situations – good and bad practices and;

b. decisions about real estate for the future.

In the four chapters of part B – one for each management task – the availability of management information from the four CREM perspectives is the main focus, see figure 3.17. How campus managers use this information in their management processes is considered to be an indicator for the level of campus management. This is derived from CREM theory (see chapter 3) and confirmed by Dutch campus managers in former research (2005-2010).

Generating more management information from the four CREM stakeholder perspectives and variables is relevant for each management task, which is also illustrated in figure 3.17. The results in part B will show that progress has already been made in using collective campus data to generate management information for individual universities. Per chapter the information demand of each management task is described, illustrated with examples of available information – from the past to the present, to learn from for the future.

answering the research question

Answering the question "Which theories apply to managing the university campus, in general and focussing on generating management information for campus decisions?", the figure 3.18 in next page summarizes the findings from the literature review that are used as input for this research. Some of the references with case study research (for instance on corporations & cities) will be used or elaborated on in the next chapter.

figure 3.17: all four CREM stakeholders and their key performance indicators are relevant for each management task

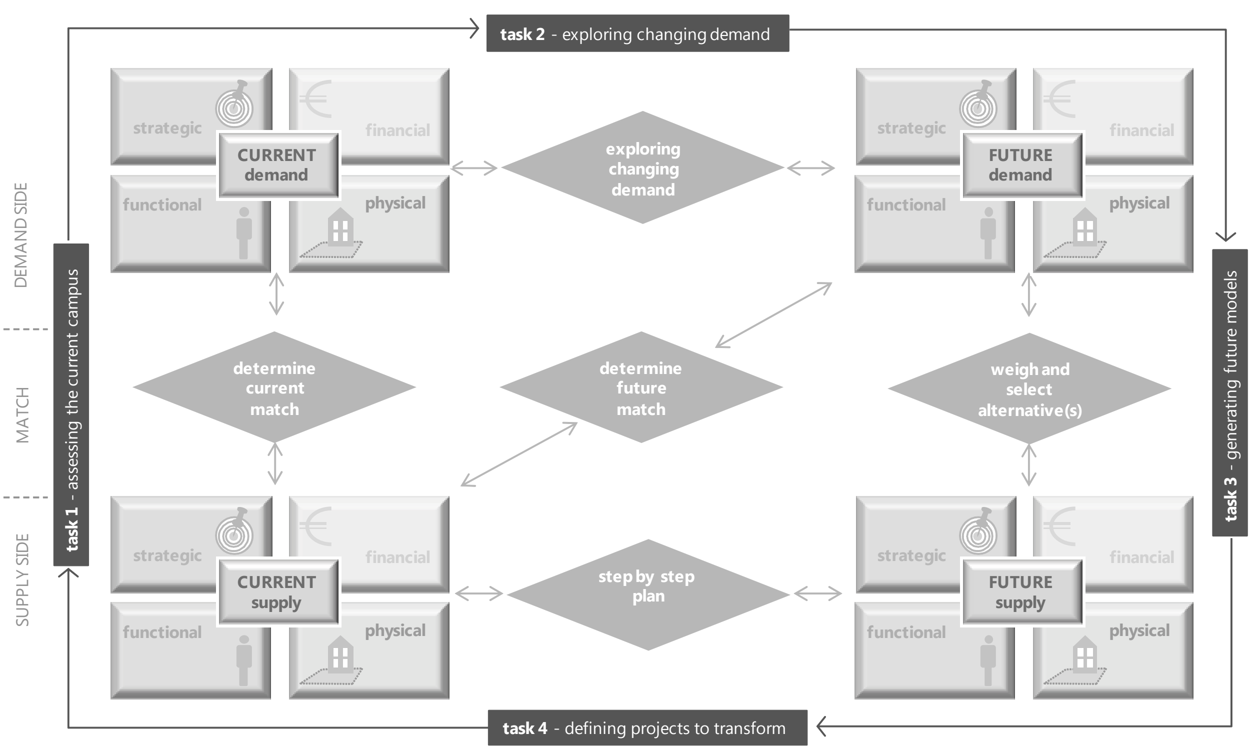


figure 3.18: findings from the literature review that are used as input for this research

BODY OF KNOWLEDGE literature, sorted by topic	INPUT / adopted theories, conceptual models and tools	references and their most important content for this research: before 1990s	references and their most important content for this research: 1990s
Corporate Real Estate Management	**on CRE / CREM** • CRE as the fifth resource and as strategic asset (Joroff) • input/output model (De Vries derived from Joroff) • CREM stakeholders (De Jonge, Van der Schaaf) **on CRE strategies** • DAS framework: designing an accommodation strategy in four steps		
Adding value with real estate	**on adding value** • hierachy of individual needs (Maslow), translated to space demand (Van der Voordt) • ten ways of adding value (De Jonge, De Vries) • hierarchy of adding value (De Vries)	**Adding value on individual level. Maslow 1954** • hierarchy of needs: from health and safety to aesthetic and self actualisation • translation of these needs to space demands of users - also based on Van der Voordt 2003, 2004 • translated to space requirements and quality levels on campus - Den Heijer 2002c, 2005, 2007, 2009	
Public Real Estate Management	**on management information** • benchmark framework of CREM variables to specify input for campus decision or strategy • key performance indicators from CREM perspectives (Den Heijer, De Vries) to specify output of campus decision or strategy		
Campus planning	**on campus planning & university city relations** • campus strategies (Chapman) • organisational models (Bank) • model for knowledge cities (Van den Berg) • different roles of the university (Perry, Wiewel) • models for 'univer-cities' (Worthington)		
Strategies for corporations & cities			

references and their most important content for this research

1990s | 2000s

OUTPUT / adding to theories, conceptual models and tools

Corporate real estate. Joroff et al. 1993
• corporate real estate (CRE) as the fifth resource, next to human resources, information, capital, information and technology
• role of corporate real estate manager: cumulative levels of competence and potentially strategic role

Succesful corporate real estate strategies Krumm 1999; Dewulf, Krumm, De Jonge 2000
• corporate real estate management (CREM) at multinational corporations
• stakeholder approach
• adding the financial perspective

Corporate real estate management De Jonge 1994, 1997, 2000; Krumm 1999
• corporate real estate (CRE) as a strategic asset that should be part of institutional or corporate strategies
• role of corporate real estate manager: cumulative levels of competence and potentially strategic role

Designing accommodation strategies (DAS) De Jonge, Arkesteijn, Den Heijer, 2007, 2008, 2009
•- introducing a uniform framework for real estate strategies in four steps
•- transforming De Jonge and Krumm's CREM model to a uniform CREM stakeholder model

on CRE / CREM
• confirming CRE as the fifth resource and emphasizing CRE as a resource in urban economics
• aligning CREM stakeholders with four CREM perspectives
• adding extra layers to CREM stakeholdings - zooming in on the organisation and zooming out from the organisation

Adding value with CRE. De Jonge 1997, 2000
• introducing seven way of adding value with real estate
• linking these to performance of the organisation
• expanding the knowledge to public organisations
• relating CRE to facility management (FM)

Adding value with CRE on organisational level De Vries 2007 De Vries, De Jonge, Van der Voordt 2008
• focus on business economics, system analysis
• elaborating on De Jonge's seven ways of adding value
• introducing a hierarchy of adding value and their link to performance: profitability, productivity and competitive advantage

Adding value with FM on organisational level Van der Voordt 2009 Van der Voordt, Jensen 2010
• focus on user satisfaction and productivity
• conceptual model with stakeholders

Adding value in educational environments Price, Matzdorf 2003
• researching the link between real estate interventions and user satisfaction, attractiveness of institution and student enrollment

Adding value with CRE on organisational level. LIndholm 2008
• elaborating on De Jonge's seven way of adding value with real estate
• elaborating on Krumm's theories on CREM
• applying theories to cases an adding strategies

on CRE strategies
• using the four steps in the DAS framework as four management tasks for CRE strategies

on adding value
• connecting the hierarchy of adding value to:
• the CREM stakeholders
•the CREM input variables: m2, euros, users and goals

Public real estate management. Dewulf, Den Heijer, De Puy, Van der Schaaf 1999 Van der Schaaf 2002 Evers 2002
• adding public goals to the CRE theory
• introducing stakeholder analysis and scenario planning as tools for real estate strategies
• emphasizing the essence of management information to support real estate decisions

Campus management as PREM / CREM case Den Heijer 2002a, 2002b, 2002c
• identifying the strategic (2002a), financial (2002b), functional (2002c) perspectives on the physical campus
• emphasizing the essence of comparative analysis of information to support real estate decisions
• introducing benchmarking among peers and scenario analysis as tool

CREM / PREM theories applied to higher education. De Vries 2007
• applied to Dutch institutions of higher professional education

Campus management information Den Heijer 2007, 2009
• identifying CREM stakeholders and their goals on campus in a framework
• identifying key performance indicators for campus management

on management information
• confirm CREM variables as input for campus decision or strategy
• specify more key performance indicators from CREM perspectives for output of campus decision or strategy

Campus planning from many perspectives Dober 1963, 1996, Tierney and Hewitt 1997, OECD / PEB 1999, Chace 2003, Daigneau 2003, Panaretos 2005, Ruben 2005, Norris and Poulton 2008
• the collective publications confirm the kaleidoscopic character of campus planning, with many different angles and aspects

Changing roles of universities Perry, Wiewel 2005, 2008
• introducing the university as a real estate developer, neighbour and enterpreneur

Campus management information Den Heijer, De Vries 2004, 2005
• identifying stakeholders and their goals on campus
• identifying key performance indicators for campus management

Campus strategies. Chapman 2006
• identifying trends and three strategic models for the future campus

Campus management organisations. Bank 2004, Bank, Den Heijer 2004
• connecting CRE organisations and adding value
•applied case study Rotterdam

Student cities & Knowledge cities. Van den Berg 2005, 2006
• emphasizing the mutually-beneficial relations between universities and cities

Campus & the city Hoeger & Christiaanse 2008
• typology of international case studies

Buiilding knowledge cities Den Heijer, De Vries, De Jonge, Raas 2006, 2008
• elaborating on Chapman's strategic models and Van den Berg's knowledge city model ('house')

CRE and PRE on urban level Worthington 2008 De Jonge, Den Heijer 2008
• corporate real estate (CRE) as the fifth resource, next to human resources, information, capital, information and technology
• role of corporate real estate manager: cumulative levels of competence and potentially strategic

on campus planning & university city relations
• combining university models, campus strategies, models for 'univer-cities' and knowledge cities in 'future models' and strategic choices for the campus of the future

BK City, Delft University of Technology
Photo: FCM

Part B
data colection and analysis

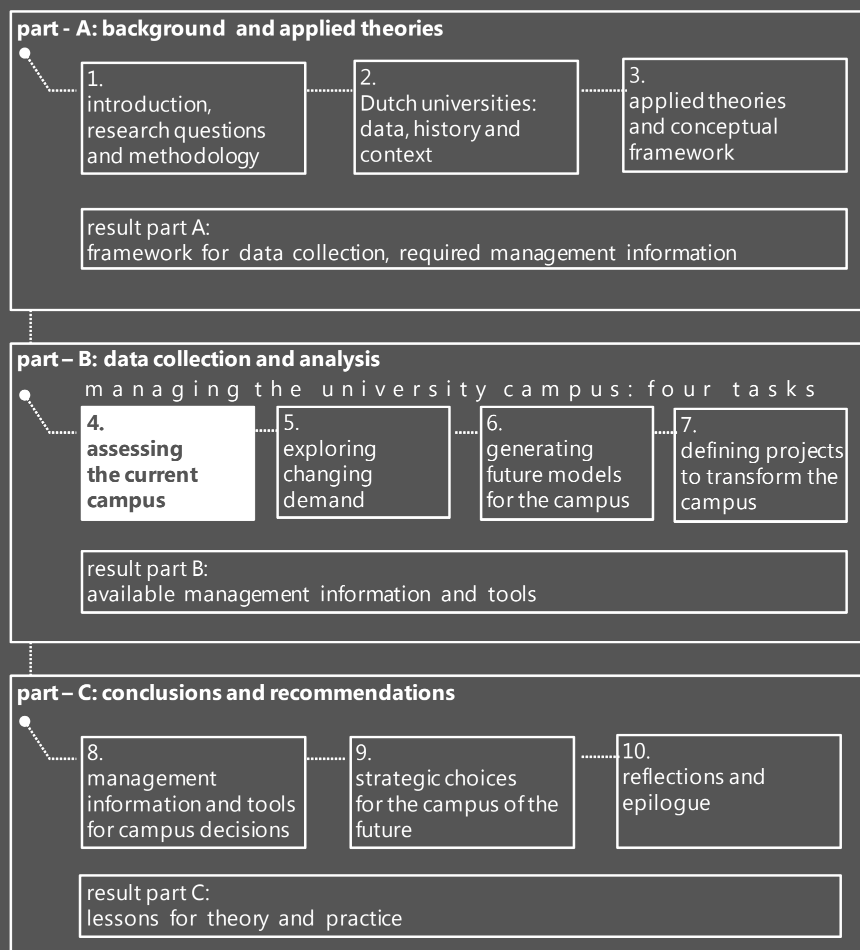
Part B of this research contains the data collection & analysis, using a range of methods in addition to the research projects and reports described in chapter 1. These are summarized below in chronological order, including the references that will be used as data sources in the next four chapters.

2005:	collecting the data of twelve recent university projects, using formats according to the conceptual framework for campus management at that time (Den Heijer and De Vries 2005)
2006:	workshop to discuss the data, research report and the format - testing the conceptual framework (January 27, 2006 in Utrecht)
2006:	two-day conference and workshops with Dutch campus managers and urban authorities "Building Knowledge Cities" about the campus and the city (October 25-26, 2006 in Rotterdam), results published in a report and articles (Den Heijer et al. 2006; Den Heijer and De Vries 2007)
2007:	collecting the data of all fourteen university campuses, using formats and questionnaires, testing three basic strategies and the conceptual CREM framework (Den Heijer 2007a)
2007:	data collection of more university projects, using the adjusted format, and analysing all twenty-six projects in the database at that time (Den Heijer 2007b)
2008:	workshop to discuss the data and reflect on the data (January 25, 2008 in Utrecht)
2008:	presentation for executive boards universities (February 15, 2008 in The Hague)
2007-2010:	collecting campus strategies, using document analysis and interviews
2008-2009:	participatory observation as member of BK city project organisation; results published in many articles, including a project description in English (Den Heijer 2009)
2008-2009:	testing campus strategies in expert meetings Think Tank "Faculty of the future", published in article of "Building for Bouwkunde" book (Arkesteijn et al. 2009)
2009:	interactive seminar "Campus of the Future" with boards of executives and campus managers Dutch universities (June 4-5, 2009 in Amsterdam)
2009:	workshop with students on the sustainable campus (October 28, 2009 in Delft)
2009:	workshop with campus managers and energy coordinators on sustainable campus (October 30, 2009 in Rotterdam)
2009:	collecting the data of thirteen university projects, using formats
2009:	presentation and discussion with members executive boards universities (November 27, 2009 in Utrecht)
2010:	presentation and interactive discussion with audience and response on data (April 27, 2009 in Wageningen), published in a report (TU_Delft 2010) and paper (Den Heijer et al. 2010)
2005-2010:	literature review, document analysis and web search of campus management networks

More details about the questionnaires or propositions that were used can be found throughout the text of part B and in appendix VIII.

Photo: DUWO

Chapter 4
Assessing the current campus



4 Assessing the current campus

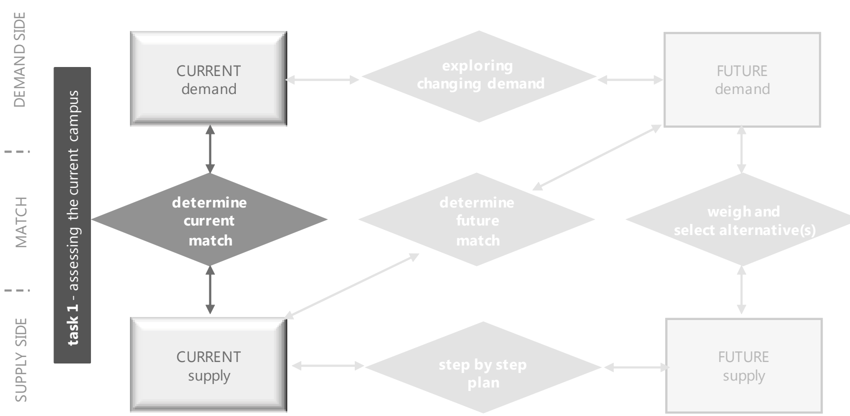
4.1 Introduction and required management information

This chapter focuses on the first management task of managing the university campus: assessing the current campus. The following research question will be answered: "What management information is required, what management information is available and what is the demand for additional information for (I) assessing the current campus?", see figure 4.1.

The essence of 'assessing the current campus' is to generate information about the (mis)match between what we have and what we need or should have currently. This assessment can be made from four different stakeholder perspectives, covering technical, functional, financial and organisational aspects from inside and outside the university.

The next sections will describe the current state of the Dutch campus, from technical, functional, financial and organisational perspectives. This will give an overview of the Dutch situation and the available information and tools that provide this information. At the end of each section this management information will be assessed on its value and what information is still missing. The last section will elaborate on the demand for additional information.

figure 4.1: the first management task: assessing the current campus



4.1.1 History of assessing the current campus

Before the transfer of campus ownership to universities in 1995 the universities were mainly responsible for maintenance of the campus and satisfying the campus users with the appropriate mix of campus functions. Consequently, required management information for campus managers focused on technical and functional aspects – and less on financial and strategic aspects. Research confirmed that before 1995 important tools for campus assessments were tools for condition based monitoring and maintenance planning, focusing on campus management from a technical perspective (De Jonge et al. 2000). This was a relatively easy process with limited information demand: floor area and technical condition of that floor area. Tools for condition based monitoring supplied the management information for this technical assessment. Campus decisions could be based on the difference between the required minimum condition and the actual condition. The 'campus strategy' was aimed at reducing or eliminating that difference. Maintenance planning tools assisted the campus planners to put these campus projects on a timeline.

required information in 1990 – assessing the current campus from a technical perspective

Still, comparative campus information – even floor area – of the period before 1995 was hard to find. At that time the Ministry of Education & Science was responsible for assessing the financial aspects and the necessity of new campus projects, on behalf of the owner of the Dutch campus at that time: the Dutch government (Den Heijer 2002b, 2004). Searching their library did not supply much information on university campuses before 1995. Just a few reports cover some of the variables that are relevant assessing the campus. One example (Ministry 1991) contains an analysis of the university's accommodation strategies of 1990. This report also includes some campus data on floor area, ownership versus rent and age profiles of the campuses. Introduced the issue of reliability of data and the necessity of using uniform definitions for comparisons between universities. As a tool for functional assessment of projects the Ministry also used the space model WORM, to allocate resources, independent of the age, condition and size of the campus at that time. For financial assessment of projects they used investment standards per function type. These tools for exploring changing demand and defining new projects can be found in the next chapters that focus on these management tasks.

The transfer of ownership in 1995 gave the universities the full responsibility of their campuses. This also introduced new perspectives and new variables to campus management, giving them financial responsibility, not only for new campus projects but also for the total costs of campus ownership and the value of the campus. Campus managers acknowledged this responsibility and the need to compare data on these aspects grew in the years that followed in the late nineties. This was confirmed by research on campus strategies that included assessments from the financial and organisational perspectives. At that time, around 2000, Dutch campus managers were gradually involving financial and organisational aspects. Even though they lacked the matching information to add these perspectives to campus management. After that initial research additional and more focused research on the required management information confirmed the need for campus assessments combining three different variables: floor area, costs and benefits for both users and the organisation (Den Heijer and De Vries 2004). The next research project (Den Heijer 2005) connected the required management information to the four CREM perspectives, resulting in the conceptual framework that is used for this research.

required information from 1995 – universities using customized tools and databases

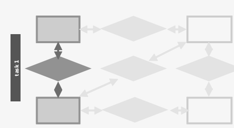
While all universities needed the same type of management information, the transfer of ownership was not accompanied with sharing information and knowledge for mutual benefits. On the contrary: universities built customized databases and administrations for campus data. Years later, when universities acknowledged the value of sharing management information, these customized administrations made it very hard to compare data, although the required management information was practically the same for every institution.

From 1995 many universities have used different tools for the same purposes and individually collected data and references to calculate rent for user groups, determine space use and assess the technical condition for maintenance and investment planning. In the first few years after the transfer of ownership almost all Dutch universities developed tools to calculate rent, based on customized financial systems and determined space use, using their own standards and floor area units. But in communicating with the different stakeholders, they needed more transparency in the administrations and more objective standards as references. For example: the users wanted to have references for the rent (also market references), controllers wanted to have references of the accommodation costs of similar institutions, policy makers wanted to know the consequences of introducing new concepts and wanted to benchmark space use and costs. The link with the organisational perspective introduced the goal of 'adding value' to the university's performance. Policy makers demanded references - best practices – of other universities: what concepts do other universities apply with the same goals? This resulted in the demand for references on key performance indicators.

required information from 2005 – the need to benchmark the current campus

Around 2005, Dutch campus managers acknowledged the value of collectively measuring, combining and comparing campus data from different CREM perspectives. At the same time, Dutch universities agreed that campus management involves four types of stakeholders and campus decisions should combine variables of four perspectives (Den Heijer 2005). This conclusion was confirmed by posing the following question (Den Heijer 2007a) in interviews and a questionnaire for campus managers: "Can you name a campus decision that does not combine these variables?" Campus managers concluded that even moving one research group to another part of the building involved – or should involve - considerations from all perspectives, let alone constructing a new building. Consequently, they agreed that collective management information should include all four perspectives and variables.

table 4.1: required management information for assessing the current campus: variables to collect per stakeholder perspective (colours match the CREM model)



variables STEP 1 ASSESSING THE CURRENT CAMPUS	physical m²	functional users	financial euro	strategic goals
common issues and decisions and their information demand (in variables)				
assessing the technical condition for investment and maintenance planning	m², condition m²			
assessing space use per function to compare between user groups	m² per function type	# and types of users		
assessing user satisfaction also related to the competitive advantage of the university	m² per function type	satisfaction students and employees		ranking, market share % students
assessing occupancy and frequency rates (intensity of use) to evaluate concepts for education, studios, offices etc.	concepts in m² and quality	occupancy & frequency rates		goals of concept, ambition level
assessing total costs per m2 to calculate the rent for users	m² per function type		total costs of ownership	
assessing costs per m2 per function to specify the rent for (groups of) users	m² per function type	space use / user group	costs specified per function type	
assessing the value of the campus for insurance, financial and strategic purposes	locations m²		market, book replacement value	
assessing 'the green campus' – the ecological footprint	m² CO_2 emission	# users	energy costs	green campus goals
assessing the input versus the output: resources (incl. m2) spent on students and faculty members versus their output	m² for students faculty	# and types students faculty	costs of students faculty	output in diplomas, publications, turnover

However, in the same research the campus managers indicate that they lack the required management information for functional, financial and organisational assessments. The most important reason is that values for functionality, financial aspects or the added value for organisational goals cannot be measured by legal standards or rules and regulations. Most of these variables require references from similar organisations to interpret the value.

It is important to illustrate this with some examples. A value of 20 m^2 per user has no meaning for policy makers if it is not compared with historical values at the same organisation or with values of other, similar organisations. Without these comparative data it is not possible to determine if this is high or low, and if a campus manager should act on it by reducing floor area or creating more space. The same goes for variables like costs per m^2. Comparing data determines the range of possibilities and the position of the individual institution in that range. That position will supply relevant management information for various decisions about the current campus: should we build or invest more, intensify use, reduce costs and introduce new concepts to study or work? However, the assessment of the current campus by comparing campus data still leaves responsibility with the institution itself. Even the institution with the highest costs per m2 might consider this in balance with the benefits per m2 and in line with the organisational goals. It just gives them references to communicate with the stakeholders within the university. In table 4.1 more common reasons to assess the current campus can be found that require management information from different CREM perspectives.

Summarizing, according to theory (chapter 2) and expert opinion of Dutch campus managers (Den Heijer 2007a), campus management and decision support information benefit from (a) combining as many stakeholder's variables as possible, (b) comparing data with similar institutions and (c) comparing data in time. The next subsection gives a chronological overview of research projects with the goal to supply the required management information to assess the current campus.

4.1.2 Collectively benchmarking the Dutch university campus

The following time line – about generating collective data for assessing the current campus – also gives insight in the competence level and complexity of campus management over the years.

2000 – comparing campus data: the start of benchmarking

One of the first aspects of the collective study in 2000 (De Jonge et al. 2000) was a chart with the floor area of all fourteen universities, linked to the number of users. The number of users consisted of the sum of students and employees. Dutch campus managers considered it very valuable information, indicating the value of a comparative analysis as management information for each institution. However, it was also clear that the input of reliable data – using the same definitions for floor area and the same sources for number of users – was a critical condition.

At that time this form of benchmarking was confirmed to be a very interesting management tool. The risk of benchmarking is that some organisations end up at the top of the list and some at the bottom, for any performance indicator that can be benchmarked. All participants in the benchmark study wanted to avoid the judgement of right and wrong, based on just two CREM variables. But still, values were compared with conclusions in terms of good or bad campus management, usually based on costs per m^2 or space use, independent of the value of other key performance indicators.

2002 – collecting campus data on floor area, users and costs

The focus on the range of values instead of the average value was a first step in clarifying the range of possibilities. The goal was to explain the differences with contextual variables. At that time, the step was set towards introducing more than two variables in any comparison, from space use to costs per m^2.

Another conclusion at that early state was that the use of uniform definitions was essential. With many administrations that gradually evaluated towards specific use of definitions, this was one of the greatest obstacles. But still, campus managers acknowledged that the value of potential comparative analysis was worth the effort. A new research project was started, funded by all Dutch campus managers, to assess the feasibility of benchmarking the university campus.

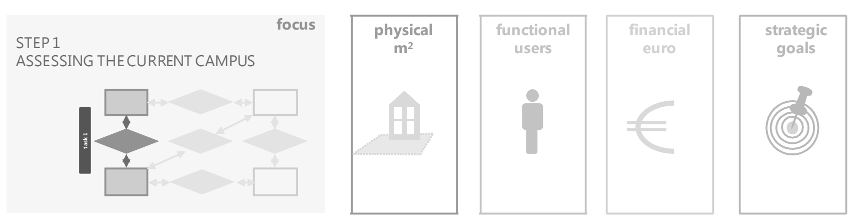
2004 – a feasibility study of benchmarking the university campus

The challenge to generate management information at that time was twofold: create a uniform format to collect current campus data and collect data of at least three variables – m^2, costs and benefits. Required information demand from all CREM variables was compared with available information. Eventually, all campus managers discussed the results in workshops. Based on the value of the management information that the research would provide, they concluded that it would be worth the effort of using uniform definitions for CREM variables. The next step in generating comparative data about the current campus was set.

2006 – operationalizing the organisational goals

Acknowledging the importance of the organisational perspective on the campus, and the (potential) positive or negative value of the campus for the organisation, made it essential to operationalize the "added value". How can goals like "creating an inspiring place to learn" be connected to quality, users or costs per m^2. Campus managers agreed on using a qualitative framework. This framework was applied in a questionnaire and in interviews, generating information about the hierarchy of (organisational) goals that shaped the current campus.

table 4.2: history of available information - assessing the current campus shows cumulative levels of campus management; note: 'x' and colour indicate available information



Generating management information over the years, at Dutch universities

	physical m^2	functional users	financial euro	strategic goals
1995 – databases to manage campus (per university)	x			
1995 – cost charging models (per university)	x		x	
2000 – first collective comparative analyses of campus data	x	x		
2004 – feasibility study benchmarking	x	x	x	
2007 – collecting data of fourteen Dutch campuses	x	x	x	x
2007 – creating a database of campus data	x	x	x	x

2007 – the first full comparative analysis – creating a database for various purposes

With a format to measure CREM variables, all Dutch universities participated in the first complete comparative analysis of the current campus, which will be explained and applied in the next sections. Again, it is emphasized that the goal of these comparative analyses is not to judge what is right and wrong, but to clarify the range of possibilities and explain the differences in values with the context of the fourteen campuses. Summarizing, table 4.2 shows that over the past fifteen years the management information for this management task "assessing the current campus" has followed the increased competence level of campus managers. Note that – the other way around – the lack of available management information on both financial and organisation variables has hindered the competence level in the first period after the transfer of ownership in 1995. Campus managers acknowledge that the level of campus management is as high as the quality of the available management information.

4.1.3 Using the campus database to generate management information

The last step in this chronological overview - the extensive benchmark study of the fourteen Dutch campuses (Den Heijer 2007a) – created a database that (potentially) contains answers to many questions about the current campus. Basically, there are two types of results from this campus database:

- fourteen campus profiles of Dutch universities, with technical, functional, financial and organisational aspects that connect all four CREM stakeholder perspectives (also referred at as 'vertical' results in figure 4.2); which can be found in appendix I

- insights from comparing data of all fourteen campuses on (combinations of) technical, functional, financial and organisational aspects (also referred at 'horizontal' results in figure 4.2).

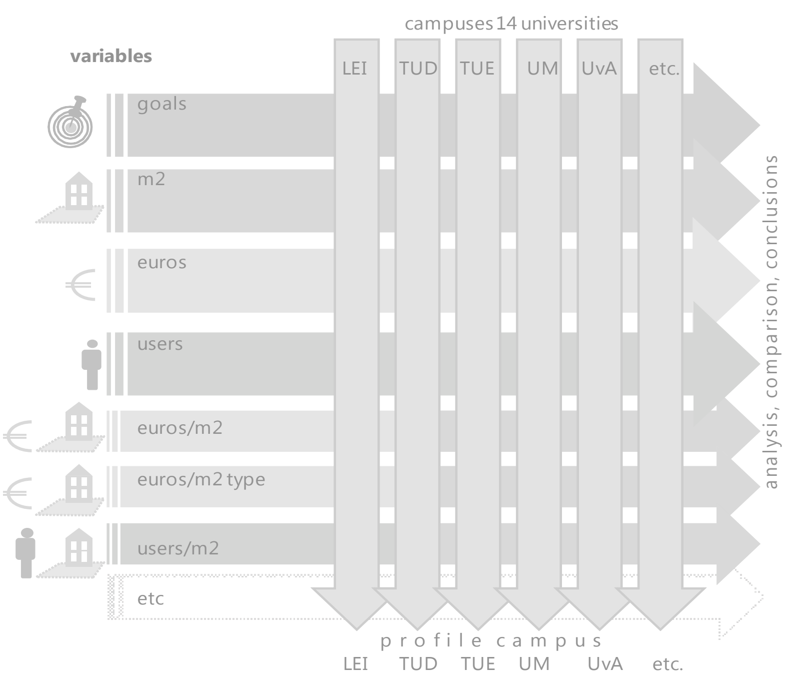


figure 4.2: the database results: fourteen campus profiles vertically, a comparative analysis horizontally

4.2 Format for assessing fourteen Dutch campuses

Below the most important campus data from all four CREM perspectives are included in a campus profile, applying the CREM model from theory. As background information some basic university and campus info is added for better interpretation of the campus data: the type, size, city and age of the university. In the appendix I case descriptions of all fourteen Dutch campuses contain more background information and more specified data on some of the CREM perspectives.

The example of the campus profile (figure 4.3) illustrates what data was collected by sending a format and questionnaire to all directors of the campus planning or management department - referred at as ‘campus managers’ – in the year 2007. Questionnaires were filled out by the fourteen campus managers themselves – sometimes with additional interviews to collect missing information – while the collection of data on other variables (m^2, euros and users) was carried out with or delegated to their employees. All data has been collected in 2007.

figure 4.3: example of campus profile connecting variables from four CREM perspectives, see appendix I for campus profiles of fourteen Dutch universities

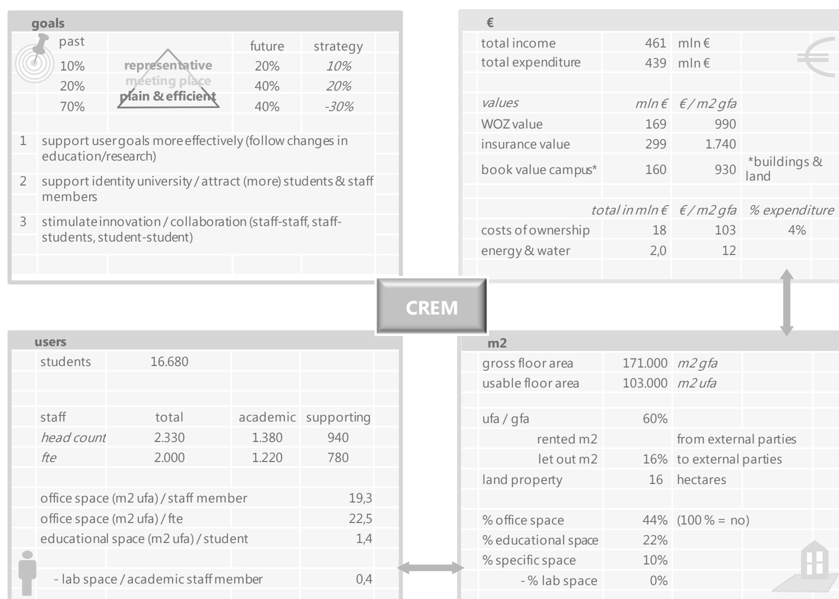


table 4.3: example of collected physical data

m2		
gross floor area	171.000	*m2 gfa*
usable floor area	103.000	*m2 ufa*
ufa / gfa	60%	
rented m2		from external parties
let out m2	16%	to external parties
land property	16	hectares
% office space	44%	(100 % = no)
% educational space	22%	
% specific space	10%	
- % lab space	0%	

4.2.1 Variables of campus profiles – the physical perspective (m2)

The most important basis of campus assessment is floor area in various definitions. Floor area was measured in gross floor area (gfa) and usable floor area (ufa). The difference is space for horizontal and vertical circulation, installation and construction. Land property is expressed in number of hectares and located on the map of the university city. Ownership distinguishes the percentages owned and rented space (0% in the example). The same 100% - that represents the floor area that is managed by the university – can be divided in terms of use, on a general level: used for the primary processes, let out to external parties (12% in the example) or vacant.

For determining the age and condition of the buildings the campus managers were asked to assess all buildings larger than 1.000 m2 gfa to get a representative sample instead of a rough estimation. Some universities used both methods (a representative sample and a rough estimation) for determining the condition of the campus and were surprised by the difference in result. The perception of the condition diverged from the more objectively obtained result, using a tool for determining the technical condition: condition based monitoring (Vijverberg 2004). This tool was originally designed for the housing stock in the eighties [1], but is now used for more types of real estate. The Dutch institute for standardization (NEN) is adopting this system to be the Dutch standard for condition measurement. The six condition scores are excellent, good, reasonable, moderate, bad and very bad. All conditions are extensively defined in various publications about condition based monitoring (CBM). Looking at the results it is important to consider that campus managers assessed their own campus. Therefore, subjectivity is inevitable in interpreting the definitions. Therefore the value of these percentages should not be overrated. Both the age profile and the condition of the campus are highlighted in a separate table (see adjoining example and appendices per campus profile).

table 4.4:example of collected data about condition and age of campus m2

CONDITION	% m2	AGE	% m2
		< 1900	4%
excellent	6%	00s	1%
		10s	
good	27%	20s	0%
		30s	1%
reasonable	25%	40s	0%
		50s	5%
moderate	29%	60s	27%
		70s	14%
bad	14%	80s	34%
		90s	5%
very bad		> 2000	8%
	100%		**100%**

[1] "Kwalitatieve Woning Registratie (KWR)" to register qualitative aspects of dwellings

Function types were collected using a uniform format derived from standards and used categories at universities and tested in earlier research on applicability within the university (Den Heijer 2005). Three function types that are related closest to the university's primary processes are shown in the campus profile: office, education and specific, including laboratories. Note: the percentage for lab space also relates to total usable floor area (and is not a percentage of the percentage specific space). More data was collected on the number of parking spaces and workplaces for students and staff members, with and without a computer. This links the technical data to functional aspects.

4.2.2 Variables of campus profiles – the functional perspective (use & users)

table 4.5: example of collected functional data

users				
students	16.680			
staff	total	academic	supporting	
head count	2.330	1.380	940	
fte	2.000	1.220	780	
office space (m2 ufa) / staff member				19,3
office space (m2 ufa) / fte				22,5
educational space (m2 ufa) / student				1,4
- lab space / academic staff member				0,4

Sources of general university data like VSNU (Association of Dutch universities) were available for student enrolment and personnel. But for campus management it is important to determine the amount of users of the floor area on campus. For instance, some of the universities also accommodate students of other HEI on campus or staff members of other institutions. Beside that, VSNU figures on student enrolment include medical students while many universities do not – or do no longer – own the building(s) of the medical faculty or the academic hospital. The number of users in the campus profiles is corrected if this is the case. In the example the number of staff members also includes about 450 external users: the 'fte' and the ratio academic / supporting staff were changed accordingly, assuming equal ratios as in the VSNU data for this university. The function types that were gathered from the technical perspective are connected to the number of users, resulting in four specific ratios for space use.

While comparing user satisfaction is on the top of the list of the function key performance indicators, there is not yet a uniform method to assess student or employee satisfaction of the current campus. The same goes for methods to compare occupancy and frequency rates, which are indicators for the intensity of use: capacity use and use in time. These are demands for additional functional information.

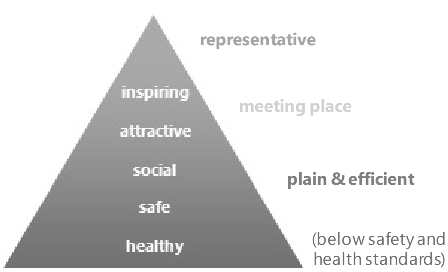
table 4.6: example of collected financial data

€				
total income	461	mln €		
total expenditure	439	mln €		
values	*mln €*	*€ / m2 gfa*		
WOZ value	169	990		
insurance value	299	1.740		
book value campus*	160	930	*buildings & land	
	total in mln €	*€ / m2 gfa*	*% expenditure*	
costs of ownership	18	103	4%	
energy & water	2,0	12		

table 4.7: example of collected strategic data – about university goals and ambitions

goals				
	past		future	strategy
	10%	representative	20%	*10%*
	20%	meeting place	40%	*20%*
	70%	plain & efficient	40%	*-30%*
1	support user goals more effectively (follow changes in education/research)			
2	support identity university / attract (more) students & staff members			
3	stimulate innovation / collaboration (staff-staff, staff-students, student-student)			

figure 4.4: quality ambitions aligned with Maslow´s hierarchy of needs



4.2.3 Variables of campus profiles – the financial perspective (€)

An important source of financial university data is CFI. CFI stands for Central Finances Institutions, a government organisation collecting and supplying financial data, connected to the Ministry of Education, Culture and Science.

For financial aspects CFI supplied figures from the universities' annual financial reports of 2006 about total expenditure, total income, book value of the campus – buildings and land – energy costs and even an indication of the total costs of ownership, as part of "Other institutional costs". Still, campus managers had to supply accommodation costs from their own information systems to get more accurate figures, using standards for facility costs of which only accommodation costs were counted (NEN 2748, group 1). Energy costs were also compared: annual reports versus data supplied by campus managers. WOZ value ("Wet Waardering Onroerende Zaken", Real Estate Valuation) refers to the Dutch Real Estate Appraisal Act. The campus managers supplied this WOZ value and the insurance value.

4.2.4 Variables of campus profiles – the strategic perspective (goals)

The questionnaire was the basis of all data on goals. Two tools were used to assess the campus from an organisational perspective:

(a) the hierarchy of needs, linked to qualities of the built environment and summarized in three ambition levels – representative, meeting place and plain & efficient – and
(b) a list of campus goals to add priorities to.

(a) ambition levels for quality

The hierarchy of needs was first introduced to Dutch campus managers in 2002 as a communication tool about quality of space. Instead of using terms like 'basic' or 'luxurious' that are ill-defined, the quality levels are linked to psychological needs of individuals. Aligning with Maslow's theory – see chapter 3 – the cumulative quality levels relate to physiological needs, safety needs, needs for love & belongingness , needs for esteem and needs for self-actualisation. These needs can be linked to cumulative building requirements: a healthy, safe, social, attractive and inspiring learning and working environment. Finally, these requirements can be matched with buildings of the current campus.

In 2007 a slightly adapted model was presented to campus managers of Dutch universities. They were asked what part of their current campus in gross floor area (2007) roughly is 'plain & efficient', a 'social meeting place' and 'inspiring & representative'. The quality 'plain & inefficient' was added for the current campus, referring to buildings that do not meet legal standards for health and safety guidelines, formulated in the Dutch Occupational Health and Safety Act ('Arbowet'). A building that does meet these guidelines is minimally 'plain & efficient'. Adding qualities to meet social needs of users makes the building a 'social meeting place'. Finally, adding qualities that make the building attractive and inspiring to both internal users and external parties, labels a building as 'inspiring and attractive': it can become a showcase for the university. The same cumulative qualities can also be projected on space within a building.

Two methods were used to fill out the percentages in the campus profile: rough estimations for the whole campus and assessments of each of the buildings larger than 1.000 m^2 gfa, to get more representative percentages. Again - similar to the results of the technical condition and because of the subjective judgments - these percentages have more value for the individual university than for the comparison of universities or for assessing the collective quality level of university buildings.

(b) priorities in a list of campus goals

The three goals that are included in the profile represent the top 3 of future goals. In their questionnaires campus managers added priorities to a list of goals. This list of goals is based on campus goals that were found in research (De Jonge et al. 2000; Den Heijer 2002a) and related to various ways of adding value to the university's performance that were introduced in the previous chapter (see figure 3.6). The following list of underlying goals for campus planning was given to Dutch campus managers. They prioritized this list. The top 3 appears in their campus profiles.

This list varies from goals that focus on efficiency (bottom) to goals that focus on effectiveness (top). Not only organisational aspects, but also technical, financial and functional aspects are covered in these goals. Some examples – like less m^2 per user and support user goals more effectively – illustrate the complexity of campus management, because these goals can be conflicting. Again, this pleads for managing the university campus by connecting different stakeholder's perspectives that confronts user needs with costs and organisational goals with the physical consequences. Assessing the current campus on different variables is the first step. The fourteen campus profiles are the result of these assessments.

Additionally to the four CREM perspectives, some characteristics of the universities are added to the campus profiles, to explain some of the differences in values: university size, type and age. These differences are very important when comparing campus data and interpreting the differences.

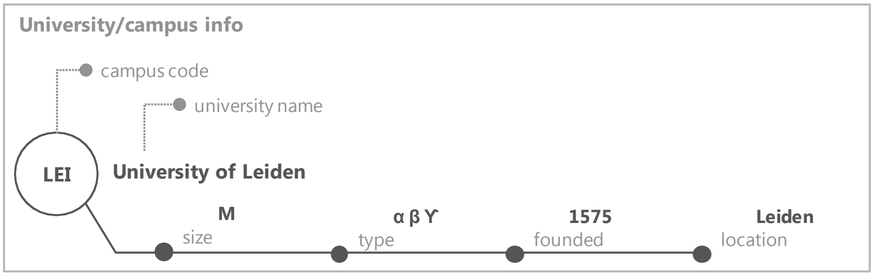
focus on effectiveness

- support identity university / attract (more) students & staff members
- support identity user (faculty, department or institution that uses the building)
- support user goals more effectively (follow changes in education/research)
- increase income / decrease expenditure on level organisation
- increase income: make building rentable to a third party
- increase income: make building marketable to a third party
- more quality for user (more luxurious, representative)
- support culture change (for instance after reorganisation)
- stimulate innovation / collaboration (staff-staff, staff-students, student-student)
- increase flexibility: non-territorial offices for staff / spaces used by multiple users
- increase flexibility: adaptability / multifunctional use
- increase occupancy and frequency rates
- less m^2 per user
- save accommodation costs
- achieve or maintain minimum quality for use permit ("safe and healthy workplace")

focus on efficiency

figure 4.5: list of goals - used for questionnaires - that can be supported with the campus

figure 4.6: collected data about the university, for the campus profile



4.2.5 Variables of university profiles for comparative analysis

In the appendices every campus profile and accompanying case description starts with a map of the Netherlands indicating the location of the university and a text from the university website ("About the university"), summarizing the mission and vision of the university. Furthermore the university profiles include three main variables that are important to be able to interpret the data: (I) the size and (II) the age of the institution and (III) the type of education and research: arts, social sciences and sciences. Criteria for size, age and type are based on the median and average values of the fourteen cases.

variable for profile: (I) size of the institution

In the table below the size of the universities is measured in student enrolment. There are more criteria to determine the size of the institution: students plus staff, financial criteria or output. In the comparative analysis, these variables of size are also used to interpret the differences in values.

Assumptions considering university size:

- small universities have more efficient space use (compact campus with every building within walking distance) than large universities, with larger campuses or more than one campus – which requires bicycles, buses or cars to move between buildings;
- the relatively compact campuses of small universities give more opportunity for facility sharing between faculties (restaurants, lecture halls, libraries), which further reduces the footprint.

table 4.8: categories of university size

S		M	L	
small		medium	large	
< 8.000 students*	8.000-12.000	12.000-18.000	18.000-22.000	> 22.000 students
TUE-Eindhoven UT-Enschede WU-Wageningen OU-'virtual'**	UM-Maastricht UvT-Tilburg	LEI-Leiden RU-Nijmegen TUD-Delft	EUR-Rotterdam VU-Amsterdam	RUG-Groningen UU-Utrecht UvA-Amsterdam

* students based on enrolment in academic year 2006/2007 (source: VSNU 2007)
** OU: based on fulltime enrolment of 6.000-7.000 students

variable for profile: (II) age of the institution

In the table below the age of the universities is represented in years, divided in three age groups from old, founded before 1800, to young, founded after 1950. LEI is the oldest university and UM and OU are the youngest universities, respectively a traditional university and a 'virtual university'.

Assumptions considering university age:

- old universities have a more diverse portfolios: from old buildings in the city centre to periphery campuses, bringing both opportunities and threats for campus management
- a diverse portfolio and more than one campus location adds to inefficient space use
- old universities have a more traditional culture of large territorial space, for both faculties and individuals; young universities have developed their campuses (and organisations) with more flexibility, non-territorial in terms of faculty use or individual use

If other age groups are more relevant for the differences on campus or in campus management, then this will be discussed when assessing the data.

table 4.9: categories of university age

➔		time			➔
old				**young**	
< 1800		1800-1950		> 1950	
LEI-Leiden	1575	TUD-Delft	1842	TUE-Eindhoven	1956
RUG-Groningen	1614	VU-Amsterdam	1880	UT-Enschede	1961
UvA-Amsterdam	1632	EUR-Rotterdam	1913	UM-Maastricht	1976
UU-Utrecht	1636	WU-Wageningen	1918	OU-'virtual'	1984
		RU-Nijmegen	1923		
		UvT-Tilburg	1927		

variable for profile: (III) types of education and research (main focus)

In the table below the profiles of the universities are described by indicating the type of education and research: arts (alpha), sciences (beta) and social sciences (gamma). Six universities combine alpha, beta and gamma and are also linked to an academic hospital with their medical faculties. Since 2004/2005, these academic hospitals are no longer included in the campus data (transfer to hospitals in the period of 2002-2004). However, in most cases, the buildings of the medical faculties still are included in the campus data. These 'broad universities' are in the middle of the table with the more specialized universities on either side.

Assumptions considering profile:

- gamma profiles require the least specific spaces, beta profiles the most specific spaces
- gamma profiles have the smallest footprint per student, beta profiles the largest
- gamma profiles have the smallest footprint per faculty member or researcher because of desk research, beta profiles have the largest footprint because of specific laboratory research

table 4.10: categories of university profile – universities categorized by their dominant profile(s), even though the universities of technologies are also offering gamma programmes

ϒ	ϒβ	α β ϒ	β	β
gamma	**gamma-beta**	**alpha-beta-gamma**	**beta**	**beta**
social sciences	social sciences sciences • theoretical • medical	arts social sciences sciences • theoretical • medical	sciences • technical	sciences • agricultural
UvT-Tilburg	EUR-Rotterdam UM-Maastricht OU-'virtual'	LEI-Leiden RU-Nijmegen RUG-Groningen UU-Utrecht UvA-Amsterdam VU-Amsterdam	TUD-Delft TUE-Eindhoven UT-Enschede	WU-Wageningen

The insights from comparing campus data of fourteen Dutch universities can be found in the following four sections that assess the current campus from each of the four CREM perspectives, using the 2007 campus database to answer a number of subquestions:

- physical perspective (section 4.3) - what is the quantity and quality of the current real estate portfolio, including location characteristics, types of spaces, condition and the age profile of the campuses?
- functional perspective (section 4.4) – how many and what types of users have to be accommodated, how do they assess the current campus and what are occupancy and frequency rates?
- financial perspective (section 4.5) – what resources are spent on the current real estate portfolio and how is this portfolio valuated?
- strategic perspective (section 4.6) – how and to what extent are institutional goals on education, research, human resources and valuation of knowledge supported, achieved or obstructed with the current real estate portfolio?

4.3 The campus from a physical perspective

Assessing the campus from a physical perspective includes collecting and analysing data of floor area, ownership, type of use, land property and location(s). The results of these assessments have been used as input for chapter 2 "Background information". This section continues with data on age distribution, which was also introduced previously, when describing developments that shaped the current campus.

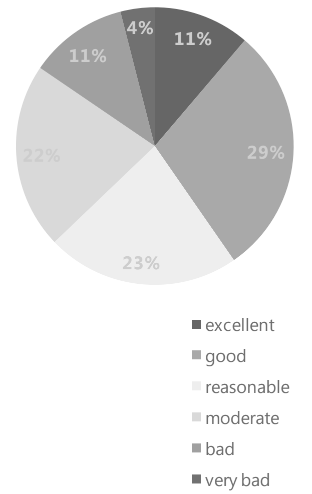
table 4.11: age distribution of buildings of all fourteen campuses (Den Heijer 2007a) in m2 gfa

				cumulatief	
182.206	182.000	4%	< 1900	4%	182.000
12.260	12.000	0%	00's	4%	194.000
51.898	52.000	1%	10's	6%	246.000
15.985	16.000	0%	20's	6%	262.000
10.442	10.000	0%	30's	6%	272.000
143	0	0%	40's	6%	272.000
207.282	207.000	5%	50's	11%	479.000
1.048.286	1.048.000	24%	60's	34%	1.527.000
1.285.486	1.285.000	29%	70's	63%	2.812.000
610.221	610.000	14%	80's	77%	3.422.000
479.193	479.000	11%	90's	88%	3.901.000
534.436	534.000	12%	> 2000	100%	4.435.000
4.438.763	4.439.000	total			

Figures about the age distribution of all buildings were collected in 2007, as part of the comprehensive research on the current campus (Den Heijer 2007a). Campus managers summarized buildings of every period, based on the year of construction or – if the building was totally reconstructed with an investment level that matched a new building – based on the year of reconstruction. But the year of (re)construction still does not give a clear idea of the condition of the buildings. And in order to give an idea about the required investments in the campus in the next decades, data about the technical condition was collected separately.

The technical condition of a building is an important indicator of the need for reinvestment. There are legal requirements for safe and healthy buildings and an organisation might loose the permission to use a building if these requirements are not met. This is independent of any problems with the functional requirements, economic performance or alignment with strategic goals.

figure 4.7: condition of the Dutch university campus (Den Heijer 2007a)



Looking at the results it is important to consider that campus managers assessed their own campus. Therefore, subjectivity is inevitable in interpreting the definitions. In figure 4.4 the data of all Dutch universities are accumulated in a chart, giving a general idea of the condition of the Dutch university campus, even though there are many differences – both objectively and subjectively – between different universities.

The chart in figure 4.7 shows that about 63% of the floor area of university buildings is considered reasonable, good or excellent and around 37% is considered moderate, bad or very bad. What distinguishes 'reasonable' from 'moderate' is the impact the aging process has on the functionality of the building: from incidentally to more structurally hindering the primary processes of education and research. This links the technical perspective to the functional perspective that is subject of the next section.

4.4 The campus from a functional perspective

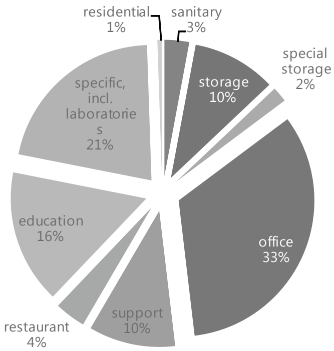
The campus accommodates many users, with students, employees and visitors being the main user groups. Like the technical perspective focuses on the physical settings, the functional perspective focuses on the users of that physical setting and in particular on the match: the use of space and 'fitness for use'. The use of space at a university can be assessed on many different levels: on campus, in buildings and in depth for different space types. But measuring 'fitness for use' does require information about the goals and primary processes of the organisation as much as information about the physical settings. Therefore this can only be assessed after overseeing all perspectives. In this section only current use of the campus is described, being an important input for campus managers in their strategies to develop and manage the campus of the future.

4.4.1 Use of space in function types

On campus level the function of university buildings in general is education and research, as also indicated in zoning plans of university cities (Den Heijer 2004a). But the current campus does not only contain buildings for education & research: the campus can be defined as a collection of different space types that facilitate a broad range of processes that are related to the university. The majority of the buildings are traditional university buildings indeed, which are directly used for educational and research purposes: lecture halls, classrooms, laboratories, libraries, et cetera. But there is more to a campus than these buildings. It is increasingly a very diverse real estate portfolio, with buildings for education & research, student housing, sporting facilities, shops, bars, restaurants and related businesses – all accessible by different types of transport and parking space. This development contains the threat that the campus is competing with its own university city.

For the level of floor area that is managed by the university, the first step in assessing functionality is switching from gross floor area (gfa) to usable floor area (ufa). Unlike the construction and installation space – generally 10-15% of gfa (Gerritse 2005) – part of the circulation space is also functional for primary processes, especially for activities that require informal space that does not have to meet the legal standards (like the Dutch Occupational Health and Safety Act, 'Arbowet' in Dutch).

figure 4.8: function types in usable floor area of the Dutch university campus in 2007 (Den Heijer 2007a)



Looking at the usable floor area of the campus more closely, there are nine function types to distinguish. These types are derived from Dutch standards for space use, applied for universities.

The chart in figure 4.8 shows that one third of ufa is office space. This is by far the greater part, all the more because the support space also contains office like spaces: meeting spaces, library spaces and space for concentration. Even more importantly, space for education is becoming more office like, with project rooms for group assignments and study rooms – usually with computers – for individual work (Den Heijer 2007a).

Nevertheless, the campus gets its specific character from the mix of space types within individual buildings and the considerable amount of specific space (21%), including laboratories. Laboratory space in total is 12% of ufa, but with large differences between universities and also between high-tech and low-tech facilities. Other function types are storage and special storage space (12% together), restaurant space (4%), sanitary space (3%) and residential space (1%). Some of the campuses do have (much) more residential and restaurant space, but just not managed by the university. Looking at these function types campus managers consider the fact that the campus is becoming more office like as an opportunity for flexible use. Since ‘fitness for use’ is the focus of the functional perspective, the possibility to use office space as educational space and vice versa is a strength of the current campus.

figure 4.9: function types per university in usable floor area (ufa in m2) in 2007,

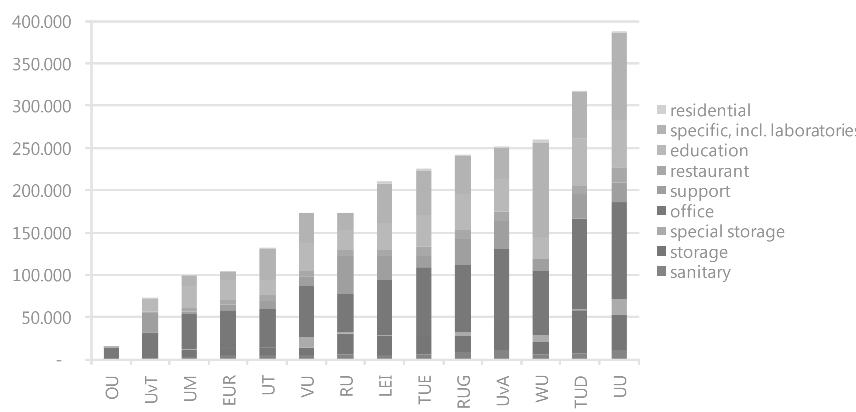


figure 4.10: space use on the current campus

educational space (m2 ufa) / student		lab high & low tech (m2 ufa) / fte academic staff	
OU	0,0	UvT	0,0
EUR	1,2	OU	0,0
RU	1,3	EUR	0,4
UvT	1,4	UM	7,1
UvA	1,5	RU	7,3
VU	1,7	UvA	12,1
RUG	1,8	VU	13,3
LEI	1,9	UU	13,6
UU	1,9	RUG	14,6
UM	2,3	TUD	15,5
UT	2,3	LEI	16,0
TUD	4,1	UT	17,1
TUE	5,1	TUE	21,9
WU	6,0	WU	38,3

space use for education, per student, and for research per fte academic staff (in 2007)

These lists show enormous differences in space use. Some of the universities historically have large real estate portfolios with separate buildings for different faculties or schools and little facility sharing – lecture halls, workshop space, laboratories – also due to the relatively long distances between buildings, like TUD (Delft) and LEI (Leiden). Universities like UvT (Tilburg), EUR (Rotterdam), RU (Nijmegen) have more compact campuses with centralized facilities. The type of disciplines – arts, science, medicine – also explains some of the differences in educational space: UT, TUD, TUE and WU all have science-based curricula and research programmes.

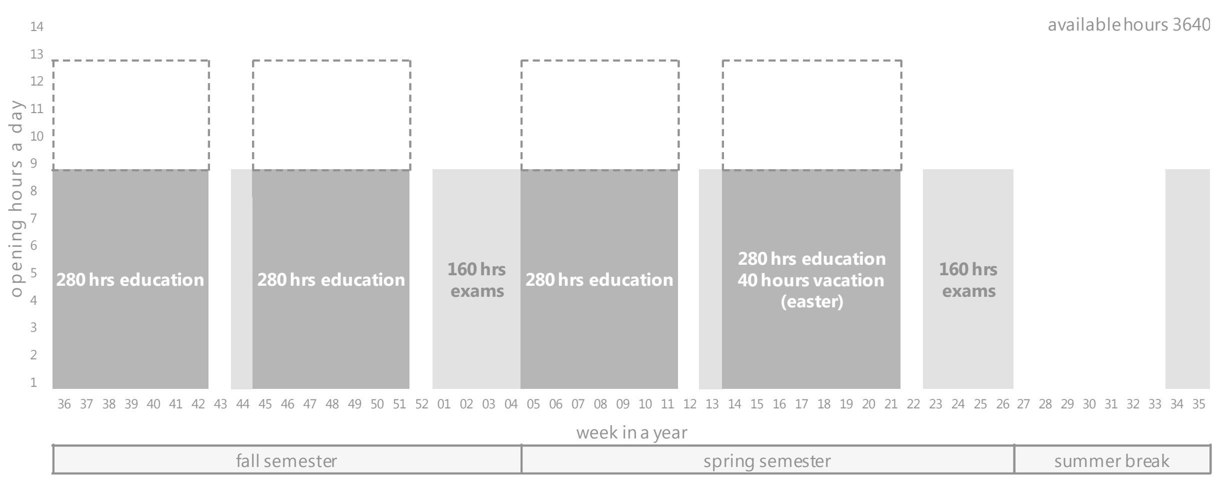
4.4.2 Use of space in time

Time is an important variable in functionality for two reasons. The first reason is that many users on campus – especially students – occupy different spaces during a regular week. The threat in this type of space demand is inefficient use of space, or even vacant space. The second reason is that space demand has changed and will change from year to year. For example, rapid changes in student enrolment and new curricula with different space requirements will influence the use of space. Assessing the current campus in terms of 'fitness for use' should therefore not just involve 'current use', but also 'future use '.

For measuring the use of space in time there are two performance indicators: the frequency rate and the occupancy rate. The frequency rate indicates hours of use versus hours available, measuring use in time. The occupancy rate indicates used capacity versus maximum capacity (APPA 2001). Research in the late nineties among UK universities showed a frequency rate of about 50% for teaching space, based on opening hours from 9 a.m. to 5 p.m. The occupancy rate for non-residential space was over 50%. In the Netherlands every university has been studying frequency and occupancy rates to some extent, but no general rates can be given. It is clear though that there is much to win in increasing both rates and balancing more efficiency in space use and accommodating the primary processes effectively. For instance, all part-time professors working on Friday is an organisational characteristic that causes a peak in demand for educational, support and office space that heavily interferes with the goal of efficient space use. On the other hand, having all part-timers work on different days of the week causes organisational problems that might not be worth the benefits of higher frequency rates. Finding the right balance is a challenge for campus managers.

In general, university buildings are used relatively inefficiently, because of the alternating periods of intensive and extensive use: intensive use during contact hours of both semesters and extensive use in exam periods and vacations. Even during periods of intensive use, different spaces are used in different weeks of the semester: lecture halls are full at the start, instruction and project rooms space in the middle and study space and presentation rooms in the end. There are opportunities in extending opening hours and using the evenings – and possibly the weekends – to accommodate peaks in demand.

figure 4.11: example of capacity use of educational spaces of a university building, during an academic year and with fourteen opening hours a day (Van Velthoven 2005)



In figure 4.12 an example is shown of the capacity use – in hours – of a university building. The academic calendar shows that the building is only used for contact hours for twenty-eight weeks a year. This is little less than half of the year. And even of the theoretical number of contact hours in these weeks only part is used in the actual educational schedules. This means in this case that the total capacity – in terms of opening hours for education – is only used for little more than 30%. (At some universities summer schools intensify the use of university buildings.)

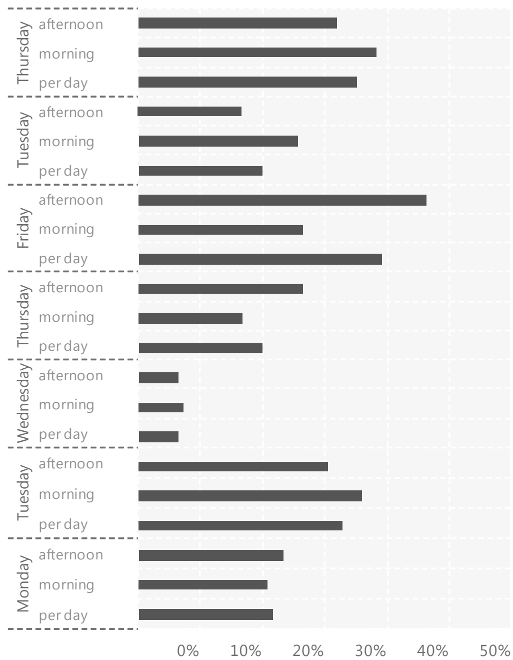


figure 4.12: measuring occupancy rates of offices at TUD's Faculty of Architecture (RISBO 2009)

Low frequency and occupancy rates are confirmed by most Dutch universities. Not only are educational and research facilities insufficiently used, low rates in office space are common as well (Den Heijer 2007a). Working at home, working part-time and travelling for conferences are just a few of the reasons for many vacant workplaces at university buildings.

This phenomenon is usually not a problem for the users - as long as the campus accommodates their activities and they do not directly pay for the space they do not use. But this can be identified as a problem from a financial perspective: expensive resources are not insufficiently used and opportunity costs can be calculated. The next section will cover these and more aspects from a financial perspective.

4.5 The campus from a financial perspective

Assessing the campus from a financial perspective has three different aspects that are connected in terms of costs and benefits: the budget that is available for managing the campus, the value of the campus and the costs of managing the campus.

4.5.1 Management context: funding and resources for the campus

When the Dutch government transferred property of land and buildings to the universities in 1995, universities were initially pleased with the full responsibility. Until 1995 the Ministry of Education, Culture and Science (ECS) controlled the budget for new investments in university buildings. The yearly budget was allocated based on priorities on a national level. Universities had to provide evidence of necessity and functionality of any proposed investment. Real estate investment decisions were taken by the Ministry and as a result universities were each other's competitors for the budget. This process ended when the budget was decentralised in 1995.

After this decentralisation process the universities have received a yearly lump sum to cover total costs of ownership. This lump sum is not sufficient (VSNU, 2004) and this was no surprise: in 1993 – before the decentralisation process – the government already stated that budgets would not be able to cover the necessary reinvestments in university buildings. An objective committee confirmed this in 1999, referring to the current replacement value of the portfolios (Commissie-Koopmans 1999).

Anno 2009 universities can make autonomous decisions about allocating the budget. The process of proving necessity and functionality has moved from outside the university to inside the university: the government role of allocating funds to universities has been taken over by the university board allocating funds to faculties and institutes. For the university board this is a complicated process for various reasons. First of all, government funding for universities has been decreasing and is under even more pressure: the costs and benefits of investments in the campus must be weighed directly against investments in education and research . Without the suitable decision support tools it is hard to judge if the costs of a project are within the range of comparable projects and – more importantly – if the costs will be recovered on the achieved goals or be lower than the costs of the current situation. Policy makers and campus managers require more background information and more tools for weighing alternative investments than currently available.

4.5.2 The value of the campus

There are many different values to measure, concerning the campus: book value, assessed value ('WOZ waarde' in Dutch), insurance value and replacement value. Research has been done to collect data on all these values, directly from annual and financial reports and indirectly from collecting data on new buildings and estimating current replacement costs. This section gives an overview of the findings and preliminary conclusions about applicability of all values for management decisions and missing information.

Book value is by far the easiest value to collect from the financial administration. It represents the historic investments in the campus minus annual depreciation, based on guidelines for controllers for the economic life span of the building: an average of thirty years in the Netherlands. It should be noted that in 2002 the Ministry of OCW introduced depreciation periods that are differentiated for types of investments: frame, envelop, machinery and infill. These periods are more in line with the functional periods in practice.

The total book value of the current Dutch university campus is 2,9 billion for all buildings and land. Adding about 275 million euro for inventory and equipment puts 3,1 billion euro on the collective balance sheet (CFI 2007). Dividing this value by the total gross floor area gives an average of € 700 book value per gfa. Even though there are differences from university to university – with € 400 at TUD and more than € 1000 at UM – this figure is only an indicator of the investments since 1995. Investments before 1995, before transferring ownership to the universities, do not show in the current book value. This makes the book value unsuitable as an indicator for replacement. Comparing the average book value with the current replacement costs per m^2 gfa – ranging from about € 1400 for office-like buildings to more than € 4000 for some types of laboratories see chapter 7 "defining projects" – will add to that conclusion: the book value is (much) lower than the current replacement value.

However, the risk is that since book value is the only campus value that is included in the financial report, it is used as a financial basis to support future campus decisions. The annual depreciation in particular, representing the capital costs, is relatively low in the current situation. That is why total costs of ownership – having capital costs as an important basis – are also low at many universities, especially the universities that did not have major investments in their campus since 1995. The threat to campus management is that – when new investment plans become reality – total costs of ownership increase 'unexpectedly', due to a lack of information on replacement costs. As soon as new investments are added to the books, capital costs will rise and better represent the annual costs that can be derived from the current replacement value. Campus managers should be able to inform their policy makers in time about this development that will have major impact on the finances of the whole university, especially at universities that postponed replacement of many of their buildings of the sixties and seventies. The fact that there is no book value on the balance sheet of building projects before 1995, points out the amount of 'hidden values'. Supplying policy makers with accumulated information of recent campus projects – to generate an indication of current replacement value – could prevent the use of too optimistic financial paragraphs of campus strategies.

Other values of the campus are the assessed value – 'taxation value' – and the insurance value. The assessed value equals the book value at 3,1 billion euro, the insurance value is much higher at 10 billion euro [2]. The average insurance value of 2250 euro per gfa is in the range of current investment levels of new university buildings. More about this can be found in chapter 5.

[2] Assessed and insurance value of UvA are estimated using RUG as a reference

Market value is a value that was not calculated as part of the research. But if users on campus pay rent for the space they occupy, they are very likely to compare this rent with market rents. Comparing a rent that covers the total costs of ownership with a plain market rent – although they are not comparable – usually dissatisfies the users with the performance of the campus management. The real estate market seems to be able to offer much lower rents, but many of the costs, additional fees for the risks of dynamics in demand and the long lease terms for users with a specific and dynamic space demand are usually invisible 'at first sight'.

Calculating the market value of a university building – for instance to sell it to another party – is dependent on the designated function, the location and the local real estate market. University buildings are generally specific, not only in terms of function mix, but also in terms of size or location. On some campuses it is not easy to isolate one single building for commercial or residential use: that building will still be part of the campus. That may be an advantage for every party that wants to be associated with the university, but at the same time the question is if the university wants to be associated with that party. Related businesses and housing for students or staff members might be close enough.

Market values of land property are becoming higher and higher, because of the considerable positions that universities have on valuable locations. But campus managers abroad (Simha 2001) advise Dutch universities should not be blinded by the value of the land and think about the value of this urban location for the institution. What role does it play in attracting and inspiring students and staff? How does it influence the institutional image? MIT for instance chose to lease out part of their land property and even the long lease terms of 75 years will insure them that the land will still be their property in the end. MIT made a long-term strategy to develop tech parks on this land; the functions on these parks add value to institutional goals or community goals.

In these kinds of developments universities cooperate with the local – or regional – government to accomplish economic growth or solve housing problems for students or staff. In the Netherlands many universities rent out space to commercial organisations, usually for similar educational processes, (student) support services and seminars. Condition for sharing a campus is "having no negative effect on the institutional goals" and preferably having a positive effect. Lack of resources might make it tempting though to rent out or sell both monumental buildings and strategic land positions, which can be a huge threat for optimally accommodating the university of the future.

4.5.3 Total costs of ownership

In the year 2000 Dutch universities spent an average of 8,9% of their income to cover the total cost of ownership, including 2,4% for capital costs (source: annual reports of universities; data collected by VSNU). Collecting data on the total costs of ownership at all fourteen universities showeds an average of 8,3% of their total income (Den Heijer 2007a). This last percentage was collected using standards for facility costs of which only accommodation costs were counted (NEN 2748, group 1, accommodation). These accommodation costs include capital costs, including interest if applicable, maintenance, energy and water, taxes and insurance. Some universities like EUR receive rent from external users of the campus – and parking fees – which reduces their percentage. In comparison it should be noted that an average of 56% of total income is spent on personnel costs at universities.

As management information universities want to use experiences and references of other universities to determine which mix of resources is most effective and efficient in achieving university goals (Den Heijer and De Vries 2004). Research showed that Dutch universities spend 47% to 73% of their total costs on personnel (CFI 2007) and 4% to 14% on accommodation costs (Den Heijer 2007a), table 4.12. But it is very hard to link this quantitative input to the output of the university: ranking, diplomas, quality and quantity of publications.

Again, if book value is the basis of capital costs the differences are highly dependent on investments since 1995 and the current percentage is not an indicator for the total costs of ownership in the future. This refers to the difference between book value and current replacement value that was discussed in the last subsection. Universities with a lot of backlog maintenance will easily double the capital costs as soon as they start investing.

One of biggest financial problems of campus managers is that the current accommodation costs have been considered the campus budget for the past decade and the years to come – despite of the technical and functional condition and the need to reinvest. Given the current investment levels of new buildings and replacement costs (see chapter 7), it is unlikely that this campus budget will be enough to cover the capital costs of new investments.

Nonetheless, ambitions must be evaluated beforehand, comparing costs and benefits of campus projects: what else can be achieved with the same investment? An investment in the campus might save on personnel costs: costs and benefits should be weighed out on the organisational level. But investments in education and research might also generate a higher return on investment than investments in the campus, when the quality of the campus is not likely to become a 'dissatisfier' in the primary processes. This process could use decision support tools for making fair and well thought-out decisions.

table 4.12: accommodation costs versus personnel costs as a % of total costs (data 2006/2007) - * UvA did not supply data on accommodation costs, but uses 11-12% of the total costs as a standard for accommodation costs.

	accommodation costs as % of total costs	personnel costs as % of total costs			accommodation costs per m2 gfa
EUR	4%	51%	EUR	EUR	€ 103
LEI	11%	48%	LEI	LEI	€ 111
RU	7%	57%	RU	RU	€ 118
RUG	4%	56%	RUG	RUG	€ 50
TUD	14%	54%	TUD	TUD	€ 132
TUE	11%	60%	TUE	TUE	€ 84
UM	7%	52%	UM	UM	€ 111
UT	11%	62%	UT	UT	€ 127
UU	11%	47%	UU	UU	€ 113
UvA	*	50%	UvA	UvA	€ -
UvT	8%	73%	UvT	UvT	€ 98
VU	7%	49%	VU	VU	€ 88
WU	13%	60%	WU	WU	€ 71
OU	9%	61%	OU	OU	€ 232

This table 4.12 shows that there are huge differences between the percentages of the total costs (CFI ultimo 2006) that are spent on accommodation costs. To explain some of the differences: EUR reduces the costs by renting out part of the floor area to commercial parties and by charging parking costs.

UvA did not supply data on accommodation costs, but uses 11-12% of the total costs as a standard for accommodation costs.

The range of possible percentages also illustrates different strategies that support different organisational values or backlog maintenance strategies to improve the functional and technical condition of the campus. If accommodation costs are related to floor area, the ranking of universities from high to low accommodation costs is different. Apparently, the differences in relative size of the campus – in terms of floor area – result in a different list (for instance: WU). These figures should be compared with space use ratios, as shown below.

4.6 The campus from a strategic perspective

The strategic perspective is all about adding value to the university goals and accommodating the primary processes. In the box text below, the general goals of higher education in the Netherlands are summarized:

University education comprises training in the independent pursuit of scholarship and/or the application of scholarly knowledge in the context of a profession. The core business of universities is to teach and to carry out research. To these tasks, the Higher Education and Research Act (WHW) has added the transfer of knowledge for the benefit of the community, the provision of initial education (i.e. first degree) courses and the training of researchers and design engineers. University education includes both the study of academic disciplines and specialised training for certain occupations (Eurydice 2006).

Even though the general goals of all universities are similar, there are differences in the primary processes, the types of activities, the ambitions and the mix of resources they use to achieve the goals. This section focuses on the link between the physical resources and the goals to support.

4.6.1 Adding value to university goals

At Dutch universities the first collective assessment of the link between organisational goals and campus plans was conducted in 2000, as part of a research project comparing campus master plans and strategies (De Jonge et al. 2000). The results pointed out that the link between institutional goals and campus plans was very weak at that time, after five years of campus ownership. Campus plans did not explicitly mention university goals and were technically or financially oriented (or both). But the campus managers were not to blame: university strategies rarely mentioned real estate as a resource to achieve their goals. The following phrases, quoted from university policy documents, are most concrete: (1) excellent research and education should be emphasized on the campus and (2) the reorganisation of faculties/schools should be accommodated in campus plans. Just one university (WU) used the following phrase: creating workplaces that optimally support employees.

More recent research (Den Heijer 2007a) shows that the link between institutional goals and real estate goals has been improved since 2000. According to Dutch campus managers campus related issues are higher on the institutional agenda than around the year 2000. In many cases this is the result of negative experiences in the past decennium, proving for instance that neglecting problems with the technical condition or functionality has a negative effect on productivity and user satisfaction. The challenge is to turn the negative cause into a positive vision on real estate.

Recent studies at American universities (Daigneau 2003) show the same pattern: campus planners have problems translating institutional goals into real estate goals. The strategic plans of higher education institutions generally reflect the same strengths and shortcomings, with each plan accurately focusing on the enormous challenges institutions will face in the 21st century. The most often repeated themes include the following (Daigneau 2003):

- meeting the needs of a new generation of upwardly (and laterally) mobile "knowledge workers";
- providing broader access to higher education for the disabled, disenfranchised, or geographically displaced;
- serving as a vehicle to improve the state or region's economic condition.

In these themes at American universities all general goals that were mentioned in the box text at the beginning of this section – focusing on Dutch universities – can be recognized. American universities have even put more emphasis on the value of the university to a community and the (knowledge) economy of the region. It also touches the subject of the global competition for the knowledge worker – students, alumni, professors, researchers, entrepreneurs – that has many universities, employers, cities and countries to choose from, when selecting a place to learn, study, teach, work and live.

In specific university mission statements almost every institution (in the world) proposes to become internationally – or nationally or regionally – recognized as a leader among a peer group as a centre of learning and research (Daigneau 2003). Effort should be put in translating these goals into requirements for the (mix of) resources: capital, human resources, information, technology and physical resources.

Referring to the goals that are mentioned in table 4.13, the main question is: what (physical) resources are necessary to teach, to carry out research, to transfer knowledge for the benefit of the community, to provide initial education and to train researchers and design engineers?

Focusing on the physical resources and the different ways of adding value to university goals, the following list of underlying goals for campus planning was given to Dutch campus managers.

For the current Dutch campus the goals with the highest scores [3] are:

1. support user goals more effectively (follow changes in education/research);
2. support identity university / attract (more) students & staff members;
3. achieve or maintain minimum quality for use permit ("safe and healthy workplace");
4. accommodating growth (students, research institutes etc.);
5. increase occupancy and frequency rates.

[3] Scores are generated giving 9 points to 'priority 1', 8 points to 'priority 2', ... , 1 point to 'priority 9'.

The list represents a mix of efficiency and effectiveness goals. These goals are linked to the ten ways of adding value that were introduced as the basis of the conceptual framework, plus 'reducing footprint'.

table 4.13: (organisational) goals of the past that shaped the current campus, with priorities (1 is highest), filled out by Dutch campus managers in 2007

	EUR	LEI	RU	RUG	TUD	TUE	UM	UT	UU	UvA	UvT	VU	WU	OU
support identity university / attract (more) students & staff members	4					3	2	2	5	3	7	6	3	3
support identity user (faculty, department or institution that uses the building)						2		3			3			3
support user goals more effectively (follow changes in education/research)	1	2	1	1	5	1	3		2	1	2	1	1	
increase income / decrease expenditure on level organisation					6						6			
increase income: make building rentable to a third party														
increase income: make building marketable to a third party														
more quality for user (more luxurious, representative)			5											
support culture change (for instance after reorganization)		2		4										
stimulate innovation / collaboration (staff-staff, staff-students, student-student)			2			4			4	4	8	3		
increase flexibility: non-territorial offices for staff / spaces used by multiple users						5								
increase flexibility: adaptability / multifunctional use											4			
increase occupancy and frequency rates		3		2	3				3			5	4	2
less m2 per user		1	3	3	2									2
save accommodation costs	2		4		1					6		2		2
achieve or maintain minimum quality for use permit ("safe and healthy workplace")	3		6	5	4		4			5	5	8	2	2
other goals:														
accommodation growth (students, research institutes, etc)							1	1	1		1	4		1

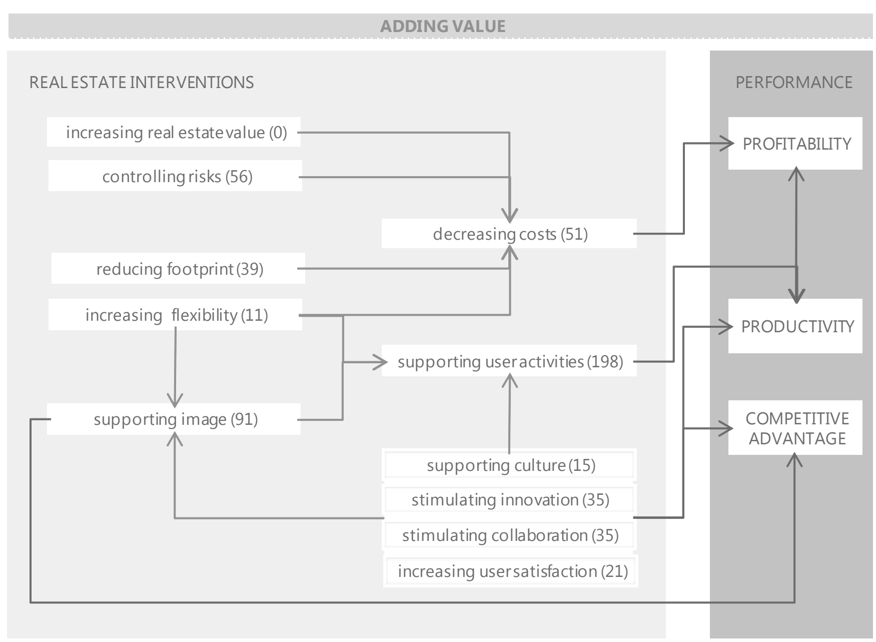


figure 4.13: what shaped the current campus - goals that campus managers of each university prioritised, collected in 2007 with questionnaires - scores are generated giving 9 points to ‘priority 1’, 8 points to ‘priority 2’, ... , 1 point to ‘priority 9’ and summarizing these points of all respondents (campus managers of fourteen Dutch universities)

The following conclusions can be drawn from the added values of the past – that shaped the current campus in figure 4.13:

- It is interesting that 'increasing real estate value' was not mentioned once, not even with a low priority;
- The interrelated ways of adding value show that past campus strategies aim at improving 'productivity' first and 'competitive advantage' second;
- 'Supporting user activities' and 'supporting image' have the highest and the second highest scores and are also related and influenced by a group of other goals like 'stimulating innovation' and 'increasing user satisfaction'.

The same technique was used to identify underlying goals for future campus decisions, to create the campus of the future. These results can be found in chapter 6 "future models".

4.7 Conclusions about assessing the current campus

4.7.1 Collected information

After covering all four perspectives on the campus, the most important statements in terms of strengths, weaknesses, opportunities and threats are summarized below.

- The most important strengths of the Dutch university campuses are their land positions on key locations. At the same time, the most important threat is that universities with limited resources might sell land to generate income, discovering afterwards that this land might have a value for the university that exceeds the once-only income. The same goes for selling buildings with a high market value that might have an even higher value for the university. The problem is that the market value is easier to determine than the strategic value for the university. For decision making about the campus it is necessary to make this value more explicit.

- The most important weakness is the technical condition of the buildings, in combination with the ongoing threat of the aging campus: renovation of old buildings has many more restrictions and high costs , for both investments and maintenance.

- Another problem for campus managers is that current capital costs are relatively low, because they are usually based on a book value that does not include investments before 1995. References of current replacement costs are indicating that most plans for the future campus will result in a much higher level of capital costs. The threat is that the campus will have a much higher impact on university finances whenever plans are implemented, and that policy makers and controllers are not prepared for that. Having a campus budget that is based on the current capital costs makes the lack of resources for campus managers increasingly felt, making it harder to keep the performance on the same level with rising costs.

- Low frequency and occupancy rates – referring to 'use in time' and 'capacity use' - are not only a functional weakness of the current campus, they also contain a threat for campus planning. Overcapacity is often not even visible, because users don't complain and controllers do not calculate what – for instance – evening or summer use of the buildings and letting vacant spaces out to third parties might save on a yearly basis. Anything saved on efficiency should nevertheless be weighed out to what these measurements will cost the organisation: less freedom of use, more opening hours will increase the costs of facility management. This indicates that a campus decision needs to be viewed from all four perspectives in this chapter to consider all consequences beforehand.

Many of the strengths, weaknesses, opportunities and threats are not unique for the Dutch universities and are even applicable to other organisations than universities. Summarizing all aspects of the current campus makes it apparent that the different perspectives – technical, functional, financial and organisational – are connected. For campus managers many decisions are about weighing functional and organisational aspects against technical and financial aspects, respectively benefits and costs.

The collected data confirm most assumptions considering university size, age and type:

- Smaller Dutch universities have more efficient space use (compact campus with every building within walking distance) than larger universities, with larger campuses or more than one campus;
- The relatively compact campuses of small universities give more opportunity for facility sharing between faculties (restaurants, lecture halls, libraries) with a lower footprint per student and staff member than larger universities in their peer groups (alpha, beta, gamma profiles).
- Old universities have a more divers portfolios - which shows when comparing the age profiles: from old buildings in the city centre to periphery campuses, bringing both opportunities and threats for campus management – opportunities because older buildings can add to the competitive advantage and threats because these same buildings have high costs of ownership; this pleads for increasing productivity (more users per m^2) to balance costs and benefits.
- The more divers portfolios of old universities and more than one campus location adds to inefficient space use, but diversity also has its advantages – it can add to the (perceived) quality of the campus.
- Old universities have a more traditional culture of large territorial space, for both faculties and individuals; young universities have developed their campuses – and organisations – with more flexibility, non-territorial in terms of faculty use or individual use.
- Gamma profiles require the least specific spaces, beta profiles the most specific spaces; gamma profiles have the smallest footprint per student, beta profiles the largest and gamma profiles have the smallest footprint per faculty member or researcher because of desk research, beta profiles have the largest footprint because of specific laboratory research, which is decreasing because of more desk related research.

The data collection can also be assessed in terms of strengths, weaknesses, opportunities and threats. The campus managers themselves consider it a strength that they were able to generate the available management information (stated in interviews in 2007), because it has already helped them to support new campus decisions and it has motivated them to supply more data for the collective databases. Nonetheless they all agree that reliable user data is hard to collect – not only for the programming and design process of new buildings, but also to determine space use in existing buildings. Opportunities are found in making the network larger – with international references – and in improving the definitions for data collection collectively. Threats are the existing, customized information systems at individual institutions that require expertise and energy to collect and convert data to the collective system.

4.7.2 The demand for additional information

The previous sections answered most of the aspects of the following research question (B1): "What management information is required, what management information is available and what is the demand for additional information for (I) assessing the current campus?". The demand for additional information is summarized in table 4.14.

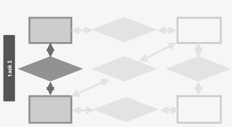
In the past years much more data has already been collected, but there is an additional demand for data on occupancy and frequency rates, user satisfaction, key performance indicators on sustainability issues and any references on the effectiveness of certain campus models or campus decisions – in terms of costs and benefits for the university. Even though many universities collect some of these data on individual basis, there is a strong need to be able to compare these data.

For user satisfaction there is a demand for tools that do not only measure user satisfaction in absolute terms, but also relatively – asking the users to choose between different situations to specify their preferences. Campus managers confirm the importance of assessing user satisfaction, but do point out that it is also important to confront these users with the costs of their demands.

This also introduces the requirement to confront each of the four stakeholders with the consequences of their needs or demands, which is especially relevant for the next management tasks "exploring changing demand" and "generating future models".

Even though all CREM variables are covered in the management information for assessing the current campus, there is still much to improve in the objectivity of measuring added value, especially when this exceeds improving health and safety or efficiency goals and concerns the effectiveness goals. Obviously, the campus database can produce much more management information than illustrated in this chapter. The campus database allows many query and comparisons with similar institutions.

The current campus is the result of past demand, in terms of quantity and quality. And demand is changing rapidly. The next chapter focuses on the next management task – exploring the changing context and demand – and the (potential) effects on the campus and campus management in the Netherlands.

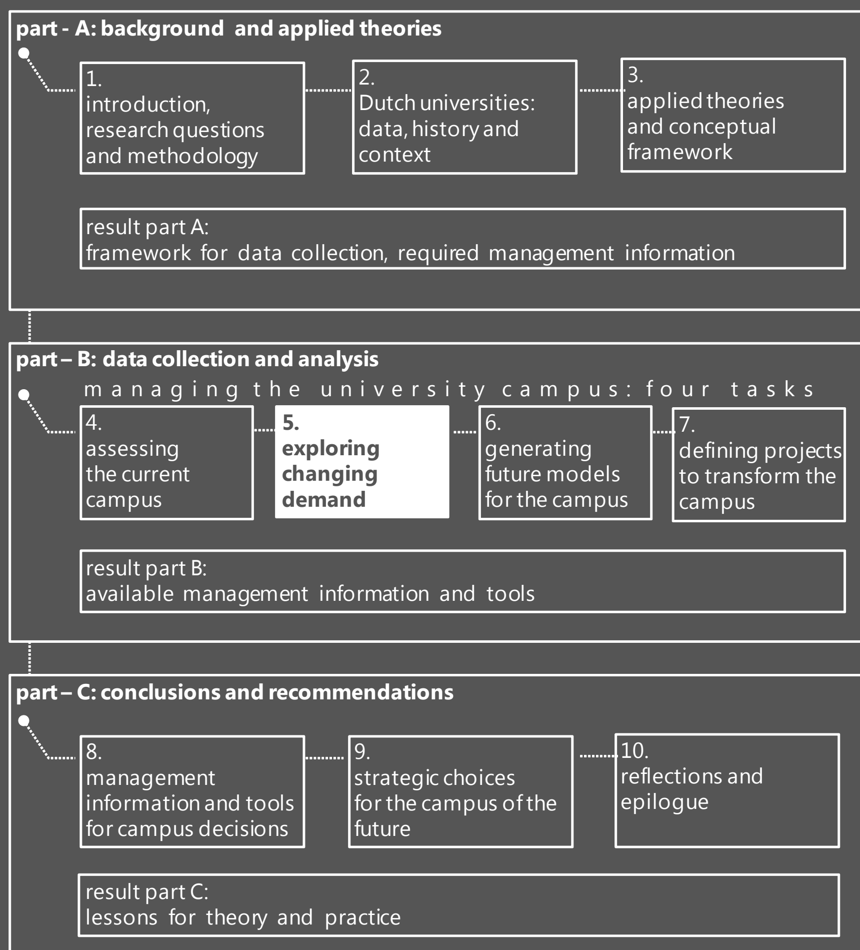


STEP 1 ASSESSING THE CURRENT CAMPUS — variables	physical m²	functional users	financial euro	strategic goals
residual management information demand				
occupancy & frequency rates (link m2 - users)	x	x		
improve link campus to user satisfaction	x	x		
assess more key performance indicators for sustainability on campus	x	x	x	x
improve link campus to performance	x	x	x	x
improve measuring added value to goals	x	x	x	x

table 4.14: the demand for additional information for assessing the current campus; note: 'x' and colour indicate types of data that still need to be collected

ACTA, University of Amsterdam and
Vrije Universiteit Amsterdam
Photo: VU

Chapter 5
Exploring Changing demand



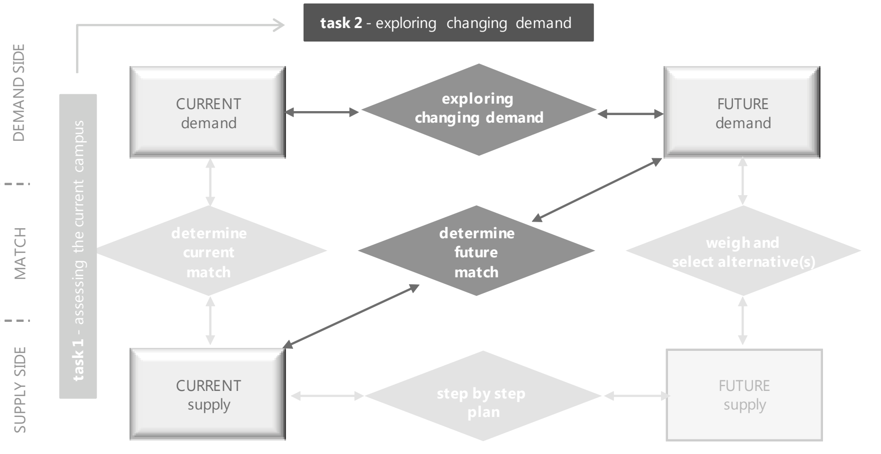
5 Exploring changing demand

5.1 Introduction and required management information

This chapter focuses on the second management task – according to the conceptual framework – of managing the university campus: exploring the changing context and demand. The following research question will be answered: "What management information is required, what management information is available and what is the demand for additional information for (task II) exploring the changing context and demand?", see figure 5.1.

The essence of 'exploring the changing context and demand" is to generate information about how relevant developments influence the campus and campus management. Given the model for campus management with four stakeholders, this can be made operational by identifying trends and developments that affect organisational, financial, functional and technical requirements for the campus and for campus management. Eventually, this task should lead to a list of programmatic requirements (demand) that can be compared or matched with the current campus (supply) to determine both the current and future match. It is obvious that demand and supply can only be compared if they are expressed in the same variables. That means that campus managers require information about future developments and trends that is expressed in these variables, see table 5.1.

figure 5.1: the second management task – exploring changing context and demand



The next questions specify the required management information for the four CREM perspectives on the campus (the financial perspective is divided in both a costs and a benefits perspective):

- How do developments affect the number and types of users that have to be accommodated, both in university buildings and with housing on and off-campus?
- How do developments affect the available resources for the university and for the campus, and what does that mean for the available resources per m^2 floor area and the need for private funding?
- How do developments affect the strategy of the university with regard to educational and research processes and consequences for the function mix on campus and the required quality of facilities?

- How do developments influence the technical, legal and environmental requirements for managing the campus?
- How do developments influence the value of the campus – buildings and land – and the interest of external parties in any partnership with the university, both on the primary and the secondary processes?

Many more questions can be posed related to different variables like the number of international students as an important user group. To answer the questions above trends like the green campus – concerning sustainability issues on various scales – and new ways of learning and developments like globalization, demographic changes and the shift to a knowledge economy have to be converted into programmatic requirements. These programmatic requirements can be used for three different matching moments in the campus management process:

1. to determine the current match – comparing our current campus (current supply) with what we want, need or can afford at this moment (current demand)?
2. to determine the 'anticipating' match – comparing our current campus (current supply) with what we want, need or can afford in the future (future demand)?
3. to determine the future match – generating future campus models (future supply) for what we want, need or can afford in the future (future demand)?

The first two matching moments are part of the problem analysis of campus management, with the second 'anticipating' match referring to a pro-active campus management process that anticipates on future developments. The third and last matching moment is part of the next management task "generating future models for the campus" – elaborated on in the next chapter. The content of that management task is highly dependent on the quality of the information about current developments and trends. Since campus management is defined as the continuous process to match supply and demand, exploring changing demand is key to a pro-active approach, while practice has often showed (De Jonge 2000, Den Heijer 2002, Den Heijer 2007a) that lack of information on future demand forces campus managers to be reactive instead of "proactive.

current campus (current supply) current campus CHARACTERISTICS	**campus management is matching supply and demand determining** PERFORMANCE	**programmatic requirements for the campus (current and future demand)** current and future REQUIREMENTS
condition, location and quality of m2		requirements for condition, location and quality of m2
function mix of m2: m2 per student m2 per employee users satisfaction	**matching programmatic requirements with current characteristics**	requirements for users to accommodate function mix quality of different functions m2 per user group
costs and benefits % resources spent values		requirements for % resources spent on campus, costs & benefits value
quality level supported goals	**determining the performance of the campus on organisational, financial, functional and technical aspects**	requirements for supporting organisational goals, quality of m2 (on different scales)

table 5.1: in order to match supply and demand on campus, both need to be expressed in the same variables

the current campus was shaped by past demand

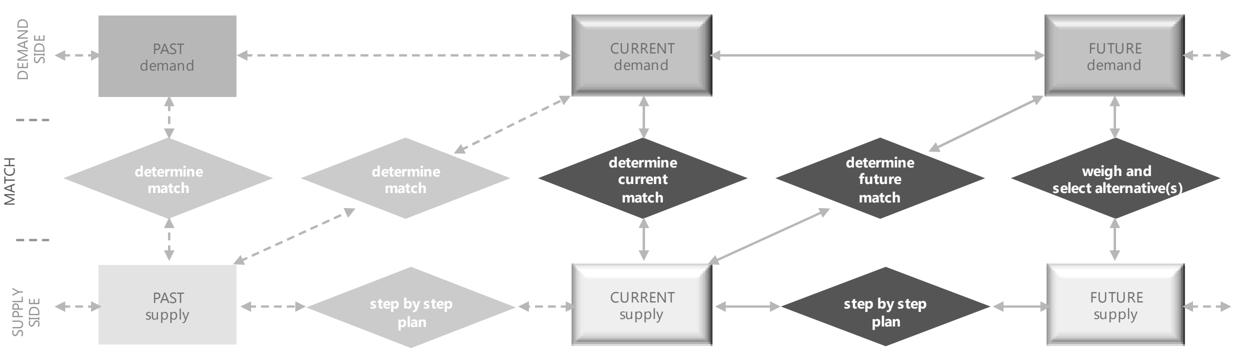
While current and future trends and developments are very important to shaping the future campus, past developments shaped the current campus. Chapter 1 (section "history of universities") showed that the rapidly changing student numbers – especially in the fifties and sixties of the past century – have shaped the current campus. Demographic developments, but also political choices that lowered the (financial) threshold for participating in higher education have been very influential. At the same time, the type of education and research programmes and the relative autonomy of the faculties or schools have determined both function mix and campus type (partly on the edge or outside of the city). All of these developments demonstrate that the current campus is a result of campus decisions of the past. These past developments that have shaped the current campus illustrate that campus development is a continuous process (see figure 5.2).

Campus managers have the opportunity to manage this continuous process proactively, anticipating on developments and trends by expressing them in manageable variables. But if this type of information is not available on time, campus managers are forced to manage reactively. Reacting usually means a mismatch between supply and demand for many years, due to the relatively long production time of new buildings and implementation time of accommodation changes. On top of that, a reactive approach might mean investing in projects that turn out to be unnecessary or dysfunctional in time. This pleads for a proactive management approach, emphasizing the importance of this management task and of putting effort in generating the required management information.

exploring changing demand in three parts

The first part of the management task "exploring changing demand" is to identify relevant trends and developments (section 5.2). The second part is to determine which developments are most influential to the future campus or campus management, using scenarios (section 5.3). The third and last part is to introduce tools to operationalize these developments into manageable campus variables (section 5.4), expressing the changing context in programmatic requirements that can be used for the next management tasks: generating future models and defining projects. The result of this management task "exploring demand" will make it possible to compare future demand with current supply on the same CREM variables. On top of that, it will enable universities to set priorities or give focus to campus strategies. The next sections show some of these efforts over the last ten years and the tools that were used to supply the required information.

figure 5.2: the continuous process of campus development, which can either be managed proactively or reactively, dependent on (timely) information about changing demand



5.2 Identifying developments and their impact on the campus

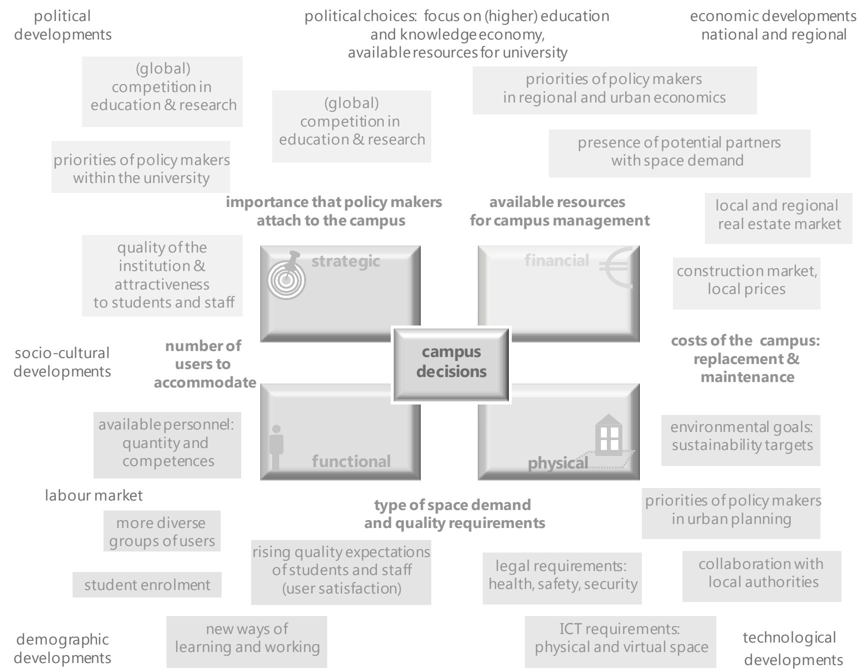
In chapter 2 three key developments with a (potentially) strong influence on the future campus were introduced: the (global) knowledge economy and the crucial role of universities, the network university and the green campus. In the context of campus management more developments were identified by interviewing Dutch campus managers (Den Heijer 2002a) and questionnaires (Den Heijer 2007a). Many of these trends are confirmed by international workshops, campus networks and literature, as described in the next sections; table 5.2 contains a list of the most relevant developments and their possible impact on the campus or campus management according to Dutch campus managers.

As a result of prior research a basis analysis was made of various developments that influence directly influence the campus – buildings and land – or that influence "internal demand", influencing the quantity and quality of the campus, or "external demand" to share the campus with other parties or sell or let out some of the campus to generate income. There are also developments that influence campus management. In a way this is an example of a 'mindmap', a tool to identify developments that are relevant. This is the first step of building scenarios.

development	possible effects and information demand
	"+" or "-" means positive / negative aspect for campus managers
economics: transition to a knowledge economy • sharing goals with national, regional and local government	+ alignment of goals, possibly sharing resources + alignment between city and campus plans - short political cycle of municipalities (4 years) changes goals, resources and conditions + possibility to collectively develop hotels for university guests, incubators for young entrepreneurs and business & science zones + more opportunities to acquire private resources for mutual goals
network economy: "collaborate global and act local" • more collaboration with partners outside the university, consequence of the 'network university'	+ share local facilities – city hall for ceremonies, concert halls for large audiences + share university facilities with local parties, to increase revenue (rent for external users) when occupancy and frequency rates of internal use are low
globalisation • globalisation of individuals • more international students	+ possibly more international students - less predictable student population - more pressure on the student housing market + opportunity for the knowledge economy: recruiting international knowledge workers
green campus	+ supporting environmental goals (collective goal to reduce CO_2 emission with 30% in 2020 (SenterNovem / Agentschap NL 2009) + more support among users for facilities sharing to reduce the ecological footprint of the university
new ways of working • changing academic workplace • new learning concepts	+ more interaction between different user groups – better use of circulation space as 'usable space' - not necessarily a space reduction or cost saving solution, which is a prejudice beforehand or preconceived opinion of campus managers + non-territorial concepts are more flexible for a (rapidly) changing working force
rising expectations of students and researchers • more competition among universities	- higher investment level per m2 due to higher quality requirements
more strict legal and technical requirements	- higher investment level per m2 and maintenance costs - relatively many resources spend on 'invisible' project that do not affect customer satisfaction (cost but no extra benefits)
more simulation in research processes	- how does this affect the use of expensive labs (lower occupancy and frequency rates)? - what are the costs and benefits of sharing these laboratories with other institutions?
more ICT in working processes	+ possibly less m2 required - lower occupancy and frequency rates of traditional offices + adds to environmental goals - possible risk for campus as 'the place to meet' and the university as a place to share knowledge, also on a coincidental basis

table 5.2: list of the most relevant developments according to Dutch campus managers and their possible impact on the campus and campus management (Den Heijer 2002a; Den Heijer 2007a)

figure 5.3: developments influencing campus decisions, linked to the four CREM perspectives



5.3 Scenarios for the university of the future

The second part of this management task is to determine which developments are most influential to the future campus or campus management. The process of building scenarios – scenario planning – can be helpful in this second part, composing possible futures for the university of the future and setting the context for the campus of the future.

Below are some examples of these processes, chronologically ordered: (1) scenario planning among Dutch campus planning, (2) scenario planning among international university and campus planners, (3) three scenarios for higher education by CHEPS and (4) translating four scenarios for 2030 into four futures for higher education. These last scenarios will also be used in the next chapter for generating future models.

5.3.1 Using scenario planning as a tool

Discussions among campus managers about the relative relevance of developments and the way to react, have also proven their use as 'tools' to generate management information. Supporting these discussions with tools like 'scenario planning' not only provides scenario variables, but also components for strategic campus choices.

Given the tool of scenario planning, there are two relevant diagrams that are demonstrated in figure 5.4. The first step is to give all developments a place in the diagram on the left, dependent on (axis X) the effect on the campus and (axis Y) to what extent campus management can influence this development. All developments that can not – or not easily – be influenced by campus management will be moved to the diagram on the right, adding predictability to the assessment. Developments that are highly influential on campus and have low predictability will be the discriminating parts of scenarios (see figure 5.5 for example).

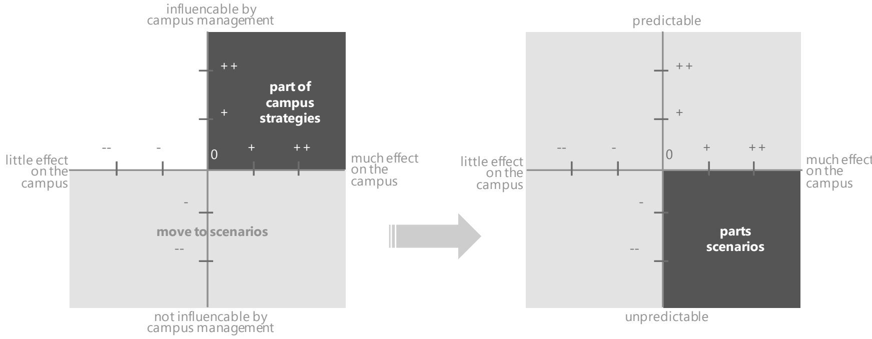


figure 5.4: scenario planning as a tool to explore changing demand – the place of all relevant developments in these diagrams will determine if they are part of campus strategies or scenarios (Dewulf et al. 1999), edited

Applying the diagram the strategic choices – of campus strategies – will be determined by developments that are influenceable by campus managers and have a substantial impact on the campus. In figure 5.5 an example is shown of this exercise, based on prior research (Den Heijer 2002a) with new insights. The strategic choices in this example are:

- local and regional spatial policy – participating in the collaborative planning process of university and city;
- new ways of learning and working – introducing new concepts to optimally support the university of the future and its strategic goals;
- sharing university facilities with external parties and using facilities of external parties;
- development of university land property.

Using this tool in discussions within universities or among campus managers can set the framework for campus strategies, identifying the strategic choices and other developments that are part of scenarios for the university of the future.

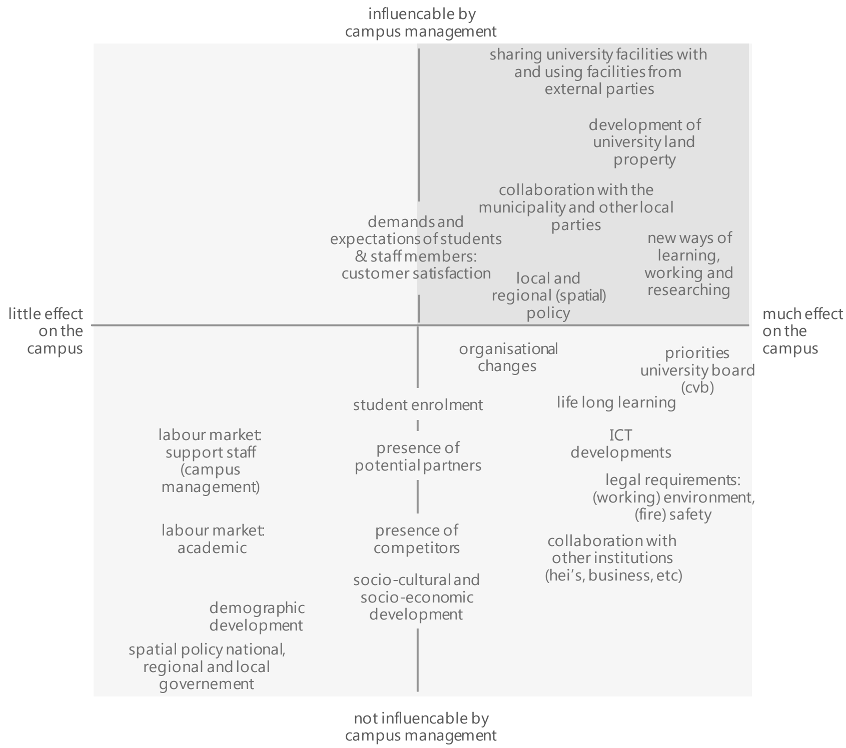
This scenario building process can be performed by brainstorming in groups of experts, by sending questionnaires or conducting interviews with campus managers. In June 2006 more than 3000 attendees of the Campus of the Future (COTF-organization 2006) conference formed small groups – six persons each – and discussed a number of driving forces effecting higher education. They were asked to identify the two most important ones and build scenarios. The results reveal a top 3 of driving forces, in random order: technological change, increased competition and population changes.

Apart from this top 3, it is interesting to see what other developments the American organisation put on the list: aging of the working force, lack of skilled workers, declines in enrolment, global economy. It is clear to see that the global knowledge economy generates more uncertainties. Developments that used to be local, regional or national are now more and more global, including environmental issues, technology development and innovation, the recruitment of talented students, excellent academic staff and skilled supporting staff for the campus, including campus management. This list also contains a hierarchy, but it could also serve as a checklist of topical issues.

Not just the top 3 of most important driving forces, but also key trends in scenarios for the university of the future were indicated, per type of university. What can be concluded from these workshop results (COTF-organization 2006) is that:

- small universities think that the university of the future will be shaped by a combination of increased government regulation and rising student expectations;

figure 5.5: example of applying scenario planning as a tool to identify strategic choices



this might lead to higher quality requirements on campus to attract and retain them and beat the competition;

- comprehensive / doctoral institutions think that the university of the future will be shaped by a combination of increased competition and (low) technological change; the latter refers to the idea that the virtual university is not as effective as expected in the nineties; the physical campus serves a purpose in creating knowledge beyond the boundaries of the existing networks;
- research universities think that the university of the future will be shaped by more uncertainty and rising student expectations; more uncertainty calls for more flexibility in many forms: by sharing more facilities with partner on and off-campus and non-territorial solutions to avoid low occupancy and frequency rates;
- community colleges think that the university of the future will be shaped by a combination of increased competitions and (high) technological change; indeed, these colleges experience more competition in (previously) serving local individuals that now have access to more institutions because of globalization and increased mobility; as a consequence it seems logical that they feel that (high) technological change will enable them to virtually connect with these and other groups.

Dutch universities would be categorized as 'research universities' in this American subdivision of universities. While these types of institutions do not currently exist in the Dutch academic system, there are political forces to differentiate to these types of institutions, also linking the institutions of higher professional education ('hogescholen') and including more university colleges to serve the most talented and motivated students. These types of institution all require different campus models that can also be accommodated within one institution.

learning from associations and groups of campus professionals

Developments that influence the future campus are relevant to campus managers all over the world. Associations for campus professionals like SCUP (SCUP 2010) inform their members periodically with publications and newsletters about topical issues. Examples are special issues of their publication "Planning in higher education" and their newsletter "Trends in higher education" (SCUP 2010) that lists both observations and reflections on new developments that influence universities and their campuses. Both are also available online for SCUP members. All campus managers within the SCUP community can use this source of management information for their campus strategies.

5.3.2 CHEPS, three visions for the future of higher education

To explore the future of higher education in 2020 the Centre of Higher Education Policy Studies (CHEPS) outlined three future scenarios (CHEPS 2004). The key variable in these scenarios is the type of coordination for universities: hierarchical from Brussels, in a network or from the market:

- scenario Centralia: will Brussels implement the Lisbon agenda from the top down?
- scenario Octavia: will the current 'network university' trend continue?
- scenario Vitis Vinifera: will the market exert more influence on the courses offered and the research conducted?

In all CHEPS scenarios there is a choice to be made between competition and collaboration. However, it is not easy to deduce the need for space in the future from these scenarios. Values can be added to these scenarios, qualifying Centralia as traditional and relatively closed, Octavia as open and collective and Vitis Vinifera as individual and commercial. These values could be transferred to types of universities that recognize themselves in these scenarios. Other characteristics can be found in table 5.3. Perhaps all these things will happen at once for different parts of the same university. This is confirmed by Wissema, who conducted extensive research on the characteristics of the so-called the third generation university (Wissema 2009):

- Exploitation of knowledge is core business and becomes the third objective.
- Operate on a international, competitive market.
- Open universities, collaborating with many partners
- Transdisciplinary research and rise of university institutes.
- Mutlicultural organizations; mass and elite education.
- Cosmopolitan university.
- No direct state financing. No state interference.

These characteristics align with the CHEPS scenarios and the other scenarios in the next sections.

5.3.3 Four scenarios for 2030 – scenarios as a context for higher education

In 2009 Agentschap NL - an agency of the Dutch Ministry of Economic Affairs, previously named "SenterNovem" - published a document describing four different scenarios for the future in 2030. These scenarios are based on other authoritative scenario studies, like "Four futures of Europe" (CPB 2004) of the Netherlands Institute of Economic Policy Analysis 2004 and the "Shell energy scenarios to 2050" (Shell 2008), with input from other trends studies on technological and ecological developments. With "Agentschap NL" promoting sustainable development and innovation, these scenarios not only describe the future in terms of demography, economy, technology, culture, political table 5.3: three scenarios for higher education in 2020 (CHEPS 2004), edited

A. Centralia, the City of the Sun	B. Octavia, the Spider-web City	C. Vitis Vinifera, the City of Traders and Micro-climates
scenario foundations • hierarchical co-ordination • power is centralised: Muscles from Brussels	**scenario foundations** • network co-ordination • power is spread throughout the network	**scenario foundations** • market co-ordination • power lies with the individual institutions
scenario characteristics • top universities in Northwest Europe. • transnational coordination • large universities with many campuses • students have international study path • no selection --> HEI graduates are in demand, because of ageing society	**scenario characteristics** • social dynamics force universities to find new stakeholders • hybrid forms of universities / colleges • crossing borders in partnerships • international – changing – project groups for research • "academic gipsy" – professors that work for different (HE) institutions • networks and social skills are more important than a diploma • diverse student population • mobility between countries, disciplines • combination of face-to-face & online contact	**scenario characteristics** • higher education is very divers • a university is what it does, universities in Europe do very different things • ranking is important • applied research, finance private • > 30 % of HEI is private • continuous competition for resources • every academic is entrepreneur • student loans are accepted to great extent
references • "one European university" • the classical university	**references** • pen academic network • the network university	**references** • commercial degree courses • the virtual university

choices and sociological developments, but also in terms of sustainability issues or – at least – influences on how sustainable the world will be in each of these futures.

Each of the four scenarios is characterised with many images and with descriptions of economic growth, consumer profiles, state of the world, societal values, population growth in the world (and in the Netherlands), the power of public authorities, the role of the European Union, (environmental) legislation, entrepreneurship, technological developments and innovation, available resources and available human resources.

The main scenario variables that distinguish the four scenarios are (a) globalisation versus regionalisation and (b) individualisation versus social integration. Combining these two variables results in the four scenarios (see figure 5.6):

1. global market – combining globalisation with individualisation: the world as the playing field for competitive organisations and individuals
2. global solidarity – combining globalisation with social integration: the world as the collective playing field to collaborate for mutual growth
3. transatlantic region – combining regionalisation with individualisation: the region or own country as a habitat to compete with others
4. regional community – combining regionalisation with social integration: the region as a community to collaborate for mutual growth

These scenarios were the basis for many studies on sustainable solutions for different sectors in the Netherlands, including higher education. Following the agreements that many Dutch HEIs signed to reduce energy use (30% from 2005 to 2020), the TU Delft conducted a research with the title "Toward a sustainable campus" (TU Delft 2010). For that research the four scenarios were transformed into four futures for higher education.

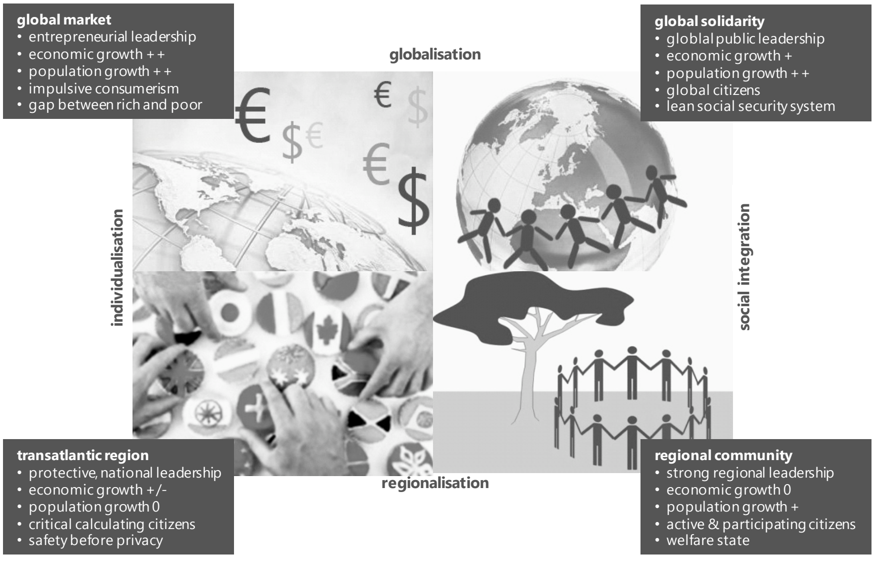


figure 5.6: Agentschap NL scenarios - four futures of the world in 2030

scenarios Agentschap NL versus IVLOS

Before describing these "university landscapes of the future" it is interesting to compare the Agentschap NL scenarios with the four scenarios that IVLOS made for 'the future of learning' (IVLOS 2004, De Graaf 2005). IVLOS is the Institute of Education at Utrecht University. The key trends that IVLOS identifies are: informalisation (more informal education and communication), computerization, intensification and internationalization. Based on these trends the discriminating variables of the four IVLOS scenarios are 'learning' versus 'teaching' and 'individual interest' versus 'common interest'. The latter aligns with one of the Agentschap NL variables. Learning communities, individual learning tracks and traditional teaching models for individuals and communities are characteristics of the resulting scenarios. These models will be merged into the futures of higher education.

composing four futures for higher education

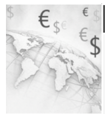
All previous scenarios were an inspiration in the process of composing four futures for higher education, with the Agentschap NL scenarios as leading scenarios. The studies with Dutch campus managers, the international workshops and insights, the CHEPS scenarios and the IVLOS scenarios are used as supporting information.

For higher education, these scenarios are expressed in five main variables (see table 5.4):

(a) the number of HEIs, the size and their profile, compared to 2010
(b) the funding of higher education, both private and public,
(c) the use of ICT, for education, research and valorisation of knowledge,
(d) the type of students,
(e) the type of scientists – professors and researchers.

Additional aspects for each of the scenarios are new partners for collaboration, the changing in student population and community, the changing space demand, function mix and quality requirements, the increased demand for related university functions:

table 5.4: four futures for higher education, derived from scenarios Agentschap NL (Den Heijer et al. 2010)




1. global market: knowledge for sale	2. global solidarity: knowledge to share
(a) more universities and schools compete with each other; (b) more private funding, high student fees; (c) greater use of ICT for distance learning and research; (d) calculating students: investing in degrees and shopping for qualifications; (e) competition between schools for the most talented student and professor, teacher and scientist	(a) fewer universities, better networks between universities and better cooperation to diversify the profiles; (b) mix of public and private resources, but emphasis on (effective use of) public resources (c) more ICT use to maintain the network and for open source knowledge sharing (d) travelling students with a home base; (e) professors are academic gypsies loyal to their home base
3. transatlantic region: knowledge for yourself	**4. regional community: knowledge applied locally**
(a) institutions for specific target group, selection on culture, religion, world-view; education in local language (b) less public and more private funding from local business community that depend on local employees and regional economic growth (c) ICT: closed network to use for individual growth; (d) students: traditional and uniform, enrol at university close to home, majority still lives at home; (e) academic staff: traditional, hierarchical – lifelong contracts	(a) universities focusing on regional economics / demand; (b) education in local language, in close collaboration with professional and local economic partners (c) strong community with a lot of personal contact, mainly using ICT for file sharing (d) students: environmentally conscious, socially active, not necessarily born and raised in same community – feeling responsible for community wherever they study (e) academic staff: idealistic, maintaining good balance between work and home, feeling responsible for community

residential, related businesses, retail & leisure and infrastructure, the feasibility of environmental goals and sustainable ambitions. Detailed information about all scenarios on all aspects can be found in appendix V.

As an example, the second scenario “Global solidarity” is elaborated on in table 5.5, because it is considered the ‘trend scenario’ by both researchers and campus planners. Many Dutch universities recognize their current context in scenario “global solidarity” (workshops with campus managers and energy coordinators in October 2009 and April 2010) that resembles CHEPS scenario Octavia and the network university with global partners that collaborate for mutual benefits. Workshops and questionnaires among Dutch campus representatives in 2010 also showed that most universities expect a combination of scenario 1 and 2, which shows the globalization trend is leading (Den Heijer et al. 2010).

The content of table 5.5 can already be viewed as management information, supplying a preliminary list of programmatic requirements for the campus and campus management of the future. However, this list still contains qualitative aspects that are still hard to use in the decision making process of campus managers.

The four scenarios will also be used in the next chapter, combining them with campus strategies to generate future models for the campus of the future. The next section explains some of the tools that have been used in the last 5-10 years to operationalize the developments in measurable and manageable campus variables.

table 5.5: trend scenario (2) "global solidarity" and the possible effects on higher education institutions

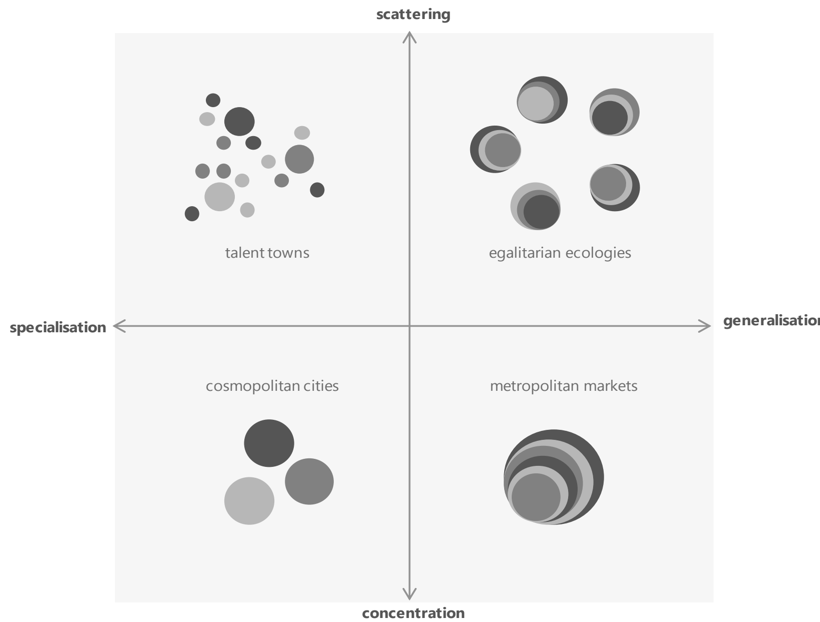
higher education scenario 2 – global solidarity (trend scenario) "knowledge to share"	
number of institutions	less than in 2009, more and better networks of institutions
collaboration	with other (higher) education institutions – both horizontally (same level) and vertically (different levels but same profession or sector)
resources	combination of private and public, but focus on public,
role ICT	open source – sharing knowledge for mutual benefits
type of student	open, divers, loves to travel, but has a home base and is loyal to 'alma mater'
type of employee	academic gypsy – like the student: uses the global network, but has a home base he is loyal to 'alma mater'
type of research	collaborating within research network, collectively developing and managing expensive research facilities, also with related businesses
space demand	shared facilities, less need for individual territory, but need for physical home base: public spaces, places to meet, 'a home away from home', social meeting place and sharing workplace
scope	sharing facilities makes university more prepared for changes in enrolment and working force; employees have contracts but can freely move around in the network – wherever they are needed most
feasibility of environmental goals	willingness to share facilities reduces footprint and energy use of institutions
demand for university related functions	housing is important for university goals, responsibility of the university, increasing demand for international students (short stay students), visiting professors (short stay faculty housing), more attention for collective space to stimulate social integration, 'home away from home', part of the 'learning experience'

5.3.4 Four futures for the Netherlands in 2040 – the future of people and cities

While the previous scenarios focused on the future of universities, the scenarios in this section explore the future of people and cities. Both types of scenarios are considered important, because the campus and the knowledge city of the future will be closely related or even integrated. The scenarios for The Netherlands in 2040 are based on three major lessons (CPB 2010) for the future of people and cities, which are considered 'the foundational building blocks of the scenarios', illustrated with two questions: who earn the money and where is it earned? The first lesson is that knowledge is and will be the key to success for the Netherlands. Human capital and knowledge are essential for participation in technological progress and for maintaining a competitive edge in a globalising world. Second, jobs will be based more and more on a collection of tasks. Third, economic activity will cluster in cities. Cities attract skilled workers who benefit from face-to-face interactions. In addition, cities are the main hubs in the economy, replacing to some extent the role of countries as economic engines. This demands a novel view on the division of work and the location of production in the future (CPB 2010).

The 2040 CPB scenarios deal with two basic uncertainties: (i) the future division of tasks among workers: will it occur anywhere in the world or will production occur more locally and (ii) whether the size of cities will become larger or smaller. Together, these two uncertainties lead to the four scenarios presented in figure 5.7: Talent Towns (TT), Egalitarian Ecologies (EE), Cosmopolitan Centres (CC) and Metropolitan Markets (MM). In each of the scenarios the size of the cities differ in numbers of inhabitants: 100.000 to 200.000 in TT, two to eight million in EE, 100.000 to 500.000 in CC and more than ten million in MM. The cities in the Netherlands can only apply for the multi-million inhabitants scenarios if they collaborate in networks, which applies to the cities in the Randstad region with seven million inhabitants altogether. More characteristics of these scenarios – and cities – can be found in appendix V.

figure 5.7: four scenarios for the future of the Netherlands in 2040 (CPB 2010) - whatever scenario will become reality: knowledge cities are the basis with a large role for universities



The need for mutual alignment with urban strategies becomes increasingly relevant in the current era of growth in student numbers and limited resources. Under the pressure of rising land values in city centres, the complexity of many neighbours, the strict conditions to expand or redevelop listed buildings and the temptation to sell parts of the inner-city campus for extra resources may lead to the decision to move the campus outside the city or to develop the city as a gated city within the city. This development could in the long term even undermine the city. All the more reason to join forces in a network of (knowledge) businesses, industry, higher education institutions and public parties – and to scale up to a regional perspective in the triple helix university-industry-government (Etzkowitz 2008). Etzkowitz explains that the interaction between higher educational institutions, cities and business is based on the assumption that a breeding ground for innovations emerges through collaboration and to some extent mutually crossing borders between these three parties. Etzkowitz also states that 'more synergy arises when actors take on the role of the other party and maintain its primary role and distinct identity' (Etzkowitz 2008). With universities acting as urban developers (Perry and Wiewel 2005; Perry et al. 2009) and increasingly focussing on knowledge transfer (Wissema 2009), they have already taken that role in the tripartite collaboration.

Influenced by all these developments municipalities are also increasingly aware of the regional – and even national scope – of the knowledge economy. The need to align urban and campus strategies is internationally acknowledged, also from the urban perspective (Edvinsson 2006; Hoeger and Christiaanse 2007). It is also interesting to realise that economic activity is where the knowledge workers want to be. Quality of place on and off-campus is becoming an increasingly important as a pull factor in the knowledge economy, which seems paradoxical in a more and more place independent knowledge economy. Many references on the future of cities confirm 'why place matters', emphasized by Richard Florida stating 'how the creative economy is making where to live the most important decision of your life' (Florida 2008). Therefore it is logical that the four scenarios for the Netherlands in 2040 (CPB 2010) represent four types of knowledge cities. This grants the support for combined campus and city models, which are subject of the next chapter.

figure 5.8: location of TU Delft campus between the Hague and Rotterdam, emphasizing the importance of regional coordination, map by Daan Zandbelt for TUD Campus Vision 2030 (TU Delft 2010)

5.4 Expressing trends and developments in manageable campus variables

The third and last part of this campus management task "exploring changing demand" is to introduce tools that operationalize relevant developments (or scenarios) into manageable campus variables, expressing the changing context in programmatic requirements. This will make it possible to compare future demand with current supply on the same CREM variables. On top of that, it will enable universities to set priorities or give focus to campus strategies. Some of the tables of the previous section already contribute to this.

5.4.1 Using tools to quantify effects on the campus

While many tools can supply qualitative input for this management task, campus managers also need to generate quantitative input for their campus strategies, project decisions and investment programmes. What does this development mean for student enrolment, for instance: increase of 10%, decrease of 20%?

Generating this information starts with making a basis analysis of how different developments relate to different variables in programmatic requirements or a brief for a new project. Eventually, all developments have to be expressed in programmatic requirements in terms of number of m2, required qualities, function mix and available budget. Over the years many space management models were used to do exactly this. The challenge is to incorporate new developments in new space standards in these models.

In this subsection the developments in space models over the last ten years will be described, assessing the quality of the input, the used space standard in the models and the quality of the management information that is output of these models.

Early search showed (De Jonge 2000) that – in most cases - extrapolated student numbers are input for a space use model that calculates the function mix of the future campus, without evaluating the space standards that are used in the models. Many campus managers acknowledge that these standards hardly match the demand side of the current campus, let alone the future campus. Anno 2009 campus managers are joining forces to evaluate space use models of the past and collectively build new models (workshop on space standards in 2009). These models have a history that goes back more than twenty years, see figure 5.9). Most important steps in the models that have provided management information for exploring changing demand are described below.

1988 – WORM (university space demand model)

In search of standards for space use 'WORM' ("Wetenschappelijk Onderwijs Ruimtebehoefte Model") was introduced as a tool for programming new buildings and assessing the current campus. WORM was a space demand model for universities and it included standards for educational space, office space and laboratory space (OCenW 1988). From 1988 the budget for the campus was based on this calculated space demand, until the ownership of the campus was transferred to the universities themselves.

1995-2005 – evolving space demand models

From the moment the university became responsible for the campus, space demand models started to evolve from the standardised WORM. The freedom of space planning had its advantages in terms of setting other priorities and customizing space standards to specific needs, but its disadvantages in terms of relating decisions to standards of similar institutions. For years universities did not feel the need to benchmark their performance with other institutions. But while complexity of campus management increased, that need eventually led to the collective initiative to analyse and compare all campus strategies in that year. The resulting report (De Jonge, 2000) showed that scenario planning lacked quantitative basis, due to the fact that most institutional (university) strategies did not supply quantitative management information on CREM variables.

2007 – initiative to collectively improve space demand models

The results of benchmark studies (Den Heijer 2004, 2007a, 2007b) made clear that space use on campus is different from space standards in the space demand models. Many campus managers were already working on improving their customized models, but they decided to join forces in 2007. They realised that the space standards in the new models had to align with the future place to study, learn or work.

Graduate student Kelvin Berghorst compared models from different universities, applied these models on the same case and concluded that all models had different outcomes with the same input. This emphasized the need for collective assessment. He also stated that space models should not focus on planning floor area, but on planning capacity (Berghorst 2008). Especially with many campus decisions concerning renovation existing

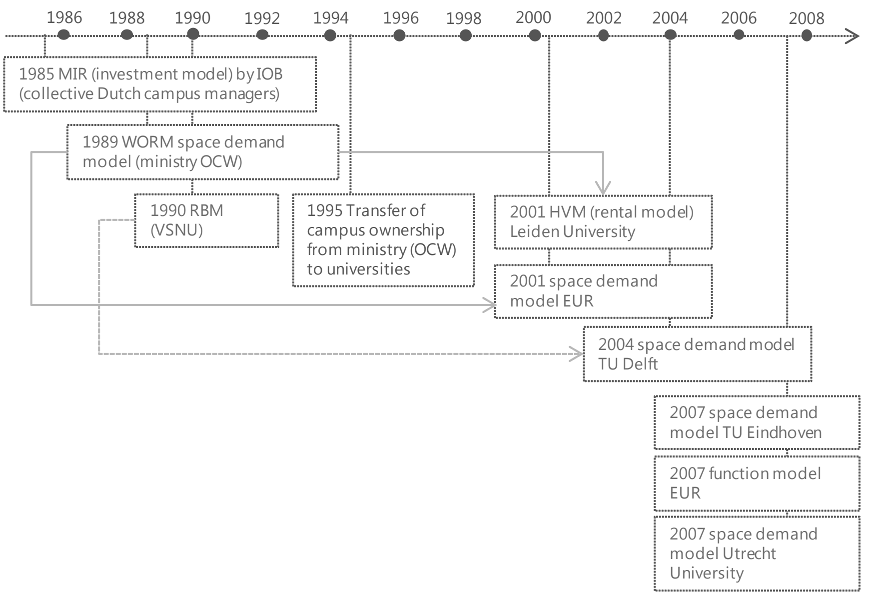


figure 5.9: space demand models over the years (Berghorst 2008) translated.

Notes: OCW is Dutch ministry of Education, Culture and Science, WORM and RBM are space demand models which were the basis of many other, customized models

buildings instead of adding new buildings, matching capacity is much more practical than matching square meters. For instance, finding workplaces for fifty researchers in an old building still allows planners and designers to be creative with the floor plan and the legal requirements. Berghorst also added financial aspects to his model –however conceptual– to calculate the consequences of different input and policies.

In any case, the campus manager needs a quantitative basis to calculate space demand, either in floor area or in capacity. The model that Berghorst provided is still conceptual and will be used as a reference for the new collective foundations for space planning.

5.5 Conclusions about exploring changing demand

5.5.1 Collected information

Most authors who write about “forecasting” and “the future” admit that planning for change is about being able and willing to change your plans (Daigneau 2003; Norris and Poulton 2008). In that case it is also important to find tools that engage the stakeholders in this ongoing process than it is to engage them in a strategic vision that is bound to change. “Tell them why you want to change things, and not what you want to change.” Also let them know the (difficult) circumstances for the planning process.

Uncertainty in future developments usually demands flexibility, in future models on various scales: the place to work and study, the buildings on campus and the campus in the city. More explicit strategies can be found in the next chapters with examples of future models and recent projects.

To make a most accurate estimation of future demand and future supply, it is most important to find a way to go through this process with all stakeholders that are potentially involved with this transition. Besides that, it is essential to express all developments and trends in the context of higher education and research in measurable variables, to be able to manage the campus and plan for change.

Preliminary answers: consequences of trends and developments

Analysis of strategic plans and interviews with campus managers (Den Heijer 2007a) can give some preliminary answers to the five questions about changing demand that were posed in the beginning of this chapter.

- How do developments affect the number and types of students that have to be accommodated, both in university buildings and with student housing on and off-campus?

Almost all universities count on increasing student numbers – Bachelor, Master, PhD students – given the growth scenarios of the ministry of education for the next decade (see chapter 2). If or how space demand will change depends on the strategic choices of the university. The first choice to make is whether or not the university want to enrol more students. The available resources - including the physical resources – might limit the number of students. The second choice, if the university decides to enrol more students, is a campus decision: can we accommodate more students on the same floor area or do we have to create more space? This not only counts for academic functions like lecture halls, library space and studio space, but also for restaurants and student housing. Especially with an increasing number of international students, the supply of student housing units on campus often limits international enrolment. References of other universities – average space use per student – could supply management information to set the maximum amount of students that a university could accommodate with the current campus.

- How do developments affect the available resources for the university and for the campus, and what does that mean for the available resources per m^2 floor area?

In many strategic visions for both the university and the campus, policy makers take into account that other, private sources for funding might become more important and have more influence on university and campus. With decreasing resources, the campus is likely to come at the bottom of the (investment) list. With the increasing acknowledgement that a campus in bad condition might influence the attractiveness for potential students and employees, some campus managers fear that the university might enter a downward spiral. Especially with the global competition for the knowledge worker of the future, many universities join forces with municipalities or other public parties. In any case, universities would benefit from having more references on total costs of ownership (per m^2) and current replacement costs or investment levels of new projects.

- How do developments affect the strategy of the university to focus on other types of educational and research processes, with consequences for the function mix on campus and the required quality of facilities?

Many universities consider implementing new ways of working, learning, studying and researching on campus. Others do reconsider exclusive use of facilities and introduce facility sharing on many levels. New concepts are likely to have different space demands, but the impact on space use is hard to predict. References of universities that have already experimented with new concepts – either in the Netherlands or abroad – would supply management information for these types of decisions. For new ways of working, references of other organisations are also applicable and welcome for campus management.

- How do developments influence the technical, legal and environmental requirements for managing the campus?

Looking back at recent history many campus managers name the more strict legal requirements as important influences on campus management. This includes restrictions in zoning plans, but emphasizes the minimal requirements of a healthy and safe working environment. In relation to the current technical condition of the campus – an average of about 37% of the Dutch university campus is in 'moderate', 'bad' or 'very bad' condition, assessed by the campus managers (Den Heijer 2007a) – it is important to collect references of the minimal investment level to improve the technical condition to at least 'reasonable'.

The environmental requirements are very much influenced by the recent (December 2008) agreement to reduce energy use with 30% in 2020. Research has collected all kinds of technical, spatial, functional and organisational solutions to achieve these sustainability goals (Den Heijer et al. 2010). Changing the energy and space use behaviour appears to be one the most influential measurements. The next chapter "Generating future models" will elaborate on some of these solutions.

- How do developments influence the value of the campus – buildings and land – and the interest of external parties in any partnership with the university, both on the primary and the secondary processes?

Developments in the global knowledge economy have already influenced the value of the campus for regional economies and local communities. The question remains if this value is expressed in the resources spent on keeping the campus – and the presence of the university – an asset. A value is worth little if it does not represent a potential resource. This valuation question exceeds the level of the campus, it reaches the level of the knowledge city, or knowledge infrastructure in general. The value of the campus on this level is considered one of the most important bases for financing the university and campus of the future (name various sources). Management information that supplies a rough estimation based on economic potential, is therefore very valuable for both university and campus managers.

5.5.2 Demand for additional information

Many studies and reports explore trends and scenarios for the university of the future, but these rarely contain numbers or quantitative (ranges of) consequences - and campus managers do need actual data to build, maintain, sell, renovate or demolish parts of the campus. As a consequence, the lack of actual data on these trends and developments makes campus managers fall back on extrapolation of current student numbers, plus or minus some percentage to calculate future space demand. This can be illustrated with many strategic visions, accommodation plans and master plans.

demand for additional information

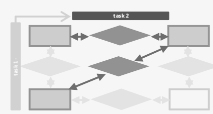
Exploring changing demand shows that many trends and developments primarily influence one CREM variable. But due to the fact that CREM variables are interconnected, the change in one CREM variable will have potential consequences for the others. How these other CREM variables will change, is usually dependent on strategic choices of the university’s policy makers and campus managers. For example, if public funding is decreasing, the university can (a) spend fewer resources on the campus and reduce m2 or (b) share facilities with external users, collect rent and spend more on the campus to attract more students and employees. These are just two possible strategies as a result of one development influencing one CREM variable.

In practice, campus managers take many different decisions based on the same trend or development. Campus managers are very interested in each other’s strategies and the results: the future campus. The demand for additional information (see table 5.6) can be summarized as the need for more references of best practices: space use data of new concepts for office space, studios, libraries, restaurants etc. and financial references like investment costs, market value, energy costs per m^2 and total costs of ownership of other universities and similar organisations. Evidence-based knowledge about the impact of a university on a city or the effectiveness of chosen strategies is hardly available but much needed. Sharing this type of knowledge for mutual benefits is relevant in international perspective.

Part of this demand can be generated by analysing innovative concepts and pilot studies at other universities. This introduces the next step in campus management: generating future models for the campus.

table 5.6: demand for addition information for exploring changing demand

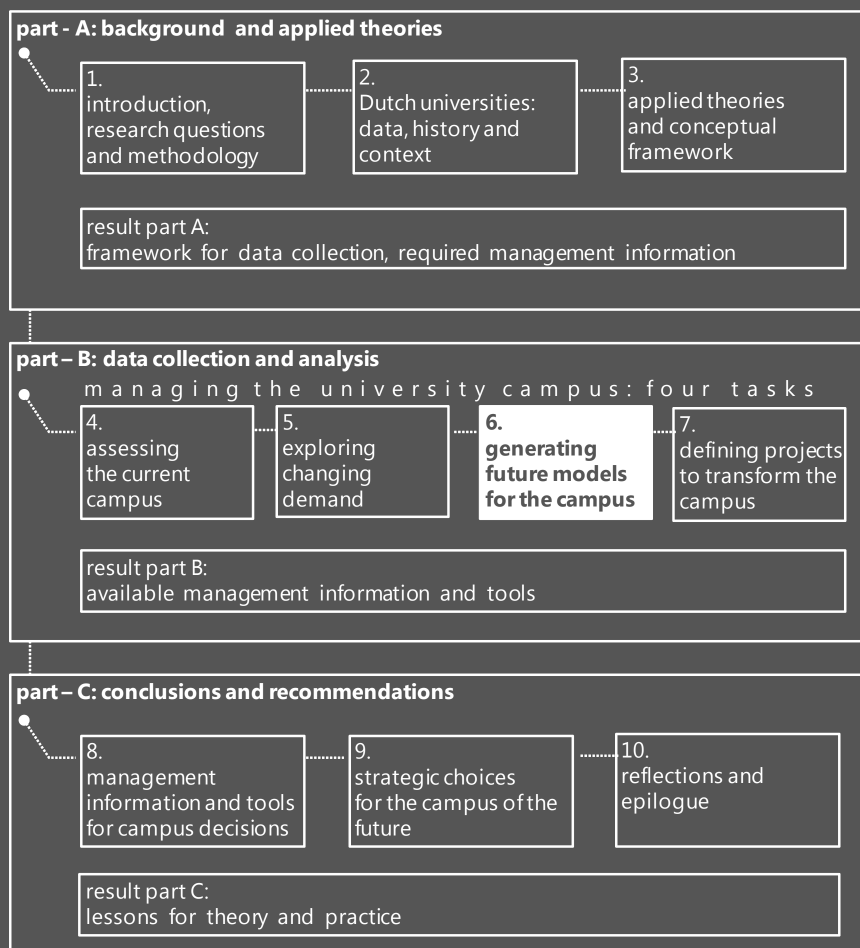
STEP 2
EXPLORING CHANGING DEMAND



variables	physical m^2	functional users	financial euro	strategic goals
demand for additional information				
space use references of new concepts: offices, studio space, libraries, restaurants etc.	x	x		
references on the total cost of ownership as a % of all costs or per m2	x		x	
investment level references of new projects (new buildings and renovation projects)	x		x	
estimations of the value of the presence of university (and campus) in the knowledge infrastructure			x	x
references to estimate the market value of real estate (land & buildings)	x		x	
examples of campus models in four CREM variables to illustrate the results of strategic choices	x	x	x	x

BK City, Delft University of Technology
Photo: FCM

Chapter 6
Generating future models for the campus



6 Generating future models for the campus

6.1 Introduction and required management information

This chapter focuses on the third management task of managing the university campus: generating future models for the campus. The following research question will be answered: "What management information is required, what management information is available and what is the demand for additional information for (III) generating future models for the campus?", see figure 6.1.

The essence of the management task 'generating future models for the campus' is finding a match between future demand and future supply. Future models can be defined on four different levels, see figure 6.2.

figure 6.1: the third management task: generating future models for the campus

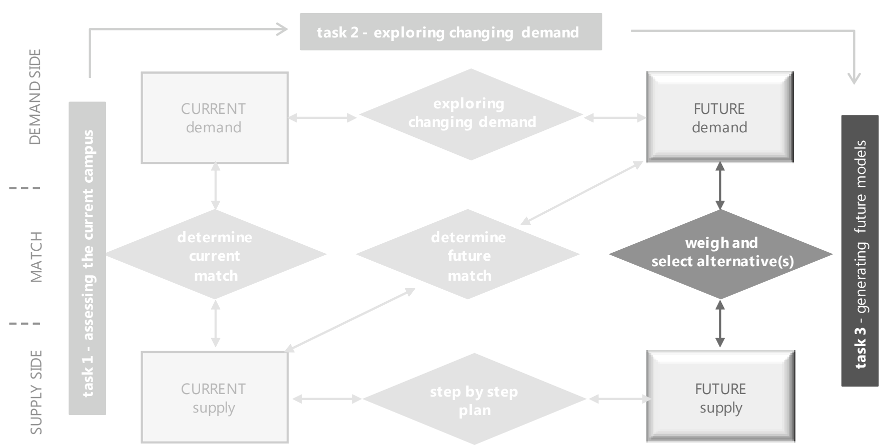
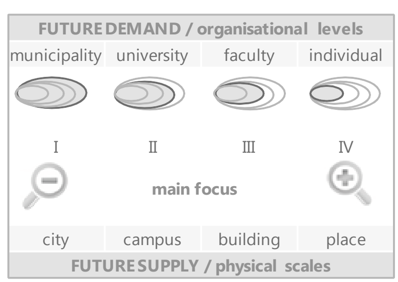


figure 6.2: future models are relevant on four different physical scales and organisational levels



On the supply side this includes future models for the (knowledge) city, the campus, the building and the places or functions within a building, like the workplace, lecture halls and libraries. On the demand side these models align with the changing goals and demands of the municipality, university, faculty and individual users on campus: students and (academic) staff members. For instance: physical models for the campus of the future should match organisational models for the university of the future.

While the main focus of this research is the physical university campus with its buildings, this management task will zoom out to the knowledge city and zoom in to the different functions within the university buildings. Consequently, this chapter will elaborate on future models that connect all of these levels:

- section 6.2: models for the university and campus of the future
- section 6.3: future models connecting the city and the campus – zooming out
- section 6.4: future models connecting the buildings and the places or functions – zooming in

In all of these models the required information will cover the four CREM perspectives. Preferably, future models are expressed in terms of floor area, space use, underlying organisational goals and effect on financial resources. The following questions should be answered to compose future models, each reflecting a combining of different CREM stakeholders issuess and perspectives:

- what do policy makers want to achieve on campus, aligning with the university strategy (goals),
- for how many and what types of students and employees, also considering users of related organisations and visitors (users),
- for what percentage of the university's resources (in euro),
- with which types of concepts (users per m^2 per function),
- with what quality level (investment level, in euro per m^2)?

The next sections about the available models will show how explicit the existing future models are in terms of CREM variables and how applicable they are for managing the university campus in practice. The last section will conclude to what extent the questions above can be answered and what additional information is still required.

6.2 Future university - campus models

General models for the future campus can be derived from models for the future university. In chapter 5 "Exploring changing demand" four different scenarios for the year 2030 were described, illustrating four different contexts for the university of the future: global market, global solidarity, transatlantic region and regional community. These scenarios differ on 'competing versus collaborating' and 'global versus regional', determining the playing field for many institutions, including universities. University models like the network university, the classical or traditional university, the university college, the community college – with a regional focus – and the virtual university all align with one of these scenarios.

While scenarios can not be influenced by definition, some of the campus models clearly anticipate on one – or a combination – of these scenarios. This can be illustrated by the campus models that Chapman introduced for the twenty-first century American campus (Chapman 2006): Clicks & Mortar, Intellectual Agora and Back to the Future.

Clicks & Mortar assumes there will be a much smaller campus with a great deal of inspiring space for social and intellectual encounters, an important trend in campus design. Intellectual Agora represents an open market place for the creation and exchange of knowledge, with the campus as an integral component of the city, where many spaces are shared with other users. Back to the Future is most similar to the present situation: an institution with large volumes of real estate, most of which is used exclusively by the institution itself.

6.2.1 Strategic choices - physical or virtual, exclusive or shared use

Chapman's models differ on 'physical versus virtual' and 'exclusive versus shared use' of the campus. They can be used as a first strategic step in shaping the campus of the future. The strategic choices are:

- What part of our university processes and activities do we accommodate physically and what part virtually?
- What part of the campus do we (want to) share and what part will be exclusively used by the university?

Consistent with the CREM theory, any choice on these strategic matters influences all CREM variables. For instance, choosing a more virtual campus reduces floor area and might save resources, but it might also affect the university goals to create a university community on a lively campus. Choosing 'exclusive use' for the whole campus might guarantee flexibility to use facilities whenever needed, but might require disproportionate resources at the costs of resources for education and research. However, these considerations require an integral CREM approach. For this research Chapman's models are expressed in CREM variables, making them more explicit and comparable for campus managers, see table 6.1.

table 6.1: Chapman's three campus models (2006), expressed in CREM variables

CREM variables	A – Back to the Future	B - Intellectual Agora	C – Clicks & Mortar
goals	the campus is almost exclusively university property, faculties have their own buildings and facilities the physical campus is private territory	the campus operates as an open market place for the creation and exchange of knowledge the physical campus increasingly becomes part of the urban fabric, other users are welcome	much smaller campus due to more working/ learning from home: 'clicks' replace some of the square meters (bricks) the physical campus is above all a meeting place: 'creative, stimulating and with a focus on intellectual and social exchange
users	largely exclusive use of buildings by their own users (students and staff members), also at faculty level	knowledge institutions make use of each other's facilities and are no longer the exclusive users of their buildings	students and lecturers spend less time at the campus, come to the campus to meet others
euros	same amount of resources available	more resources due to shared usage – external users pay	same amount of resources available
m^2	same number of m^2	same number of m^2 higher occupancy & usage	far fewer m^2 campus is partly virtual
combining the CREM variables	same money available for the same m^2 → no resources available to increase quality level	more money available for the same m^2 → higher quality per m^2 possible	more money available for fewer m^2 → higher quality per m^2 possible

Some remarks to describe these campus models and to perceive the differences are relevant to interpret this management information:

- The assumption is that the model "Back to the future" is based on a university that has grown in the fifties and sixties as a result of increasing student numbers, still has a campus size that anticipated on further growth and has designated buildings for relatively autonomous faculties or schools.

- The different campus models vary in terms of quality and quantity of floor area: model A has most quantity, but - with a constant budget – hardly any (extra) resources to add quality. Model C has least quantity and has – with the same amount of resources available as in model A – (much) more money available per m^2 floor area.
- However, model B shows that it is also possible to invest in both quantity and quality of space, as long as the university is prepared to share some of the facilities with other (paying) parties.
- Nevertheless, model A can be feasible if additional resources are available, for instance by increasing tuition fees or lobbying for alumni funding; this can be applicable for university colleges or other – more exclusive – university models.
- While some universities combine different university models in their institutional strategy, more than one campus model can be applicable. In the Netherlands many universities combine the network model with a university college.

Questionnaires among Dutch campus managers in 2007 - asking towards which campus model their university was moving - supplied the following results (Den Heijer 2007a):

- The three universities of technology move towards "Intellectual Agora" - more shared use of facilities - also because of their relatively large footprint and expensive laboratory facilities.
- The oldest, broad universities are more likely to choose "Back to the future" as the leading model, often differentiating this model with a 'closed and exclusive campus model' for a university college.

Workshops in 2006 among campus managers of universities and institutions for higher professional education (Den Heijer and De Vries 2006) showed that the latter are more inclined to choose for "Clicks & Mortar". More extensive educational processes and more desk-research activities make it easier to replace physical facilities with virtual facilities. To what extent these institutions will replace 'bricks with clicks' is also dependent on the strategy and available resources.

In the same questionnaires among Dutch campus managers in 2007, campus managers were asked to indicate the underlying goals of their campus strategies. Similar to figure 4.13 in chapter 4 – identifying past goals that shaped the current campus - figure 6.3 shows the scores of the goals that campus managers indicated and prioritised, when asked about what goals will shape the future campus. In this figure colours are added, matching the leading CREM perspective – and stakeholders – for each goal in the real estate strategy and for each performance criterion.

Compared to the goals that shaped the current campus, the scores are more equally spread over all the goals and over the performance indicators 'profitability', 'productivity' and 'competitive advantage'. Apart from this, more conclusions can be drawn about these goals that will shape the future Dutch campus, according to campus managers:

- The top 5 goals in terms of scores are 'supporting user activities' (145), 'supporting image' (89), 'decreasing costs' (66), 'stimulating innovation / collaboration' (64) and 'controlling risks' (62).
- However, figure 6.3 shows that many of these goals are interrelated. For example: 'increasing flexibility' can also contribute to 'reducing footprint', 'increasing user satisfaction', 'supporting user activities' and 'decreasing costs', dependent on the measurements that are taken.

- Controlling risks – in this research – focuses on physical aspects: achieve or maintain minimum quality for use permit ("safe and healthy workplace"); it also confirms the increased attention to safety and security requirements. This can result in more usable floor area, better functionality and a higher real estate value.
- Looking at the colours of the leading CREM perspectives per goal, the attention for the future goes out to the functional (orange) and strategic (blue) perspectives.
- Nevertheless, compared with the past (figure 4.13 in chapter 4) there is also relatively more attention for financial and physical goals, especially reducing the footprint to encourage sustainable development. In figure 6.3 this is added as an explicit performance criterion.
- This results in four performance criteria that can be linked to the four CREM perspectives. In part C of this research both the performance criteria and the (goals of) real estate strategies are made operational – measurable and manageable.

The results of this questionnaire show what campus goals are identified by Dutch campus managers. However, in the end, what they want and what they can afford are two different things. The profitability is very dependent on the funding system and the available resources from external parties. The competitive advantage and productivity can both enlarge funding chances – from alumni and research institutions – but still the effect that campus decisions have on these performance indicators should be assessed in the whole system of policy measurements and resources within the university. Eventually, the future campus is a result of what a university can decide upon and what the future will bring. Consistent campus models should be combined with possible futures. The next subsection combines strategic choices with scenarios for the year 2030.

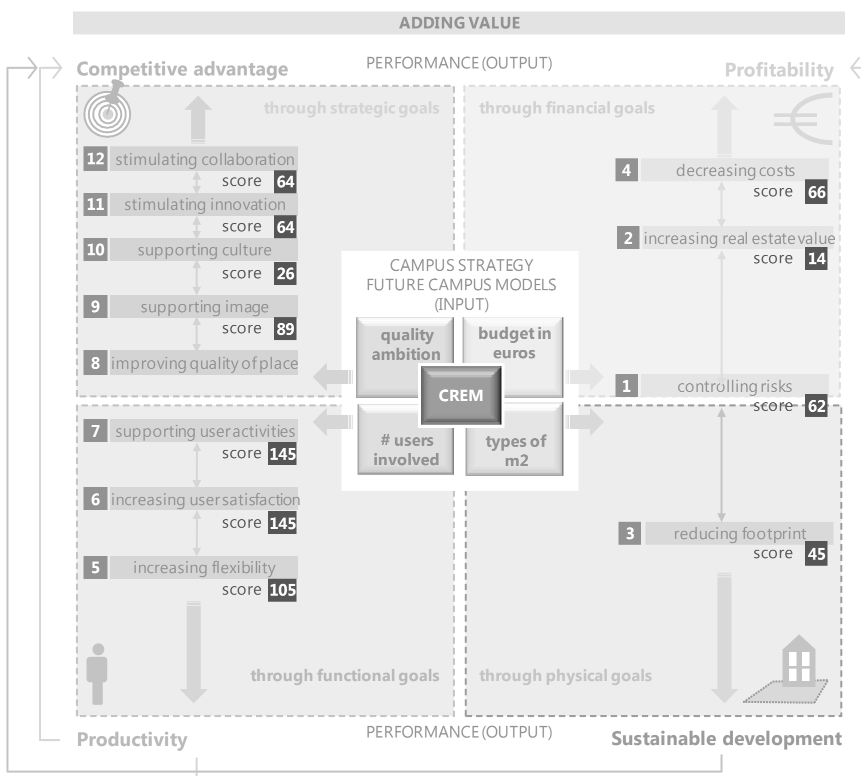


figure 6.3: what will shape the future campus - goals that campus managers prioritised in 2007, expressed in scores that are generated giving 9 points to 'priority 1', 8 points to 'priority 2', ... , 1 point to 'priority 9' and summarizing these points of respondents from all fourteen Dutch universities

6.2.2 Campus models anticipating on different scenarios - twelve future models

As a result of research on the future of higher education (Den Heijer et al. 2010; TU Delft 2010), the four scenarios are connected to the three campus models. This results in twelve future 'university-campus' models, combinations of the university and campus of the future, see table 6.2.

Some of these are more likely than others and many of them already exist. These are - for instance - university colleges, network universities, open source virtual networks and traditional university campuses, either gated or increasingly part of the urban tissue. Some Dutch universities combine these different models for different target groups: regular students, international students, talent classes and post-experience students.

Expert meetings among campus managers (TU Delft 2010) indicate the following about these twelve models:

- The most likely combinations of strategies and scenarios are A1, A3, B1, B2, B3, B4 and C1
- The most likely models to be reality within the near future: B1 and B2
- The most preferred models among Dutch campus managers are B2 and B4
- The ranking from most sustainable models (green) to least sustainable model is C-B-A for the strategies and 4-2-3-1 for the scenarios, based on the footprint of individual users, the predicted mobility and the willingness among users to share facilities and implement sustainable solutions

	1. global market global competition	**2. global solidarity global collaboration**	**3. transatlantic region regional competition**	**4. regional community regional collaboration**
	knowledge for sale	**knowledge to share**	**knowledge for yourself**	**knowledge applied locally**
A - back to the future	A1 university college closed campus, 'members only'	A2 traditional university open campus, but university use only	A3 national university gated, safe campus for group of individuals	A4 community college our campus village
B - intellectual agora	B1 closed network university, campus to share with invited guests	B2 open network university, campus to share with many partners	B3 university as local market place, campus as 'shopping centre for individual growth'	B4 university as local place for knowledge exchange, campus as town centre with social function
C - clicks & mortar	C1 virtual university, pay to study online	C2 open source virtual network	C3 gaming setting, play with peers to win	C4 our virtual community (in low density areas)

table 6.2: linking the campus models to four scenarios: twelve university-campus models

Note: the models C1 to C4 are most sustainable within the system of the university campus. However, the ecological footprint of students and employees might still be quite large outside the campus, when they work elsewhere, at their homes with more floor area and higher energy use for their workplaces. The energy problem will just be moved.

All twelve models are described in appendix V. However, the feasibility or applicability of a future campus model not only depends on future scenarios and strategic choices of universities, but also on the current physical and functional setting. This will be elaborated in the next section, zooming out to the urban or regional scale.

6.3 Future campus-city models

Literature reveals many angles on the campus of the future, but the mutually-beneficial relationship between campus and city – and university and local or regional governments – is emphasized by many (Van den Berg and Russo 2004; Van den Berg et al. 2005; Hoeger and Christiaanse 2007; Worthington 2007; Wiewel and Perry 2008; Perry et al. 2009; Worthington 2009), Chapman).

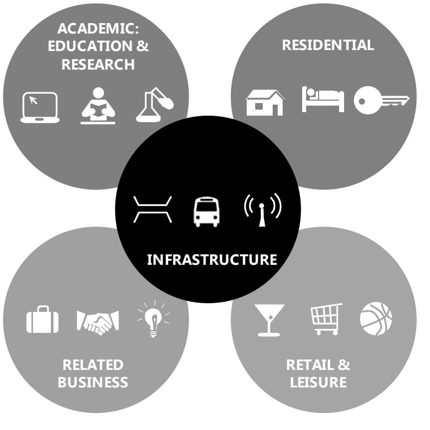
Worthington uses the word 'univer-city' (Worthington 2007) that is adopted by many universities – and cities – as a future model, including the VU (see text box VU Amsterdam). He uses the following statement to connect universities and cities: 'cities are founded on exchange - universities thrive on transaction' (Worthington 2009). In the knowledge economy transaction can be characterized as 'knowledge transaction' and cities have become 'networks of places'.

Consequently, future campus-city models can be composed from two perspectives: from the university and from the city or regional authority. The following two subsections successively elaborate on both perspectives, finally merging the two.

6.3.1 Models for the univer-city from university perspective

While the models in the previous section focused on organisational choices and scenarios - future organisational campus models - the models in this section focus on the physical and functional setting. The physical campus models relate the campus to the city. The functional campus models are based on the required functions for the university processes and goals, which are illustrated in figure 6.4.

figure 6.4: space types on campus - the required university function mix for the future university



1. (red) academic functions for education & research,
2. (blue) residential function: housing students & staff, hotels,
3. (orange), related business function: space for partners linked to academic goals & supporting processes,
4. (green) retail & leisure: sports, cultural and catering facilities and
5. (black) infrastructure: from parking to accessibility

This function mix has been specified by Dutch campus managers in workshops (Den Heijer and De Vries 2006) and was confirmed when assessing the current campus (Den Heijer 2007a).

The list of specified space types can be found in table 6.4. Both figure 6.3 and table 6.3 show that there are five categories of facilities associated with the campus: education and research, residential functions, retail and leisure facilities, related businesses and infrastructure.

Developments in university strategies show that the university is increasingly becoming dependent on the presence of non-academic space types in the near vicinity. Examples are international student housing and apartments or hotel capacity for visiting professors for internationalization goals. Trendy coffee bars and sports facilities are important for creating a lively campus and a place to meet on campus. To assure knowledge transfer – most universities mention this as their third strategic goal – it is crucial to accommodate businesses that combine learning and working, incubators for entrepreneurs and breeding grounds for young artists. Finally, good infrastructure and enough parking spaces should guarantee the accessibility of the university for students, staff members and the many visitors.

This required function mix for the university does not necessarily have to be supplied on campus. Dependent on the location of the university in the city, the urban function mix can complement the supply on campus; table 6.3 combines the required university functions with the physical relation between the campus and the city. All three urban settings have different (dis)advantages.

The campus-city models in table 6.3 show that - dependent on the urban setting of the campus - supplying and managing the required university functions is not necessarily a management task of only the university. In practice collaboration with the municipality and third parties is already quite common, especially on residential, retail & leisure and related business functions, see table 6.4. In workshops with both campus managers and urban authorities in October 2006 the following question was posed for each university function: restaurants, student housing, incubators: who manages, owns and uses this function? (Den Heijer and De Vries 2007).

required university functions	current location campus – city - university		
	village campus city outside city / "greenfield" campus	park campus city concentrated within city/ "gated" campus	univer-city buildings buildings city buildings buildings merged with city / "integrated" campus
	• university is relatively autonomous in creating campus of the future • distance from city will determine whether campus managers are forced to supply all campus function on their own terrain • campus competes with city	• campus can be both isolated from city population and open for collaboration for different functions (both with advantages and disadvantages)	• plenty of opportunity to supply campus functions in collaboration with city and third parties • identity campus can be diffuse, affecting the sense of community

table 6.3: opportunities and threats of collectively supplying university functions for three campus-city models

Many of these functions do not have to be realized for exclusive university use. On the contrary: in practice similar functions already exist in the urban setting – for other functions or target groups – and these facilities can easily be shared with the university. The figure 6.5 shows an example of how all of the required university functions can also be supplied by a network of partners in neighbouring cities.

Nevertheless, the possibility to share functions or have other parties supply these functions does not mean that the university should take that opportunity. Some universities chose to manage and own most university functions themselves in order to keep control over functions that are crucial for achieving the university's goals. However, exclusive use, ownership and management also have a price for the university, at the cost of primary resources for education and research. Universities should consider these advantages and disadvantages when choosing the future campus models. In terms of management information they are looking for references of other universities to base their decisions on.

Increasingly, campus managers also consider it efficient and effective to collectively supply and manage space for some of the academic functions (Den Heijer and De Vries 2007). Under influence of both economic and sustainability developments, not frequently used expensive facilities are reconsidered in terms of exclusive use for the university. But even if the university and the other parties are willing to collaborate in supplying campus facilities, the physical setting of the campus could make it less fruitful or feasible. The short distances and high-density urban setting in the Netherlands make facility sharing in future campus-city models more feasible for Dutch campus management than in many other countries.

In literature on the campus physical and functional typologies are often mixed. Greenfield campuses, inner-city campuses, high-tech campuses and corporate campuses (Hoeger and Christiaanse 2007) differ on both physical setting and functional mix: a corporate campus can be a greenfield campus at the same time. In table 6.5 shows the typology of campuses, composed with physical and functional characteristics. Some resulting campus types are elaborated upon with some examples.

figure 6.5: required university functions in fictitious example, supplied by a network of university partners in neighbouring cities or regions

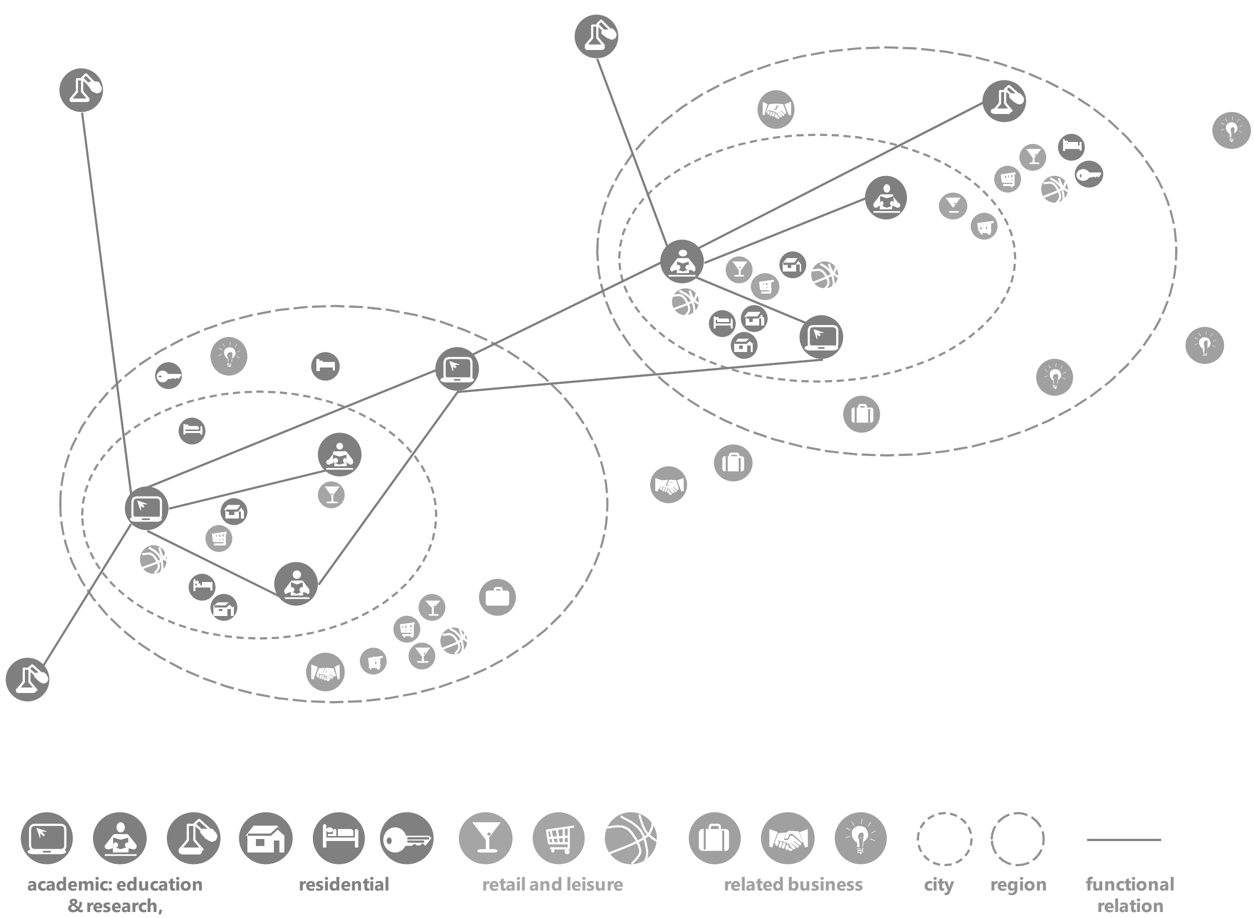
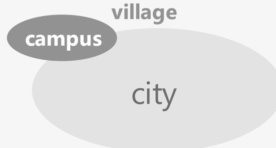
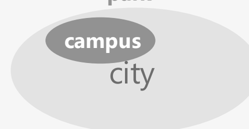
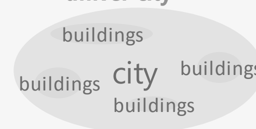
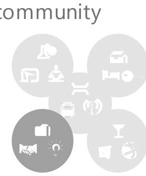


table 6.4: required university function mix, specified by campus managers and supplied and managed by university, municipality or third party

Note: data from research results "Building knowledge cities" (Den Heijer and De Vries 2007)

functions	who manages / own / uses?			similar city functions
	university	municipality	3rd party	alternative available in city? examples
ACADEMIC • EDUCATION & RESEARCH				
class rooms and studio spaces (small groups)	x			
lecture halls (large groups)	x			cinema, theater
office space academic staff	x			
office space support staff	x			
laboratories	x		x	R&D facilities of businesses
study places for individual use / small groups	x			inner city coffee bars
library	x			community library
special places for ceremonies (graduation)	x	x		city halls, churches
special conference facilities	x		x	conference center
special educational facilities (dance, media, arts)	x	x		theather, studios, musea
academic hospital			x	other hospital
medical school			x	
RESIDENTIAL				
student housing / national			x	social housing city
student housing / international – short stay	x		x	hotels or apartments
alumni housing / young potentials, creative class			x	housing supply in city
faculty housing			x	housing for expats
housing for support staff			x	housing supply in city
hotel facilities			x	hotels in city
short stay apartments for visiting professors	x		x	
RETAIL & LEISURE				
sports facilities	x		x	sport facilities in city
book stores			x	book stores in city
coffee bars	x		x	espresso bars in city
student associations and societies / fraternities			x	
restaurants (lunch)	x		x	restaurants (lunch)
restaurants (dinner)	x		x	restaurants (dinner)
bars	x		x	bars
theaters			x	theatres
jazz clubs			x	jazz clubs
cultural centre, museum	x		x	cultural centre
dry cleaning, day care centre, supermarkets			x	existing city facilities
RELATED BUSINESS				
incubators (academic spin-off)	x		x	office supply in city
R&D facilities of large companies			x	business campuses
related services (service spin-off)			x	office parks in city
business who combine learning and working			x	
artists, creative professions			x	(vacant) industrial buildings
INFRASTRUCTURE				
parking space	x	x		existing parking facilities
transport on campus (trolleys)	x			
accessibility (by car)	x	x		car transport network city
accessibility (by public transport)	x	x		public transport network city
public space (bicycles, pedestrians)	x	x		bicycle paths in city

table 6.5: typology of campuses: combining physical setting (locations) and functional mix

types of functions on campus types of communities	current location campus – city - university		
	village  outside city / "greenfield" campus	park  concentrated within city/ "gated" campus	univer-city  merged with city / "integrated" campus
academic community 	academic village campus	academic park campus	academic univer-city campus
residential community 	residential village campus	residential park campus	residential univer-city campus
socio-cultural community 	socio-cultural greenfield campus	socio-cultural park campus	socio-cultural univer-city campus
business & science community 	business & science village campus	business & science park campus	business & science univer-city campus
campus community 	campus village	campus park	campus university
business community 	business village "corporate campus" outside the city	business park "corporate campus" gated within the city	corporate city "business district" within the city

Many other sources emphasize the importance of the city for the university, acknowledging the quality of life as a key variable in the competitive advantage of the university – especially with the world as a higher education market (Tenney 2008, Hoeger and Christiaanse 2007, Worthington 2007, 2009). Worthington poses a very clear question to university board of executives: “Is the university an ivory tower or landscape for learning”. This question also includes the strategic choice: to what extent do we merge campus functions with city functions and campus users with city inhabitants? The same question can be asked for every campus function.

Worthington also states “the real value of education lies in the discourse generated by interaction” (Worthington 2009). Encouraging cross-overs between academics and businesses would be the deliberate form, but he is also referring to what happens coincidently, stimulating serendipity. He defines the learning landscape as holistic, loosely-coupled, on and off campus, formal and informal, virtual and physical.

Worthington also provides some programmatic requirements for the learning landscape:

- Traditional categories of space are becoming less meaningful as space becomes less specialized, boundaries blur and operating hours extend toward 24 hours a day, 7 days a week;
- Space types designed primarily around patterns of human interaction rather than specific needs of particular departments, disciplines or technologies;
- New space models focus on enhancing quality of life as much as on supporting the learning experience.

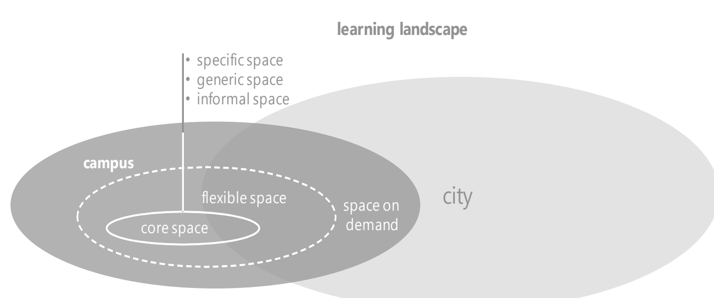
In terms of general functionality he divides the space demand in specialized, generic and informal space types. This could also be compared with designing private and public space, and anything in-between. The tendency to reduce the private space in favour of public space is also visible with universities revaluing their inner-city locations (see campus strategies in text boxes and chapter 7) many mixes populations of university and city and lowers the threshold for external users.

One of the other practical future models that Worthington suggests is distinguishing three types of space in terms of campus ownership: (1) core space, (2) flexible space and (3) space on demand, on different levels. This introduces ‘ownership’ as a variable. The mix of these three types of space depends on the uncertainties in demand and the specific, customized space demands.

It should be emphasized that ‘core’, ‘flexible’ and ‘on demand’ do not (necessarily) correspond with the three functional categories ‘specific’, ‘generic’ and ‘informal’. In figure 6.6 Worthington’s learning landscape is illustrated in relation to the city.

figure 6.6: interpretation of Worthington’s learning landscape in relation to the city

Worthington ends with the summarizing advise: (a) improve the quality of the learning experience, (b) expand academics expectations of amenity, (c) increase the range of learning settings, (d) change the paradigm: intensify the use of space and time, (e) blur boundaries – share with partners, (f) reconsider the business model, (g) maximising the value of the brand.



business & science communities – campus or technology park

"business & science community"

Over the past decades many Dutch universities started technology, science and business parks on the campus land, sometimes relatively isolated from the faculty buildings, sometimes fully integrated.

In international perspective, there are many examples of successful and less successful science and technology parks on and off-campus. MIT's first initiatives date from the 1960s and took decades to get the profile and added value that they indended in the beginning (Simha 2001, Simha 2002). This at least has a warning advise: developing a successful business park takes patience.

Another advice Simha – who was MIT's campus planner for about forty years – gives, is not to sell the land to the private parties that are involved (Simha 2007). For MIT's university park a 75-year lease contract was signed, assuring that MIT can reclaim the land for academic use in the long term (Simha 2002). Many publications have been written about university-industry interaction – in a triple helix with the government (Etzkowitz 2008)– and about clustering (ICES-KLICT 2003). Groen and Van der Sijde mention various examples and categorize them (Groen and Van der Sijde 2002). The question is: what distinguishes a business park from a business & science park: the intensity of the relationship with the university. This is usually derived from the physical presence of a university, which is no guarantee for actual interaction.

"business community"

In their book "The campus and the city" Hoeger and Christiaanse give many examples of high-tech campuses and corporate campuses, next to the greenfield and innercity campuses (Hoeger and Christiaanse 2007). As high-tech campuses they mention and describe cases like Stanford Research park in Palo Alto, USA and Otaniemi Science Park, Espoo in Finland, which are clearly related to their nearby universities. As corporate campuses they have cases like Vitra in Weil am Rhein, Germany, the nearby Novaris in Basel, Switzerland and Microsoft in Seattle. The latter are clearly 'business communities' (which does not exclude a collaborative relationship with universities).

In 2009 Buck Consultants International published a report about business and/or science campuses in the Netherlands, see map with more than fifty campuses in figure 6.7 (Buck Consultants International 2009). The fact that the ministry of Economic Affairs initiated and paid for this research indicates that they acknowledge the (potential) economic power of these campuses. What the city is worth to the university and what is the university worth to the city. The first question should be answered by the university – which is increasingly an entrepreneurial university (Etzkowitz 2008)– the second by the public authorities and the private companies that select a campus location to accommodate their business processes.

However obvious the value of the university for economic growth in a city and region is, not many publications are very explicit about the actual numbers. That lack of information – not being able to calculate the benefits – makes it very hard to justify the (necessary) investments. Adding value to employment numbers, attractiveness to employees, gross national product (GNP) or regional product. Recent TNO research supplied same data for these performance indicators (see text box on page 191).

The consumer power is another factor – especially the visitor's power to a location – with the hotels, restaurants, gas stations, shopping – retail and leisure functions they use and make feasible or possible. This switches the perspective to the city view on the 'univer-city'. From this view the university is considered a knowledge base in the knowledge city many cities want to be.

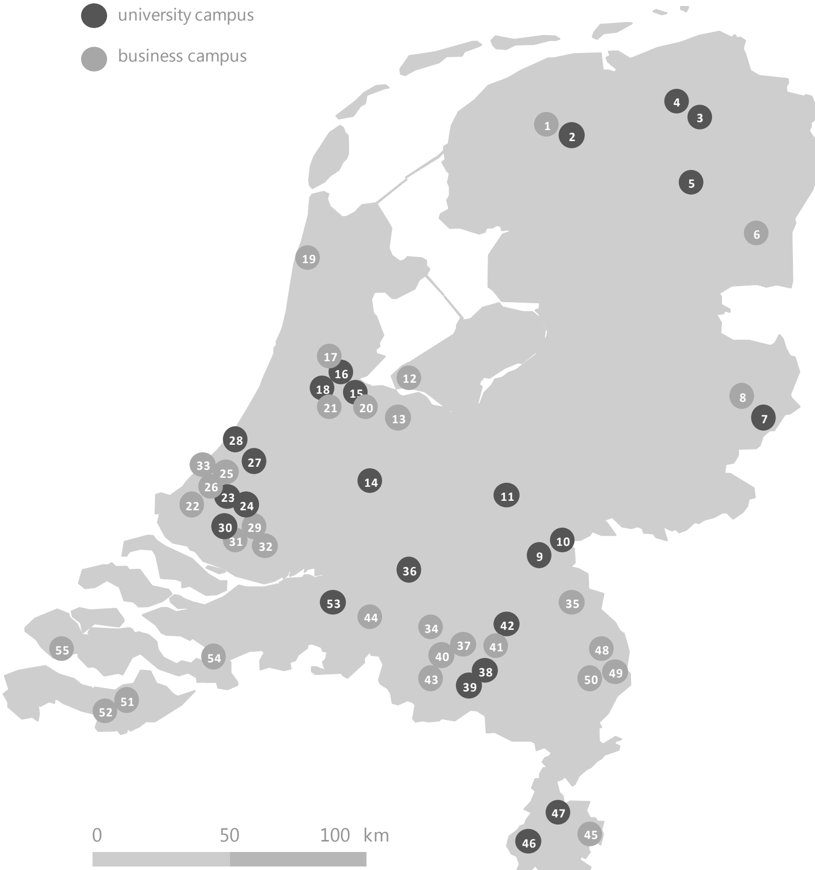


figure 6.7: more than fifty business & (applied) sciences campuses in the Netherlands (Buck Consultants International 2009 for the Ministry for Economic Affairs) edited.

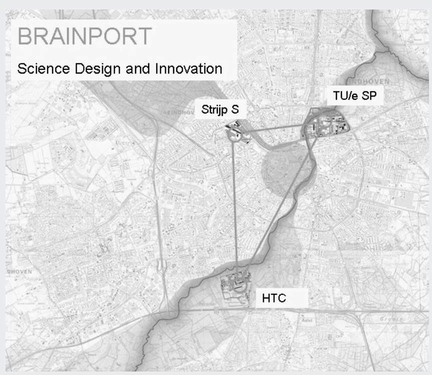
1. Kennispark Leeuwarden - Leeuwarden
2. Wetsus / Watercampus - Leeuwarden
3. UMCG Omgeving - Groningen
4. Zernike Science Park - Groningen
5. Sensor Information Parc - Assen
6. Kenniscampus Emmen - Emmen
7. Kennispark Twente - Enschede
8. Thales Campus - Hengelo
9. NXP / Novio Campus - Nijmegen
10. Universiteit Nijmegen/UMC/Mercator - Nijmegen
11. WUR Wageningen / Food Valley - Wageningen
12. Medical Trade Park - Almere
13. Mediapark - Hilversum
14. Science Park Utrecht - Utrecht
15. AMC Medical Business Park - Amsterdam
16. Science Park Watergraafsmeer - Amsterdam
17. Shell NTC / New Energy Docks - Amsterdam
18. VU Biomedical Park - Amsterdam
19. ECN Petten - Petten
20. Solvay Weesp -Weesp
21. Amsterdam Zuidas R&D - Amsterdam
22. Greenport Campus - Westland
23. TU Delft Campus - Delft
24. Technopolis (Science Port Holland) - Delft
25. ICT / Creatieve Campus Binckhorst - Den Haag
26. Technologie Park Ypenburg - Den Haag
27. Bio Science Park - Leiden
28. Space Business Park - Noordwijk
29. Biobased Campus - Rotterdam
30. Erasmus Medisch Centrum Hoboken - Rotterdam
31. Rotterdam Climate campus - Rotterdam
32. Research Business Park Schieveen - Rotterdam
33. Internationale Zone - Den Haag
34. High Med Campus - Best
35. Health Campus - Boxmeer
36. Food & Health Campus - Den Bosch
37. Design Campus Strijp S - Eindhoven
38. High Tech Campus - Eindhoven
39. TU/e Campus (sciencepark) - Eindhoven
40. Brainport Innovative Campus - Eindhoven
41. Groene Campus - Helmond
42. High Tech Automotive Campus - Helmond
43. High Med Campus – Veldhoven
44. Wijkerpoort-Tilburg
45. Euro-Avantis - Heerlen
46. Life & Science Campus - Maastricht
47. Chemelot - Sittard-Geleen
48. Greenport Campus - Venlo
49. Océ Campus - Venlo
50. Scheuten (Sunrise) Campus - Venlo
51. Bèta Campus - Terneuzen
52. Bio Park - Terneuzen
53. Logistieke Campus Breda - Breda
54. Aviolanda - Woensdrecht
55. Maritiem - Vlissingen

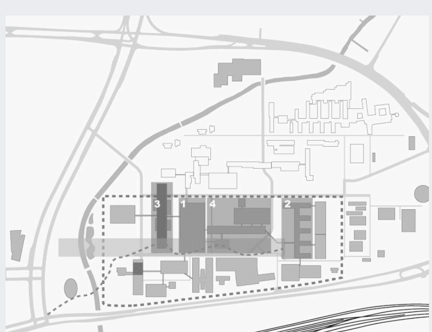
The text boxes below illustrate some successful examples – also according to the report for the Ministry for Economic Affairs (Buck Consultants 2009) – like the case of Wageningen (WUR / Food valley, 11 in figure 6.7) and various locations in Eindhoven (37-40 in figure 6.7). However, the Eindhoven case shows that the distance between university and business campus is quite long.

Future model Wageningen University & Research centre (WUR) – Campus 2020 strategy

The merger between Wageningen University and DLO – Dienst Landbouwkundig Onderzoek – formed Wageningen University & Research centre (WUR), a large institutions with many locations and buildings. With the merger an ambitious campus strategies was introduced: reducing the floor area by 30% and gradually moving all campus activities to one location Wageningen campus.

Based on WUR Campus 2020





Future model Eindhoven University of Technology (TUE) – Campus 2020 strategy

University is 'multinational in knowledge management' and competes with many other universities in this respect. An attractive and vibrant working environment along with good facilities is becoming more and more important. Campus 2020 is a four-project plan (see campus map on the right).

The quality boost of Campus 2020 must not incur any structural increase in accommodation expenses. This will be accomplished by:

1. A substantial reduction in m2 use - from 180,000 m2 ufa in 2006 to 140,000 m2 ufa in 2020 (including 10% growth tendency) – by disposal of out-of-date labs, more intensive use of education facilities and modern office concepts;

2. Facility sharing with externals (High Tech Campus laboratories);

3. Even distribution of costs of campus and facilities with third parties on campus.

The Campus 2020 vision also emphasizes TUE being part of a regional network with Philips' Strijp location and High Tech Campus (HTC) in "Brainport – Science, Design and Innovation" (see regional map on the right).

Based on sources: TUE Campus 2020

6.3.2 Models for the univer-city from city perspective

In the past ten years managing the university campus gradually changed in managing the campus as (a vital part of) a knowledge city. Publications of Perry, Wiewel, Knaap, Marlet, Van der Panne and many more offer valuable insights and best practices. One of the most applicable models for the (future) knowledge city is 'the knowledge house', see figure 6.8, that EURICUR used for their case study research on European knowledge cities (Van den Berg et al. 2005). This model identifies both foundations and activities for the knowledge city, which are elaborated upon below, describing the criteria the researchers used to score the case studies on these aspects.

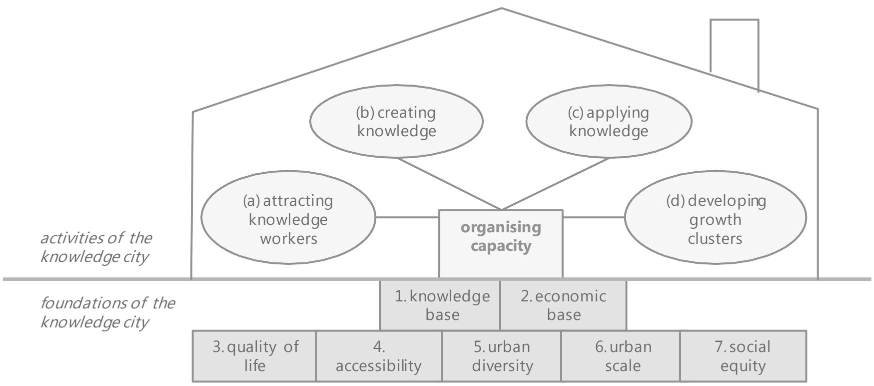


figure 6.8: The foundations and activities of a knowledge city (Van den Berg et al. 2005)

1. The knowledge base is not only determined by the number of universities and colleges, but also by the percentage of inhabitants with third level education (higher education), as potential output of the knowledge base; the knowledge base can be assessed by the quality, quantity and diversity of universities, other educational institutions and research & development activities;

2. The economic base is the potential for economic growth, expressed in number of jobs of companies in knowledge and services. It should be noted that creating jobs for people with a higher education degrees usually also creates jobs for people in supporting services. Creating innovation is a goal that links knowledge bases to economic bases. Research by Van der Panne concluded that there are limitations to the distance between the two. Results among almost 400 innovators show that local innovativeness tends to increase with the number of HEIs up to a distance ban of 35 kilometres (Van der Panne 2004). Another interesting number that adds an economic value to presence of the knowledge base was supplied by TNO research (Manshanden 2009) by order of KENCES, the Dutch knowledge centre for student housing: every student adds about € 25.000 to the urban economy (see text box).

3. Quality of life is acknowledged as a key determinant to attracting and retaining knowledge workers. Van den Berg mentions functions like high-quality housing, attractive city parks, good traffic systems and a rich variety of cultural institution. In his book about 'attractive cities' Marlet introduced an index to measure the attractiveness of a city, emphasizing the importance of culture, accessibility, safety, quality of the housing stock and available retail and leisure (Marlet 2009). However, the basis of many of these functions is a population with consuming power and preferably a creative class. This reverts to the presence of solid knowledge and economic bases, which could lead to an upward spiral to create attractive cities with quality of life if they are available, but also to a downward spiral if they are not.

Exploring the added value of a knowledge base for the urban economy

The Dutch 'knowledge complex' consists of all higher education institutions, research & development departments of companies and medical staff of hospitals. This sector employs 288.700 people, 73% of them work in one of the thirteen university cities (including the Hague). Together they represent an economic value of 14,5 billion (2005), of which 10.9 billion is in the thirteen cities. That is an average (rounded) of 25,000 euros per student. Set against the urban economy that is 37,5% of the Wageningen economy, 18,5% of the Leiden economy and 6 to 6.5% of the economies of Amsterdam and Rotterdam. These numbers represent a medium to large sector in the urban economies of the thirteen university cities.

Based on research TNO by order of KENCES (Manshanden 2009)

4. Accessibility can be assessed as international, regional and multimodal – in networks with other knowledge nodes. With good traffic systems – both for public transport and for cars – are also key to the quality of life. On top of that, digital accessibility is vital to a knowledge city

5. Urban diversity is vital to a knowledge city, but also a result of a solid knowledge base that provides jobs to both high and low incomes – and to a diversified group in terms of age.

6. Urban scale is very relevant for critical mass for a knowledge base and related functions. Van den Berg states that knowledge-intensive activities take place in medium-large and large cities. Again, the size could also be the result of these activities and the presence of a solid knowledge base.

7. Social equity is linked to the available workforce, but also to (in)equality issues that can cause a gap between groups of people. This can influence the attractiveness of a city or region, because of (the perception of) safety and security.

Activities of the knowledge city can also be described and collectively undertaken in the triple helix 'university-government-industry' (Etzkowitz 2008):

(a) Attracting knowledge workers can relate to joined strategies to attract students and knowledge workers to a certain city or region, with a guarantee of housing (to some extent). An economic base, quality of life and social equity are important foundations.

(b) Creating knowledge is not just referring to the universities – however dominant. The knowledge base can be much broader and interrelated.

(c) Applying knowledge is increasingly important, also because universities are more and more dependant on funds from industry and society. This is often a good opportunity to use the network of related businesses to either collaborate or join forces in an international network.

(d) Developing growth clusters is the step that follows logically. The presence of a business & science community, as described earlier, is an indicator that this activity has been conducted.

All criteria that are mentioned above can be seen as key performance indicators for the knowledge city and can therefore be added to the required management information for campus management. The text box on next page shows how Chicago Loop U has had a very positive effect on the city, illustrated with as many facts and figures as possible (Perry 2009).

Perry states as a conclusion (edited): "In a transformation to the "global university", there are certainly, both in the United States and around the world—in "Europe" and the "Global South"—rising expectations to make universities socially, economically and culturally 'vested': urban anchor institutions, engaged in reciprocal mutually-beneficial relations. However, and Perry agrees, it is a strong recommendation for campus management – and managers – to collect information of the perceived added value of a university for a city, to the mutually-beneficial relations of knowledge cities (univer-cities) and express them in a collective strategic investment plan to achieve the mutual goals.

Future campus models: “Chicago Loop U” – current map, data and 2012 ambitions

David Perry uses the success story of Chicago’s South Loop to illustrate the benefits. He also acknowledges that it is easy to verbally state the mutual university-city goals, but much harder to support this with facts and figures. Especially for this specific lecture he collected some data to illustrate the outcome of the last seven years of Chicago’s South Loop: about 13.000 employees are connected to the twenty colleges and universities, the area welcomes about 500.000 visitors annually, the number of students increased from 25.000 to 63.000 and the floor area from 750.000 to 1,1 million m2. The area transformed from desolate downtown area to the new anchor of Chicago development in the Loop: “a 24/7 educational corridor of the clusters in the knowledge economy”.

Perry states the economic impact of South Loop U in terms of 2012 projected ambitions to achieve: largest “campus” in the Midwest of US, top three business zones in the city, 90.000 students ten years, three times the annual visitors, double the condos and apartments. Between three and four times value of new and renovated buildings, double the floor area of developed space, anchor of full fledged cluster of the U.S. “knowledge economy”, contributing to employment in many ways.

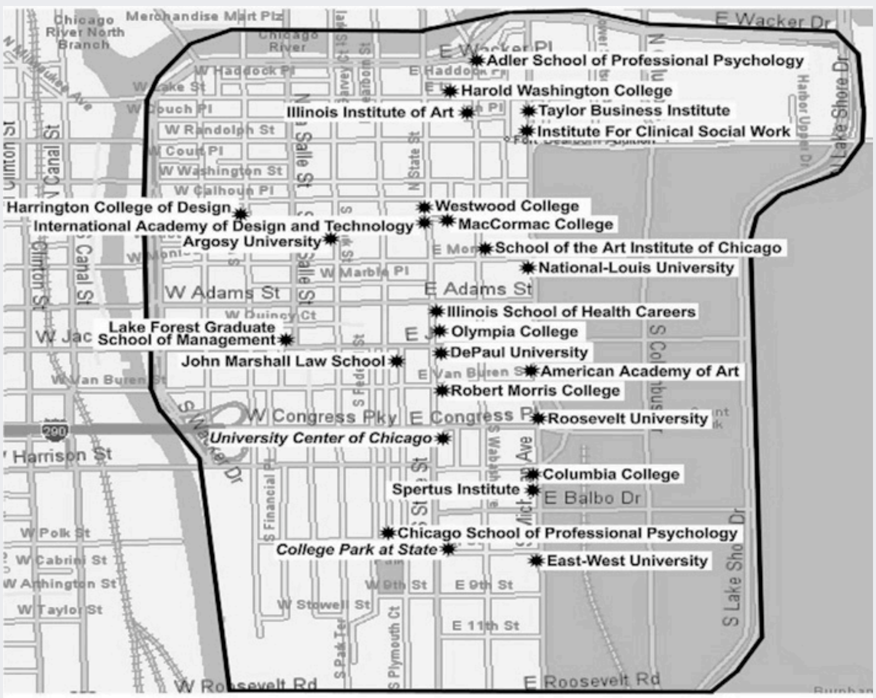


figure 6.6: map of colleges and universities in Chicago South Loop U

Sources:
- Perry, D. (2009). From Enclaves to Anchor Institutions: global universities, their cities and land. Campus of the Future, Amsterdam, June 4-5, 2009.
- Wiewel, W. and D. C. Perry (2008). Global universities and urban development, Case studies and analysis. New York, Lincoln Institute of Land Policy.

The campus-city models show that (dependent on the urban setting of the campus) supplying and managing the required university functions is not necessarily a management task of only the university. In practice collaboration with the municipality and third parties is already quite common, especially on residential, retail & leisure and related business functions: who manages, owns and uses these function?

This requires the definition of key performance indicators for the knowledge city, and measuring these KPIs for both the current situations and the preferred future model, which will be elaborated upon in chapter 8:

- number of visitors
- number of apartments for higher incomes

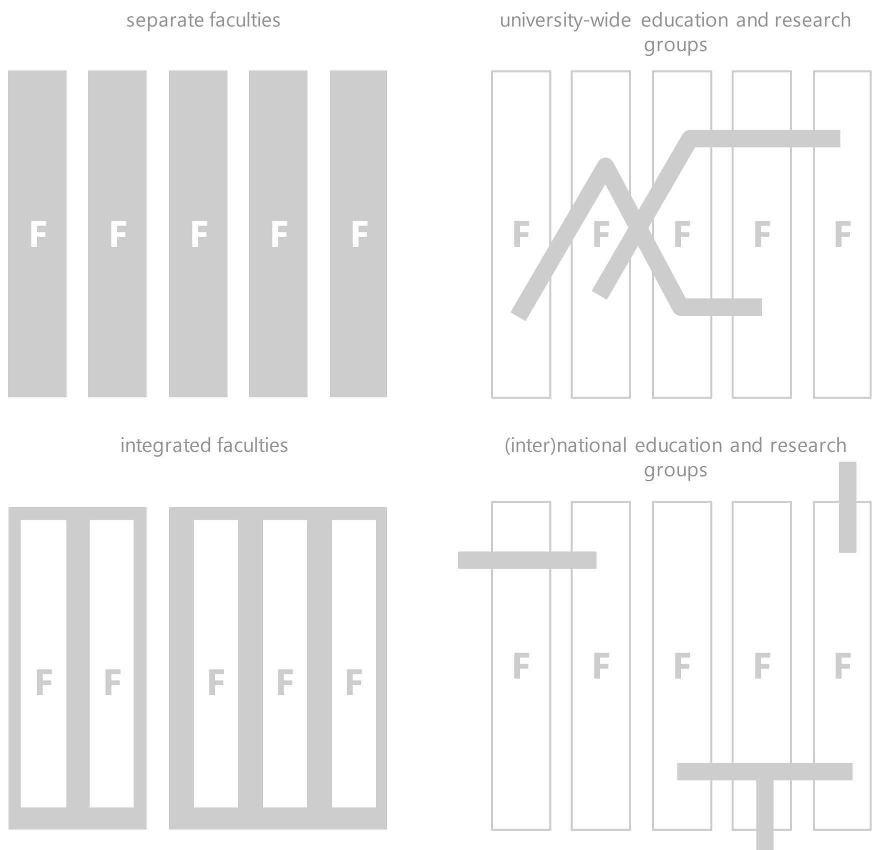
- number of student apartments / units
- percentage of students living in city / region
- total number of students in region / total inhabitants
- floor area of collective universities and colleges
- GDP in knowledge / services sector

Concluding on campus-city level, generating future models is dependent on the physical setting, the functional mix in the campus vicinity and the decisions of university and campus managers to either share facilities with related or neighbouring partners or pay for exclusive use of facilities.

6.4 Future campus-building models

Considerations to share facilities not only take place between campus and city level (zooming out), they also are increasingly relevant between campus and building level (zooming in). Even within buildings future workplace models for academic offices or studio space for students reconsider the division between individual and group level: what is individual territory and what can (or should) be shared with other sections and departments? These types of questions are posed in many universities, given the current trends and new concepts (Arkesteijn et al. 2009). These developments in future campus-building and building-place models align with developments within universities to reconsider the traditional faculty model (see figure 6.9).

figure 6.9: models for collaboration between faculties within the university (Arkesteijn et al. 2009)



Sharing more facilities between different faculties can both be a result of a new faculty model or a way to achieve a new faculty model. For instance, sharing laboratories can stimulate collaboration between researchers from different faculties. Even sharing a restaurant between two faculties can be effective to achieve this. At the same time, faculties or any kind of group within an organisation also need a critical core of their own facilities in order to have a home base with identity (Arkesteijn et al. 2009).

For future campus-building models ten space types are defined: (1) education: studio space, (2) office space, (3) education: lecture halls, (4) library space, (5) other educational facilities, (6) laboratories, (7) conference rooms, (8) restaurants, (9) retail, leisure and public space and (10) storage space. All functions can easily be shared between different organisational groups - faculties, departments, sections and individuals - but the question is to what extent.

Below, figure 6.10 shows three alternatives for the division of these space types within university buildings between university and faculty level on organisation level and campus and building on physical level.

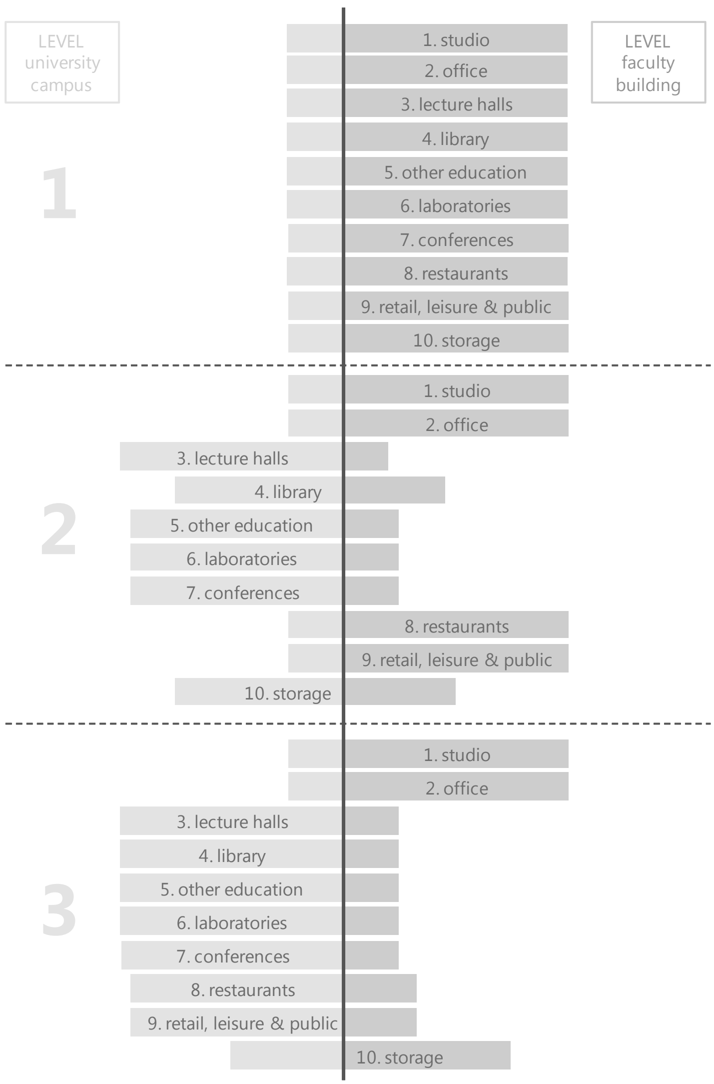
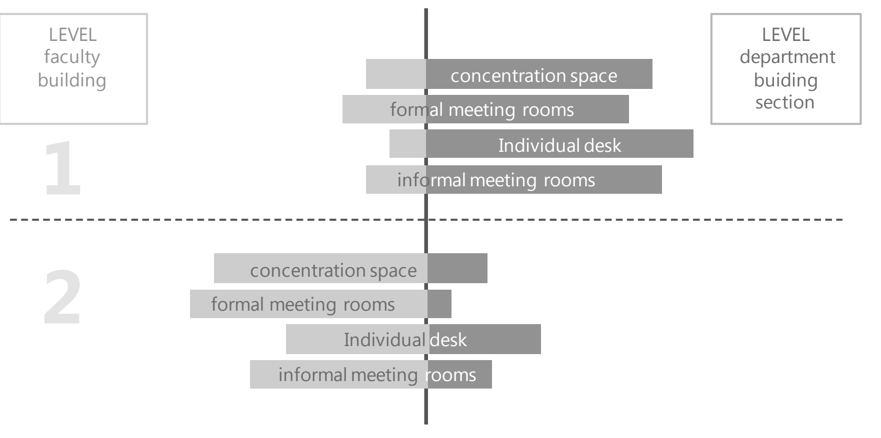


figure 6.10: three examples of dividing faculty space types between campus and building

Zooming in on one particular space type on campus - (2) office space - future models focus on the division between collective and individual space (CABE 2005; TU Delft 2009; DEGW 2009; Gorgievski et al. 2010). For instance, academic staff members can have individual territory for their workplace and meeting facilities or share these with a group of staff members - on sector, department, faculty or even university level; figure 6.11 shows two examples of this division.

For all kinds of space types future models can be composed. The first step can be to discuss what can be used collectively - on different levels - and what should be used exclusively, by a certain group or even by an individual. Organisational priorities - also driven by available resources - and the physical setting of the buildings on campus determine the choice for a particular model.

figure 6.11: two examples of future workplace models - emphasizing on individual territory (above) and on collective or shared territory (below)



6.5 Merging future campus models

The first step in composing future campus models is to decide what to share and on what level. These levels can be defined organisationally and physically. Again all CREM stakeholder perspectives are involved, because these levels also influence the campus and campus management functionally and financially. This is elaborated upon below.

sharing space – from an organisational perspective

Organisationally, the university can zoom out as far as 'global partners' to share laboratory facilities with and zoom in as far as the 'individual' student or staff member for studio space and office space. Underlying goals are usually supporting culture, stimulating collaboration or reducing the footprint. Physically, the future campus can be designed as part of a global physical network - zooming out - and as detailed as a single space within a university building.

Considerations to share facilities not only take place between campus and city level (zooming out), they also are increasingly relevant between campus and building level (zooming in). Even within buildings future workplace models for academic offices or studio space for students reconsider the division between individual and group level: what is individual territory and what can (or should) be shared with other sections and departments? Potential partners can be found for shared use, shared management or shared ownership of the required campus functions (see figure 6.12).

However, apart from the increasing availability of future models as tools, they need to be expressed in measurable and comparable variables to support decisions of campus managers on any of these models. While many future models can already be found in current practice – either in an experimental or in a tested form – analyzing recent projects and new concepts on uniform variables is essential, which has been done in the last five years and is advised to repeat periodically to follow trends and evaluate chosen solutions – to learn from successful concepts and to prevent copying less successful concepts.

The figure 6.12 gives a more general overview on levels on both demand and supply side of the future campus and figure 6.13 gives an example of what to share on what level.

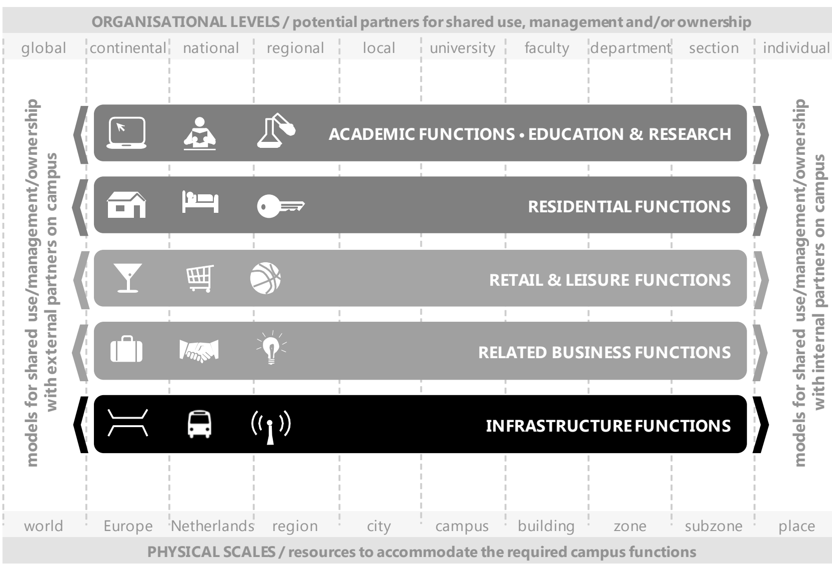
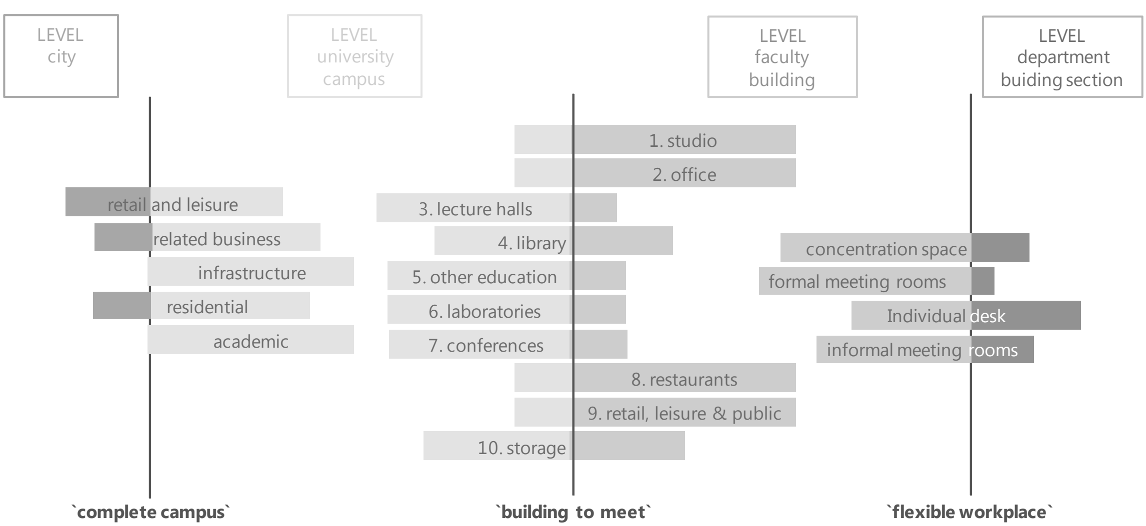


figure 6.12: an important step of composing future models is to determine what to share – in use, management and/or ownership – on what organisational level or physical scale

figure 6.13: future models on different levels combined - models for facility sharing



6.6 Conclusions about generating models for the future campus

This chapter elaborated on the following research question: "What management information is required, what management information is available and what is the demand for additional information for (III) generating future models for the campus?".

6.6.1 Collected information

B3. What management information is (a) required and (b) available and (c) what is the demand for additional information for: (task III) generating future models for the campus?

The essence of the management task 'generating future models for the campus' is finding a match between future demand and future supply, on different scales. On the supply side this includes future models for the (knowledge) city, the campus, the building and the places or functions within a building, like the workplace, lecture halls and libraries. On the demand side these models align with the changing goals and demands of the municipality, university, faculty and individual users on campus: students and (academic) staff members. For instance: physical models for the campus of the future should match organisational models for the university of the future.

In expressing demands for future models each stakeholder should be confronted with the consequences of his requirements and choices. Two examples: (1) policy maker should be confronted with the functional, financial and physical consequences of his (changed) policy on education or research, beforehand, and (2) users should be confronted with the costs of their demands, possibly in giving alternative options to spend a similar amount of resources (in salaries, lower tuition fees or extra facilities on the workplace). The goal is to generate alternative models to choose from.

While the main focus of this research is the physical university campus with its buildings, this management task "generating future models" should zoom out to the knowledge city and zoom in to the different functions within the university buildings. Consequently, required management information focuses all of these levels: (I) models for the university and campus of the future, (II) future models connecting the city and the campus – zooming out and (III) future models connecting the buildings and the places or functions – zooming in.

In all models the required information will cover the four CREM perspectives. Preferably, future models are expressed in terms of floor area, space use, underlying organisational goals and effect on financial resources.

6.6.2 Demand for additional information

The demand for additional management information on all CREM variables - floor area, number of users per m^2, resources and goals to support - follows the decisions on what to share on what level for the future campus. Ultimately, this should answer the following questions:

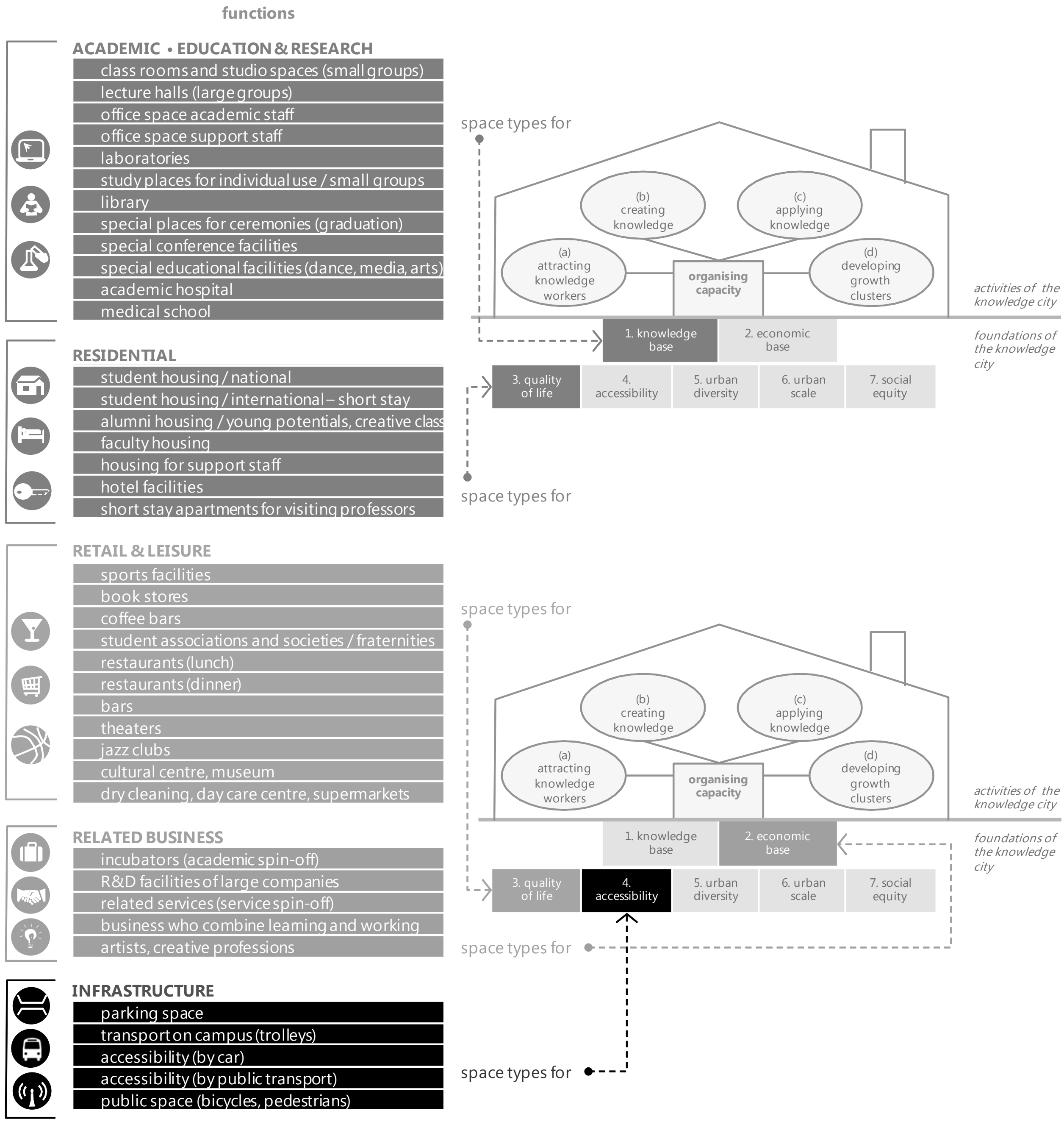
- what do policy makers want to achieve on campus, aligning with the university strategy (goals),
- for how many and what types of students and employees, also considering users of related organisations and visitors (users),
- for what percentage of the university's resources (in euro),

- with which types of concepts (users per m^2 per function),
- with what quality level (investment level, in euro per m^2)?

The next chapter will focus on defining projects to transform the current campus in the future campus and on analyzing almost forty recent projects at Dutch universities. The goal of this last management task is to generate references of relatively new concepts on all CREM variables, to answer the questions above for future various campus models. Models for the campus of the future are already tested on many current campuses. Knowledge about these new concepts will ultimately supply management information about future decisions.

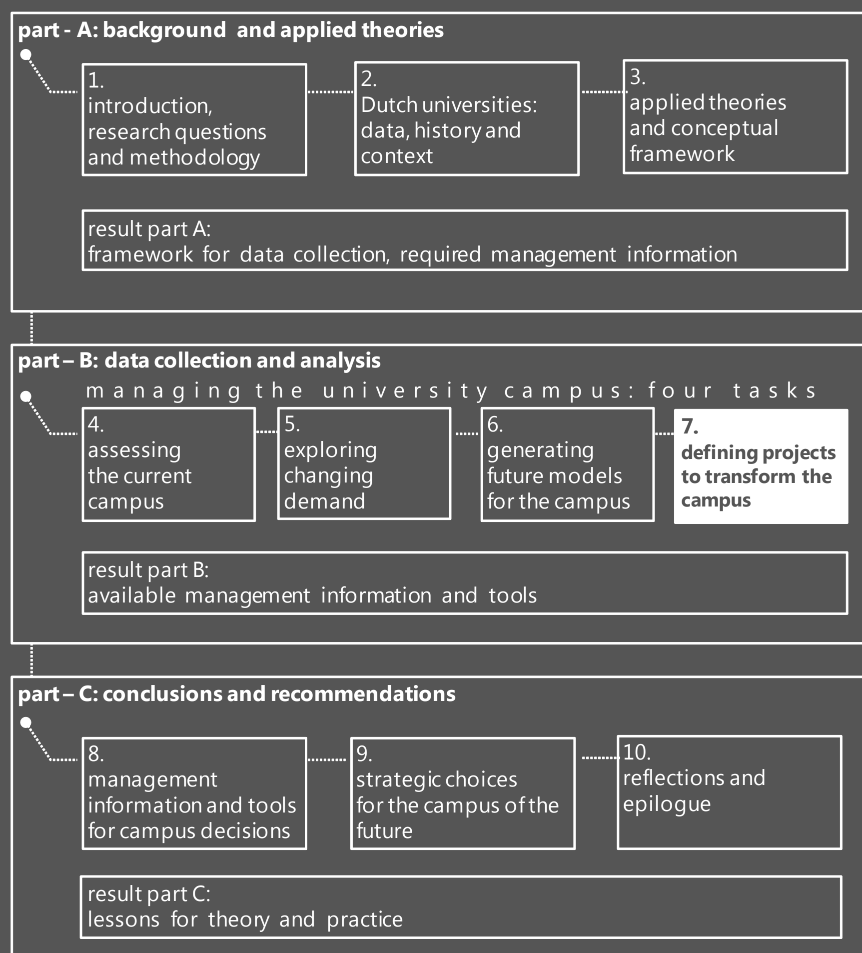
The future campus is shaped by looking at the future as well as learning from the past. Paradoxically, many of the future models can be derived from current – more experimental and innovative – project. Evaluating these projects can fill the project database that provides references for decisions about the future. This emphasizes the role of evaluation models. It also pleads for databases on new projects, which is part of the next chapter.

figure 6.14: future model of knowledge city (Van den Berg et al. 2005) linked to university function mix and space types



Mekelpark, Delft University of Technology
Photo: TU Delft

Chapter 7
Defining projects to transform the campus

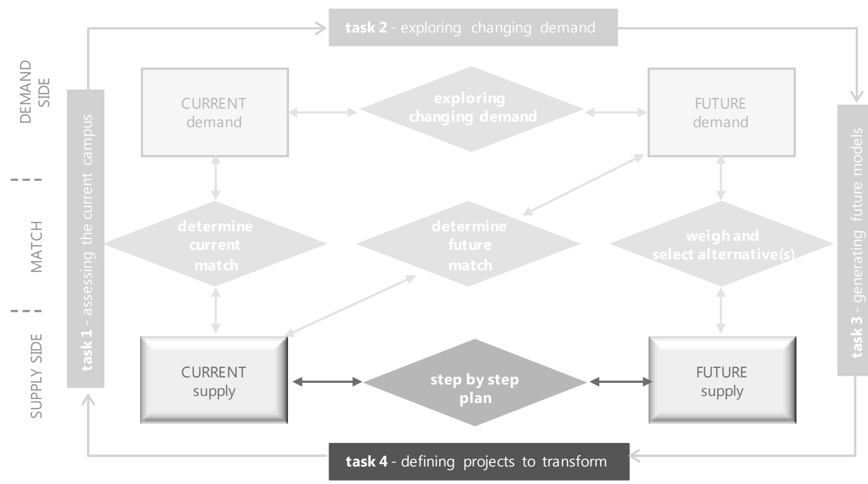


7 Defining projects to transform the campus

7.1 Introduction and required management information

This chapter focuses on the fourth management task of managing the university campus: defining projects to transform the current campus into the future campus. The following research question will be answered: "What management information is required, what management information is available and what is the demand for additional information for (IV) defining projects to transform the campus?", see figure 7.1.

figure 7.1: the fourth management task: defining projects to transform the current campus



Ideally, this task requires information about both the current campus and the future campus in the same CREM variables. In practice this step can also be taken without this information, assessing each individual project without the context of the whole campus or without a vision of the campus of the future. This distinguishes two types of project definition:

- proactively defining projects: conducting this fourth management task after the first three tasks, assessing the current campus, exploring changing demand and generating future models

- reactively defining projects: reacting on an occurring problem on the current campus, like increased student numbers, lack of resources or dissatisfaction of users

In practice, most projects start from the reactive approach (Den Heijer 2005, Den Heijer 2007b). A faculty needs more space, a new laboratory is needed to keep up with international research challenges or a building is in bad condition and needs to be refurbished or renovated.

However, most campus managers acknowledge that these projects should be assessed in terms of changing future demand (task 2) and new visions on the campus (task 3). Defining projects also means assessing them on their contribution to the future campus model, combining a reactive and a proactive approach.

While most Dutch campus managers consider the proactive approach more favourable (Den Heijer 2007a), the lack of management information can threaten its effectiveness. Without comparable data of both the current campus (after task 1) and future campus (after task 2 and 3), the proactive approach of defining projects might – in practice – still be the reactive approach due to poor management information. An example: if a university does not have a vision of the future campus – in terms of floor area of which quality and what function types (education, office, laboratories) – then how can they assess the projects to transform the campus?

7.1.1 Expressing projects in CREM variables

For both the reactive and the proactive approach, it is beneficiary to express a project in CREM variables. For the proactive approach it is necessary to connect the current with the future campus. For the reactive approach it is considered necessary (Den Heijer and De Vries 2004) to compare projects with each other, to benchmark and to learn from successful and less successful projects from the past and from other universities.

Characteristics of these projects are interesting to all campus managers. In line with CREM theory these characteristics can be sorted in physical, functional, financial and strategic aspects (see table 7.1 for examples) to align with the external and internal (types of) stakeholders involved.

As stated in the previous chapter, projects that transform the campus contain essential management information about the campus of the future. At each university new, improved concepts are tested in practice. Comparing space use and investment levels of projects with similar goals or for similar use, is highly required management information of Dutch campus managers.

table 7.1: examples of projects that transform the current campus into the future campus

current campus CHARACTERISTICS	examples PROJECTS	(required) future campus CHARACTERICS
PHYSICAL 100.000 m^2 in moderate or (very) bad condition energy use 'x' kWh / user carbon footprint in CO_2 emission	increase technical condition > 80.000 m^2 reduce ecological footprint: implement sustainable concepts goal: student works on campus	**PHYSICAL** > 80% m^2 in excellent, good or reasonable condition energy use 'x-30%' kWh / user < carbon footprint - 30 %
FUNCTIONAL 3 m^2 per student 10 m^2 per employee	add m^2 education goal: new ways of working other concept m^2 office share laboratories with related businesses and research groups	**FUNCTIONAL** > m^2 per student = m^2 per employee
FINANCIAL costs and benefits % resources spent	invest in public space and facilities, on campus and in buildings	**FINANCIAL** < costs and benefits < % resources spent
STRATEGIC place to work campus is (inter)national place to learn	add housing and facilities for international students	**STRATEGIC** place to meet campus is international place to learn and live

figure 7.2: defining a project, from changing strategic goals to functional, physical and financial consequences

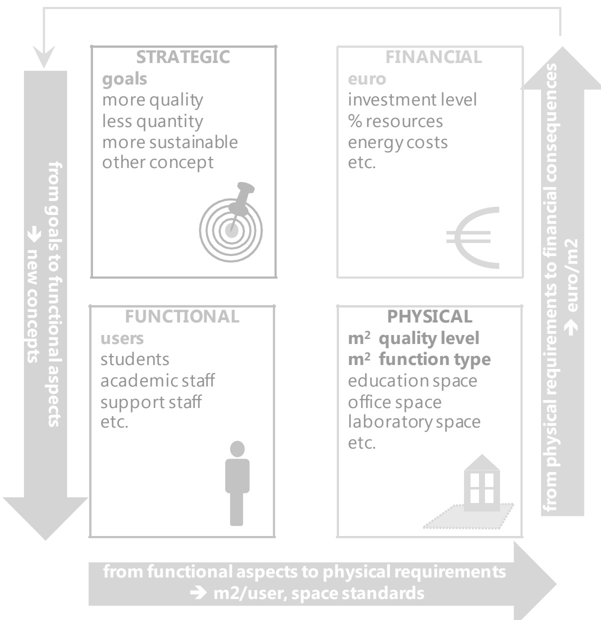
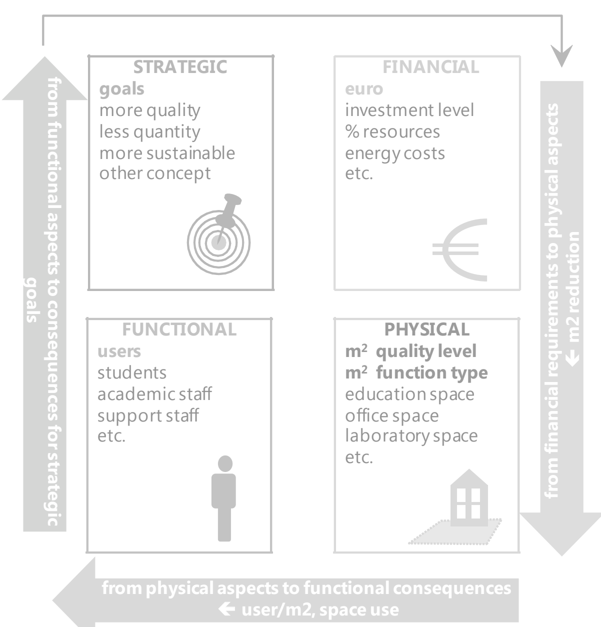


figure 7.3: defining a project, from financial problems to physical, functional or strategic consequences



Even if a campus manager just conducts task 4 – defining projects reactively, without conducting the other tasks – he needs management information about all CREM variables to define a project in a programme of requirements or brief. An example: a new home for 100 extra students and 20 extra employees needs to be expressed in m2, specified in function types with certain quality demands and completed with a matching investment level. In figure 7.2 this definition process is illustrated, including the information demand for space standards (m2 / user) and investment levels (euro / m2). While many campus managers state that the space standards and investment levels they use as management information are out-dated, their collective projects potentially contain exactly what they need: management information of new, innovative projects.

While many projects are defined as a result of changing demands or goals, another range of projects is initiated to solve financial or physical problems. Some of these projects start with the goal to reduce the total cost of ownership by reducing floor area – selling or renting out some of the buildings or merging laboratory facilities of different faculties. Others can start with a physical problems – bad condition hindering the primary processes – and have both functional and financial consequences.

However, in theory this task “defining projects” can be – and also has been – conducted without exploring the changing demand and generating models (tasks 2 and 3), but that indicates a less strategic, anticipating level of campus management.

In the past lack of reliable management information for task 2 and 3 was the main reason to skip these tasks (De Jonge 2000, Den Heijer and De Vries 2004). But over the years campus managers have professionalized their administrations to generate this information. Ironically, the management information for tasks 2 and 3 can be generated through the projects of task 4. Data of these new projects – containing new insights and innovative concepts for education and research – implicitly include components of future campus models.

Note that future campus models can be generated on different levels - city-campus, campus-building and building-function – which was illustrated in chapter 6. This also counts for the assessment of the current situation. Consequently, projects can also be defined on different levels: for the whole campus (sustainability projects), single buildings (renovation or new buildings) or certain building functions (like office space) or building parts (like extra floors).

The history of generating management information on project level is subject of the next subsection. After that the available information is described and analysed, to generate management information for this management tasks and the previous ones. Finally, the last sections conclude on both the content and the residual demand for information.

7.1.2 History of defining projects in the Netherlands

Before 1995 universities competed for public resources to finance new construction projects. Projects were judged on necessity and were assessed using standards for space use and investments levels. This budgetary system (only) required universities to define projects for increased or changed space demand without assessing the consequences on campus or exploring the future. This could lead to situations in which new faculty buildings were built while other faculty's buildings were vacant, or buildings were built for (just) a temporary increase in student numbers. The current Dutch campus still shows signs of this method, which stimulated additional buildings instead of renovating older ones.

When the Dutch government decentralized the responsibility for the campus (from January 1, 1995), the universities were responsible for both maintaining the existing campus and investing in new construction projects. This changed the way they defined and assessed their projects, being responsible for the resulting future campus.

Transferring both the ownership and the resources to the universities themselves at least gave them freedom to allocate resources. But how much to invest in what type of floor area of what quality? This was the campus management question that demanded more management information to be answered.

1993 – collecting data on thirty new projects to substantiate a funding request

The history of collecting comparative data on project level, as management information information in the Netherlands, dates from 1993. The urgency was the transfer of campus ownership to the universities and the indication that the resources for managing the campus were not sufficient to cover the necessary campus investments. The campus managers collected data of thirty recent projects at that time. They included usable floor area, the function mix and the investment level and compared the data with benchmarks that the ministry set for funding the university campus.

The figures of the newest projects at that time indicated higher investment levels than expected by the Ministry of Education, Culture & Science. In 1999 the report of the 'Commissie Koopmans' confirmed the resulting funding problems, indicating a gap between what the universities needed and what they got.

However, this collective action to generate data of thirty recent projects and the conclusion of 'Commissie Koopmans' did not lead to (much) more resources. This emphasized the need to join forces to generate management information to convince internal and external policy makers of the (increasing) costs of university projects, the higher current replacement value that should be the basis for annual reservations and the urge for more (allocated) resources for the campus (Den Heijer 2002b).

2005 – comparative analysis of 12 new university buildings

Further research in 2000, 2002 and 2004 proved that campus managers were prepared to join forces to conduct a comparative analysis of new buildings. All universities supplied data of relatively new buildings. After collecting data on three CREM variables

– floor area, investment costs and number of users and space use – the data format was completed with the organisational goals (“Why this project?”). In 2005 a report with all data, background information and many photos of the new buildings was distributed among Dutch campus managers and policy makers.

The focus on the range of values instead of the average value was a first step in clarifying the range of possibilities. For instance: the investment level of new university buildings could vary from 1200 to 2400 euros per m2 GFA (price level 2005). The goal was to explain the differences with contextual variables. At that time, the step was set towards introducing more than two variables in any comparison, from space use to costs per m^2.

2007 and 2009 – second and third round of adding new projects (total 39 projects)

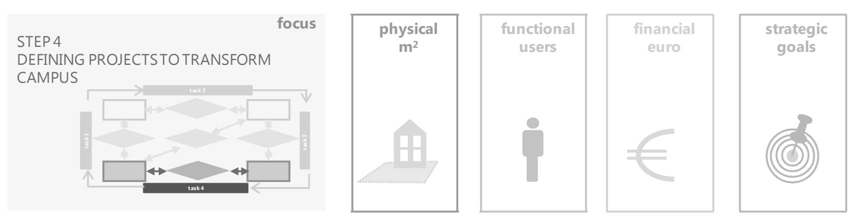
The value of the resulting management information was illustrated with the effort that campus managers put in the next two rounds to add projects to the database. In 2007 they proposed to add not just new buildings, but also refurbishments and transformations of buildings. Campus management is increasingly about renovating old university buildings, so filling a database with new buildings would not reflect campus management in practice. The disadvantage was that the database became more diverse and heterogeneous, which made it harder to compare projects. But the advantage of having a more representative mix of current projects was considered a stronger argument in discussions among campus managers.

In 2007 an extensive report described and analysed the data of 26 projects in total (Den Heijer 2007b). In 2009 thirteen more projects were added to the dataset, resulting in a total of 39 projects at the end of 2009. The resulting database of campus projects as presented in appendix II is a source of management information, not just by comparing the data of similar projects, but also by assessing the space use of all office buildings or comparing the investment levels of all new laboratories.

7.1.3 Using a database of projects to generate management information

Again, the time line – similar to the process of collecting data for “assessing the current campus” – gives insight in the increasing competence level and complexity of campus management over the years. The format that was used to collect data for the last

table 7.2: supply of management information - history of defining and assessing new projects over the years



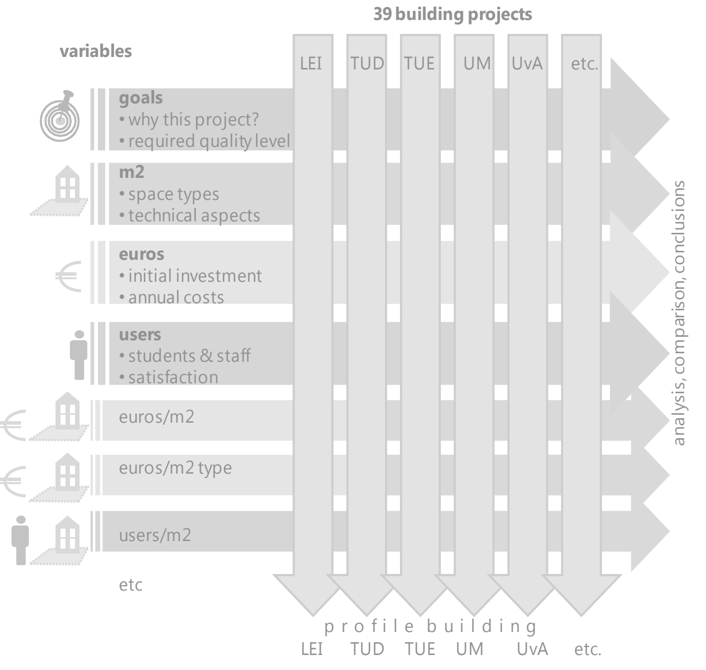
generating management information over the years, at Dutch universities	physical m²	functional users	financial euro	strategic goals
1993 – collecting data of 30 new buildings & projects	x	x	x	
2005 – first round collecting data of 12 new buildings, part I	x	x	x	
2005 – adding the organisation perspective, collecting info	x	x	x	x
2007 – second round collecting data of 14 new buildings & projects			x	x
2009 – third round, collecting data of 13 new buildings & projects	x	x	x	x

three phases of benchmarking projects will be elaborated upon in the next section. The created project database (potentially) contains answers to many questions about defining projects. Basically, there are two types of results from this project database:

- thirty-nine project profiles, with technical, functional, financial and organisational aspects that connect all four CREM stakeholder perspectives ('vertical' results, see figure 7.4);
- insights from comparing data of all projects on (combinations of) technical, functional, financial and organisational aspects ('horizontal' results in figure 7.4).

This chapter contains the results of both types of analysis. It will elaborate on project types, also related to trends and some international references in text boxes. and it will draw conclusions on the available data of specific aspects, like space use and current investment levels.

figure 7.4: the database results: thirty-nine project profiles vertically, a comparative analysis horizontally



7.2 Format for campus projects

Changing demands, new concepts and visions on the future campus are important indicators for new directions, types of decisions and campus strategy. Describing some projects per university gives a bottom-up vision on Dutch campus management, complementing the top-down view on the Dutch campus of the future of the previous management task (and chapter). For this PhD research this adds to quality standards like dependability and confirmability with another method to assure triangulation of data.

All projects are summarized in appendix II, coded with the name of the university and a number (LEI-3, TUD-2 etc.). All universities – except Open University - supplied recent projects that were described using the same CREM framework that was derived from theory in 2005. This results in thirty-nine project profiles connecting physical, functional, financial and strategic perspectives. . An extensive example can be found, in figure 7.6, which shows one of the thirty-nine recent projects that are described using this CREM framework.

The four perspectives of this project profile are explained as far as data are supplementary and different from the CREM framework for the campus profiles in chapter 4. The campus project profile contains general project info about the university, city, name of the building, project type and year of completion. Other information is linked to CREM perspectives.

Physical perspective:

- Beside the floor area and function types, technical characteristics were collected as background information (Den Heijer, 2007b). This information about materialization and construction methods is too detailed to summarize in the building profile. However, the information is available to explain differences, if necessary. Two photos also give a first impression of materialization, design quality and volume.

Functional perspective

- The number of users of the building was even harder to determine than the number of users on campus level. The brief of the building gives an indication of the expected numbers of students and staff members, but reality often differs from these number, reflecting one of the problems campus managers have: a lack of information on occupancy and frequency rates.

Financial perspective

- Construction costs and investment costs have been collected using certified standards (NEN2631).
- Of the building's costs of ownership the three largest items were identified by the campus managers – after discussions about the research and the data collection format to use (Den Heijer 2005). This concerns maintenance costs, energy costs and cleaning costs. Beforehand it should be noted that especially these costs are hard to compare, because universities used different methods to generate these data: some of them estimated the costs, some of them used the real costs as input.

Strategic perspective

- Similar to the campus profile, the quality level of the whole building was assessed, in terms of 'plain & efficient', 'effective meeting place' and 'representative landmark' and linked to a list of goals that could be supported with a campus project. Even though it is hard to give an objective value to these variables, it still gives enough explanatory information to interpret other values like investment level.

In order to increase the reliability and applicability of data, all project information was checked by the universities in various steps: (1) to verify and confirm their own dataset and (2) after presenting the data in a comparative analysis in two workshops (January 2006 and November 2007) and at two meetings of campus managers (September and November 2009).

All data was collected from the beginning of 2005 to the end of 2009. All costs are expressed in euros, price level October 2009 and can therefore be compared with projects of other universities. The indices for new office buildings – demonstrated in figure 7.5 – were used to convert investment levels of different years.

figure 7.5: construction price indices 1977-2010 (1995 = 100), price references of new office buildings (source MBK 2010)

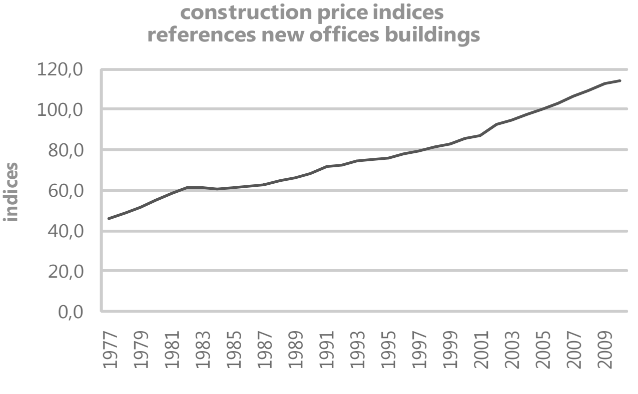


figure 7.6: Dutch campus projects, expressed in the same variables, in ascending order of investment level

	code	UU-4	TUD-3	RUG-3	RUG-2	UU-5	RUG-5
	city / university	Utrecht / UU	Delft / TUD	Groningen / RUG	Groningen / RUG	Utrecht / UU	Groningen / RUG
	project	Kruyt building	Mijnbouwstraat 120	Storage library	Education building	Drift 10	FEB offices

	project type	maintenance	renovation	extra floors	transformation office	renovation	workplace concept
	completion year	2009	2009	2006	2005	2008	2007
M2	*gfa*	49.400	13.800	3.160	1.730	1.250	10.800
USE	*office-% ufa*	27%	44%	35%	16%	83%	87%
	education-% ufa	8%	1%		76%	2%	
	specific-% ufa	47%					1%
€	*investment € / gfa*	**€ 390**	**€ 580**	**€ 660**	**€ 740**	**€ 1.340**	**€ 1.340**
GOALS	*representative* *meeting place* *plain & efficient*	plain & efficient	representative meeting place plain & efficient	meeting place plain & efficient	plain & efficient	plain & efficient	meeting place plain & efficient
	investment	**€ 19,3 million**	**€ 8,0 million**	**€ 2,1 million**	**€ 1,3 million**	**€ 1,7 million**	**€ 14,5 million**

	code	RU-1	UT-1	WU-1	UT-3	TUD-1	EUR-1
	city / university	Nijmegen / RU	Enschede / UT	Wageningen / WU	Enschede / UT	Delft / TUD	Rotterdam / EUR
	project	Gymnasion	Noord & Oosthorst	Main building Lisse	Meander	TBM faculty	J building

	project type	new building	redevelopment halls	new building	new building	n. building in 2 parts	new building
	completion year	2003	2004	2003	2007	2000	1999
M2	*gfa*	36.000	8.900	2.680	10.200	13.300	10.800
USE	*office-% ufa*	12%	7%	49%	44%	54%	34%
	education-% ufa	14%	63%			19%	28%
	specific-% ufa	23%		32%	53%		2%
€	*investment € / gfa*	**€ 1.640**	**€ 1.670**	**€ 1.770**	**€ 1.840**	**€ 1.960**	**€ 2.090**
GOALS	*representative* *meeting place* *plain & efficient*	representative meeting place plain & efficient	plain & efficient	meeting place plain & efficient	meeting place plain & efficient	meeting place plain & efficient	meeting place plain & efficient
	investment	**€ 58,7 million**	**€ 14,8 million**	**€ 4,7 million**	**€ 18,8 million**	**€ 26,0 million**	**€ 22,6 million**

	code	LEI-1	VU-2	UvA-1	TUD-2	UT-2	RUG-6
	city / university	Leiden / LEI	Amsterdam / VU	Amsterdam / UvA	Delft / TUD	Enschede / UT	Groningen / RUG
	project	Van Oort building	W&N faculty	REC E faculty	L&R extension	Westhorst	GMW education

	project type	new building	extra floors	new building	new building	redevelopment hall	new building
	completion year	1998	2008	1991	2002	2005	2008
M2	*gfa*	6.930	1.620	13.200	5.320	4.800	1.560
USE	*office-% ufa*	57%	83%	76%	63%	15%	
	education-% ufa	4%		14%	1%	16%	98%
	specific-% ufa	27%	1%	1%		65%	
€	*investment € / gfa*	**€ 2.340**	**€ 2.350**	**€ 2.370**	**€ 2.400**	**€ 2.410**	**€ 2.505**
GOALS	*representative* *meeting place* *plain & efficient*	representative meeting place plain & efficient	meeting place plain & efficient	meeting place plain & efficient	plain & efficient	plain & efficient	meeting place plain & efficient
	investment	**€ 16,2 million**	**€ 3,8 million**	**€ 31,2 million**	**€ 12,8 million**	**€ 11,5 million**	**€ 3,9 million**

note: price level October 2009, more information about each project can be found in appendix II

UM-3	UM-1	TUE-2	UM-2	WU-2	EUR-2	TUE-4	*code*	
Maastricht / UM	Maastricht / UM	Eindhoven / TUE	Maastricht / UM	Wageningen / WU	Rotterdam / EUR	Eindhoven / TUE	*city / university*	
Zwingelput 4	UNS 60 building	Vertigo, faculty BK	Bonnefantestraat 2	Rikilt building	T building	Black Box	*project*	

renovation	new building	redevelopment	renovation	new building	new building	redevelopment	*project type*	
2006	2004	2002	2005	2009	2005	2006	*completion year*	
4.770	10.700	26.000	5.000	5.650	46.100	1.730	*gfa*	M2
15%	49%	23%	67%	38%	65%	21%	*office-% ufa*	USE
77%	33%	27%	5%		17%	32%	*education-% ufa*	
	3%	29%	13%	45%	2%		*specific-% ufa*	
€ 1.375	**€ 1.400**	**€ 1.460**	**€ 1.480**	**€ 1.560**	**€ 1.570**	**€ 1.590**	*investment € / gfa*	€
meeting place **plain & efficient**	meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	**plain & efficient**	meeting place **plain & efficient**	meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	*representative* *meeting place* *plain & efficient*	GOALS
€ 6,6 million	**€ 15,1 million**	**€ 38,0 million**	**€ 7,4 million**	**€ 8,8 million**	**€ 72,5 million**	**€ 2,8 million**	*investment*	

VU-1	UvT-1	TUE-1	WU-3	EUR-3	RUG-1	RUG-4	*code*	
Amsterdam / VU	Tilburg / UvT	Eindhoven / TUE	Wageningen / WU	Rotterdam / EUR	Groningen / RUG	Groningen / RUG	*city / university*	
OZW building	Tias building	Helix	Forum building	L building	Zernikeborg	Bernoulliborg	*project*	

new building	new building	new building	new building	new building	new building	new building	*project type*	
2006	2002	1998	2007	1990	2003	2007	*completion year*	
20.100	11.100	29.900	35.300	16.600	5.200	12.000	*gfa*	M2
21%	53%	32%	18%	51%	47%	49%	*office-% ufa*	USE
52%	34%	16%	39%	15%	11%	21%	*education-% ufa*	
4%		44%	4%	0%	19%	2%	*specific-% ufa*	
€ 1.980	**€ 2.030**	**€ 2.090**	**€ 2.150**	**€ 2.180**	**€ 2.210**	**€ 2.210**	*investment € / gfa*	€
representative meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	**plain & efficient**	**representative** meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	*representative* *meeting place* *plain & efficient*	GOALS
€ 39,9 million	**€ 22,6 million**	**€ 62,5 million**	**€ 75,9 million**	**€ 36,2 million**	**€ 11,5 million**	**€ 26,5 million**	*investment*	

LEI-2	RU-2	UvA-2	UU-1	UU-2	TUE-3	UU-3	*code*	
Leiden / LEI	Nijmegen / RU	Amsterdam / UvA	Utrecht / UU	Utrecht / UU	Eindhoven / TUE	Utrecht / UU	*city / university*	
Kamerlingh Onnes	Huygens	FNWI faculty	NITG building	Hijmans van den Bergh	Spectrum	Jeanette Donker-Voet	*project*	

new + renovation	new building	new + renovation	new building	new building	new building (lab)	new building (lab)	*project type*	
2004	2006	2010	2002	2005	2002	2006	*completion year*	
20.500	50.100	70.320	16.900	14.300	7.760	6.310	*gfa*	M2
38%	41%	28%	42%	27%	6%	24%	*office-% ufa*	USE
19%	13%	14%	14%	55%	0%	3%	*education-% ufa*	
	22%	35%	28%	0%	88%	45%	*specific-% ufa*	
€ 2.630	**€ 2.650**	**€ 2.650**	**€ 2.660**	**€ 2.690**	**€ 4.070**	**€ 4.160**	*investment € / gfa*	€
representative meeting place **plain & efficient**	meeting place **plain & efficient**	meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	**representative** meeting place **plain & efficient**	**plain & efficient**	*representative* *meeting place* *plain & efficient*	GOALS
€ 53,9 million	**€ 132,7 million**	**€ 186,3 million**	**€ 44,9 million**	**€ 38,5 million**	**€ 31,5 million**	**€ 26,2 million**	*investment*	

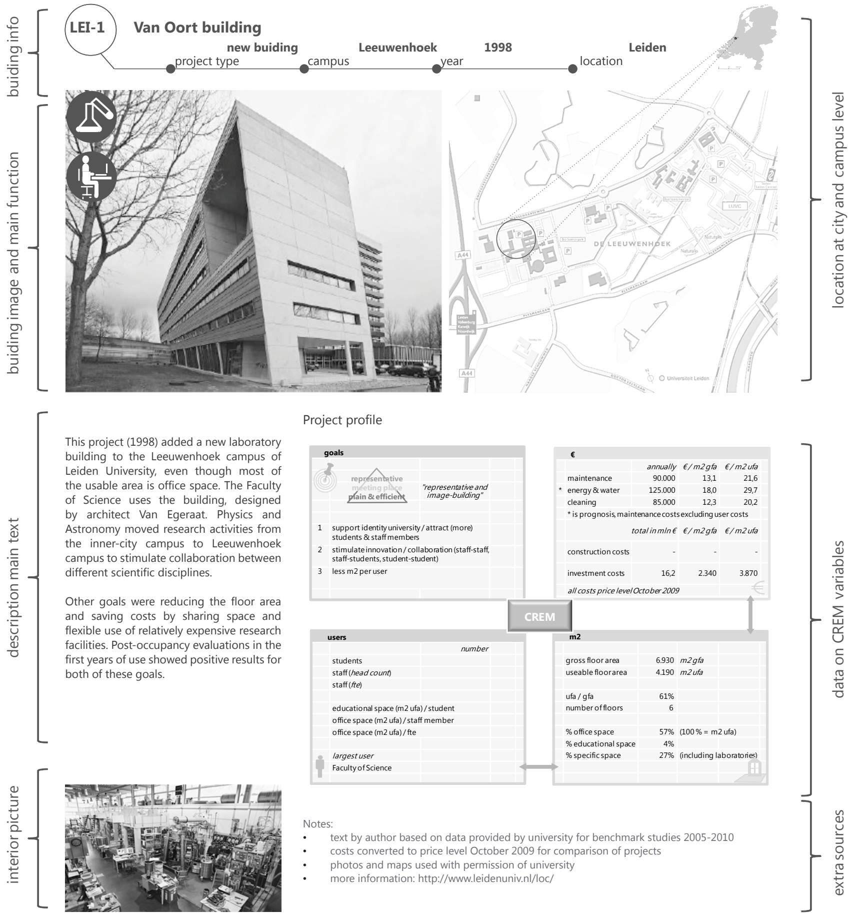


figure 7.7: example of a project profile, as shown in appendix II, with info and data on all four CREM variables

7.3 Management information from the project database

7.3.1 Using 39 project profiles as references for defining projects

Since 2005 Dutch campus managers supplied data for a project database. Anno 2010 the database contains thirty-nine projects of all types. The resulting database of campus projects is a source of management information, not just by comparing the data of similar projects, but also by assessing the space use of all buildings combining office and education space or the investment level of all new laboratories. The available information for this task supplies the demand for additional information of the previous management task, generating references for future models on different building and space types. Appendix II contains a one-page summary of each of the thirty-nine projects.

7.3.2 Analysing the database on various performance indicators

Before analysing the project data and comparing projects, it is interesting to generate some numbers from the complete project database.

General and physical aspects:

- Collectively the thirty-nine projects represent a floor area of about 620.000 m^2 gfa, which equals the complete campuses of Nijmegen (RU) and Twente (UT) together.
- Twenty-five are new buildings, covering about 70% of the total floor area of all projects. The rest of the projects relate to redevelopment, renovation, refurbishment and extra floors on existing buildings.
- The projects range in size from 1,250 m^2 (UU-5, acquisition and renovation) to 70.000 m^2 gfa (UvA-2, new building and renovation for Faculty FNWI).

Financial aspects – investments and operating costs:

- In total the thirty-nine projects add up to an investment in the Dutch campus of 1,2 billion euros (price level October 2009)
- Almost all projects have been realised in the past fifteen years – after the transfer of campus ownership to the universities - but it should be emphasized that these projects are not the complete set of new buildings and renovation projects in that period: it is a selection made by the campus managers, also based on availability of data.
- Based on the floor area and the investment the average m^2 has an investment level of almost 2000 euros per m^2 gross floor area, ranging from 390 to 4160 euros (price level October 2009). Per m^2 usable floor area the price ranges from 810 to 6800 euro; this is a number that should be related to the presumed (extra) benefits per m^2 – also adding the operating costs to the equation.
- Of almost all projects there is data available about maintenance, energy and cleaning costs are available. Some universities filled out the annual costs based on a five-year prognosis; others tried to estimate the real costs. Comparing these data is very hard because of the different methods that are used. This is even complicated by the fact that most universities are not very explicit about the price level of these costs. Nevertheless, the data per project are included in appendix II with footnotes on the method that was used.

Functional aspects – users, use and user satisfaction:

- The database contains many different buildings in terms of function mix. Some are very much like office buildings. The highest percentage of office space is 87% (RUG-5, Faculty of Economics and Business), the highest percentage of educational space is 77% (UM-3, Maastricht University College) and the highest percentage of specific space is 88% (TUE-3, Spectrum laboratory).
- Because of the difficulties that universities had met with to determine how many users are involved, it is hard to tell how many students and employees are affected by these projects. Estimations start at 60.000 students and 12.000 employees – which is the total of the numbers that were filled out – which is more than 25% of all students and employees at Dutch universities. This means that many students and staff members are affected by (radical) changes in their working environment.
- Many universities frequently measure student and employee satisfaction. Many projects have been graded by their users and assessed on functionality and climate issues. Some universities already state that they would change the brief in retrospect if they had the chance. These data cannot be compared, because the methods and techniques differ, but there are many lessons in comparing evaluations with the intended goals of the project, which were also filled out for each project and can be evaluated periodically.

Strategic aspects – goals of the projects:

- Assessing the ambition level of the projects, nine projects are categorizes as 'plain & efficient', fifteen as 'effective meeting place' and fifteen as 'representative landmark'. It should be noted that the projects are assessed, not the buildings. Sometimes 'plain & efficient' is indicated for renovation projects, even though the building is a landmark. On top of that, there are differences in perception between universities of what is 'representative' and 'sober'. Nonetheless, universities do appreciate this method as a way of indicating the ambition level that is related to the investment level.
- Indeed, the relation between ambition level and investment level is visible, but many other aspects, like the size and type of the project and the function mix (office, education and specific space) are confounding this relation.
- More conclusions can be drawn from the goals of the projects, indicated by giving priorities to the list of goals to the project managers. The top 5 goals in terms of scores are 'improving quality of space' (234), 'supporting user activities' (233), 'supporting image of university (127) and faculty (106)', 'stimulate collaboration/ innovation' (113) and 'increasing flexibility' (105). Other scores can be found in figure 7.8.
- Another frequently mentioned goal is 'accommodating growth' (67). Anno 2010 universities and campus managers indicate that they choose concepts with more efficient use of space, 'reducing the footprint' (HOI 2010). This is also notable in their campus strategies, more than in their projects. Reducing the footprint on campus level can still mean investing in quality in the residual portfolio and new projects.

Besides these generalised facts and figures about the projects it is also interesting to categorize the projects and look more closely at investment levels and space standards.

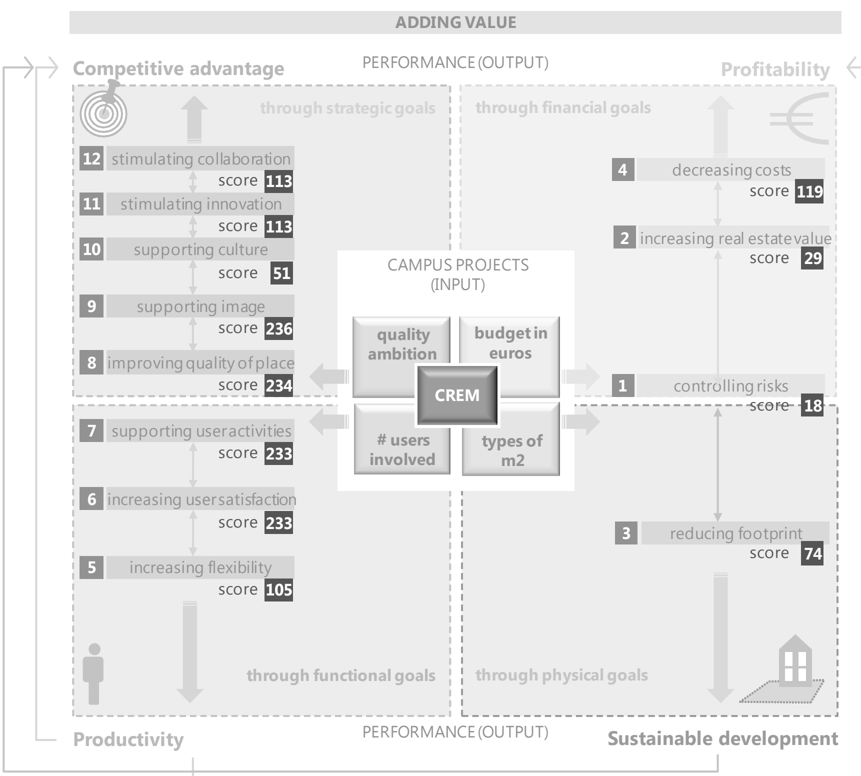


figure 7.8: goals of thirty-nine recent projects – see appendix II – prioritized by 39 respondents from 2005-2010, expressed in summarized scores, giving 9 points to 'priority 1', 8 to 'priority 2', ... , 1 point to 'priority 9'

7.4 Selections of projects to illustrate trends

In order to generate management information for the required performance indicators the next subsections all contain selections of similar projects: (1) new life for old buildings, (2) the changing academic workplace, (3) state-of-the-art laboratories, (4) new faculty buildings, (5) the flexible place to learn, including libraries and learning centres, (6) buildings for related university functions. For each selection of project the international trends, references from the database and other sources are summarized.

7.4.1 New life for old buildings

Many recent projects at the Dutch university campus can be characterised as project that create 'new life for old buildings'. A special category is reserved for cultural heritage, building that emphasize the historical value of the university. Literature on campus design refers to these buildings as historical landmarks, prominent features that sometimes have a legal definitions, because of their exceptional value and an obligation to protect and preserve (Dober 2003). Financially, the high replacement costs of historic buildings are often perceived as a burden, as literally stated in one of APPA's annual reports on Facilities Performance Indicators (APPA 2005). Many Dutch campus managers have confirmed the relatively high costs of their heritage buildings and stated that this is the main reason why these buildings are often sold (Den Heijer 2002b).

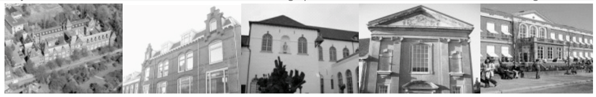
But increasingly – in global competition – these buildings are revalued for the contribution to meaningful places to study and work (Kenney et al. 2005). This is also related to their location in the city, while these buildings are most likely to be part of historical inner cities that also contribute to the quality of place. With an increasingly amount of international exchange students many universities are explicitly using these buildings as a competitive advantage, as part of the strategy to rediscover the opportunities of their inner city campuses. Nevertheless, the higher costs should be compensated by higher benefits – more production and people per m2 building and using other sources of funding. Possibilities for funding by alumni – more common at campuses in the United States – are also explored in the Netherlands.

At Dutch universities there are much more examples of reinvesting in cultural heritage, like the Agnietenkapel (UvA), Mijnbouwstraat and BK city[1] (TUD) and one of the university libraries in the inner city of Utrecht (UU). International references show many examples of universities that cherish their heritage buildings – like campus expert Richard Dober who describes and illustrates 'the contributions campus heritage can make to promote, strengthen and support institutional goals and objectives' (Dober 2005). As a strong competitive advantage for the global student and knowledge worker European universities should cultivate their history, with 'univer-cities' like Uppsala, Cambridge and Oxford as striking examples. Other examples can be found in Antwerpen – Het Brantijser in Antwerpen for their post-experience Masters (Universiteit Antwerpen 1999) – Gent and Leuven. The latter has a medieval inner-city campus. It is quite common to accommodate university colleges or post-experience Masters in these buildings, as buildings that visualize academic values, but also to balance the relatively higher costs with the benefits from higher tuition fees.

[1] BK city (the new home for TUD's Faculty of Architecture after the fire) is subject of a text box in this chapter. More background information can also be found in appendix VI.

Another trend in this category concerns universities acquiring buildings with historical value that were not previously used as university buildings. This is the case for three of the five projects of figure 7.9. Both projects of Maastricht University (UM-2 and UM-3) were previously monasteries. The project of Utrecht University (UU-5, Drift 10) was acquired and renovated, because of the adjacent university buildings and the campus strategy to invest in the inner-city campus. Utrecht University also acquired cultural

code	TUD-3	UU-5	UM-3	UM-2	LEI-2
city / university	Delft / TUD	Utrecht / UU	Maastricht / UM	Maastricht / UM	Leiden / LEI
project	Mijnbouwstraat 120	Drift 10	Zwingelput 4	Bonnefantestraat 2	Kamerlingh Onnes



		TUD-3	UU-5	UM-3	UM-2	LEI-2
	project type	renovation	renovation	renovation	renovation	new + renovation
	completion year	2009	2008	2006	2005	2004
M2	gfa	13.800	1.250	4.770	5.000	20.500
USE	office-% ufa	44%	83%	15%	67%	38%
	education-% ufa	1%	2%	77%	5%	19%
	specific-% ufa				13%	
€	investment € / gfa	**€ 580**	**€ 1.340**	**€ 1.370**	**€ 1.480**	**€ 2.630**
GOALS	representative meeting place plain & efficient	representative meeting place plain & efficient	plain & efficient	meeting place plain & efficient	plain & efficient	representative meeting place plain & efficient

figure 7.9: selection of projects "New life for old buildings" from the project database

heritage in Middelburg for their Roosevelt Academy – the first university college in the Netherlands – and an old military terrain in Utrecht for their university college, including student housing.

An interesting side effect can be the fact that users are more likely to respect the relatively fixed structure of heritage buildings, because it cannot easily be changed – in contrast with relatively new buildings with a flexible structure. Functional and technical problems can even be tolerated with a higher threshold for complaints for the same reason. This can be an extra incentive to consider reusing these types of buildings.

This project type can be summarized with the following trends for the campus of the future:

- New life for old, heritage buildings – revaluing the old instead of creating the new, also linked to sustainability goals and the trade of quantity for quality of space.
- Trade quantity for quality, towards less floor area, more intensively used, with more quality
- Reducing the footprint on campus – by reusing the old before considering the new, setting the example for a new generation
- Revaluing the inner-city campus and balancing the (extra) costs with more benefits from higher productivity or a competitive advantage

Academic model in the inner-city Utrecht University (UU) – redeveloping buildings at "Drift"

With some universities selling their inner-city buildings, Utrecht University has done the exact opposite: they have acquired property around their historical heritage, for instance in the street Drift, in the historical inner-city of Utrecht.

A project at Drift 10 was recently added to the inner city campus. In the same street they are currently renovating a building to accommodate one of their libraries (Drift 25).

Based on UU campus material

7.4.2 The changing academic workplace

Universities in many countries are experimenting with new office concepts, including a less territorial and more activity-related concept for the current activities of an academic staff member. It should be noted that the 'academic workplace' in the broadest sense does also include support staff and students. Yet, the focus in most literature on this subject is on the workplaces of professors, researchers and other academics employees, since the culture change in the working environment of these groups is potentially more rigorous and – according to sources (Pinder et al. 2009) – more vital in the current transition process of the university.

In the past decade there have been many reasons to reconsider the traditional 'single-occupancy cellular office' for academic staff, based on literature (Van der Voordt 1999; Van der Voordt 2003; Pinder et al. 2009; Strathclyde University et al. 2009) and discussions about the academic workplace with Dutch campus managers:

- the transition from specialised mono-disciplinary to multi-disciplinary, interdisciplinary, more collaborative research
- the way information and communication technology changed the activities and place independency of academic staff,
- the low occupancy rates of academic offices – also as a consequence of the ICT developments – of 15 to 20% at Dutch universities, according to Dutch campus managers and expressing the average percentage of used workplaces during the semester
- financial pressures on the resources spent on the campus, with decreasing funding for higher education in general
- carbon reduction commitments, goals to reduce the ecological footprint
- the importance of (re)build a community on campus, accommodating groups instead of individuals and stimulating physical contact (and serendipity) on the increasingly virtual campus.

The range of workplace types is illustrated in workplace research in the UK (CABE 2005; Hardy et al. 2008; Pinder et al. 2009). These types differ on territory, floor area per workplace and number of workplaces in one office: the single-occupancy cellular office, multi-occupancy cellular office, combi-office, open-plan office and non-territorial office. (Pinder et al. 2009).

Research about productivity in the office environment emphasizes that if the office is "a conduit for both knowledge creation and knowledge transfer", then offices need to allow both collaborative work and individual work to coexist without causing conflicts between the two (Haynes 2007). Fifteen years ago Becker and Steele (1995) already referred at office environments as knowledge exchange centres. The academic office

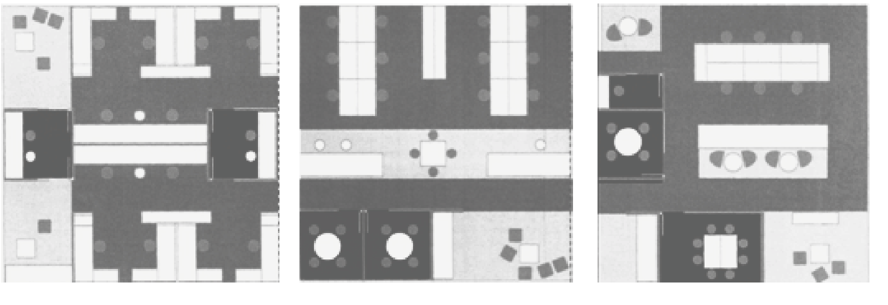


figure 7.10: three typologies of the academic office, results of research (Strathclyde University et al. 2009)

in an increasingly multidisciplinary university therefore is the ultimate knowledge transfer centre and should optimally support this. Haynes' defines office productivity as a composite of the physical environment and the behavioural environment. His research shows that the behavioural components of office productivity that have a greater effect on productivity than the physical components (Haynes 2007). This pleads for introducing strict rules and regulations for the (collective) use of any workplace environment. Supporting interaction without causing distraction is a paradox and challenge in the brief for university buildings.

Practice shows how hard it has been in the past decade to transform the traditional academic office into a more activity-related, collaborative, more interactive working environment that still allows concentrated work. Van der Voordt (1999) described two cases at Delft University of Technology, emphasizing the resistance, culture change and pride in different phases of the process and the result of smaller (still territorial) offices with more collective space to share. Projects at other (Dutch) universities show that it is easier to reduce the territorial office in size than it is to move to non-territorial concepts.

Recent projects in the database and appendix II show more efficient office concepts compared with total office space on the current campus. This can be concluded comparing the office space per staff member on campus in table 7.3 and the office space per staff member for recent projects in figure 7.11. Office space on campus ranges from about 15 m^2 usable floor area at UM to more than 30 m^2 at TUE and WU. The last figure was not reliable, because WU was in a merger with research institutes and supplied data including the extra floor area and excluding the new employees. Nevertheless, there are large differences in use of office space – historically grown or also related to the type of institution.

The figures of recent projects in figure 7.11 show – ignoring the lowest and highest value – that the average value is 15 m^2 usable floor area, with many projects below 10 m^2 per fte. However, in an evaluation of the first benchmark studies (in 2006) campus managers mentioned that the number of users of a project was hard to determine, because many projects can not be assigned to one single faculty or user group and because these numbers are very dynamic – they change rapidly. For the next benchmark study (2007) this led to a new approach: measuring the number of workplaces in combination with the floor area – the size of the workplace. These data are available for a selection of projects, shown in a chart in figure 7.12 and shown with more data about the projects in figure 7.13 to interpret the data with more background on the other variables like the size of the project, the investment level per m^2 and the quality ambition.

table 7.3: office space on campus, based on usable floor area and personnel data of 2007

office	m2/employee	m2/fte
UM	12,6	15,0
RU	12,7	15,3
VU	15,7	19,1
LEI	16,0	19,2
OU	16,5	20,0
UT	17,5	19,8
UU	18,1	22,1
UvT	18,6	23,1
UvA	19,2	23,2
RUG	20,5	24,2
TUD	21,2	24,1
EUR	23,3	27,2
TUE	28,7	31,6
WU	30,0	34,4

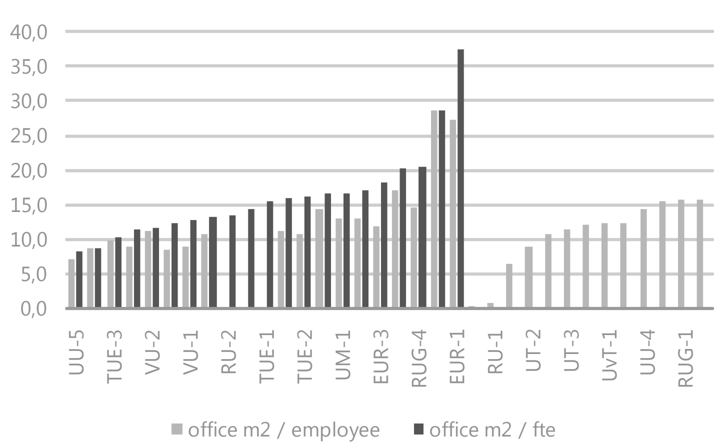
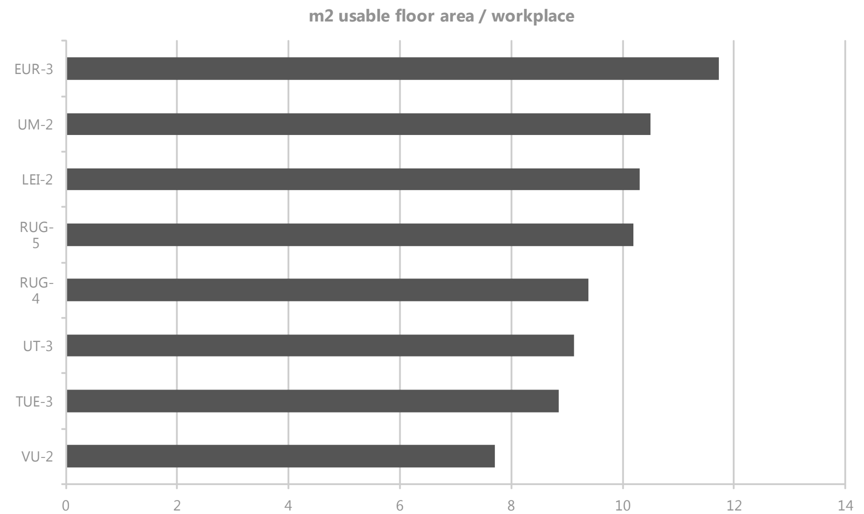


figure 7.11: available project data – office space use per employee and fte

figure 7.12: eight projects and the size of their workplaces in usable floor area



It should be noted that these workplaces –ranging from 7,7 to 11,7 m^2 usable floor area– are not specifically for academic staff, but for university staff members in general. The definition of office space as used in the charts and other figures in this section excludes non-territorial meeting space (to share between departments), but includes storage and meeting spaces in the rooms or close to the workplace. The more flexible and non-territorial the office concept, the harder it is to use the same definitions to compare different office concepts. Storage space is something to focus on, to identify how many m^2 are used as static archive in potentially usable area.

At the end of 2010 there are many initiatives to change the workplaces of academics in particular. Research by Mark Knuvers (2011, forthcoming) identified projects in Amsterdam-UvA (Faculty FNWI), Wageningen (Radix), Utrecht (Beta faculty, 380 workplaces), Amsterdam-VU (Law, 325 workplaces). TUD's BK city project with more than 450 workplaces and a non-territorial office concept for academics is introduced in one of the next subsections and described in appendix VI. In the brief of the BK city project the office concept was defined as an activity-related concept with flexible workplaces of 12 m^2 usable floor area. Evaluations at the end of 2010 show less (396) and smaller (11,1 m^2) workplaces, see appendix VI.

Expressing the office concept in number of workplaces instead of number of people to accommodate is becoming a common method when defining projects. The workforce is considered very dynamic – not just when the building is used, but also when the project is still under construction. Non-territorial office concepts are – by definition – more flexible in use and most rewarding in time, when changes in the workforce can be accommodated more easily (without moving people).

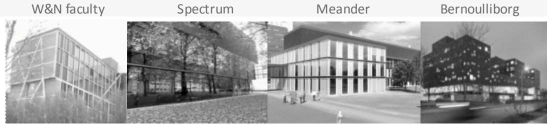
This project type can be summarized with the following trends for the campus of the future:

- Less space for individual territory and more space to share – from cellular offices that are symbolising 'cellular research' to offices to share, emphasizing the shared research agenda
- More flexible concepts are a better match for the increasingly dynamic workforce: with many guest professors, mobile workers, temporary staff and part-time employees

- Trade quantity for quality – towards less floor area, more intensively used, with more quality
- Place independency – caused by ICT developments – allows students and employees to study and work at the most meaningful places - the best place to work
- Reducing the footprint on campus – by assessing the impact of physical storage space on the usable area, the territory of people, the accommodation costs and the ecological footprint

In terms of demand for additional information more references are very welcome, including evaluations. For research, measuring the performance indicators before and after implementing the project – how is the project affecting productivity, competitive advantage, profitability and sustainable development – is important to assess effectiveness of these types of projects.

	code	VU-2	TUE-3	UT-3	RUG-4
	city / university	Amsterdam / VU	Eindhoven / TUE	Enschede / UT	Groningen / RUG
	project	W&N faculty	Spectrum	Meander	Bernoulliborg



	project type	extra floors	new building (lab)	new building	new building
	completion year	2008	2002	2007	2007
M2	gfa	1.620	7.760	10.200	11.980
USE	office-% ufa	83%	6%	44%	49%
	education-% ufa		0%		21%
	specific-% ufa	1%	88%	53%	2%
€	investment € / gfa	€ 2.350	€ 4.070	€ 1.840	€ 2.210
GOALS	representative meeting place plain & efficient	meeting place plain & efficient	representative meeting place plain & efficient	meeting place plain & efficient	representative meeting place plain & efficient
	m2 ufa / workplace	**7,7**	**8,9**	**9,1**	**9,4**

	code	RUG-5	LEI-2	UM-2	EUR-3
	city / university	Groningen / RUG	Leiden / LEI	Maastricht / UM	Rotterdam / EUR
	project	FEB offices	Kamerlingh Onnes	Bonnefantestraat 2	L building

	project type	workplace concept	new + renovation	renovation	new building
	completion year	2007	2004	2005	1990
M2	gfa	10.790	20.500	5.000	16.600
USE	office-% ufa	87%	38%	67%	51%
	education-% ufa		19%	5%	15%
	specific-% ufa	1%		13%	0%
€	investment € / gfa	€ 1.340	€ 2.630	€ 1.480	€ 2.180
GOALS	representative meeting place plain & efficient	meeting place plain & efficient	representative meeting place plain & efficient	plain & efficient	representative meeting place plain & efficient
	m2 ufa / workplace	**10,2**	**10,3**	**10,5**	**11,5**

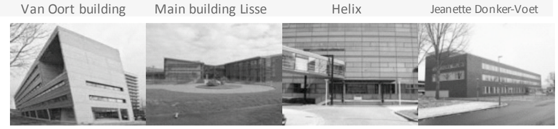
figure 7.13: selection of projects "the changing academic workplace", including their footprint per workplace

7.4.3 State-of-the-art laboratories

The laboratory spaces on the current campus are as diverse as the primary processes that they accommodate. At the same time, they are usually designed as flexible spaces, anticipating on changes in the research tasks. Literature on programming and designing laboratory space (Aalders et al. 1999; Braun and Grömling 2005) illustrates that the workplace has gradually developed from a territorial workplace with specialised facilities towards a more flexible research environment to share. As Braun and Görming state that laboratories should be based on flexible, modular elements that enable a great variety of uses and fit-outs. According to them components in chemical, biological and medical laboratories allow maximum flexibility for a large range of user. At the same time, simulation models are increasingly available to be less dependent on physical installations, which makes the traditional laboratory assistant more place independent.

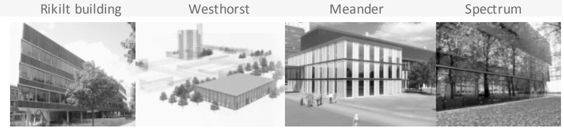
figure 7.14: selection of projects "state-of-the-art laboratories", in order of percentage specific space

		code	LEI-1	WU-1	TUE-1	UU-3
		city / university	Leiden / LEI	Wageningen / WU	Eindhoven / TUE	Utrecht / UU
		project	Van Oort building	Main building Lisse	Helix	Jeanette Donker-Voet



		project type	new building	new building	new building	new building (lab)
		completion year	1998	2003	1998	2006
M2		*gfa*	6.900	2.680	29.900	6.310
USE		*office-% ufa*	57%	49%	32%	24%
		education-% ufa	4%		16%	3%
		specific-% ufa	**27%**	**32%**	**44%**	**45%**
€		*investment € / gfa*	€ 2.335	€ 1.770	€ 2.090	€ 4.160
GOALS		*representative* *meeting place* *plain & efficient*	representative meeting place plain & efficient	meeting place plain & efficient	plain & efficient	plain & efficient

		code	WU-2	UT-2	UT-3	TUE-3
		city / university	Wageningen / WU	Enschede / UT	Enschede / UT	Eindhoven / TUE
		project	Rikilt building	Westhorst	Meander	Spectrum



		project type	new building	redevelopment hall	new building	new building (lab)
		completion year	2009	2005	2007	2002
M2		*gfa*	5.650	4.800	10.200	7.760
USE		*office-% ufa*	38%	15%	44%	6%
		education-% ufa		16%		0%
		specific-% ufa	**45%**	**65%**	**53%**	**88%**
€		*investment € / gfa*	€ 1.560	€ 2.410	€ 1.840	€ 4.070
GOALS		*representative* *meeting place* *plain & efficient*	meeting place plain & efficient	plain & efficient	meeting place plain & efficient	representative meeting place plain & efficient

The transition towards flexible use is more than welcome for type of project that can be characterised by its high investment level. In figure 7.14 a selection of references from the project database is shown, which shows investment levels up to 4.160 euros per m2 gross floor area.

The relatively high investment levels are also all the more reason to share these spaces with other universities or partners in research and development. However, the professors and researchers who use these spaces also point out the safety and security issues of shared use to the campus managers. The increased competition between universities also plays a role in their hesitations to share.

In return, the Dutch campus managers are more and more inclined – and forced by controllers and policy makers – to make sound business cases for these types of projects, while they state that costs and benefits should be balanced. Strategic misinterpretations of the potential benefits and underestimation of the costs.

International references show that private funding is no longer an exception. Research about the ‘third generation university’ (3GU) emphasizes the current transition from science-based universities towards more entrepreneurial institutions that increasingly explore the exploitation of know-how (Wissema 2009). According to Wissema this transition is a response to the fact that decreasing public funding is no longer sufficient to finance research programmes and the trend that technology-driven enterprises discontinue to carry out fundamental research themselves and are looking for collaboration with universities. The 3GU increasingly becomes part of a large network of other universities, industry and technostarters that will share the ownership, use and management of facilities.

This project type can be summarized with the following trends for the campus of the future:

- Place independency – caused by ICT developments – allows researchers to spend more time outside of the laboratory, resulting in less frequently used laboratories, with lower occupancy (capacity) and frequency rates (use in time)
- State-of-the-art laboratories can be used for branding the university – to attract talented researchers, as a competitive advantage – but making a business case should weigh costs and benefits
- Making a business case for every laboratory: the high investment level and maintenance costs should be compared to the (extra) benefits from higher productivity or a competitive advantage as a result of investments in laboratories – involving researchers in the considerations
- Partners institutions in research & development are more willing to share space use, management tasks and ownership, also caused by less favourable economic circumstances
- Trade quantity for quality – towards less floor area, more intensively used, with more quality - matching the benefits per m^2 to the costs per m^2
- Sharing laboratories with internal and external partners – shared use, ownership or management – can reduce the footprint on campus or increasing income for the university
- Less laboratory space for specific users and more multifunctional, multi-user laboratories

7.4.4 New faculty buildings

This project type “new faculty buildings” should also be related to the next project type “flexible places to learn”. Universities are reconsidering the faculty territory in favour of more campus buildings to share. Nevertheless, there is also a strong need to build faculty communities. These home bases are used to support the identity of specific user groups – making faculty products visible in public space and accommodating education and research in more and more transparent and open spaces.

For the project Faculty of the Future (Arkesteijn et al. 2009) five think tanks discussed about new models to divide different types of space between faculty buildings and the campus. The resulting models were illustrated in the previous chapter, in section 6.4 “Future campus-building models”. The projects in the database show the same trend: universities are making more efficient faculty buildings that share increasingly more functions on campus level. In figure 7.15 shows a selection of projects from the database, in chronological order.

The project database contains older buildings that were initiated to accommodate growth of specific faculties. It also includes some very large new faculty buildings from the past five years (2005-2010), accommodating large faculties or large clusters

figure 7.15: selection of projects “new faculty buildings”, in chronological order (1991-2010)

		code	UvA-1	TUD-1	TUE-2	UM-1	UU-2
		city / university	Amsterdam / UvA	Delft / TUD	Eindhoven / TUE	Maastricht / UM	Utrecht / UU
		project	REC E faculty	TBM faculty	Vertigo, faculty BK	UNS 60 building	Hijmans van den Bergh

		project type	new building	n. building in 2 parts	redevelopment	new building	new building
		completion year	**1991**	**2000**	**2002**	**2004**	**2005**
M2		*gfa*	13.200	13.300	26.000	10.700	14.300
USE		*office-% ufa*	76%	54%	23%	49%	27%
		education-% ufa	14%	19%	27%	33%	55%
		specific-% ufa	1%		29%	3%	0%
€		*investment € / gfa*	€ 2.370	€ 1.960	€ 1.460	€ 1.400	€ 2.690
GOALS		*representative* *meeting place* *plain & efficient*	meeting place **plain & efficient**	meeting place **plain & efficient**	representative meeting place **plain & efficient**	meeting place **plain & efficient**	representative meeting place **plain & efficient**

		code	EUR-2	RU-2	RUG-4	UvA-2
		city / university	Rotterdam / EUR	Nijmegen / RU	Groningen / RUG	Amsterdam / UvA
		project	T building	Huygens	Bernoulliborg	FNWI faculty

		project type	new building	new building	new building	new + renovation
		completion year	**2005**	**2006**	**2007**	**2010**
M2		*gfa*	46.100	50.100	11.980	70.320
USE		*office-% ufa*	65%	41%	49%	28%
		education-% ufa	17%	13%	21%	14%
		specific-% ufa	2%	22%	2%	35%
€		*investment € / gfa*	€ 1.570	€ 2.650	€ 2.210	€ 2.650
GOALS		*representative* *meeting place* *plain & efficient*	meeting place **plain & efficient**	meeting place **plain & efficient**	representative meeting place **plain & efficient**	meeting place **plain & efficient**

of faculties in more flexible buildings. Educational facilities like lecture halls are often shared on campus, accommodating the facilities for smaller groups in faculty buildings and making the buildings more office-like and multifunctional.

This project type can be summarized with the following trends for the campus of the future:

- Trade quantity for quality – towards less floor area, more intensively used, with more quality
- Reducing the footprint on campus – sharing more space

7.4.5 Flexible places to learn

As a reaction to developments in information and communication technology, students and staff members can work anywhere. With that development the fundament of the university, exchanging knowledge, and the basis of the campus as a market place of knowledge were challenged. To some extent this fundament and market place can be replaced with virtual models. However, many references on the changing university – as introduced in chapter 2 and 5 – highlight the importance of physical contact and social encounters as catalysts of intellectual exchange.

Many projects at the Dutch campus show evidence of universities offering more space to students on campus, moving them from their wireless workplaces anywhere to the university community on campus. Reviews of space utilization across the UK higher education estate found that utilisation rates of teaching space were often between 15% to 20% during core learning hours (Neary et al. 2010). This UK report about the transition from traditional educational space towards 'learning landscapes' describes them as 'the result of the possibilities offered by new technologies, the demands of students for more collaborative and immersive experiences and the requirements of academic staff for interdisciplinary research'. Key words are student-centred learning, greater collaboration and engagement between staff and students (Neary et al. 2010).

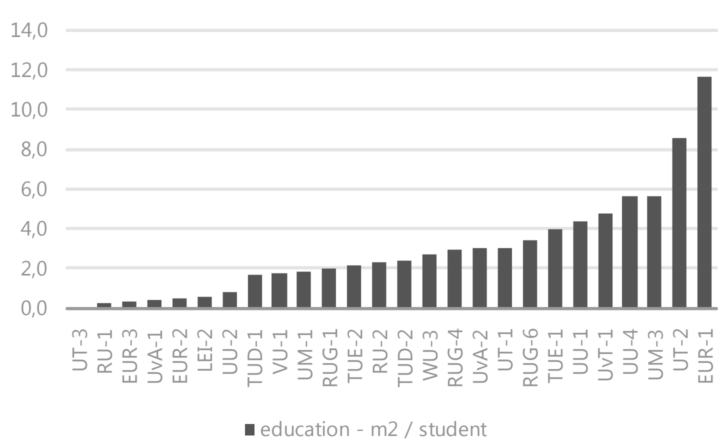


figure 7.16: project data - education space (in usable floor area) per student

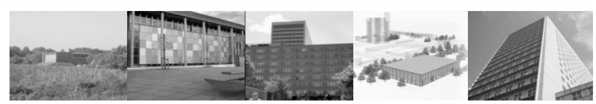
Dutch campus managers identify a trends that universities either want their students back at the university – to build community – or they are confronted with students that increasingly consider the campus their home and that want to work on campus all day long. International students have set this trend, because the campus is their home away from home: the university community is often the only social network they have in a foreign country. On top of that, the high(er) tuition fees also put more pressure on their performance and requires more discipline to study.

Recent project show higher footprints of students than the average figures on campus. This can be concluded by comparing figure 7.16 to figure 4.7 in chapter 4. While the educational space use on most Dutch campuses was lower than 2 m2 per students in 2007 – except at universities of technology (TUD, TUE and UT) and agriculture (WU) – recent projects show higher figures. The difference between the footprint of students and employees is getting smaller on campus.

Group work, better facilities (than at home) and the social needs have brought the student back to the campus, despite the ICT developments that enable them to work anywhere. Innovations like downloading lectures from iTunes University, Collegerama, YouTube and Blackboard have made content accessible from different locations, but the traditional lecture still represents a moment of shared concentration, especially at these times of distracting mailboxes, alerts and infinite sources of information. The learning landscape should inspire but also help to focus: a challenge for designers.

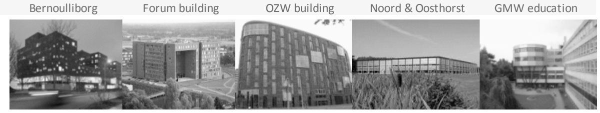
figure 7.17: selection of projects "the flexible place to learn", in order of percentage educational space

	code	RUG-3	TUD-2	EUR-3	UT-2	EUR-2
	city / university	Groningen / RUG	Delft / TUD	Rotterdam / EUR	Enschede / UT	Rotterdam / EUR
	project	Storage library	L&R extension	L building	Westhorst	T building



	project type	extra floors	new building	new building	redevelopment hall	new building
	completion year	2006	2002	1990	2005	2005
M2	*gfa*	3.160	5.320	16.600	4.800	46.100
USE	*office-% ufa*	35%	63%	51%	15%	65%
	education-% ufa		**1%**	**15%**	**16%**	**17%**
	specific-% ufa			0%	65%	2%
€	*investment € / gfa*	€ 660	€ 2.400	€ 2.180	€ 2.410	€ 1.570
GOALS	*representative* *meeting place* *plain & efficient*	meeting place plain & efficient	plain & efficient	representative meeting place plain & efficient	plain & efficient	representative meeting place plain & efficient

	code	RUG-4	WU-3	VU-1	UT-1	RUG-6
	city / university	Groningen / RUG	Wageningen / WU	Amsterdam / VU	Enschede / UT	Groningen / RUG
	project	Bernoulliborg	Forum building	OZW building	Noord & Oosthorst	GMW education



	project type	new building	new building	new building	redevelopment halls	new building
	completion year	2007	2007	2006	2004	2008
M2	*gfa*	11.980	35.300	20.100	8.900	1.560
USE	*office-% ufa*	49%	18%	21%	7%	
	education-% ufa	**21%**	**39%**	**52%**	**63%**	**98%**
	specific-% ufa	2%	4%	4%		
€	*investment € / gfa*	€ 2.210	€ 2.150	€ 1.980	€ 1.670	€ 2.505
GOALS	*representative* *meeting place* *plain & efficient*	representative meeting place plain & efficient	representative meeting place plain & efficient	representative meeting place plain & efficient	plain & efficient	meeting place plain & efficient

Many projects represent some form of flexible learning landscape, balancing the place to meet with the place to concentrate. In figure 7.17 ten recent projects are selected, in order of percentage education space. Many of these buildings have multiple user groups or are flexible for other types or use.

Storage space is an important issue in the learning landscape, since physical storage determines territory in an academic working environment. This pleads for more digital storage and the use of more electronic media. Individual physical libraries of students and staff will increasingly be replaced by online and physical libraries to share. This will also save valuable usable space in the working environment. Libraries of books are becoming learning centres with many digital sources. Libraries has transformed info a learning landscapes where students find a relatively silent place to study. Many references show examples: university libraries – especially the recently built and renovated ones in Utrecht – learning centres like at Glasgow Caledonian University and the many virtual knowledge centres of universities.

This project type can be summarized with the following trends for the campus of the future:

- More workplaces to share for students – making the difference between the workplace for employees and the workplace for students smaller and smaller, and making them exchangeable
- Trade quantity for quality – towards less floor area, more intensively used, with more quality
- Place independency – caused by ICT developments – allows students and employees to study and work at the most meaningful places – choosing best place to work for each activity
- Reducing the footprint on campus – sharing meaningful workplaces with many users

7.4.6 Expanding the campus: accommodating related university functions

Finally, the sixth project type that represents another trending topic on the university campus is accommodating related university functions. The previous chapter about future campus models already introduced five function types on campus: academic, residential, retail & leisure, related business and infrastructure. The selection in figure 7.18 contains recent examples in order of size.

The selection shows buildings that accommodate a science & design museum, incubators and start-ups (TUD-3), related businesses like TNO (UU-1) and ICT facilities (RUG-1), sports facilities (RU-1), café and cinema functions (TUE-4) and post-experience Master programmes and business schools like Rotterdam School of Management (EUR-1) and TiasNimbas (UvT-1).

figure 7.18: selection of projects "accommodating related functions", in order of size (m^2 gfa)

code	TUE-4	RUG-1	EUR-1	UvT-1
city / university	Eindhoven / TUE	Groningen / RUG	Rotterdam / EUR	Tilburg / UvT
project	Black Box	Zernikeborg	J building	Tias building
				
project type	redevelopment	new building	new building	new building
completion year	2006	2003	1999	2002
M2 gfa	**1.730**	**5.200**	**10.800**	**11.100**
USE office-% ufa	21%	47%	34%	53%
education-% ufa	32%	11%	28%	34%
specific-% ufa		19%	2%	
€ investment € / gfa	€ 1.590	€ 2.210	€ 2.090	€ 2.030
GOALS representative / meeting place / plain & efficient	representative / meeting place / plain & efficient	representative / meeting place / plain & efficient	meeting place / plain & efficient	representative / meeting place / plain & efficient

code	TUD-3	UU-1	RU-1
city / university	Delft / TUD	Utrecht / UU	Nijmegen / RU
project	Mijnbouwstraat 120	NITG building	Gymnasion
			
project type	renovation	new building	new building
completion year	2009	2002	2003
M2 gfa	**13.800**	**16.900**	**36.000**
USE office-% ufa	44%	42%	12%
education-% ufa	1%	14%	14%
specific-% ufa		28%	23%
€ investment € / gfa	€ 580	€ 2.660	€ 1.640
GOALS representative / meeting place / plain & efficient	representative / meeting place / plain & efficient	representative / meeting place / plain & efficient	representative / meeting place / plain & efficient

Based on questionnaires in 2007 and current campus strategies of Dutch universities, the following trends can be identified for each of the five functions, also summarizing other project types.

icons trends

Laboratories are more likely to be shared with other universities and related businesses, like TNO. Sharing these facilities is not limited to use: they also share ownership and management tasks.

Learning centres and knowledge centres are replacing the traditional libraries. Storage space for physical books is replaced by electronic sources and places to study in silence.

Lecture halls are increasingly shared by many different users, including external users, located more centrally and facilitated for working with many laptops. However, the fact that users can also use their laptops and smart phones to communicate about other things than the content of the lecture, calls for more ICT rules during lectures (and meetings).

Partners institutions in higher education and related businesses are willing to share space use, management tasks and ownership, also caused by less favourable economic circumstances. The limited resources and sustainability goals stimulate creative solutions to collaborate

Available (student) housing has become vital for the competitive advantage of university – especially for international students who do not have an alternative when they start studying. All Dutch universities are increasingly taking that responsibility and collaborate with student housing associations.

Retail & leisure will safeguard quality of life, as a vital foundation for a successful knowledge city. Sports facilities are space consuming on campus, which stimulates shared use with other parties – also to generate more income for the university. These types of functions also encourage evening and weekend use of the campus.

Espresso bars are popular at every Dutch university, following the successful trend at many international campuses and university cities. With the increased use of the espresso bar on campus and in the city – not just for having coffee, but also for informal meetings, collaborative work and individual work with laptop and wireless internet – these types of spaces have become an extended home, campus, office and place for social networking, and a relatively cheap one for the individual knowledge worker. The daily costs of this workplace for the individual user equal the price of some cappuccinos and lunch. The non-territorial aspects and the public character that encourages social encounters and enables serendipity, make this type of public space a key element in considerations about the campus of the future.

Infrastructure is connecting all functions and becomes increasingly important, including accessibility and parking. Most Dutch universities either have or are considering a system of paid parking.

All related functions contribute to transforming the campus into a city: multi-functional, with different users, many visitors and used day and night, also in weekends. Practice shows that by lack of other social networks, international students and professors are more dependent on their university networks and more likely to stay close to the campus functions after working hours. Facilitating these groups with more – differentiated, not necessarily larger – functions can emphasize the international character of the university community or highlight the local culture. All retail & leisure functions can add to creating more quality of place and provide knowledge workers with meaningful places that they will make their temporary home. This is summarized in the following statements:

- The campus is (becoming) a city:

  - strategically: the campus has become a market place in knowledge
  - financially: the campus should have a higher floor productivity (more users, output per m^2)
  - physically: less private space (individual territory) and more public space
  - functionally: less mono-functional and more multi-functional space (to intensify space use)

- The campus with all its functions is increasingly used for branding the university

In chapter 9 the strategic choices for all five function types – academic, residential, retail & leisure, related businesses and infrastructure – are summarized in five figures.

7.4.7 BK city as a special project

The project to relocate TU Delft's Faculty of Architecture has the characteristics of four of the previous project types: new life for old buildings, the changing academic workplace, a new faculty building and a flexible place to study. The text box next pages describes the project with background information about the process and the brief that it was based on.

The BK city project is elaborated in appendix VI and can be summarized with the following trends for the campus of the future:

- Trade quantity for quality – towards less floor area, more intensively used, with more quality - matching the benefits per m2 to the costs per m2
- Less space for individual territory and more space to share
- Trade quantity for quality – towards less floor area, more intensively used, with more quality
- Place independency – caused by ICT developments – allows students and employees to study and work at the most meaningful places - the best place to work for every activity
- New life for old, heritage buildings – revaluing the old instead of creating the new, also linked to sustainability goals and the trade of quantity for quality of space.
- Reducing the footprint on campus – setting the example for a new generation
- The campus and university buildings should be designed as cities:
  - strategically: the campus has become a market place in knowledge
  - financially: the campus should have a higher floor productivity (more users, output per m^2)
  - physically: less private space (individual territory) and more public space
  - functionally: less mono-functional and more multi-functional space (to intensify space use)
- The university building is used for branding the faculty and university
- Public space was very important in connecting all functions and creating a lively 'city'

Project that shaped the future campus at Delft University of Technology - BK city realised under pressure

On Tuesday May 13, 2008 a huge fire did not just destroy an iconic building and a place of work for more than three thousand of students and more than thousand staff members: an entire community lost its home. Luckily, the building was evacuated very fast and everybody got out safely.

The faculty library was saved, but the fire destroyed the individual and group libraries of professors and researchers, as well as valuable collections and irreplaceable art that individual staff members had brought to their workplaces over the years.

On top of that, many students and staff lost their work in progress, at least that part that could not be – or was not – saved digitally. This disaster was unprecedented in its kind, on that scale, in the Netherlands.

In the process that followed in the year after, theories on adding value could be applied on the series of solutions that were found to accommodate both students and staff members of the Faculty of Architecture:

- from May 13, 2008: at home, working close to emergency meeting point at the Aula and at individual workplaces with colleagues from other faculties
- from May 19, 2008: in tents, at home and scattered all over the campus, in other faculty buildings, staff members with new laptops and company cell phones
- from September 1, 2008: partly in the completely refurbished monumental building, referred at as BK city
- from November 3, 2008: practically all faculty members reunited at BK city
- from May 13, 2009: all faculty functions fully operational at BK city (including the additional glass houses that accommodate the workshops, modelling facilities, exhibition space and more studio space for students)

In one day the faculty lost many resources that are crucial for the faculty's performance: information sources, technology – computers, phones etc. – and a building where people could meet.

Literature and prior research for other universities already indicated that the campus has become the place to meet - next to the place to work. In Delft the situation in the months after the fire proved that the place to work on campus could easily be replaced with a workplace at home, at another faculty building or even in a tent, but the place to meet was much harder to replace. However, the place to meet and place to work are closely related. Most people do not come to campus just 'to meet', if their workplace is elsewhere and they do not have any other reason to be on campus. A meeting place is only functional in the vicinity of activities of staff or students. The tents worked as a meeting place for students – because they also worked in tents – but much less as a meeting place for staff members, because they worked elsewhere.

In the months after the fire, the staff members indicated that they really suffered from not seeing their own colleagues. The social function of the university campus was confirmed in this situation. In this case, the loneliness of some of the researchers was even worse, due to all the research material they lost in the fire and the support of colleagues they needed to get over their individual and collective loss.

The dean was clear about that from the first week: we want to find a 'new' building that can accommodate the whole faculty: for community building socially and more importantly, to emphasize the collective power of the faculty's multidisciplinary sciences.

The completely refurbished building at Julianalaan - BK city – did not only serve as a new building to work and meet, but also as a laboratory for the faculty's range of disciplines: interior design, construction, acoustics, construction management, glass constructions, new ways of working and learning and the newest insights of the campus of the future. The added value in terms of competitive advantage – also caused by the media attention – can be measured by the many new students and very enthusiastic visitors since September 2008. Student enrolment in the year 2008/2009 and 2009/2010 shows double-digit growth percentages in first year students. And even though the economic recession has had an impact from the fall of 2008, this could not have influenced the 2008/2009 numbers. According to faculty policy makers, the rise in 2009/2010 can partly be explained by the attractiveness of the new learning environment. However, this can not be considered as hard evidence. In the same period figures at other TU Delft faculties also showed growth in enrolment. This confirms how hard it is to relate changes in performance to real estate interventions.

In this renewed faculty building, the new ways of working introduced another experiment with potential effect on the faculty's performance. While the difference in performance is hard to measure – due to the many changes in the new situation after the fire – the new, more flexible and activity-related working environment has great impact on the academic workplace. Questionnaires after three months indicated (Risbo 2009) that many academics still had to get used to the flexible offices and were dissatisfied about the storage space, acoustics and the safety of the workplaces. However, they were very proud of the whole building and satisfied with the new place to meet, reuniting them with both the students and their colleagues.

From March 2008 a new phase started of solving the acoustics problem, allowing people to add more material – photos, research work, models – to their working zones to improve the image and show the identity of the group territory. Gradually, the faculty's new home is mirroring the values of the different departments and groups. The faculty is on a smaller footprint than in the old building, but with more quality of space and furniture.

The added value of a working environment – both negatively and positively – rarely found a more eloquent example. In the coming years more evaluations will follow, generating more management information for both Delft and other universities.

sources:

- RISBO report 2009, the first evaluation of the new working environment (in Dutch)
- Gorgijevski, M. et al., "After the fire. New ways of working in an academic setting" in Facilities, 2010
- Interviews with various users in B-nieuws, the faculty magazine
- Den Heijer, A.C. "The Making of BK city – a laboratory for a faculty of architecture" in Architecture Annual 200/2008, 010 Publishers, June 2009
- Ten articles Den Heijer & Cruyen in Facility Management Magazine (2008/2009)
- more information: www.bk.tudelft.nl/bkcity

7.5 Conclusions about defining projects to transform the campus

7.5.1 Collected information

Apart from describing the project database, this chapter also highlighted project types that characterize current Dutch campus management, identifying the trends, the input data on all four CREM variables and intended campus goals (adding value). Nonetheless, there should be more attention for evaluations of the projects: (how) did these projects actually add value and contribute to the performance?. Making a business case at the start of the project (ex ante) and evaluating the project periodically afterwards (ex post) would be highly recommended, also based on the reactions of campus managers on the project database. All trends will be summarized in chapter 9, introducing the strategic choices and recommendations for the campus of the future.

7.5.2 Demand for additional information

This chapter elaborated on the following research question: (B4) "What management information is required, what management information is available and what is the demand for additional information for (IV) defining projects to transform the campus?".

add more projects on innovative concepts

The enthusiasm about the applicability of the database as management information for campus decisions has led to periodically adding new projects to the database, preferably on current trends like implementing sustainable concepts and new concepts for the academic workplace. The new inventory of projects is scheduled in 2011. With more projects, more management information can be generated on new space standards, new concepts and better sense of current replacement costs of the campus buildings, derived from the range of investment levels related to project types and quality levels.

improve reliability of data

Even after two feedback loops, improving the reliability of the data is still an important issue. The data on physical aspects are most reliable; the use of a similar system for registration of space types is recommended to compare space standards for office space and educational space that are most wanted by campus managers. The reliability of financial data can be derived from sources related to the annual financial reports. Building a collective set of references can reduce subjectivity in perception of quality. The project database is a first step in this process.

add more reliable data on users involved

However, adding reliable data about the number of users involved can generate much more management information, for instance about current space standards (users per m^2, types of m^2 per types of users). An alternative solution is collecting more data on capacity of spaces, to generate design standards for office and study workplaces, in m^2 per unit. This can also be input for tools to calculate future space demand, to explore scenarios for changing demand.

add evaluation data

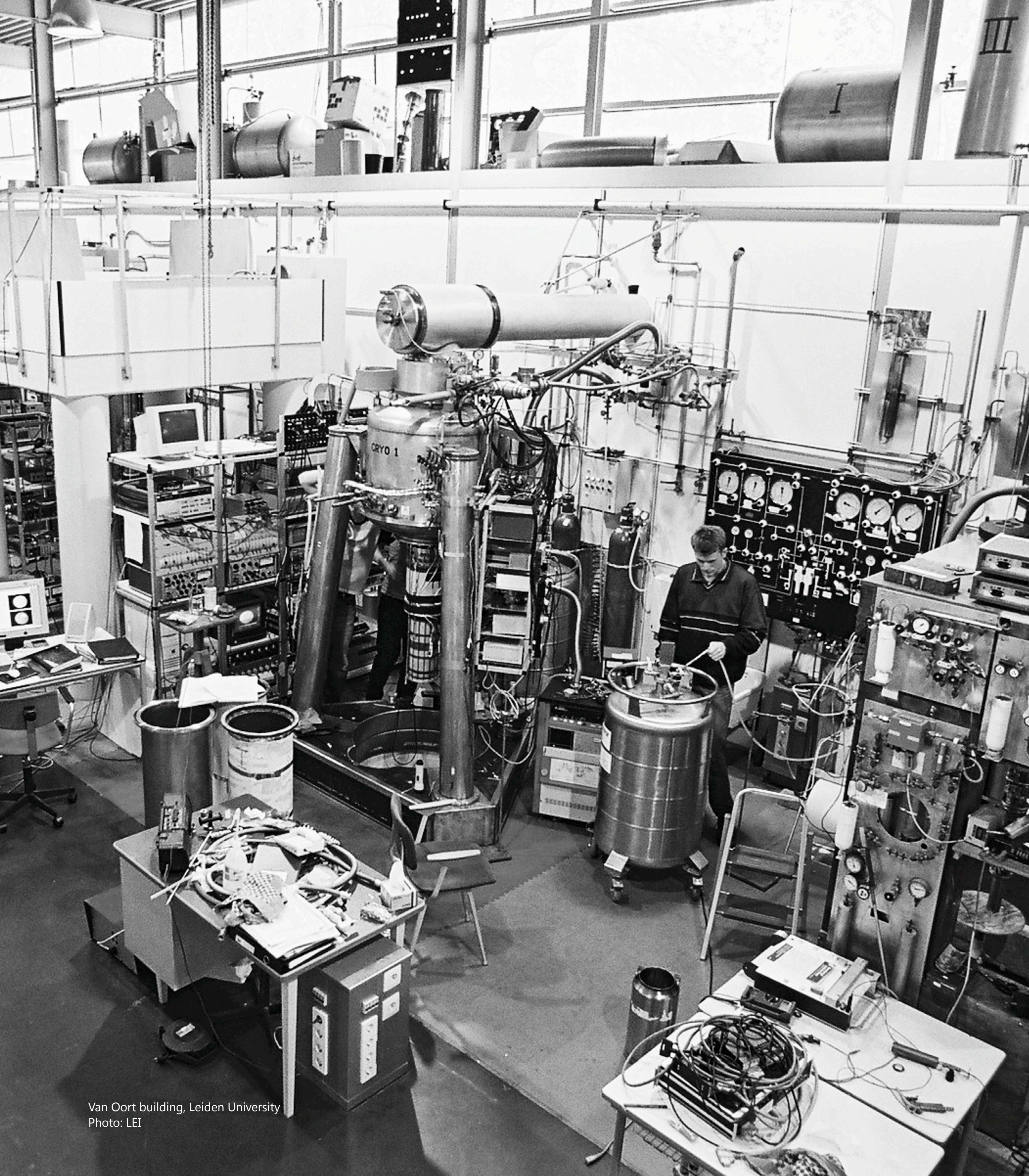
The demand for additional information also counts for the user satisfaction with the new projects or concepts and the judgement of policy makers about both the intention of the concept and the actual result. Apart from adding new projects on current trends, Dutch campus managers plead for adding evaluations to the projects that are already in the database, in order to find answers to the following questions: have the goals been achieved, is the building used as planned, how satisfied are policy makers about the effectiveness and efficiency of new concepts and how satisfied are the users?

Photo: DUWO

Part C
conclusions and recommendations

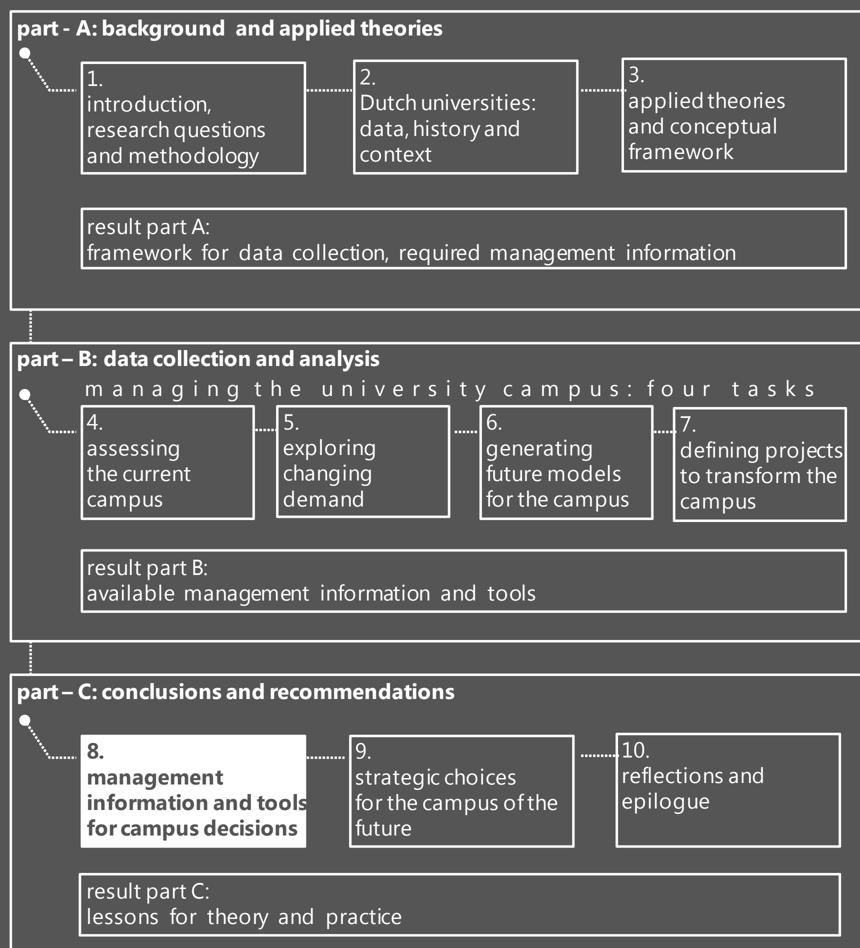
C

Part C of this research summarizes both the theoretical and practical insights from part B in new frameworks, models, tools and management information for campus management specifically and for real estate management in general (chapter 8). It also merges the trends and future models into strategic choices for the campus of the future (chapter 9).



Van Oort building, Leiden University
Photo: LEI

Chapter 8
Management information and tools for campus decisions



8 Management information and tools for campus decisions

8.1 Introduction

The background information of part A and the data collection and analysis of part B will be used to come back to the problem statements and to deliver the insights for answering the main research question: "How can universities improve strategic campus management, adding value to the university's performance, conducting which management tasks and using what information and tools?".

The components of this research question – strategic campus management, adding value, the university's performance and the management tasks – will be reflected upon. Conclusions are highlighted throughout this chapter, starting with reflections on the assumptions and components of the problem statement:

1. Campus management is more successful when a campus planner considers all stakeholder perspectives in the management process, weighing benefits and costs in the broadest sense, covering the strategic goals, the user demands, the resources and the physical aspects of the campus. This is also referred to as 'an integrated approach to managing the campus'.
2. Confronting stakeholders with the consequences of their (proposed) decisions leads to more conscious choices and improves campus management.
3. Management information contributes to 'an integrated approach' and 'more conscious choices' – acknowledging 'bounded rationality' (Simon 1997) and still allowing intuition and emotion in the decision-making process.

Practice shows that there are two reasons why campus management has become more complex: (a) the many developments that make future demand more uncertain – like less predictable student enrolment, decreasing public funding and changing functional needs – requiring a more flexible campus and (b) the acknowledgment of the strategic value of the campus for the university and even the regional economy and – as a consequence – the more stakeholders to involve and satisfy. This has increased the level of complexity for the campus manager's tasks and for the required management information.

Campus management requires a multi-stakeholder approach, confirming assumption 1

Campus management is more successful when a campus manager considers all stakeholder perspectives in the management process – covering the strategic goals, the user demands, the resources and the physical aspects of the campus – weighing benefits and costs in the broadest sense. This is also referred at as 'an integrated approach to managing the campus', even though it is important to acknowledge separate stakeholder perspectives first and to weigh their goals in an integrated solution secondly.

Practice shows that the acknowledged and required integrated approach brings more complexity to the campus management process: more complex decision-making, more people at the table for each real estate decision, more information to collect and more key performance indicators (KPIs) to consider and weigh. However, the Dutch campus managers also acknowledge that more stakeholders could also bring more resources to the collective problem and desired future model to realise and finance.

The integrated and more complex approach to campus management is reflected in the process of generating management information: it should serve multiple stakeholders and the information should be weighed or integrated in order to be valuable for decision-making. That is why campus management 'could benefit' from sharing more information – if the information is supplied in a form that campus managers can handle and share with each of the stakeholders: policy makers, users, technical managers and controllers. Any tool that brings structure to the management information or supports the process to operationalise and integrate different stakeholder perspectives, can be beneficial. Tools should supply 'multi-stakeholder information', connecting KPIs of the strategic, financial, functional and physical perspectives in order to reflect the complexity of campus decisions to each of the stakeholders involved.

Multi-stakeholder information' could improve campus management by contributing to more conscious campus decisions, confirming assumptions 2 and 3

Confronting stakeholders with the consequences of their (proposed) decisions will lead to more conscious choices and therefore improve campus management. It is important to note that available management information does not guarantee a better decision, also acknowledging bounded rationality and allowing intuition and emotion in the decision-making process (Simon 1997). But at least it will make the decision-making process more transparent and can make different stakeholders more aware of other stakeholder's goals and the considerations of campus managers to weigh these different goals, usually in terms of costs and benefits in the broadest sense.

This research provides universities with models and information that can deal with the complexity and support the multi-stakeholder approach.

This statement relates to the research object or intended result. In this chapter the most important models will be elaborated upon, also answering the next two research questions: (C1) what insights from practice can be added to theories on campus management and CREM and (C2) what information can support campus management in the Netherlands and elsewhere? The answers to these questions will include the subject of generalisation of these insights to organisations with similar contexts. These questions will be answered using the components of the body of knowledge and conceptual framework as introduced in chapter 3: new insights on the four management tasks (section 8.2), new insights on exploring 'real estate adding value' to performance' (section 8.3), new insights on the CREM model and the stakeholders and perspectives (section 8.4), and performance indicators to use for decision-making (section 8.5). Finally, the last section summarizes the insight to the theories that were the basis of this research (section 8.6).

8.2 New insights on management tasks

Part B of this research showed that the process of campus management can be subdivided in four management tasks, as illustrated in figure 8.1. The continuous match between demand and supply represents the definition of real estate management. The applicability on different levels – the knowledge city, the campus, the building – was illustrated when generating future models on different scales. These different scales also emphasize the broad range of real estate objects for which this method can be useful.

The shift to urban area development has introduced a different planning scope for campus management, but the basic structure of the management process remains the same: assessing the current situation, exploring changing demand to determine the future mismatch between demand and supply, generating future models or visions of the future and defining projects to transform the current situation into the chosen future model. In practice the cycle of these four tasks represents a planning cycle, while the last two tasks can also be conducted in an iterative process, searching for a future model that meets future demand, but is feasible at the same time.

Conclusion 1: the campus management process can be organised in four main tasks: (1) assessing the current campus, (2) exploring changing demand, (3) generating future models and (4) defining projects to transform the campus

The data collection and analysis of part B showed that each of these tasks requires different management information, supported by different tools. These tools and the conclusions about the demand for additional information are summarized in figure 8.2.

Figure 8.2 emphasizes that the four management tasks represent the planning cycle of real estate management, highlighting the required products of each of the tasks that could be part of a masterplan or strategic plan:

- (1) assessing the current situation
  product: a real estate assessment on physical, functional, financial and strategic aspects that represents the problem statement of starting point of any real estate strategy

- (2) exploring changing demand
  product: a list of programmatic requirements or a brief, explicit on physical, functional, financial and strategic requirements for a future model

- (3) generating future models
  product: a masterplan, real estate vision or strategic plan, including future models on physical, functional, financial and strategic aspects

- (4) defining projects to transform
  product: a real estate strategy, investment or maintenance planning, explicit on which physical, functional, financial and strategic aspects will be changed to achieve the desired future model

The cyclical character becomes evident when the quality or costs aspects of the resulting real estate strategy are reason to reconsider the future model or when the current situation changes. Any of the available tools that are listed in table 8.2 can be helpful in the iterative character of the management process.

figure 8.1: four tasks in managing the university campus

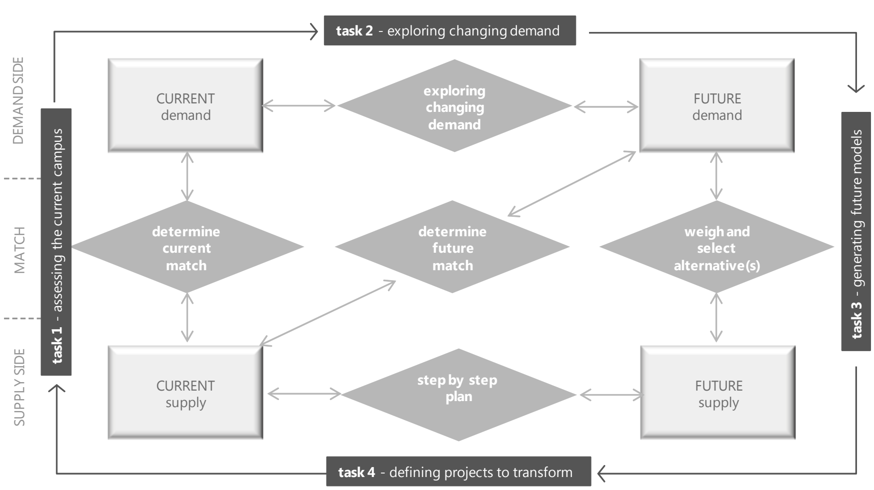


figure 8.2: managements tasks, tools that support them and demand for additional management information

available tools

- strategic models (university of the future)
- physical models (campus versus city)
- functional models (required function mix)
- financial models (shared use, management and ownership)

additional demand for management information

- evidence-based knowledge on the effect on performance of future models

available tools

campus benchmark format, as described in chapter 4 and illustrated in appendix I on campus level:

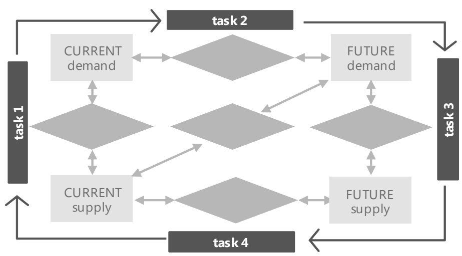
- physical: condition based monitoring
- functional: post-occupancy evaluations (POE), workplace diagnosis instruments (WODI), occupancy measurements
- financial: valuation models, tools to assess the total costs of ownership (per building)

assessing the current situation
products:
campus assessment, on strategic, financial, physical and functional aspects, in text, maps and tables

additional demand for management information

- functional: occupancy and frequency rates
- strategic: adding value assessment (ex post) - what is the strategic value of buildings on campus?

exploring changing demand
products:
campus brief or programmatic requirements for future campus



defining projects to transform – the current into the future, desired situation
products:
campus strategy
campus investment planning
campus maintenance planning

available tools

- external analysis – exploring external developments that influence the campus
- internal analysis – exploring internal developments that shape the campus
- scenario planning
- space demand models – calculating the spatial consequences of more/less students

exploring changing demand
products:
campus brief or programmatic requirements for future campus

additional demand for management information

- trends and developments, expressed in measurable variables (conform CREM)
- space standards that reflect new trends and developments, derived from new projects

available tools

- project benchmark format, as described in chapter 7 and illustrated in appendices II on project level:
- functional: post-occupancy evaluations (POE), workplace diagnosis instruments (WODI), occupancy measurements
- financial: investment planning models, references on investment levels (from benchmark) valuation models, tools to assess the total costs of ownership (per building)
- space planning models, references on new space standards (from benchmark)

additional demand for management information

- evidence-based knowledge on the effect on performance of new projects:
- tools to make a business case (ex ante), before a campus decision
- adding value assessment, afterwards, to evaluate a campus decision and draw lessons from it (ex post)

Conclusion 2: the four tasks of the campus management process represent a cycle, to use both as a planning cycle (ex ante) and as an evaluation cycle (ex post)

Conclusion 3: most KPIs require evidence-based knowledge (management information) about the added value of new functional concepts and campus models

The additional demand for management information has a focus on evidence-based knowledge about successful and less successful models, strategies or experimental projects. Assessing the added value of past decisions afterwards or the presumed added value of an intended decision beforehand is most important models to support campus management in a network of stakeholders with goals that interfere. The next section shows a composition of previously introduced models that could supply this residual information demand.

8.3 New insights on exploring adding value

Conclusion 4: most required management information focuses on the relation between real estate decisions (input) and performance (output), operationalising 'adding value'

The basis of real estate management and any real estate decision is the presumed added value of real estate (input) on performance (output). In figure 8.3 the process of adding value is demonstrated in terms of input, throughput and output. This is a tool to use, either before a real estate decision (ex ante) to make a business case or after a real estate decision (ex post) to conduct a post-occupancy evaluation. The different components of this tool will be described below. The colours that are used to characterize the input, throughput and output in figure 8.3 refer to the four CREM perspectives: strategic, functional, financial and physical. This also indicates which of the CREM stakeholders is most likely to aim at this real estate goal.

Conclusion 5: the model to assess the added value of real estate decisions can be used ex ante, to make business cases of proposed projects or ex post, to evaluate projects

The input of the process of adding value – the real estate decision – can be expressed in four CREM variables, which is demonstrated in the previous chapters and in the campus and project appendices. The latter also illustrates that a real estate decision could involve just one building or a whole real estate portfolio. The CREM variables include the quality ambition (from basic to inspiring), the budget in euros or the investment level per m^2, the number of users involved and the required function mix in types of m^2. Ideally, the variables of the input are compared to references (ratios and benchmarks in figure 8.3) for instance for the investment level of comparable buildings or the space standards of similar workplace concepts. This will support real estate managers in making a business case for their real estate decision, relating the input to the output.

The output can be expressed in four different but interrelated performance criteria: profitability, productivity, competitive advantage and sustainable development. In the end, every real estate decision should be justified by its positive effect on these criteria. In fact, any decision that involves one of the five resources – people, capital, information, technology and real estate – should be evaluated by this effect.

The throughput is the core of the process of adding value, identifying more than the original ten 'real estate goals' or ways of adding value that were introduced in chapter 3. Based on the data analysis of part B the ten existing real estate goals have been renamed and some new goals have been included. All real estate goals have also been given the colours of the CREM perspectives, characterizing them as primarily financial, physical, functional or strategic. Together they form a new hierarchy of real estate goals that are defined as 'throughput', adding value to the 'output' of an organisation. The changes in the elements of 'adding value' are described below (numbers align with figure 8.3).

(1) controlling risk
In campus strategies this usually aims at controlling technical and functional risks by carefully monitoring the technical condition to make sure primary processes are not hindered; examples are all tasks that aim at achieving or maintain the minimum quality for a use permit ("safe and healthy workplace"); in the end, controlling technical and functional risks is also about controlling financial risks by lowering the chance of production loss.

(2) increasing real estate value
It is obvious from assessing the campus strategies in part B that campus managers – unlike managers of commercial or other corporate real estate – do not primarily aim at increasing real estate value, for instance by making it more marketable or rentable for other users or potential owners. They rather collaborate with partners that share primary tasks or goals, increasing productivity or competitive advantage of both partners.

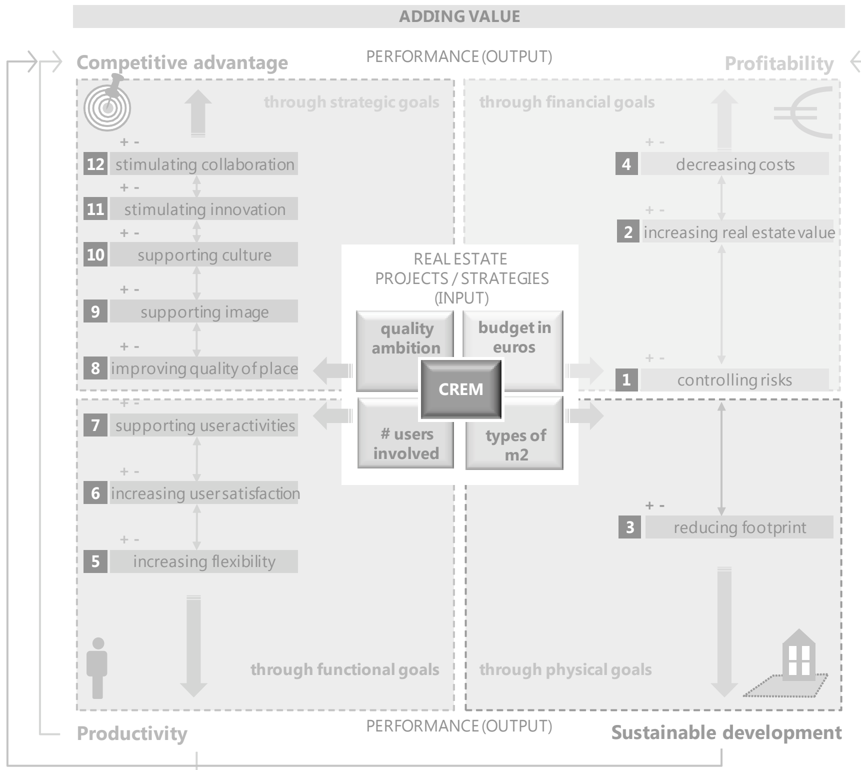
(3) reducing the (ecological) footprint
Primarily 'reducing the (ecological) footprint' is added because many universities have campus strategies with the explicit goal to use, manage or own 'less floor area'. For many universities the campus of the future is smaller than the current campus, also adding to profitability goals by 'decreasing costs'. At the same time reducing the footprint can also add to sustainability goals. In many university and campus strategies 'sustainable development' or 'greening the campus' has become an explicit goal with performance indicators to measure. This is a second reason to add 'reducing footprint' to the hierarchy of adding value, either interpreted as 'less floor area' or as 'reducing the carbon footprint' in terms of CO_2 emission. However, to make the goal of reducing energy use or CO_2 emission more explicit, this has also been included in the hierarchy of adding value. Energy reduction can be an explicit real estate goal of technical interventions in university buildings or a result of reducing the floor area of the campus.

(7) supporting user activities
One item was changed compared to the previous list: 'increasing production' became 'supporting user activities' with a link to (increasing) 'productivity', due to many campus decisions that aim at supporting primary processes more effectively, in order to improve the quality of products (publications, degrees, knowledge).

(8) improving quality of place
In the global competition for knowledge workers many universities have campus strategies to improve the quality of place, to satisfy the users and add to the competitive advantage of the university in attracting and retaining students, professors and other employees and to add to the image of the university for incidental or frequent visitors.

Examples of campus decisions like implementing sustainable concepts, introducing new ways of working on campus, making university buildings more suitable for external users show that the hierarchy of adding value can have different forms, highlighting different real estate goals and connecting these with different directions of the arrows. Organisations can even have different real estate goals with the same decision. For instance, new office concepts can be introduced to stimulate collaboration, to support the (changing) culture, to improve the quality of place. It can also be introduced for efficiency reasons, to decrease costs by reducing the footprint or by increasing flexibility. It can even be implemented to achieve all of these goals at the same time. However, the hierarchy of adding value - in customized form - can be used as a tool to support the process of making a campus decision, making visible what goals to achieve beforehand and evaluating this afterwards. On the next pages table 8.1 summarizes the information demand and the available tools to support campus managers for assessing these 'added values' ex ante (for the business case) and ex post (for the post-occupancy evaluation).

figure 8.3: model to assess the added value of real estate decisions – from project (input) to performance (output) – ex post and ex ante



Conclusion 6: real estate goals in the adding value model can be connected to four CREM perspectives and related performance criteria

While CREM theory defines the real estate decision-making process as a collective task of many stakeholders, the four CREM stakeholder perspectives are connected to the real estate goals and the performance criteria profitability, productivity, competitive advantage and sustainable development. The strategic, functional, financial and physical perspective and their corresponding colours are added to each of the components of the adding value model and to each of the performance criteria.

- the strategic perspective
  Contributing to the primary goals of the organisation and the competitive advantage among similar institutions, the strategic perspective focuses at decisions that improve the quality and effectiveness of the primary processes by – for instance – improving the quality of place, supporting culture, collaboration and innovation and supporting the image of the organisation

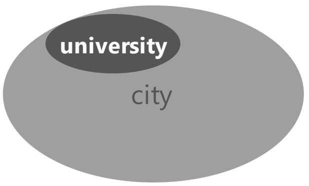
- the financial perspective
  Universities do not primarily focus on making campus decisions to add to the profitability of the organisation. Nonetheless, many other – more commercial – organisations do have financial goals with their real estate strategies. Indirectly, by decreasing costs, reducing floor area or controlling financial risks by –for instance– making buildings more flexible for other use or users, campus managers can contribute to profitability goals.

- the functional perspective
  Aiming at improving the productivity of the organisation, the functional perspective focuses at decisions that (optimally) support the user activities by changing the quality and quantity of space; decisions that relate to this performance criterion are assessed in terms of costs and benefits, because ultimately productivity is assessed in terms of output versus input. The real estate goal to increase user satisfaction can be relevant to add to productivity and can also contribute to the competitive advantage of an organisation with satisfied users being (more) loyal to their employers

- the physical perspective
  To distinguish this perspective from strategic and functional perspectives the physical perspective has a focus on technical aspects like maintaining the minimal quality level to allow user activities and by controlling technical risks that could hinder the primary process. The performance criterion that is primarily be related to the physical perspective is 'sustainable development'. With explicit goals to reduce energy use and CO_2 emission – reducing the ecological footprint – this performance criterion has gained importance in many real estate strategies.

adding value by	primary stakeholder	what to measure (management information)	how to measure (tools)
(1) controlling risk	technical manager controller	• the percentage of the campus in (very) bad technical condition • the percentage of the campus that could easily be sold or disposed	• condition based monitoring • market analysis
(2) increasing real estate value	controller	• the value of the land property • the value of the campus buildings	• valuation tools
(3) reducing the footprint	technical manager	• the ecological footprint: energy use and CO2 emission • m2 per function type or user group (student, staff member)	• sustainability tools: Greencalc, DCBA method, www.duurzamecampus.nl • references on space use from databases
(4) reducing costs	controller	• costs/benefits of proposed project in comparison with alternatives • effect on other organisational costs (personnel) in comparison with alternative projects	• project database • campus database • references on investment level, maintenance costs
(5) increasing flexibility	users	• multi-functional character of space types • use by different user groups	• post-occupancy evaluations: space use
(6) increasing user satisfaction	users	• student satisfaction over the years • employee satisfaction, periodically	• post-occupancy evaluations: customer satisfaction
(7) supporting user activities	users	• occupancy and frequency rates • references on similar concepts at other universities: best practices and lessons learned elsewhere	• post-occupancy evaluations: changing demand • project database with new concepts
(8) improving quality of place	policy makers	• quality before and after • user requirements and willingness to pay for more quality • references on quality related to costs	• Maslow's pyramid with cumulative user needs, connected to investment levels • project database with references
(9) supporting image	policy makers	• image before and after • use of building as marketing tool by users • opportunity costs (related to other marketing tools)	• reputation monitor of user group (faculty or university) • project database: references on image and costs
(10) supporting culture	policy makers	• culture before and after • opportunity costs (related to other ways of supporting culture)	• post-occupancy evaluations: user satisfaction
(11) stimulating innovation	policy makers	• innovation before and after	• output assessment (before and output)
(12) stimulating collaboration	policy makers	• multidisciplinary output, before and after • effect on social encounters • effect on 'community building', sense of belonging	• output assessment (before and output) • post-occupancy evaluations: user questionnaire

table 8.1: adding value on organisational level, connected to primary stakeholders, KPIs to measure (management information) and how to measure (tools)

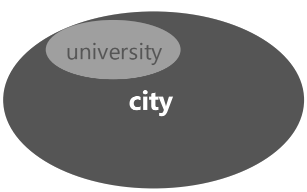


These four perspectives are related to a number of stakeholders. While all perspectives are predominantly connected to one type of stakeholder the essence of real estate decision-making is that each stakeholder is aware of all perspectives in the management process. Understanding each other's performance criteria and real estate goals is an essential condition in successful – collectively supported – real estate decisions.

conclusion 7: campus management includes multiple levels (city, campus, building) affecting many stakeholders inside and outside the university and their performance criteria

Adding to the complexity of real estate decisions multiple levels of performance criteria can be distinguished: performance of the organization, (groups of) individuals and societal goals. In the context of universities changing demand and future models show that campus decisions not only affect the organization, but also individuals (knowledge workers) within the organization and goals of urban or public authorities. Below table 8.2 - contains the KPIs and available tools for the urban level – to compare with table 8.1 on organizational level: the knowledge city with the university campus as an important part of the knowledge base and economic base, contributing to urban diversity with the population of knowledge workers and to quality of life.

table 8.2: adding value on urban level, connected urban stakeholders, KPIs to measure (management information), and tools that can be useful



adding value by	primary stakeholder	what to measure (KPIs, management information)	how to measure (tools)
(1) controlling risk	spatial department economic department	• vacancy rates • possibilities for transformation	• market analysis • transformation tools (Remøy 2010)
(2) increasing real estate value (including land value)	economic department	• local land prices • local rent levels	• valuation tools • market analysis
(3) reducing the footprint	spatial department	• the carbon footprint of the city • density	• sustainability tools: DCBA, etc. • floor space index (FSI)
(4) reducing costs (or increasing benefits)	economic department	• costs and benefits of foundations of knowledge city • GDP per capita • purchasing power of population	• references of other knowledge cities (Van den Berg et al. 2005)
(5) increasing flexibility	city population	• urban diversity: age, education • available labour force: knowledge workers	• demographic analysis • analysis labour market
(6) increasing user satisfaction	city population	• available cafés, restaurants • retail & leisure facilities • units student housing • quality of (student) housing • hotel rooms, short stay apartments	• Who's your city (Florida 2008) • attractive city index (Marlet 2009)
(7) supporting user activities	city population	• accessibility by car, bicycle • public transport • parking • quality of economic base	• network analysis – infrastructure • benchmark with other cities
(8) improving quality of place	urban authorities	• attractiveness of city, as place to live • attractiveness of city for businesses • diversity in urban population	• Who's your city (Florida 2008) • attractive city index (Marlet 2009)
(9) supporting image (city marketing)	urban authorities	• number of visitors • number of visitors related to the university • quality of knowledge base	• rankings of cities • reputation monitor • university rankings
(10) supporting culture	urban authorities	• urban diversity: culture, lifestyle • specialisations in economic base • specialisations in knowledge base	• branding (existing qualities)
(11) stimulating innovation	urban authorities	• number of start-ups, incubators • GDP per capita • distance between knowledge base and economic base	• innovation index • comparison / benchmark
(12) stimulating collaboration	urban authorities	• university-industry collaboration • university-community collaboration	• assessment of network • assessment of network

8.4 New insights on campus stakeholders – expanding the CREM model

While most corporate real estate theories focus on the level of the organisation, practice of campus management and the insights of the previous section show that the organisational level is not necessarily the most dominant level in campus decision-making. The KPIs in table 8.2 on urban level already introduced urban stakeholders: urban authorities (goals), economic department (euros), spatial department (m2) and city population (users). Sometimes it is even hard to define who takes decisions about new facilities: the professor who needs a new laboratory to keep up with the international competition or the national politician who stimulates university colleges to keep talented and highly motivated students within the borders of the country – to safeguard the national knowledge economy. In the first example it is a stakeholder at individual level, in the last at societal level. In-between there are many levels of groups of researchers, sections, departments, faculties and research institutions. Dependent on the organisational structure of the university and the division of power, there may be many stakeholder involved.

Even though multi-layered organisations are very common – certainly for large or multi-national corporations – universities are extra complex in terms of decision making. Like in hospitals the individual level consists of specialized professionals – professors and doctors – that claim to know best what facilities would support their activities maximally. However, the benefits of these facilities still have to be compared to the costs and the advantages to the disadvantages, in a system of performance criteria as explained in the previous section. With many more parties involved than the stakeholders on individual level, decision-making can become very complex and campus management processes can become very slow. This is all the more reason to make these layers more explicit and to add management information to support these considerations. With the CREM model

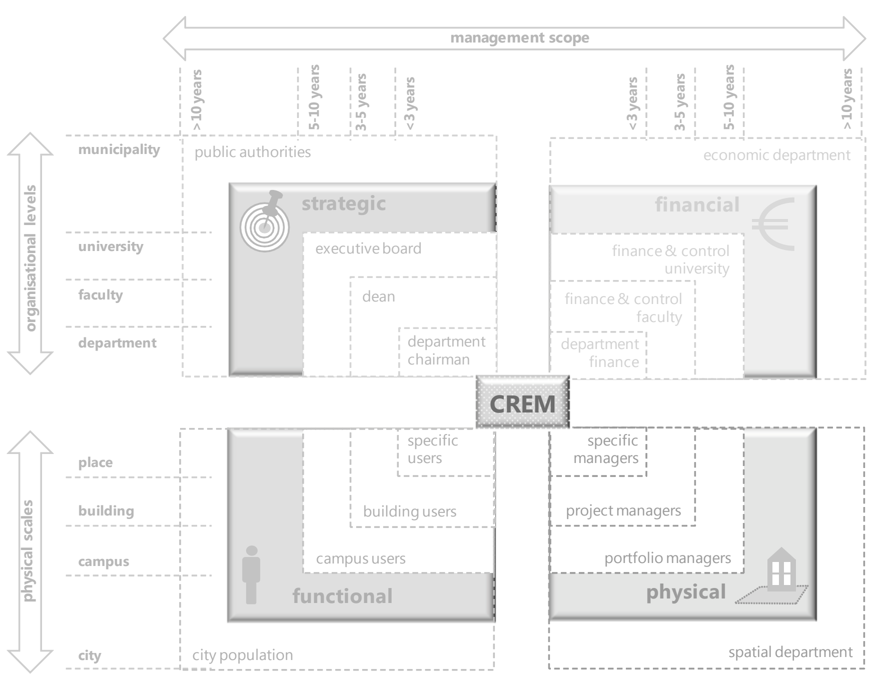
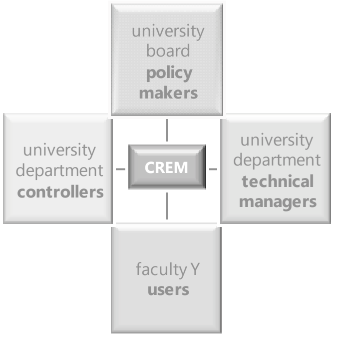


figure 8.4: CREM stakeholders with their organisational levels, physical scales and management scopes

that was introduced in chapter 3 as a basis, at least two more layers can be introduced for campus management. The campus managers – in the middle of the CREM model – having to connect their goals, needs and interests in every campus decision.

Some universities have more decentralized power than others, with more authority and autonomy at the school or faculty level for primary and supporting processes. Analogously, at this type of universities the faculty or school level has more influence on campus decisions than the university level. With decision-making closer to the individual (professor) level, performance criteria like productivity are closer to the users who are responsible for the output – producing publications and diplomas – but usually (and logically) at the cost of performance criteria on higher levels. With performance criteria on societal level becoming increasingly relevant, stakeholders outside the university are more and more involved. On local community level this has already been applicable for some time in the Netherlands, with the city and the campus more and more physically and socially interwoven, and the university economically connecting with local and regional businesses.

figure 8.5: the input from four stakeholder perspectives is not only favourable for management information, but also for representatives within project teams, on all levels of campus decisions



Some of the matching stakeholders on both faculty level and community level can be found in figure 8.4. The focus of campus management is between university and faculty level, with some real estate decisions involving stakeholders outside the university or within faculties. It also connects the organisational levels to the most common physical scales and it gives management scopes to these different levels, ranging from less than three years to more than ten years.

The management scopes are also relevant for the four tasks of campus management that can also have a different object on different physical scales or organisational levels.

The goal to connect management information of all four stakeholder perspectives in campus decisions, can be projected on tools like the databases and conceptual models that were part of the previous chapters or on the organisational form that is required to support a campus decision. Consequently every project team needs representatives with (mandates of) all CREM stakeholders. With complex campus projects that involve multiple actors, this project team (see figure 8.5) can also have different layers.

These project teams can be active in all tasks of campus management: assessing the current campus (from different perspectives), exploring changing demand (brainstorming about the demands of the university of the future), generating different campus models and defining projects.

8.5 Key performance indicators on multiple levels

With the goal of this research being to generate management information for the four tasks and for connecting the CREM stakeholder interests in campus decisions, the research question was (C2) what information can support campus management in the Netherlands and elsewhere This question was answered, connecting these stakeholders to the performance criteria in the previous section. Performance indicators for these criteria can be identified to measure if stakeholder goals are reached.

The data connection and analysis in part B confirmed the three dimensions of 'the playing field' of campus management: (x) the four performance criteria for expressing the output, (y) the four stakeholder perspectives to integrate and (z) the different levels to connect. Accordingly, the required management information follows these dimensions. This is summarized in figure 8.6.

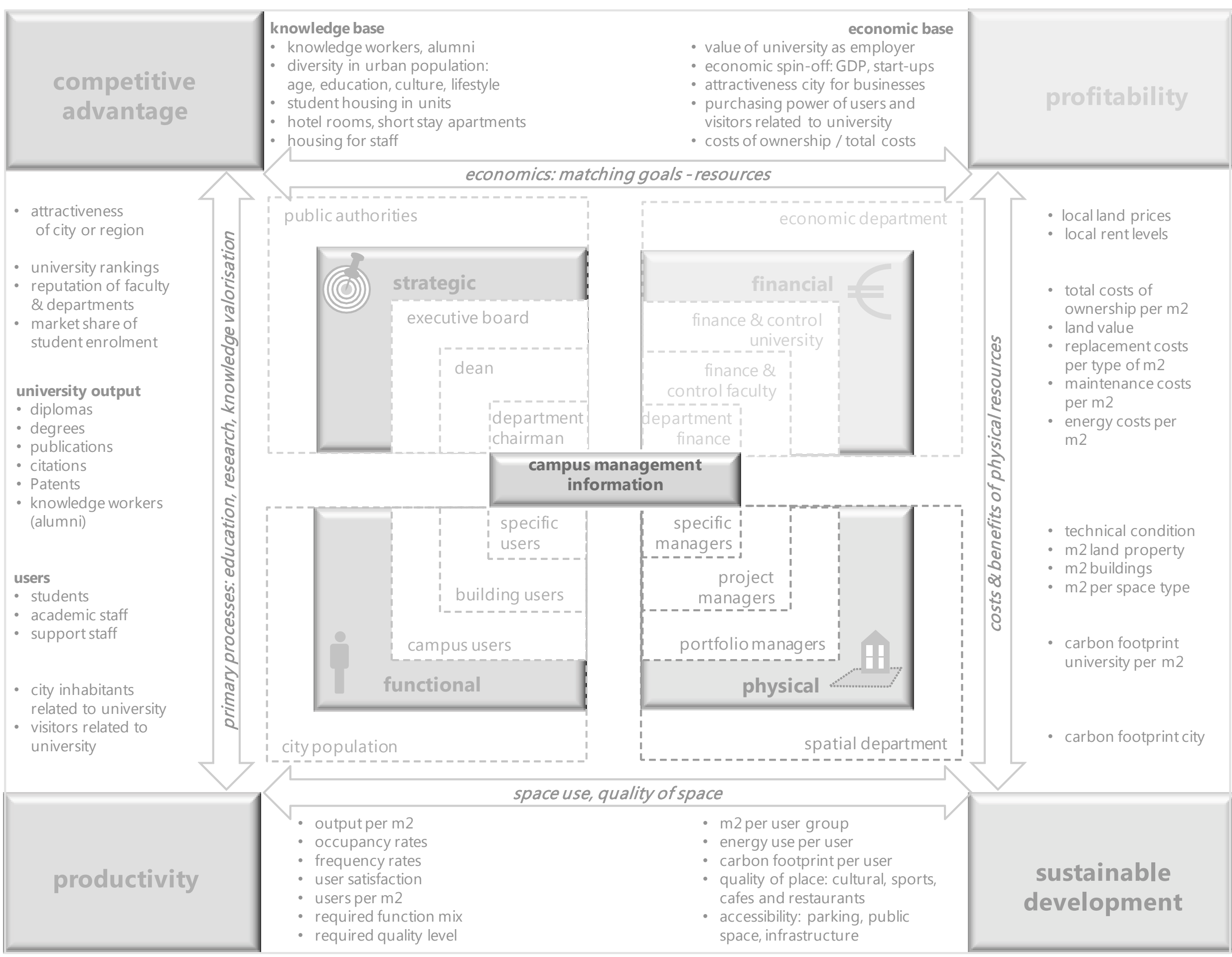
Conclusion 8: campus management information should connect the input variables of four CREM perspectives and the key performance indicators of four different output criteria on levels within and outside the university.

If project level involves a single faculty that can be considered 'a university at a smaller scale', the same KPIs as those at university level can be used. The KPIs are applicable to specific projects that exceed the boundaries of organisational units or single buildings for single users. Examples of these projects are implementing a new type of learning environment, innovative sustainable concepts or a more flexible workplace environment.

What makes this level more difficult is that performance – like number of publications or diplomas - cannot easily be connected to this organisational scale if a faculty or specific group uses more than one building to produce output. Nonetheless, this level can be useful to describe the added value of a new laboratory, a learning centre for the university, a new faculty building or new sustainable concepts to support ways of learning.

Linked to conceptual frameworks for the knowledge city, region or nation, projects that exceed the physical scale of the campus have a different set of performance indicators,

figure 8.6: required management information, summarized from results part B and previous tables, expressed in KPIs and linked to four CREM stakeholder perspectives and four matching performance criteria (competitive advantage, productivity, sustainable development and profitability)



also linked to productivity, profitability, competitive advantage and sustainable development but on a larger scale. Adopted from theory on knowledge cities (Van den Berg et al. 2005) these KPIs include the characteristics of seven foundations for a knowledge city: a knowledge base, an economic base, quality of life, urban scale, urban diversity, accessibility and social equity. Some of these components are hard to measure or compare between different knowledge cities, like quality of life. This statement introduces some of the current limitations and required conditions for collecting data to generate management information on the key performance indicators.

Conclusion 9: campus management theory provides key performance indicators based on a sound set of definitions for benchmarking universities.

Some key performance indicators are well-defined, like floor area, student numbers. Many standards like NEN2580 (floor area), NEN 2631 (investment costs) and NEN2748 (facilities costs) are available in the Netherlands. Nonetheless, there are many international differences. Campus management networks all over the world have their own standards or definitions for annual benchmark studies. Much can be learned from these organisations (see appendix IV) that have experience with benchmarking. They already have tested definitions for 'carbon footprint', 'total costs of ownership', 'occupancy rates' and 'user satisfaction'. Exchange and comparison of definitions and tools can be very helpful (and efficient) to improve campus management.

Even for well-defined performance indicators practice shows that is hard to collect reliable and comparable data, especially when individual institutions are using their own standards and definitions in customized information systems or campus databases. This will even be harder when functions on campus are merging, like office and education space. The multifunctional use of many spaces on campus has made it more and more complex to determine the function of space. At the same time, the increased number of external users makes it harder to assess space use by the university or a particular faculty. Ultimately, this information is necessary for programming new campus projects. This is all the more reason to join forces for assessing space standards in a larger network of universities.

Conclusion 10: It is useful to collect and share management information in a (larger) network of universities, because many professional networks of campus managers have tested systems to benchmark campus management.

Globalisation not only enables students and scientists to make use of the knowledge of a network of international universities, it could also benefit campus management by sharing more campus knowledge internationally. Many countries already have associations of campus managers, facilities managers and executives at universities. Most of them acknowledge that evidence of the impact of facilities on university performance is hard to quantify. This is one of the most important reasons for campus managers to join forces: they all need this type of evidence – and successful references - to justify investments in their campuses.

The need for more evidence-based references also includes the ambition to join forces in developing collective frameworks to compare future models and innovative new projects on all CREM aspects and performance criteria and not just the financial or physical aspects. As peer organisations universities may also consider businesses with similar primary processes, a similar workforce of knowledge workers or similar facilities. Examples are multinationals like Philips, Shell and Unilever, which could also be partners in sharing facilities, personnel and research programmes.

The latter pleads for building better networks between universities and with related businesses, not just for the primary processes, but also for the supporting processes like campus management. The university goal of knowledge valorisation also applies to sharing knowledge about management processes, as the alternative – generating the knowledge solely – is most likely to be more expensive. Best practices, business cases and post-occupancy evaluations of implementing new concepts can be shared among a large group of campus managers with similar problems.

Many local, national networks intend to do exactly that, but language problems prevent knowledge exchange between many counties. Like in education and research the language barrier will be taken, either because the potential benefits make it worthwhile or because the global competition will force them to. But – like in education and research – this will take time and a culture change. Nonetheless the language barrier has also limited international data collection for this research, which shows in the focus on countries and networks of campus managers which supplied data in English, either on their website or in publications (see appendix IV for country overviews).

8.6 Conclusions on applied theories

This chapter answered two research questions, about new insights for theory on campus and real estate management (C1) and about the required management information (C2). After the previous section this concluding section answers the first question: (C1) "What insights from practice can be added to theories on campus management? The answers are given using the components of the body of knowledge, demonstrated in figure 8.7 and introduced earlier.

the campus and corporate real estate as the fifth resource

This research not only emphasizes the strategic value of the campus for the university – an example of corporate real estate for an organisation – it also expands the value to stakeholders outside the university and a larger physical scale including the city, the region and the country. This is applicable to the university as a driver for economic growth and a producer of knowledge, innovation and highly educated human capital – a workforce of knowledge workers. This can be generalised for any organisation with an economic spin-off on a larger scale with benefits for stakeholders outside the organisation.

connecting four stakeholders and variables in the CREM model

This research showed that the CREM model can be used to identify four different perspectives – strategic, functional, financial and physical – on the campus that can be connected to four groups of stakeholders, their input variables like quality ambition, floor area, users and euros (budget) and their real estate goals and performance criteria to contribute to. This makes the process of campus decision-making operational by being able to discuss and compare the costs and benefits. Other organisations might give different weights to performance criteria like profitability, productivity, competitive advantage and sustainability, but are likely to have similar assessments of real estate decisions.

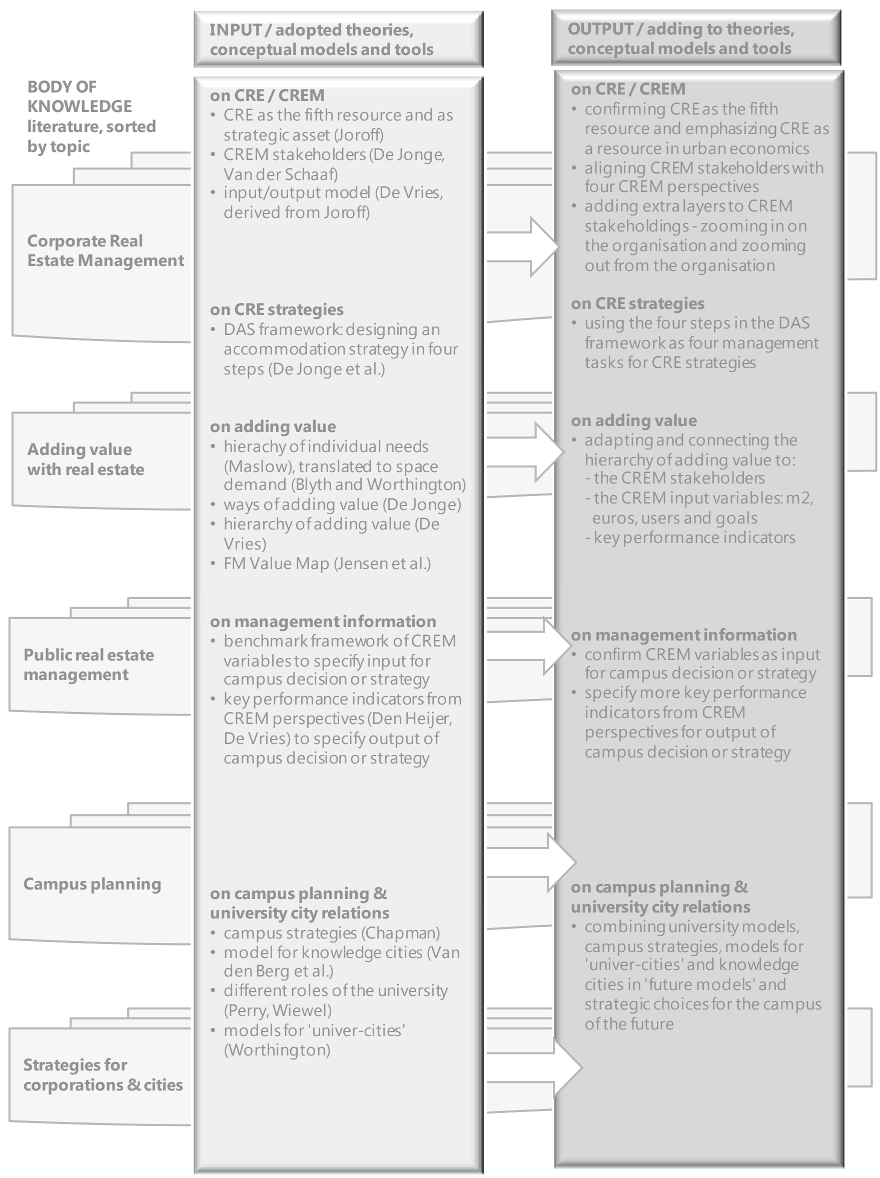
adding value as a process of input, throughput and output

This research identified more 'real estate goals' – with more focus on quality of place and environmental goals - and adjusted and expanded the existing hierarchy of adding value. By adding extra levels, zooming into and zooming out of the organisation, a real estate strategy can be assessed in terms of input, throughput and output on all of these levels, contributing to performance indicators of many stakeholders.

four management tasks collectively defining real estate management

For this research the four management tasks cover many activities that campus managers recognise as steps to match supply and demand on campus in a certain period of time. While this research has a strategic scope – with a planning term of more than 5 years – the four management tasks could also describe more operational tasks to match supply and demand, looking at the near future. It should be emphasised that real estate management can start with any of the four tasks, with defining a new project

figure 8.7: body of knowledge – before and after this research



or brainstorming about future models. In any case, some information of the other management tasks – assessing the current situation or exploring changing demand as a result of external or internal developments – is necessary to assess or evaluate a campus decision in the broader perspective of the whole campus and the university and campus strategy.

management information to support campus decisions

This research showed that to assess or evaluate a campus decision, the comparison with decisions or strategies of similar organisations can support the decision-making process by supplying all stakeholders with references. These references on CREM variables like investment levels or space use ratio on the input side and key performance indicators like production per m^2 or energy use on the output side can help to justify or reject campus decisions.

increased complexity of campus management

This research showed the increased complexity of campus management giving both opportunities and threats. The opportunities are apparent in the presence of (many) more stakeholders that benefit from the university and are potentially willing to invest. The threats are obvious in the management process with (many) more perspectives, stakeholders, input variables and key performance indicators to contribute to. Supporting this process better is worth the effort.

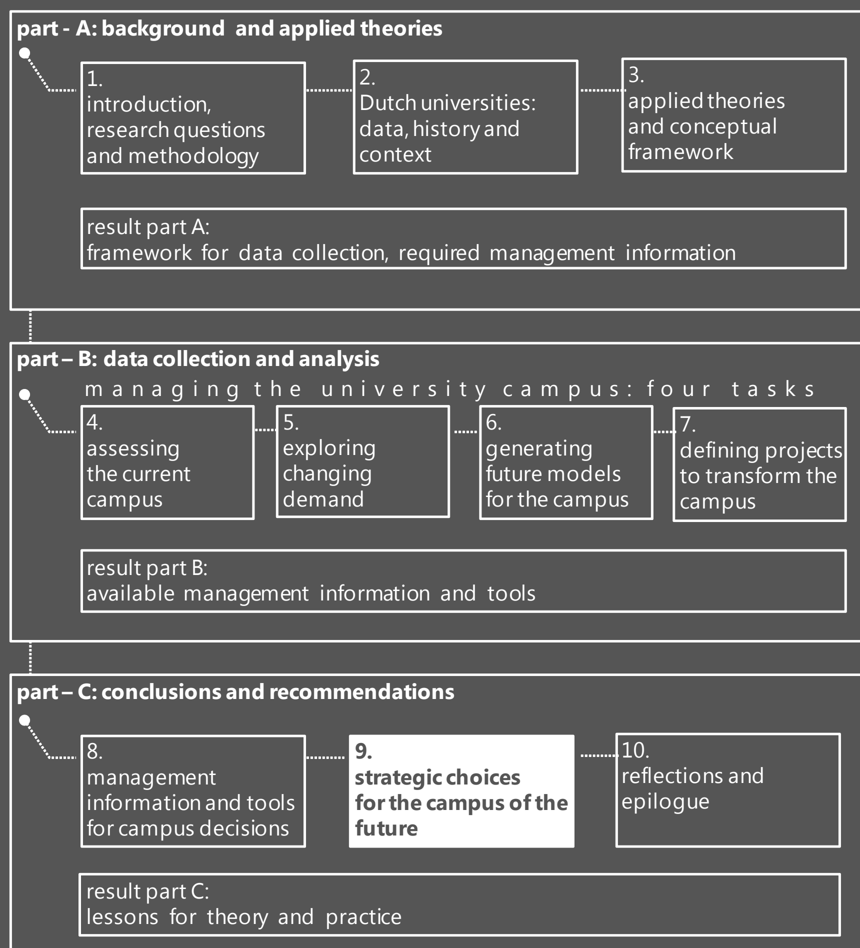
further research – applying the framework and learning from others

Further research on managing the campus could also focus on collecting more references of innovative adopting definitions, frameworks and tools, from other networks of universities, but also from other sectors with similar real estate portfolios or management issues. Not to generate more information, but to collect more reliable and comparable data that support campus decisions to accommodate the university of the future, starting today.

Applying the frameworks and tools of this research to other public or private organisations that manage large real estate portfolios, could be subject of further research on managing real estate in general. Hospitals and business campuses are examples that are closely related to the university campus – like academic hospitals and science parks – and that have many comparable characteristics, as they are also vital parts of (future) knowledge cities. Shifting the research scope to other sectors and larger areas will start new empirical cycles, which can further improve real estate management theories.

Central library,
Delft University of Technology
Photo: AdH

Chapter 9
Strategic choices for the campus of the future



9 Strategic choices for the campus of the future

9.1 Introduction

In this chapter the following research question will be answered (C3): What strategic choices are universities faced with for the campus of the future? The analysis of literature and empirical data of the Dutch and international cases is the basis for answering this question. This chapter briefly describes the strategic choices that universities are confronted with, focussing on the campus. The strategic choices are derived from trends and new concepts that have already appeared on the campus of today (see chapter 7 and appendix I and II), and can be summarized in some key trends. Most trends can be applied to portfolio level, affecting the whole campus strategy. But some are specifically related to certain building types and focus more on project level.

- Less space for individual territory and more space to share
- Trade quantity for quality – towards less floor area, more intensively used, with more quality
- Place independency – caused by ICT developments – allows students and employees to study and work at the most meaningful places - the best place to work
- New life for old, heritage buildings – revaluing the old instead of creating the new, also linked to sustainability goals and the trade of quantity for quality of space.
- Reducing the footprint on campus – setting the example for a new generation
- The campus is (becoming) a city:
    - strategically: the campus has become a market place in knowledge
    - financially: the campus should have a higher floor productivity (more users, output per m^2)
    - physically: less private space (individual territory) and more public space (for everyone)
    - functionally: less mono-functional and more multi-functional space (to intensify space use)
- The campus is used for branding the university
- Partners institutions in higher education and related businesses are willing to share space use, management tasks and ownership, also caused by less favourable economic circumstances
- Available (student) housing has become vital for the competitive advantage of university
- Related businesses are increasingly important for the valorisation, innovation and employability
- Retail & leisure will safeguard quality of life, as a vital foundation for a successful knowledge city
- Infrastructure is connecting all functions and becomes increasingly important, including accessibility and parking

In line with the four-stakeholder-approach of campus management, the strategic choices represent campus decisions that consider the combined effect on university performance criteria: competitive advantage, profitability, productivity and sustainability goals. Like the trends, some of these strategic choices involve the whole campus, some are related to specific building types or required functions. The strategic choices are posed as questions, using “we” to emphasize the collective nature of the decision-making process for the campus of the future.

9.2 Strategic choices about the university of the future

There are many different models for both the university and the campus of the future – also described in appendix V – but the most important choices can be summarized in four questions that match the four basic models as presented in pictures and figure 9.1 on the next page: How exclusive do we want to be? How do we accommodate a "university college"? How many activities do we allow to be accommodated outside the campus? How much space are we prepared to share with others and what activities do not need to be accommodated on university's territory?

With all models having different characteristics, summarized in the table below, it is also possible and quite common among Dutch universities to choose a combination of two or more models.

Recommendation 1: choose a selection of the basic university models (A-B-C-D) characterised by competition versus collaboration, exclusive versus shared use, large versus small, open versus closed and physical or virtual – or combine these models for different parts of the university

model A

How exclusive do we want to be? Can we still afford this model without (more) public and private funding?

- *exclusiveness, elite & large*
- *can we still afford this?*

model B

How much space are we prepared to share with others? How many activities do we allow to be accommodated outside the campus?

"campus is market place of knowledge"

- *sharing the campus: 'univer-city'*

Campus of the future

model C

What activities do we not want to accommodate on campus and leave to the city or other partners to manage?

- *work where you want*

model D

How do we accommodate a "university college"? Which functions do we need to attract students and build a (new) community?

- *small, broad, Bachelor in English, selected talent* figure 9.1: four university models to choose or to combine within one university

	Model A Traditional university (= reference model)	Model B Network university	Model C Virtual university	Model D University college
m^2		same m^2	much less m^2	less m^2
users		more users	more users	less users
euros		more euros available (from more users)	more euros available (for less m^2)	more euros available (higher added value)
quality per m^2		higher quality	higher quality	higher quality

9.3 Strategic choices about university values in private and public space

Now that the workplace for students and staff could be anywhere, it is more and more important to attract the university population to the campus to create a community and offer a home base to an increasingly mobile and footloose labour force. Questions to consider supporting this strategic choice are, from the perspective of the university:

- How do we show our corporate identity, image and goals on campus? (examples: openness or exclusiveness, transparency, innovation, creativity, sustainability, academic character)
- About the private space: what concepts do we use to accommodate students, faculty members and management, in terms of quality versus quantity and territory versus flexibility?
- About the public space: how much space do we use for informal meetings and social encounters?
- Can we find new life for monuments (relatively expensive buildings) by exchanging quantity (m^2) for quality (per m^2), reducing the number of users per m^2 and giving them a more inspiring place to work in return?

Recommendation 2: develop and manage the campus as a city

The campus is (becoming) a city. Strategically, the campus has become a market place in knowledge. Financially the campus should have a higher floor productivity (more users, output per m^2). Physically there is a tendency towards less private space (individual territory) and more public space (for everyone). Functionally that means less mono-functional and more multi-functional space (to intensify space use). Many future models are available (see chapter 6) to collectively develop the campus and the city with the urban authorities.

Campus of the future: transparency of processes to support image of faculties and university

Recommendation 3: express university values in private and public space

How do we show our corporate identity, image and goals on campus? Examples are openness or exclusiveness, transparency, innovation, creativity, sustainability and academic history.

About the private space: what concepts do we use to accommodate students, faculty members and management, in terms of quality versus quantity and territory versus flexibility? On different levels new concepts are tested at universities around the world. There are new concepts for university buildings – new types of laboratories or educational buildings like learning centres – (re)considering multifunctional use or multi-user functions. Zooming out, there are new campus models in the city – for academic function and for housing, leisure & retail and related businesses – like university colleges or more integrated 'univer-cities'. Zooming in, universities are testing new ways of working, learning and teaching. Exploring how all of these models affect the performance criteria can be of great value to other universities that are considering implementing the same models.

Improving quality of space
Investing in the quality of floor area can range from creating a healthy and safe workplace to diminish backlog maintenance on campus level. Again, the question is if the benefits exceed the costs. For real estate investments this should be considered for a certain period, determined by how long the investment has effect.

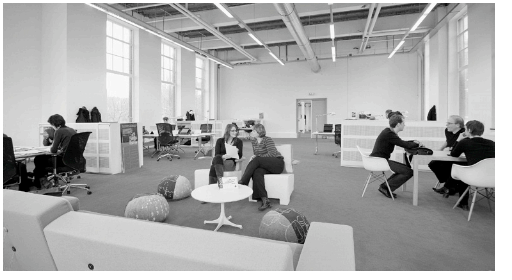
Emphasizing academic identity
Campus decisions and strategies that aim at emphasizing the academic identity are usually a reaction to a few trends: globalization, the differentiated university landscape and the low costs and flexibility of standardized concepts. In response, universities want to emphasize their history –with their cultural heritage buildings or link with historic inner cities– or their state-of-the-art landmark buildings that support their innovative image.

Improving interaction
About the public space: how much space do we use for informal meetings and social encounters? Shared use can be combined with the strategy to improve interaction on many levels. While shared use has efficiency goals, improving interaction aims at more effectiveness in education and research – more collaborative research, more interaction between students and lecturers and between colleagues – eventually to improve the quality of production, but also to add to the sense of community which might lead to a more loyal and satisfied employees and students and – ultimately – to a good network of (former) employees and alumni: knowledge workers for the local, regional and national knowledge economy.

Recommendation 4: reconsider the old buildings before considering new

Can we find new life for monuments (relatively expensive buildings) by exchanging quantity (m^2) for quality (per m^2), reducing the number of users per m2 and giving them a more inspiring place to work in return? If the costs per m^2 of these heritage buildings are very high, there are two options: remove them from your campus portfolio or adjust the benefits per m^2 to the cost: increase floor productivity, more output per m^2 and more users per m^2.

Campus of the future: changing the academic workplace



Campus of the future: creating the place to meet

Campus of the future: more quality, less quantity new life for old buildings

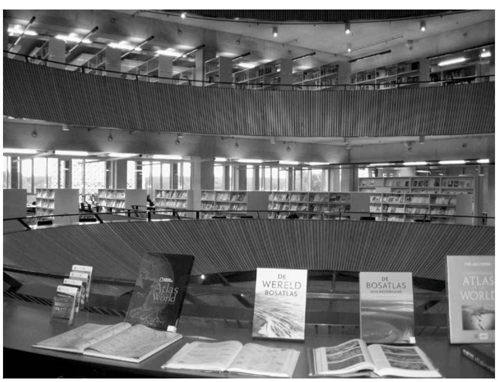
9.4 Strategic choices about reducing the footprint

Related to one of the most important trends on campus, reducing the footprint is not even a choice, but how to reduce the footprint is one of the challenges. The questions below will help as an introduction to the possibilities, while there are many international publications available with all types of measures.

- How and on what level can we apply sustainable solutions, to have a green campus?
- Can we share our most expensive or least used facilities with other parties? (laboratories, auditoria, conference facilities)

The strategy to reduce the footprint of the organisation –and its individuals– usually has efficiency goals: can we have the same (quality of) production with less resources. In campus management 'resources' in this sense means 'facilities'. While the academic concepts focus on the primary processes –education and research– new sustainable concepts focus on secondary processes: more efficient use of resources. These two interact when universities test their own innovations on sustainable development on their own campus. This ultimate example of 'practice what your preach' can have positive impact on performance indicators on many levels. Nonetheless, the multi-level impact of sustainable concepts is very hard to measure. Stimulating academics and students to work at home to reduce the footprint and the CO_2 reduction of less mobility might costs more extra energy per household than it saves for the university. The first step is to acknowledge a possible negative or positive impact, the second to quantify that impact as much as possible.

Campus of the future:
sustainable solutions
CO2 neutral campus



Nevertheless, at universities the human resources produce the output and are easily affected by campus decisions. Less floor area can affect their satisfaction and quality and quantity of production. This might have more negative effect on performance than reducing resources has positive effect. Sustainable solutions can also set a good example to users on campus, with students being the decision makers of the future. Nowadays, universities and campus managers indicate that they would more likely aim at 'reducing the footprint' (HOI 2010). This is more notable in their campus strategy, rather than in projects. Reducing the footprint on campus level can still mean investing in quality in the residual portfolio.

Recommendation 5: reduce the footprint in favour of quality, scarce resources and sustainable development

Campus of the future:
sharing laboratories and other expensive facilities

Partners institutions in higher education and related businesses are willing to share space use, management tasks and ownership, also caused by less favourable economic circumstances. Can we share our most expensive or least used facilities with other parties? (laboratories, auditoria, conference facilities). One of the campus strategies that has impact on most performance indicators –both positively and negatively– is (deciding on) shared use and ownership of facilities (see figure 9.2). It should be noted that the impact of shared ownership is much larger.

Recommendation 6: consider partnerships for managing the academic functions of the campus of the future

The choice in better financial times used to be: your own facilities or shared facilities: now – in these times of budget cuts - it is shared or nothing. The willingness to share was never this positive. Shared ownership of campus facilities usually means that the university can no longer (exclusively) decide on these facilities. In terms of 'adding value' this can 'support culture' and 'increase flexibility' because it can be a flexible solution on the long(er) term and it can reduce risks when student number decrease. However, shared use can also negatively affect flexibility of use for university purposes. Shared use on (work)place level can also mean that (groups of) users no longer have their own territory of libraries, meeting rooms or even workplaces. This is usually more space efficient, reduces costs and the footprint of individuals. It can even stimulate collaboration between groups within the faculty or university and increase the quality of production. But apart from these benefits, it can also have negative effect on 'image' and 'user satisfaction' and 'production'. Management, ownership and use of academic functions can be shared among a range of partners. For programming the academic function on campus figure 9.2 can be used as both a checklist and a tool for discussions about possible partners and resources. It can apply to reconsidering the balance between private territory and spaces to share, from the level of the individual when rethinking the academic workplace and from the level of the university when thinking about shared use, management and ownership of expensive or infrequently used laboratories.

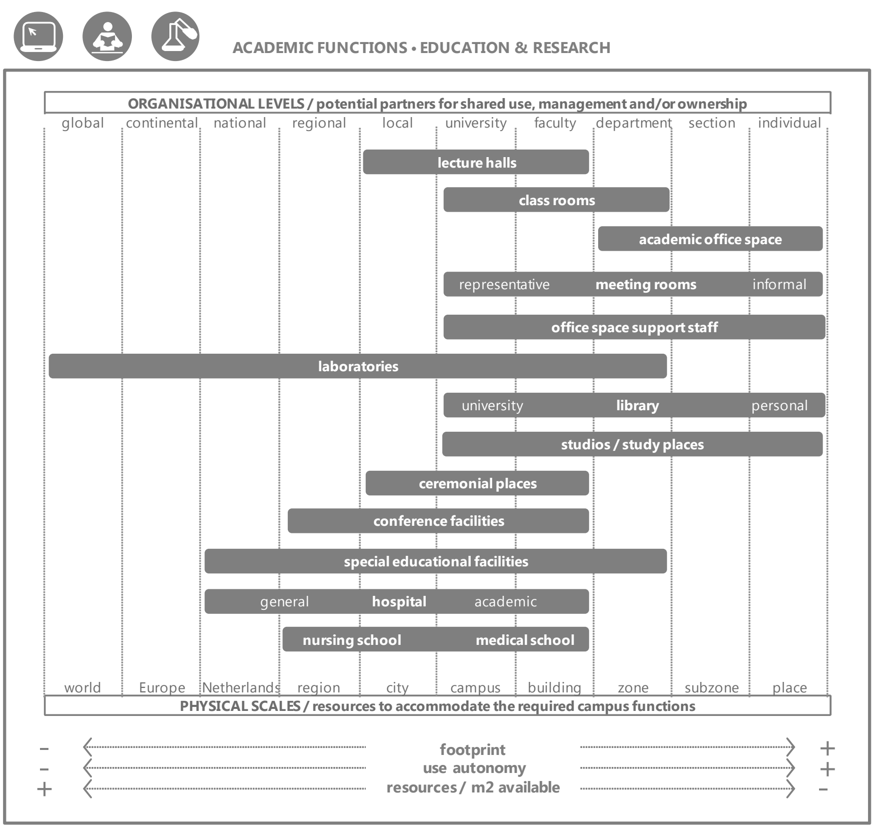


figure 9.2: academic functions to share with different partners, on different levels and scales

9.5 Strategic choices about expanding the borders of the campus

With internationalisation, attracting and retaining national and international students, one of the most important conditions is having enough student housing available. The strategic choice is not if this is relevant, but how do we share ownership, (preferred) use and management tasks with other parties, like housing associations. Related questions are:

- How can we create a univer-city, combining the best of both worlds, socio-culturally?
- How can we create a univer-city, combining the best of both worlds, economically?
- How much responsibility do we take for housing, for (international) students and staff?

Recommendation 7: consider partnerships for managing the residential functions of the campus of the future

Campus of the future: student & faculty housing

How much responsibility do we take for (international) housing, for students and staff? Available (student) housing has become vital for the competitive advantage of university, adding to quality of life and building a community on campus and in the city. Management, ownership and use of residential functions can be shared among a range of partners. For programming the residential function on campus figure 9.3 can be used as both a checklist and a tool for discussions about possible partners and resources.

The goal to facilitate a more international population puts extra pressure on creating enough housing units for students and visiting professors. Short-stay housing is more and more important as flexible accommodation, preferably close to the campus and in meaningful places of the knowledge city. Providing an international community with 'a home away from home' also emphasizes the need for social interaction. The assumption is: the better the social network of international students and professors, the more likely they are to stay as knowledge workers and the more they contribute to the knowledge economy. The social network benefits from good housing facilities, but also from longer opening hours of academic facilities and retail and leisure functions like espresso bars and restaurants.

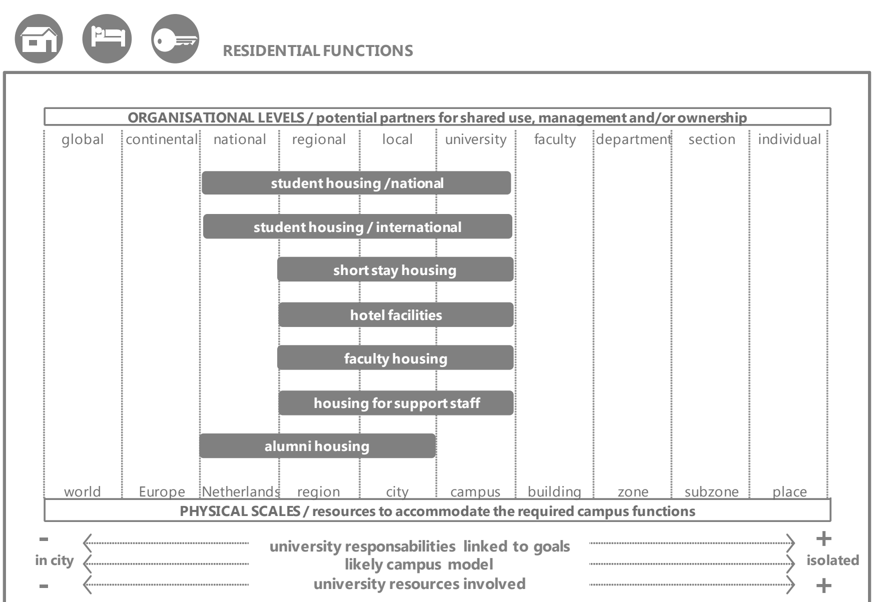


figure 9.3: residential functions to share with different partners, on different levels and scales

The university's responsibility for alumni housing and housing for support staff is more relevant when the campus is relatively isolated from urban areas and labour is scarce in the local market. Alumni housing – following student housing after graduation – can be key in keeping knowledge workers for the regional economy.

Recommendation 8: consider partnerships for managing the university-related business functions of the campus of the future

Campus of the future: univer-city building a knowledge city competitive advantage of city for university / university for city

Related businesses are increasingly important for the valorization (knowledge exchange), innovation and employability. They contribute to the economic base that is important to a knowledge city.

How can we create a univer-city, combining the best of both worlds, (knowledge) economically? Management, ownership and use of related functions can be shared among a range of partners. For programming the related business function on campus figure 9.4 can be used as both a checklist and a tool for discussions about possible partners and resources.

Organisational levels vary from national collaboration on research & development activities to department level for academic spin-offs of specific scientific disciplines in knowledge centres. This can also include the process of marketing a product that resulted from education or research. Small-scale incubators are usually located on campus, sometimes in faculty buildings – sharing space with the academic staff or with other entrepreneurs. Once these academic entrepreneurs become more successful they usual to designated buildings on campus, to the local science park or elsewhere. Universities should weigh the costs and benefits of keeping them on campus.

All related businesses could not only share space, but also network facilities, libraries and academic and support staff. To what extent is also dependent on weighing the costs and benefits of sharing.

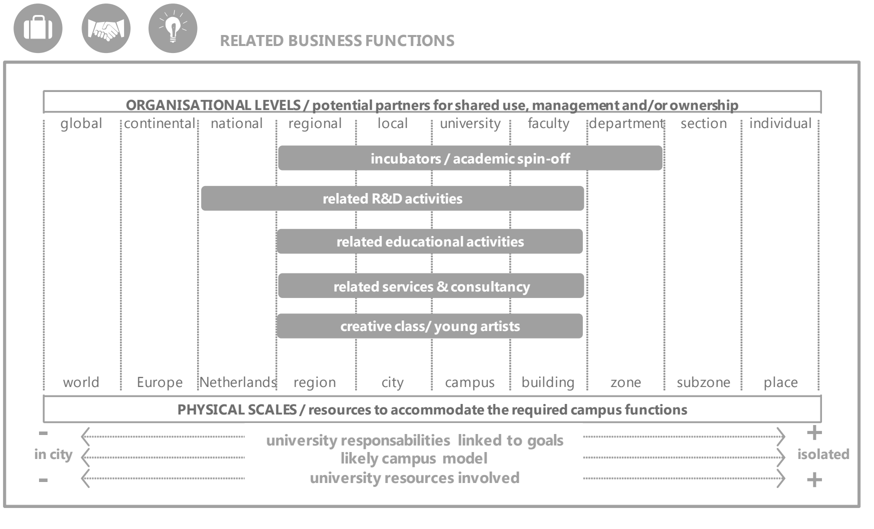


figure 9.4: related business functions to share with different partners, on different levels and scales

Arts faculties could have a different spin-off that is closely related to cultural functions on campuses and in the city – students could perform or give workshops to the local community. This is referred to as the creative class in figure 9.4, which could also include a broad range of design and engineering professions. This links the related business functions to the retail & leisure.

Recommendation 9: consider partnerships for managing retail & leisure functions of the campus of the future

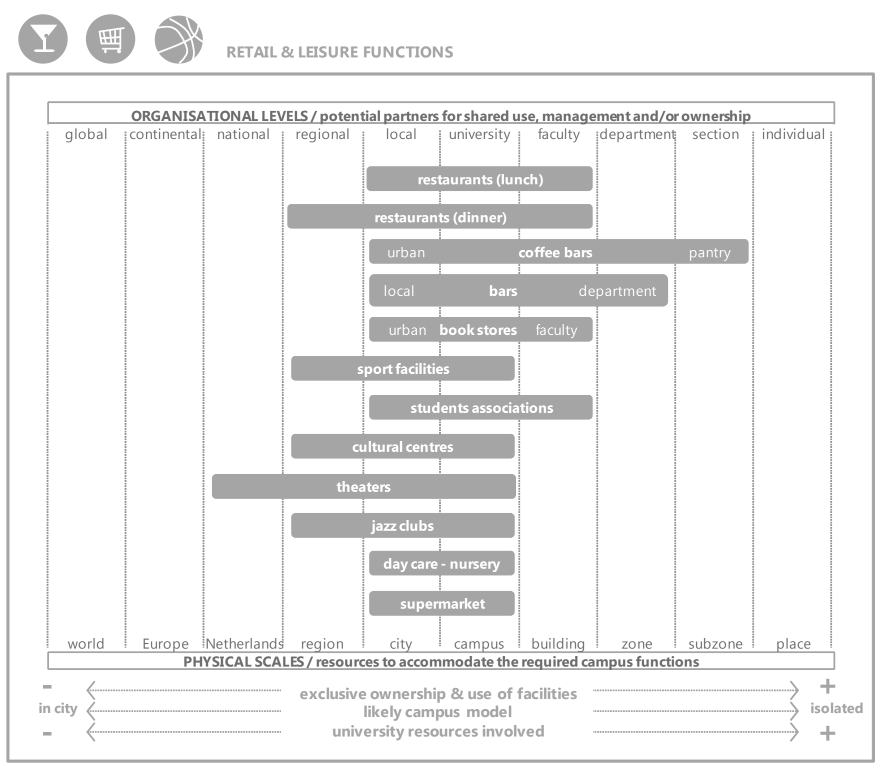
Campus of the future: "univer-city"

How can we create a univer-city, combining the best of both worlds, socio-culturally? Retail & leisure will safeguard quality of life, as a vital foundation for a successful knowledge city. Management, ownership and use of retail and leisure functions can be shared among a range of partners. For programming the retail and leisure function on campus figure 9.5 can be used as both a checklist and a tool for discussions about possible partners and resources.

Evidently the more integrated the campus is with the city, the more retail & leisure functions are already available to use within reasonable distance (and travel time). But then in student cities many of these functions exist because of the presence of the university. The maximum distance between the campus and particular functions differs depending on the quality and necessity of the function. For instance, coffee is required close to the workplace, but good espresso might be worth a five-minute walk.

Adding retail & leisure function and more non-territorial, public spaces could be feasible, when the university decides to reduce territorial academic space (m^2 per user) and collaborates with partners that share the benefits.

figure 9.5: retail & leisure functions to share with different partners, on different levels and scales



Recommendation 10: consider partnerships for managing the infrastructure functions of the campus of the future

Infrastructure is connecting all functions and becomes increasingly important, both accessibility and parking. Many Dutch universities are using or are about to introduce a system to charge the campus users for parking. Management, ownership and use of infrastructure functions can be shared among a range of partners. For programming the infrastructure function on campus figure 9.6 can be used as both a checklist and a tool for discussions about possible partners and resources.

Again, the value of these functions should be compared with the costs: making a business case for each function, considering the key performance indicators of the university's stakeholders. Once more, the university's responsibility for accessibility by car, bicycle and public transport depends on the distance between the campus and the city. While all other functions on campus depend on accessibility, this cost-benefit analysis should consider this whole system of campus functions.

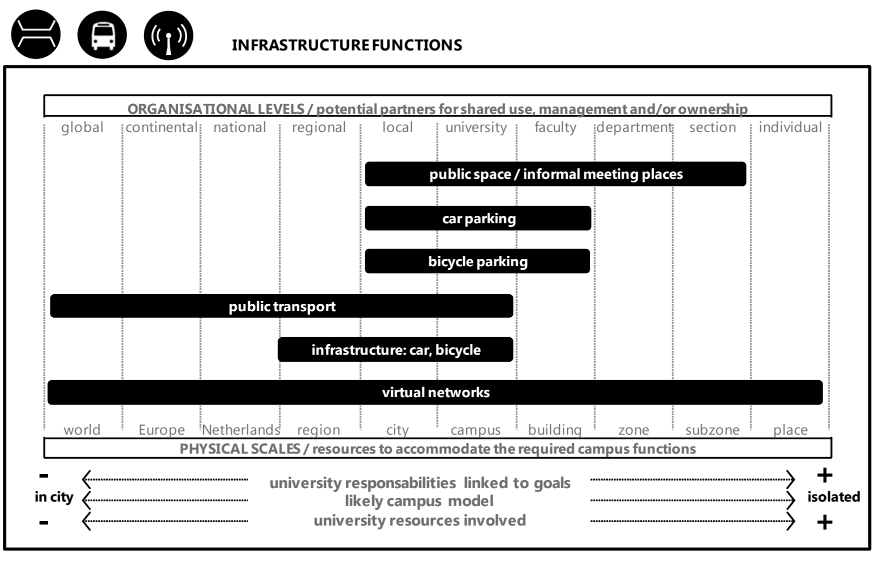


figure 9.6: infrastructure functions to share with different partners, on different levels and scales

9.6 Interrelated strategic choices

This chapter transformed current trends for the campus of the future in a number of strategic choices for either the whole campus or specific spaces on campus. Every university can make a series of strategic choices, but should consider the relations between them. In figure 9.7 some examples can be found that are linked to just one CREM variable: organisational goals, available resources, use and users and the campus in quality and quantity.

All choices are interrelated: the condition of buildings and ecological footprint – both technical aspects – are linked to the university goals, the support of users is linked to the percentage of university resources spent on the campus. Ultimately, the cases on both project and campus level are the basis of making these interrelated variables more explicit and measurable. The reference databases in the appendices (campuses in I, projects in II) show many examples that can be used as management information to support these strategic decisions.

However, for every strategic choice or campus decision it is important to make a business case, to be explicit about both the benefits and the costs, using the key performance indicators (KPIs) to determine the affect on the university's performance (see chapter 8) and collectively considering if the benefits justify the costs.

Finally, all recommendations are summarized in a vision on the campus of the future:

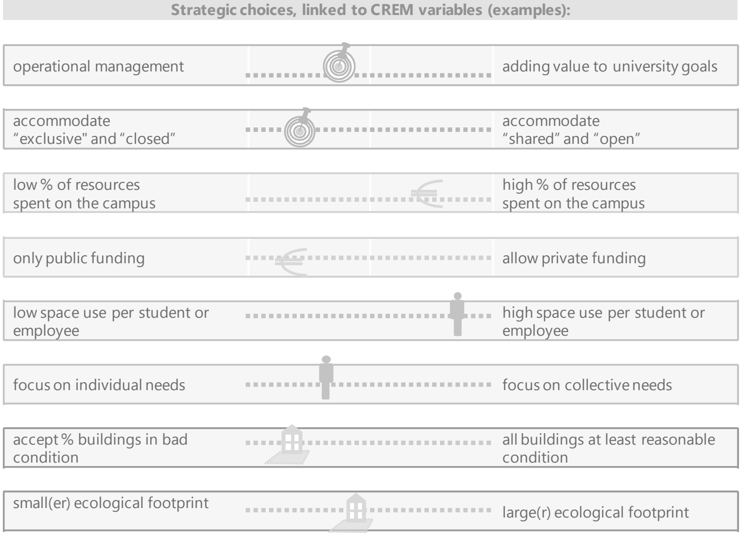
1. Choose a selection of the basic university models (A-B-C-D) characterised by competition versus collaboration, exclusive versus shared use, large versus small, open versus closed and physical or virtual – or combine these models for different parts of the university
2. Develop and manage the campus as a city – in close collaboration with the urban authorities.
3. Express university values in private and public space – to inspire and build a community.
4. Reconsider the old buildings before considering new and and intensify the use of meaningful buildings by increasing productivity to cover the costs.
5. Reduce the footprint in favour of quality, scarce resources and sustainable development

Consider partnerships for shared use, ownership or management of the campus of the future:

6. for academic functions (education and research) and their supporting functions;
7. related business functions: incubators, services for the university on business and science parks;
8. residential functions, like student housing, short-stay facilities and hotels for (international) students and professors;
9. retail & leisure functions – restaurants, (espresso) bars, sports and cultural facilities;
10. and infrastructure functions, like public transport and accessibility with cars, including parking.

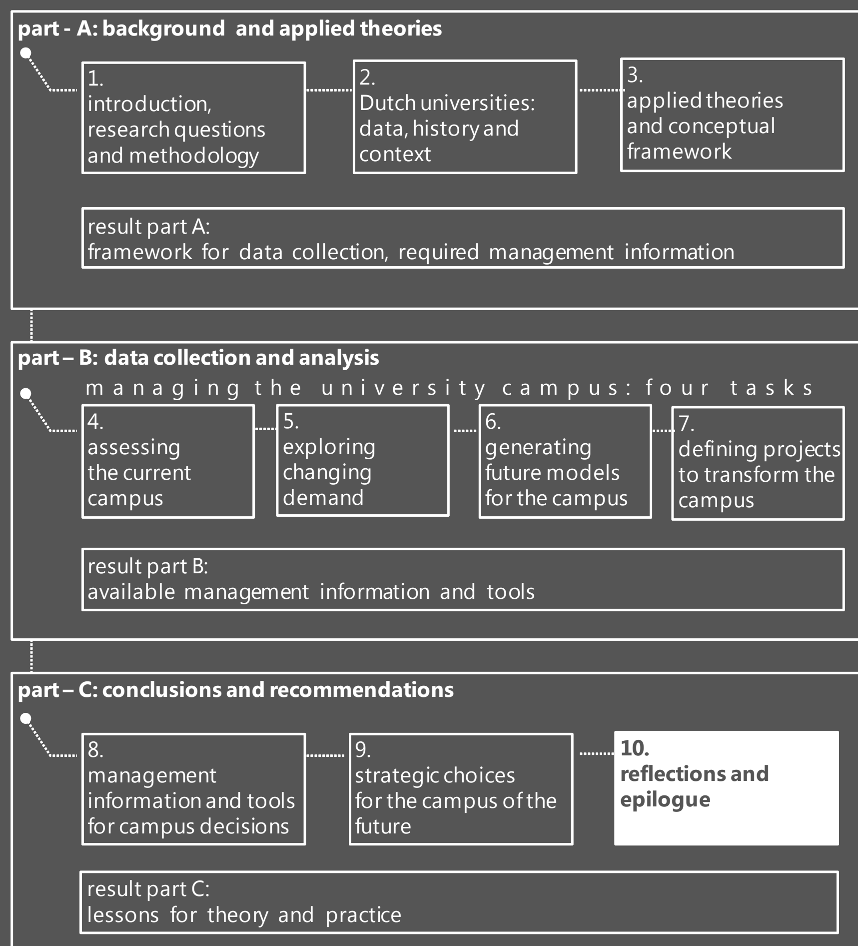
The campus profiles in appendix I and the campus projects in appendix II show the choices that Dutch universities have made in the past and how they shape the Dutch campus of the future.

figure 9.7: interrelated strategic choices to consider



Student life, Delft
Photo: DUWO

Chapter 10
Reflections and epilogue



10 Reflections and epilogue

10.1 Reflections on the research process

How to simplify an increasingly complex discipline?

After ten years of research on this subject it was quite a challenge to merge many of the previous results in one book, not as a goal in itself, but because these results were relevant to either theory or practice of managing the university campus. During the past decade the profession of campus manager even became more complex, introducing the strategic value to decision making – entering the university boardroom – and highlighting the link to the city and the regional economy – entering the area of urban development.

As a consequence the challenge of this research was to acknowledge the complexity of the scientific discipline and the dynamics in the context and – at the same time – distil the most important aspects into comprehensible tools for decision makers and new frameworks for campus management or real estate management in general.

The ambition to involve insights from many scientific disciplines

The fact that real estate management (as we define it at Delft University of Technology) is a relatively young scientific discipline had both advantages and disadvantages. Like a designer I liked the idea of having enough freedom and space to shape new models, also by rethinking and adjusting existing models or using existing components to build new structures. Nevertheless, there were enough boundaries to consider in this 'creative research process'. Existing research frequently focuses on one stakeholder perspective (however valuable) and not on integration of perspectives. On top of that, there are not many references that provide hard evidence on a causal relation between real estate interventions and performance – or in my case, the relation between the campus and the university's performance. It can be made plausible, but we can hardly prove it [1].

[1] Ironically, the fire at our own Faculty of Architecture supplied some evidence on the value of a university building for a faculty and university – affecting the competitive advantage, the productivity, profitability and sustainable goals (see appendix VI)

During this research process I found literature references from many perspectives on (managing) real estate in general or the university campus in particular. Usually these references originated from specific scientific disciplines, like business economics, organisational psychology and urban planning. Many references focus on real estate management from a commercial viewpoint, with a focus on financial aspects or references with a focus on technical aspects of buildings. Emphasizing the importance of the combined owner-user perspective, literature about corporate real estate management introduced both the user goals and contribution to the organisational performance. However, tools that actually merge these perspectives – focussing on integration instead of analysis of single perspectives – are still very rare.

References on the campus illustrated the same problem. Literature on the historical value of the university's cultural heritage, on the mutually beneficial relation between city and university and on the psychological aspects of the academic workplace are all very relevant, but practice shows that decision makers should integrate most of these aspects in their campus strategies and need multidisciplinary management information to support the discussion with different stakeholders.

In figure 10.1 the relevant scientific disciplines – introduced in the first chapter of this book – are connected to the different stakeholder perspectives as used to define the multidisciplinary approach of campus management. The blue, yellow, orange and green areas indicate bodies of knowledge on a range of scientific disciplines, the applied sciences related to managing real estate in general and the requirements for managing the university campus in particular.

My literature review confirmed the need for a multidisciplinary approach to the subject, but did not provide many references that offered a multidisciplinary approach. That conclusion was the starting point for this research. My challenge was to connect different bodies of knowledge by identifying key performance indicators – derived from specialised theories for each perspective – to integrate in both the theoretical frameworks and tools for decision makers in practice. The fact that these same decision makers were involved in this research and required practical tools was an important incentive that forced me to make every concept operational for use in practice. In return I got access to data and direct response on the usability of tools.

I would also recommend this mutually beneficial relation with practice to fellow researchers in real estate management, because this broad subject benefits from having a focus in the synthesis to avoid being carried away in the analysis. The position of this scientific discipline in a design faculty can be very helpful in this process, because it forces to translate insights in programmatic requirements for interventions in the physical environment.

The risk of self-fulfilling prophecies

Whereas the close relation with practice assured direct feedback on the applicability of complex theoretical frameworks, it also had some risks. Testing theories in practice could easily become 'convincing practice of theories'. Some indications of the latter can be illustrated by an example. In one of the first reports I made a list of developments that shaped the context of Dutch campus management and upcoming trends on the campus. Some campus visions that followed contained the same (cited) text and some projects of the past decade show that the 'upcoming trends' of that report have indeed shaped the current campus. Was I right about the trends or did I contribute to them? The same goes for the statement that "Dutch campus management is increasingly becoming

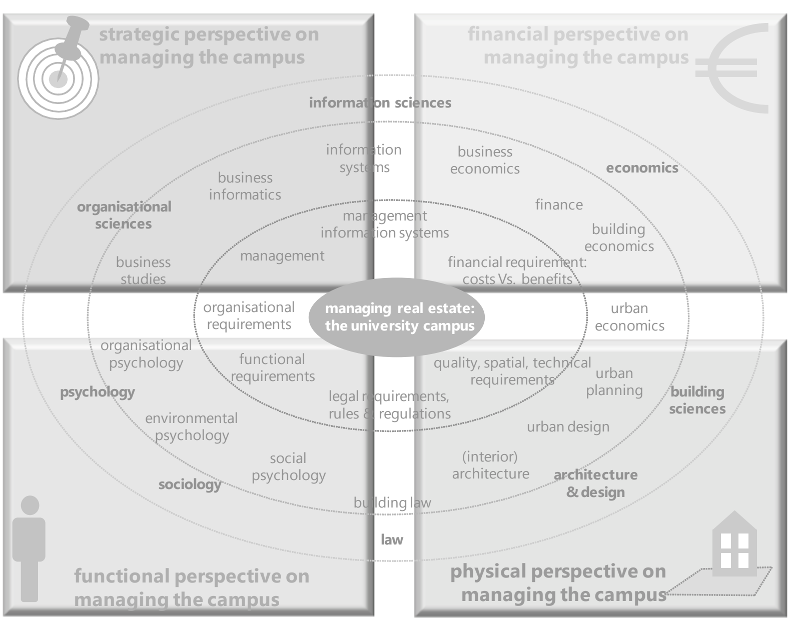


figure 10.1: relevant scientific disciplines for "managing the university campus" matching the four stakeholder perspectives, emphasizing the broad scientific field of managing real estate

more strategic" and the advice "to use the CREM model for campus decisions". De Groot would call that 'contamination' (De Groot 1961), while the application of my conceptual models in practice could also be considered a compliment. While I would not dare to overestimate my influence on campus management in practice, it should be noted that there was a substantial chance of self-fulfilling prophecies in this research process that has known many empirical cycles in close collaboration with practice.

Being part of the system

No scientific researcher on the university campus can be completely objective about this subject, because it is concerning his or her own employer, working environment and former learning environment. Their personal values and cultural background will influence their views. In my case this subjectivity was combined with my role as an internal consultant to my own university and faculty – to policy makers, controllers and facility managers, covering indeed all stakeholder perspectives.

However integrated with the system this already seems, the fire that destroyed our own architecture building gave the research method 'participatory observation' a whole new meaning. Not only was I part of the team of policy makers, controllers, technical managers and users that shaped the current faculty building, but together – as users of the campus – we experienced what it means to loose a place to work and learn with all memories and physical archives, what is means to be 'homeless' as a faculty for half a year, what is means to be reunited as a faculty community in a building with historical value for the university and what it means to be accommodated in an office concept without individual territory. Both process and project – of a building that is called BK city – gave an opportunity to test theories, show trends and implement new concepts. In this case, the risk of self-fulfilling prophecies was evident. My more personal reflections on this process can be found in appendix VI.

10.2 Reflections on how the BK city project added some valuable lessons

Exactly because of the risk of self-fulfilling prophecies, it is mainly up to others to judge how successful the process and project of BK city have been. Nonetheless, I will summarise my lessons in some conclusions and recommendations – to specify what I think other campus managers could learn from this project and focusing on the findings that are confirmed by the data analysis of this research, matching some of the recommendations for the campus of the future.

(1) the user acceptance of supply shaping demand

First, my view on real estate management as a match between supply and demand was challenged. Mainly because I used to believe that supply would ideally follow demand – ideally if infinite resources were available. However, in practice, financial resources are hardly ever infinite and physical resources take many resources to change. As quite a revelation to me, the BK city project shows that users are more likely to accept and appreciate their working environment when the current physical setting strongly influences – or even dictates – the floor plan and the functional possibilities, not open for much discussion or change.

(2) re-use of meaningful buildings

Secondly, this project convinced me that re-use of existing university buildings – especially cultural heritage that emphases the history of the university – is an important strategy for many universities in global competition. While adversaries often state that talented researchers would work at a workplace without any identity at the top-ranked universities in the world, that leaves thousands of universities below the top that do not differ much on quality of research and education and can compete on quality of life, both on campus and off-campus. With BK city being closer to the historical inner city of Delft, the project can illustrate both.

(3) matching the benefits with the costs per m2 – with more users per m2

Thirdly, the strategy above can only be paid for if the benefits per m2 match the costs. With rising replacement costs for university buildings, the productivity per m2 should be increased accordingly. Apart from encouraging employees to generate more output or income, this can also be done by reducing the footprint of students, professors and other staff members, making better use of space in time and allowing external users to share space with the university.

(4) 'quality for quantity' helps for acceptance – having something to gain

BK city shows that campus users are more willing to accept a reduction in quantity if they get quality in return. In general, the sense of urgency of any crisis will help in the acceptance process of any unpopular intervention in the working or learning environment. During the making of BK city the economic crisis led to tighter budgets that encouraged the awareness of 'the glass being half full' instead of 'half empty' in the perception of employees. Choosing between 'all or half' feels like loss, choosing between 'half or none' feels like something to gain.

(5) having stakeholders with mandates at the table

The project organisation of BK city involved representatives from strategic (board of executives, dean, management staff), financial (controllers on university and faculty level), functional (representatives of students and employees) and physical perspectives (technical manager, project leaders), covering all relevant stakeholders. Due to the strict deadlines these persons hardly had any time or opportunity to discuss alternatives with the parties they represented, which also introduced the risk of decisions without commitment or support, which could reveal risks in the phases that followed. This was the case for introducing the non-territorial academic office concept.

(5) the importance of references for stakeholders

During the whole process of the making of BK city, the importance of references was illustrated in discussions and negotiations with many stakeholders. References of used space standards – m2 per student of comparable architecture faculties and schools, investment levels of similar projects and evidence-based best practices for every new concept that we introduced were supplied to satisfy the need to compare projects, to be transparent about the considerations and to gain trust of the community by demonstrating our expertise and experience.

(6) 'bounded rationality' in decision-making

This project under severe time pressure also illustrated the concept of 'bounded rationality', with limited time to collect management information and allowing intuition and emotion in the decision-making process. Yet, the fact that most of the project members had been involved in campus projects or faculty policy-making for years did not make it as applicable as one would think based on the characteristics of the project.

On the contrary, it was often stated that the project organisation collaborated so well, because of the implicitly and explicitly available background knowledge, experience in similar projects and the incentives to think beyond satisfying their own needs.

(7) the need and search for reliable data

From the beginning to the end the availability of reliable data was critical. In the first phase the search for dependable data on number of employees – both head count and full time equivalents – showed that different sources provide different figures. Human resource management gave me other figures than the departments themselves. The same problem arose for student numbers, also distinguishing 'enrolled students' and 'active students'. The process only emphasized the value of structurally collecting dependable figures of student population and number of employees, also for post-occupancy evaluations of implemented concepts. In appendix VI the BK city project is described in numbers.

(8) a faculty of architecture as an ideal laboratory

A building for a faculty of architecture appeared to be an ideal laboratory to test new concepts. With education and research on planning, designing, realising and using the physical environment, students and employees are – in theory – most likely to be open for experiments in their own working and learning environment. At the same time, this type of community is most likely to be critical about decisions – also because they can relate to the subject in theory or practice. This become clear in the discussion about the top-quality furniture, that was appreciated but also criticized as too expensive for a faculty that needs to cut budgets, even though the furniture was part of a sponsor contract and financed with insurance money that could not have been spend on human resources. We concluded that if this discussion about costs starts at a faculty of architecture, it will probably start anywhere else.

(9) creative faculties are important for a lively campus

Since BK city is in use, many visitors have commented on the vibrant and creative atmosphere that the faculty community brings, even after working hours. The value of the creative class for the quality of life in a city has been subject of many publications (Florida 2002; Florida 2008). The creative class of a university – students and academic staff of design faculties or schools for other creative professions – might very well have a similar positive effect on quality of life on campus. Many students do not follow the 9-to-5 working hours and they often work in groups and on physical products that are visible and inspiring to others. These types of faculties also enrol many international students that form a social community that considers the campus their home. Because of their working hours and their type of work they are more likely to demand retail and leisure functions on campus, like espresso bars, restaurants, supermarkets and shops for materials and printing.

(10) the relativity and territorial aspects of paper - the changing academic workplace

One of the most provocative concepts that we implemented after the fire was the transition of a traditional territorial cellular office into an activity-related concept without individual territory. The starting point was unique: without paper archives. Almost all academic staff members lost their physical archives in the fire. As members of the project group we knew that the former building was stacked with paper and that whatever space we would offer as archive would be filled with paper. So we decided on very limited personal archives, to encourage the paperless office and sharing of books, magazines and other collective resources and – most importantly – to stimulate the use of digital sources, archives and networks.

We knew that paper archives do not only use much (usable) floor area in buildings, it also makes people more territorial: they want to be close to their archives. With the goals of making better use of existing space, of reducing the footprint and of stimulating shared use of space, reducing the paper archives seemed to have many benefits. As a researcher I would like to add that digital sources are easier to share, to find and to search on key words, which also contributes to better collaboration in education and research. Nonetheless, the culture change was and still is huge, especially for the group of staff members that have worked with a large physical archive for most of their working life.

The BK project was an extraordinary test for many theories and tools at the end of this research process. The lessons mirrored and emphasized many conclusions and recommendations that were based on literature review and the analysis of (other) empirical data. This includes the importance of collecting reliable data, the need for more references from peer organisations and the need to share knowledge in (international) networks of universities. It also confirmed the limits to rational decision-making and the risks of strategic misinterpretations by stakeholders in the process, also by using heuristics – sometimes because they lack reliable references.

Use the network of campuses as a European competitive advantage

Elaborating on the need to share campus knowledge, my recommendation would be to connect a network of campus managers at European universities – not just to exchange management information, but also to discuss a collective strategy to use the history and diversity of European universities and the quality of life at their historical university cities and campuses as a collective competitive advantage in attracting talented knowledge workers to Europe. Linked to more inter-university collaboration in education and research – and with shared use of facilities, also with local partners and related businesses – this could offer international students a European learning experience at many meaningful places. In return, this would contribute to the European knowledge economy.

10.3 Reflections on the results of this research

Reliability of data

With a substantial amount of empirical data it is necessary to reflect on the value of these data, judged by the used research methods and techniques. While much data was collected by asking campus managers (or one of their staff members) to fill out formats or questionnaires, triangulation was used in different stages of the research to assure the truth value of the data. Values were double-checked by other staff members of by the campus manager. Nonetheless, there are many reasons to doubt the dependability of data. Strategic behaviour is one: the person that supplies the data can be influenced by what will be done with the information. The use of the right definitions, rapid changes in data like student numbers and human errors in filling out the forms are other reasons. Some examples may illustrate this. At the first stage of the data collection many universities interpreted the definitions for floor area differently. It was quite difficult to collect comparable figures on floor area of fourteen Dutch universities – before they collectively decided to use the same definitions. Combining these figures with student numbers or staff introduced the gap between the figures from the administration files and the figures in reality. Adding the figures about the costs and benefits added another factor in reliability, while universities might not want to be too explicit about relatively high investment costs or budget overruns.

The risk of strategic misinterpretations is most apparent when asked about the intended effects of projects, like increasing the number of students, the output of researchers or the ranking of the university. This research recommends being as explicit as possible about these effects or determining what it is worth to the university, derived from the costs of alternative measures with the same proposed effect. Yet, in practice, this 'honesty' might be 'punished' by cancelling the project beforehand, while inaccurate calculations that are only based on optimistic scenarios might be 'rewarded'. This might give some stakeholders 'perverse incentives' in the process of supplying data for a project's business plan.

As a researcher I also double-checked some of the data, by comparing ratio to my own library of references. The question whose responsibility the reliability of the data in this book is, is hard to answer. I consider it a shared responsibility of the supplier of the data and the researcher, using both triangulation and some tests to assess the quality of data. Yet, the use of the data after publishing still remains the responsibility of the reader.

Bounded rationality in decision-making

Bounded rationality is defined "as the notion that in decision making, rationality of individuals is limited by the information they have, the cognitive limitations of their minds, and the finite amount of time they have to make decisions" (Simon 1997; Gigenzer and Selten 2001). Again, the complexity of the scientific discipline and the profession of campus manager makes both vulnerable to ignoring angles on the subject that are hard to make operational and complex to weigh against investment costs, condition scores or other more concrete aspects of the campus. That usually leaves the psychological, social, organisational and environmental issues underexposed, while costs are calculated in great detail.

Even supplying multidisciplinary references to decision makers does not rule out the possible strong effect of intuition and emotion on campus decisions. At least, it gives the possible to relate decisions to key performance indicators and to be more transparent in discussions with the different stakeholders. How this information is weighed and used in the actual decision is still the responsibility of the campus manager.

The ultimate test of this book: practise what you preach

In a way the ultimate test for finding the right balance between supplying relevant management information about this comprehensive subject and keeping it comprehensible, was writing this book. I should at least practice what I preach. That quality requirement - for a perfectionist like me – was one of the reasons why I could hardly finish it, at least not without external pressure. During the research process I have been judging my own work as (management) information that could still be presented more clearly or supported with more theoretical references or evidence-based reasoning. Now that the book is ready, it is up to others to judge if I succeeded.

But above all, I hope that these same professors, researchers, university policy makers, students and others will be more aware of all aspects that universities have to manage to make campuses vital parts of the network of knowledge cities and meaningful places to work and study that will often be remembered for life.

Central library,
Delft University of Technology
Photo: FCM

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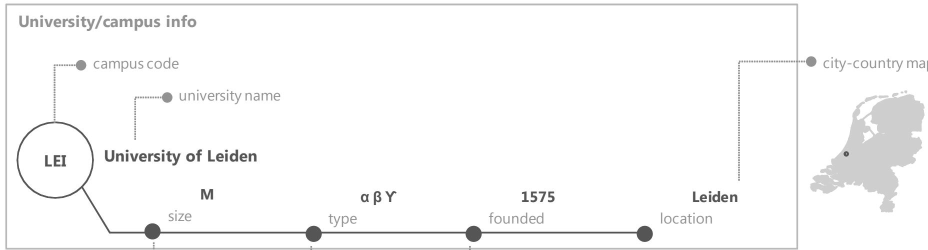
Appendices


BK City,
Delft university of Technology
Photo: Tu Delft (RtH)

Appendix I
Dutch university campuses

EUR Erasmus University Rotterdam
LEI Leiden University
OU Open Universiteit
RU Radboud University Nijmegen
RUG University of Groningen
TUD Delft University of Technology
TUE Eindhoven University of Technology
UM Maastricht University
UT University of Twente
UU Utrecht University
UvA University of Amsterdam
UvT Tilburg University
VU Vrije Universiteit Amsterdam
WU Wageningen University

Reader's guide appendix I



time

old		young
< 1800	1800-1950	> 1950
LEI-Leiden 1575 RUG-Groningen 1614 UvA-Amsterdam 1632 UU-Utrecht 1636	TUD-Delft 1842 VU-Amsterdam 1880 EUR-Rotterdam 1913 WU-Wageningen 1918 RU-Nijmegen 1923 UvT-Tilburg 1927	TUE-Eindhoven 1956 UT-Enschede 1961 UM-Maastricht 1976 OU-'virtual' 1984

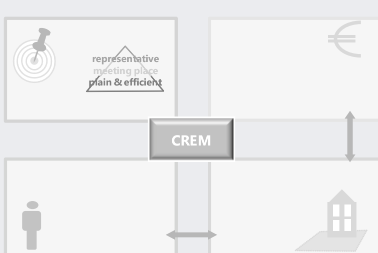
ϒ	ϒβ	α β ϒ	β	β
gamma	**gamma-beta**	**alpha-beta-gamma**	**beta**	**beta**
social sciences	social sciences sciences • theoretical • medical	arts social sciences sciences • theoretical • medical	sciences • technical	sciences • agricultural
UvT-Tilburg	EUR-Rotterdam UM-Maastricht OU-'virtual'	LEI-Leiden RU-Nijmegen RUG-Groningen UU-Utrecht UvA-Amsterdam VU-Amsterdam	TUD-Delft TUE-Eindhoven UT-Enschede	WU-Wageningen

S		M	L	
small		**medium**	**large**	
< 8.000 students*	8.000-12.000	12.000-18.000	18.000-22.000	> 22.000 students
TUE-Eindhoven UT-Enschede WU-Wageningen OU-'virtual'**	UM-Maastricht UvT-Tilburg	LEI-Leiden RU-Nijmegen TUD-Delft	EUR-Rotterdam VU-Amsterdam	RUG-Groningen UU-Utrecht UvA-Amsterdam

* students based on enrolment in academic year 2006/2007 (source: VSNU 2007)
** OU: based on fulltime enrolment of 6.000-7.000 students

This appendix contains two pages of campus information for each of the fourteen Dutch universities, including their campus maps, strategy and a campus profile that summarizes campus data from four different perspectives – physical, strategic, financial, functional. The campus data was collected in 2007, using spreadsheet formats to assure comparable data, questionnaires for strategic priorities and interviews with directors of university real estate departments (campus managers). The information about the campus strategy was updated in 2010 by collecting renewed strategy documents and presentations. Chapter 4 and appendix VII contain more information about the data collection and the used abbreviations and definitions.

Campus profile



Strategic data: planned quality transition of m2 from current to future (using the Maslow pyramid) and the top 3 goals, selected from a list (or added) and prioritized in 2007.

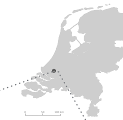
Financial data: income, expenditure, book value and energy costs from the CFI databases (2007), cost of ownership based on group 1 of NEN2748; price level 2007.

Functional data: students and staff from VSNU databases (2007) specifying all enrolled students; space use calculated based on users and specified floor area in 2007.

Physical data: gross ('bruto') and usable ('nuttig') floor area based on NEN2580 (gfa=bvo, ufa=no); space use in 2007 specified with a standardized list (nine categories), with education, office and specific space as the largest and most defining space types.
Age profile and condition of the campus based on gross floor area, assessing all buildings larger than 1000 m2 gfa – using definitions of condition based monitoring

EUR Erasmus University Rotterdam

size **M** | type **β ϒ** | founded **1913** | location **Rotterdam**

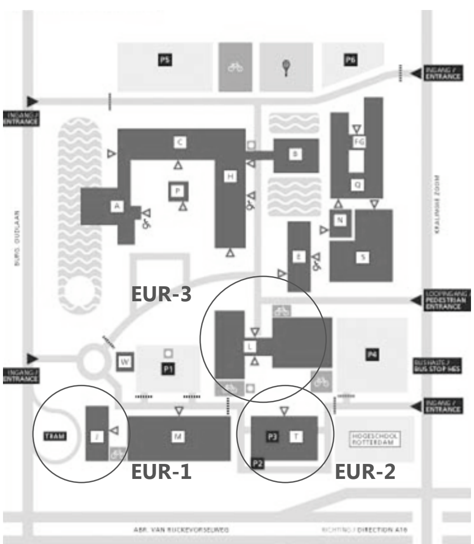


University profile

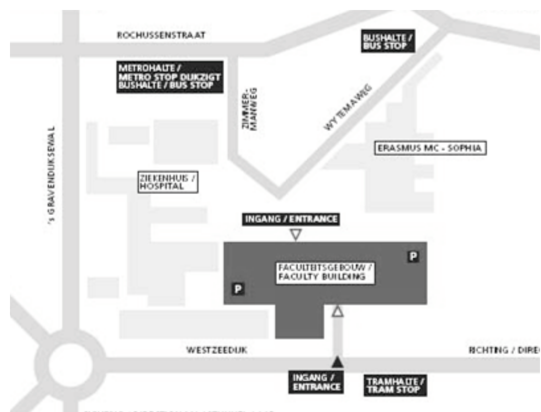
The Erasmus University Rotterdam (EUR) is an internationally oriented research university which is closely associated with the city of Rotterdam. The history of the Erasmus University Rotterdam dates back to 1913, converted to the National School of Economics (NEH) in 1939, worldwide renown due to the work of Nobel Prize laureate Jan Tinbergen. The merger with Medical Faculty Rotterdam resulted in the EUR.

The education offered at EUR is academic as well as practical, focusing on the transfer and exchange of knowledge at the highest level, designed to teach students (of 114 different nationalities) to analyse and solve economic, social, legal and medical problems in society. Scientific research at the EUR is traditionally based on a strong focus on society, drawing on the city and its surroundings as a source of inspiration. Research and education focus on Economics and Management, Medicine and Health, and Law, Culture and Society. Faculties are Economics; Law; Social Sciences; Philosophy; History and Arts; Erasmus Medical Centre; Institute of Health Policy and Management; Rotterdam School of Management and Institute of Social Studies.

W - Woudestein



H - Hoboken



Notes:

- text university profile provided by EUR through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.eur.nl/efb/cio

EUR-1

EUR-2

EUR-3

present

Notes:
EUR campus profile just refers to campus Woudestein. Campus Hoboken is not owned by the university. All data was collected from the year 2007 for comparison with other universities. Since 2007 EUR student numbers have increased with more than 25% (to more than 21.000), staff numbers in fte decreased, WOZ, insurance and book values have increased and floor area remained the same (data 2010).

CONDITION	% m2
excellent	34%
good	54%
reasonable	9%
moderate	3%
bad	
very bad	
	100%

AGE	% m2
< 1900	
00s	
10s	
20s	
30s	
40s	
50s	
60s	30%
70s	7%
80s	9%
90s	27%
> 2000	27%
	100%

EUR Campus profile

goals

past		future	strategy
10%	representative	20%	*10%*
20%	meeting place	40%	*20%*
70%	plain & efficient	40%	*-30%*

1 support user goals more effectively (follow changes in education/research)
2 support identity university / attract (more) students & staff members
3 stimulate innovation / collaboration (staff-staff, staff-students, student-student)

€

total income	461	mln €	
total expenditure	439	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	169	990	
insurance value	299	1.740	
book value campus*	160	930	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	18	103	4%
energy & water	2,0	12	

CREM

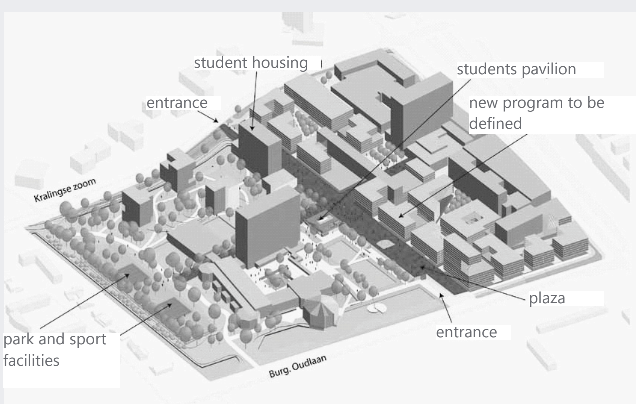
users

students	16.680		
staff	total	academic	supporting
head count	2.330	1.380	940
fte	2.000	1.220	780
office space (m2 ufa) / staff member			19,3
office space (m2 ufa) / fte			22,5
educational space (m2 ufa) / student			1,4
- lab space / academic staff member			

m2

gross floor area	171.000	*m2 gfa*
usable floor area	103.000	*m2 ufa*
ufa / gfa	60%	
rented m2		from external parties
let out m2	16%	to external parties
land property	23	hectares
% office space	44%	(100 % = no)
% educational space	22%	
% specific space	10%	
- % lab space	0%	

Campus strategy



When the ownership of the medical cluster Hoboken was transferred to Erasmus Medical Centre, the EUR focused on campus Woudestein. The campus strategy is aiming at transforming a business-like campus into a park-like, lively place to meet. Strategic goals are creating a more inspiring place to work, learn and live – by adding more student housing and retail & leisure – and contributing to a more sustainable campus by reducing the ecological footprint, also by implementing more flexible concepts. The challenge is to create a green campus, also by finding solutions for parking.

EUR wants to contribute to Rotterdam's knowledge city goals, by creating a vibrant, more open campus as an integrated part of the city. EUR wants to welcome more international students by providing them housing on the campus and adding cultural and sports facilities. EUR is also rethinking the academic workplace to encourage more collaboration and innovation on campus.

Note: Strategy text is written by author based on documents (EUR 2008, EUR 2010), interviews and questionnaires.

future

LEI Leiden University

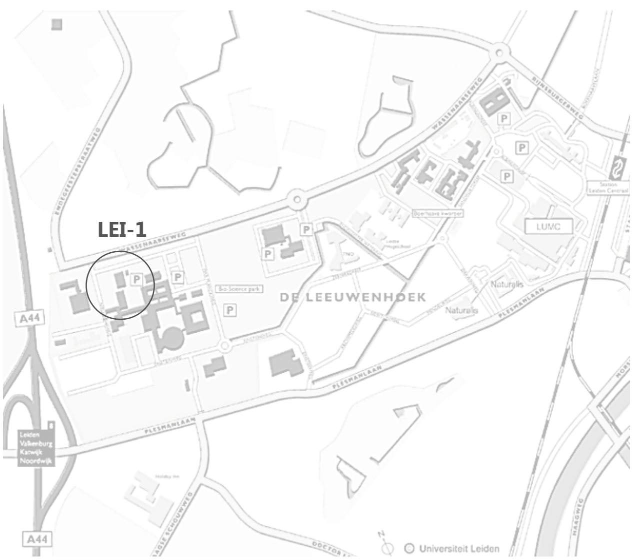
size	type	founded	location
M	α β ϒ	1575	Leiden

University profile

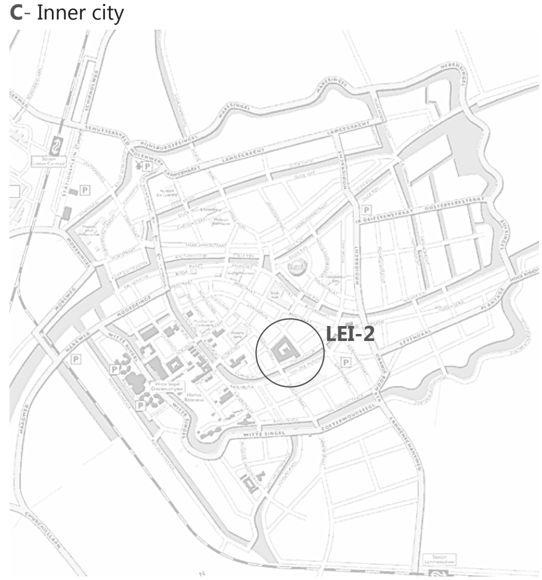
Leiden University is an internationally oriented university offering a wide range of research inspired bachelor and master programmes. Faculties are Archaeology, Humanities, Law, Science, Social and Behavioural Sciences and Leiden University Medical Centre (LUMC). The international reputation in the field of research is confirmed by its prominent position in several rankings of the universities in Europe and the world. In 2002 Leiden University initiated the founding of LERU, the League of European Research universities, an association of 22 European top universities.

Founded in 1575, Leiden University is the oldest university in the Netherlands. Several great scholars and scientists have brought fame to Leiden University, including physicist Albert Einstein and four professors who have received the Nobel Prize. Since 1999 the university has a campus in The Hague for post-academic training. In addition, Leiden University College The Hague (LUCTH) was launched in 2010. LUCTH will provide a three-year Liberal Arts & Sciences programme in English for a selected group of excellent and highly motivated students from around the world.

L - Leeuwenhoek

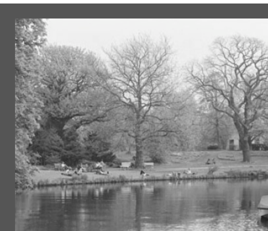


C- Inner city



Notes:

- text university profile provided by LEI through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.leiden.edu/



present

LEI Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	6%
good	27%
reasonable	25%
moderate	29%
bad	14%
very bad	
	100%

AGE	% m2
< 1900	4%
00s	1%
10s	
20s	0%
30s	1%
40s	0%
50s	5%
60s	27%
70s	14%
80s	34%
90s	5%
> 2000	8%
	100%

goals

past		future	strategy
4%	representative	5%	*1%*
17%	meeting place	29%	*11%*
78%	plain & efficient	66%	*-12%*

1 support identity user (faculty, department or institution that uses the building)
2 stimulate innovation / collaboration (staff-staff, staff-students, student-student)
3 save accommodation costs

€

total income	405	mln €	
total expenditure	416	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	312	790	
insurance value	633	1.600	
book value campus*	173	440	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	44	111	11%
energy & water	7,4	19	

CREM

users

students	15.330		
staff	total	academic	supporting
head count	4.010	2.110	1.900
fte	3.330	1.830	1.500
office space (m2 ufa) / staff member			16,0
office space (m2 ufa) / fte			19,3
educational space (m2 ufa) / student			2,1
- lab space / academic staff member			7,9

m2

gross floor area	395.000	*m2 gfa*
usable floor area	210.000	*m2 ufa*
ufa / gfa	53%	
rented m2	3%	from external parties
let out m2	3%	to external parties
land property	81	hectares
% office space	30%	(100 % = no)
% educational space	15%	
% specific space	22%	
- % lab space	14%	

Campus strategy

Traditionally, the university is fully integrated with the inner city. Their strategy is to cherish the 'univer-city' Traditionally, the university is fully integrated with the inner city. Their strategy is to cherish the 'univer-city' and to gradually renovate the inner city buildings to meet current and future demand. The limited resources force them to intensify use and trade quantity for quality of space. On their new university college location in The Hague (Lange Voorhout) they also value the relation with inner city.

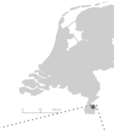
At the Leeuwenhoek location, the campus strategy is to encourage university-industry interaction, both with the Academic hospital (LUMC) and the bioscience and life science businesses. This location is increasingly becoming a vital part of the city, with more student housing, other institutions (Hogeschool Leiden) and museums (Naturalis). Other strategic goals are increasing flexibility, stimulating collaboration and reducing the footprint. The university combines a more traditional university campus model with an increasingly open network model.

Based on questionnaire 2007, LEI 2006 and www.leiden.edu

future

OU Open Universiteit

size **S** | type **β ϒ** | founded **1984** | location **Heerlen**

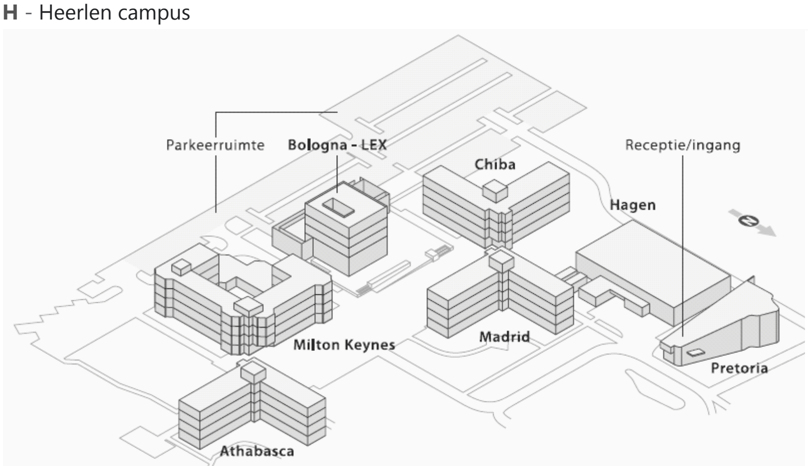


University profile

The Open Universiteit develops, provides and promotes, in collaboration with networks and alliances, innovative higher distance education. As the prime university for lifelong learning, it addresses the wide-ranging learning needs of people during the course of their lives, plus the need to achieve a considerable increase in the knowledge level of the community at large. OU is an independent government-funded institute for distance learning at university level. The Dutch governments purpose in founding OU was to make higher education accessible to anyone with the necessary aptitudes and interests, regardless of formal qualifications.

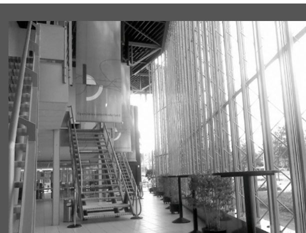
OU is strongly anchored in the Dutch higher educational system through its educational, research and innovative activities. It also operates successfully in the field and market of lifelong learning. It serves as a pioneer in open higher distance education and has a leading role in educational innovation, both in the Netherlands and abroad. Faculties are Management; Cultural Sciences; Computer Science; Environmental Science; Psychology; Law and Education.

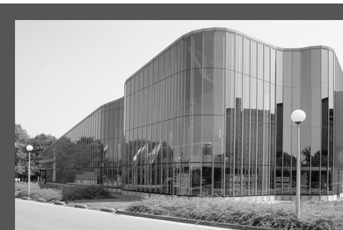
H - Heerlen campus



Notes:

- text university profile provided by OU through VSNU
- photos and maps used with permission of university
- OU has study centers in The Netherlands and Belgium
- more information: http://www.ou.nl/



present

OU Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison with other universities. Anno 2010 OU enrols even more students. The gross floor area is smaller than in 2007 (20.840 m2 gfa), the usable floor area is larger (17.900 m2 ufa) and about 10% is let out to external parties. Strategy text is written by the author based on documents, interviews and questionnaires 2007-2010.

CONDITION	% m2
excellent	12%
good	21%
reasonable	14%
moderate	53%
bad	
very bad	
	100%

AGE	% m2
< 1900	
00s	
10s	
20s	
30s	
40s	
50s	
60s	
70s	
80s	66%
90s	21%
> 2000	13%
	100%

goals

past		future	strategy
12%	representative	12%	
11%	meeting place	80%	*68%*
77%	plain & efficient	8%	*-68%*

1 support user goals more effectively (follow changes in education/research)

2 more quality for user (more luxurious, representative)

3 accommodate meeting places

€

total income	62	mln €	
total expenditure	59	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	15	680	
insurance value	34	1.590	
book value campus*	16	750	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	5,0	232	9%
energy & water	0,3	16	

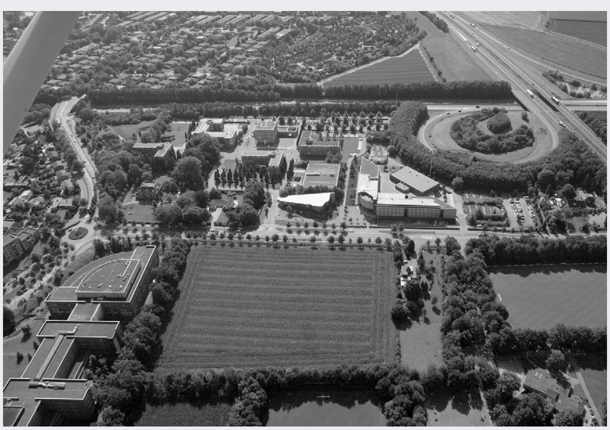
users

students*	24.000	*6.000-7.000 fulltime	
staff	total	academic	supporting
head count	710	320	390
fte	580	260	320
office space (m2 ufa) / staff member			16,4
office space (m2 ufa) / fte			20,1
educational space (m2 ufa) / student			0,0
- lab space / academic staff member			

m2

gross floor area	22.000	*m2 gfa*
usable floor area	14.000	*m2 ufa*
ufa / gfa	64%	
rented m2		from external parties
let out m2	4%	to external parties
land property	6	hectares
% office space	80%	(100 % = no)
% educational space	2%	
% specific space	0%	
- % lab space		

Campus strategy

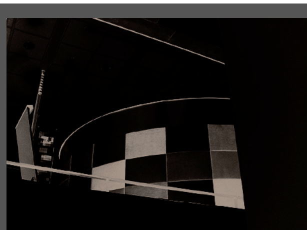


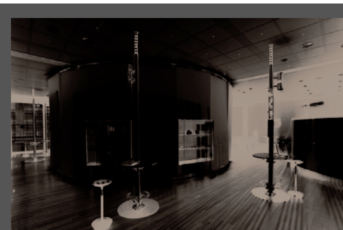
Having the most virtual campus model of all Dutch universities, OU only has a small campus in Heerlen. This campus accommodates employees and a learning centre called Bologna-LEX. Apart from this campus OU rents about 6800 m2 at other campuses. These rented study centres are used for exams and other educational facilities.

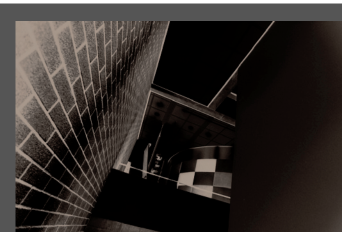
At OU the transition from paper syllabi to digital learning materials has also shaped the campus. It changed the use of the Heerlen campus as a logistic centre. This increasingly paperless model has also highlighted the strategic goal to reduce the ecological footprint and to realise a sustainable, CO_2 neutral campus. In the past years OU has been experimenting with innovative, sustainable solutions – using water of the nearby mines – in close collaboration with the neighbouring education institutions in Heerlen, also involving students and local businesses, making it an excellent example of knowledge transfer.

Based on questionnaire 2007, OU 2008, OU 2009

future



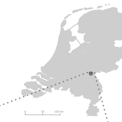




RU

Radboud University Nijmegen

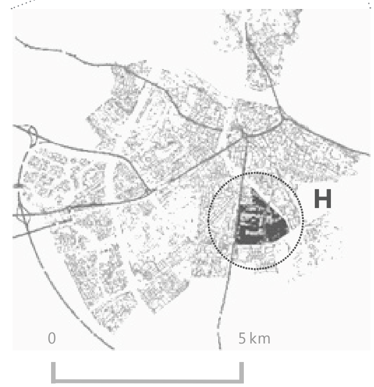
size **M** | type **α β ϒ** | founded **1923** | location **Nijmegen**



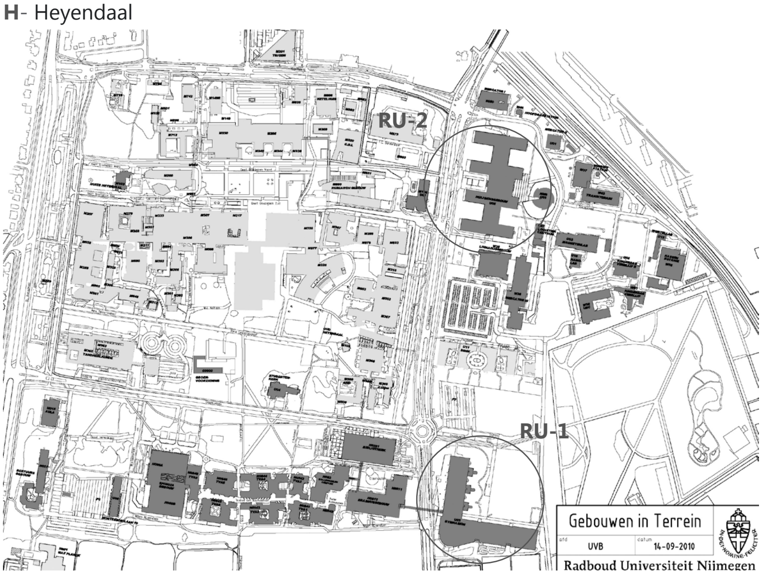
University profile

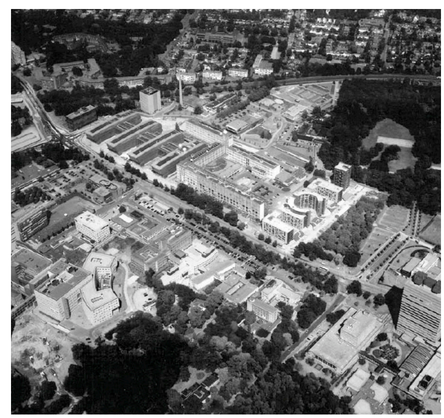
Radboud University (RU) was founded in Nijmegen, the oldest city in the Netherlands, in 1923. The university has a campus with modern buildings located on a former country estate: a green campus they cherish. Social life, personal contacts and mutual cooperation on the campus are important.
Research and education at RU cover a wide range of humanities, social science, natural sciences and medical disciplines. From both national and international perspective, one of RU's strong points is its interdisciplinary research and educatíon.

Apart from well-equipped study facilities and lecture rooms, advanced laboratories and equipment, automated libraries and computer networks, RU boasts its own techno campus. The techno campus, where top-class experimental techniques are combined, accommodates various facilities, including a High Field Magnet Laboratory (HFML) one of only four of the strongest in the world, a Nuclear Magnetic Resonance Laboratory (NMRL), a Trace Gas Laboratory (TCL), and the Nanolab Nijmegen. Faculties are Theology; Religious Studies; Philosophy; Arts; Law; Social Sciences; School of Management; Science and Medical Sciences.



H- Heyendaal





Notes:
- text university profile provided by RU through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.ru.nl/

present

RU Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	39%
good	35%
reasonable	15%
moderate	11%
bad	
very bad	
	100%

AGE	% m2
< 1900	
00s	
10s	1%
20s	
30s	0%
40s	
50s	
60s	27%
70s	23%
80s	8%
90s	3%
> 2000	39%
	100%

goals

past		future	strategy
5%	representative	5%	
10%	meeting place	25%	*15%*
85%	plain & efficient	70%	*-15%*

1 support user goals more effectively (follow changes in education/research)
2 support identity university / attract (more) students & staff members
3 stimulate innovation / collaboration (staff-staff, staff-students, student-student)

€

total income	473	mln €
total expenditure	466	mln €

values	*mln €*	*€ / m2 gfa*	
WOZ value	210	720	
insurance value	481	1.660	
book value campus*	279	960	*buildings & land

	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	34	118	7%
energy & water	5,1	18	

CREM

users

students	15.280		

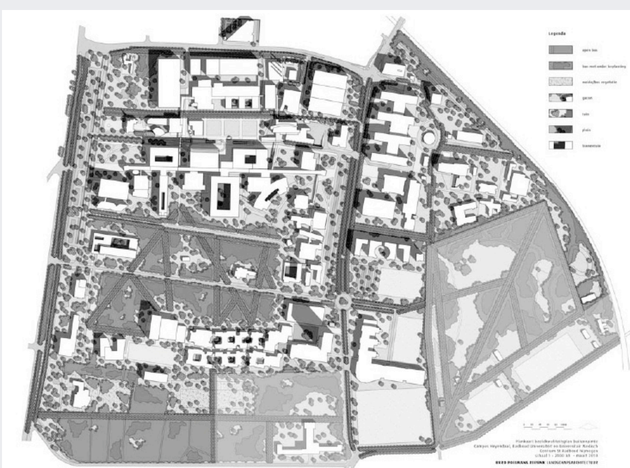
staff	total	academic	supporting
head count	3.590	1.780	1.800
fte	2.980	1.520	1.460

office space (m2 ufa) / staff member	12,7
office space (m2 ufa) / fte	15,2
educational space (m2 ufa) / student	1,5
- lab space / academic staff member	4,3

m2

gross floor area	290.000	*m2 gfa*
usable floor area	174.000	*m2 ufa*
ufa / gfa	60%	
rented m2	0%	from external parties
let out m2	5%	to external parties
land property	40	hectares
% office space	26%	(100 % = no)
% educational space	13%	
% specific space	12%	
- % lab space	6%	

Campus strategy

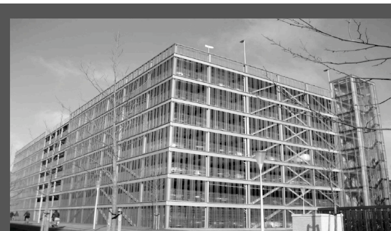


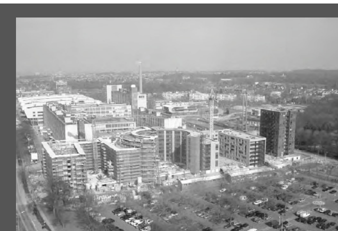
The campus strategy focuses on two goals: maintaining the green park character of the campus and accommodating more and more users on campus. Stating the campus anno 2010 has become ‘a city in a city’ one of their challenges on the Heyendaal campus is to solve ‘parking in the park’. Not only Radboud University but also the academic hospital (UMC St. Radboud), Mercator Science Park, many research institutions and the university of applied sciences (HAN) generate traffic with both their users and many visitors.

On top of that, the university is adding more functions to the campus, like student housing, sporting facilities and culture. Consequently, the university is working on a shared parking policy to keep the campus green and allow the network concept with relations to related partners in education and research. Other strategic goals on campus are stimulating collaboration and innovation between the different user groups.

Based on RU 2006, questionnaire 2007, RU 2010

future





RUG

University of Groningen

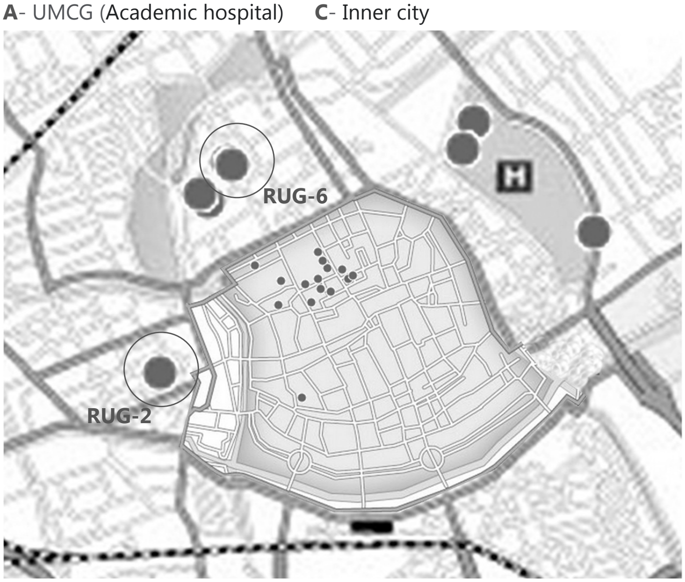
size	type	founded	location
L	α β ϒ	1614	Groningen

University profile

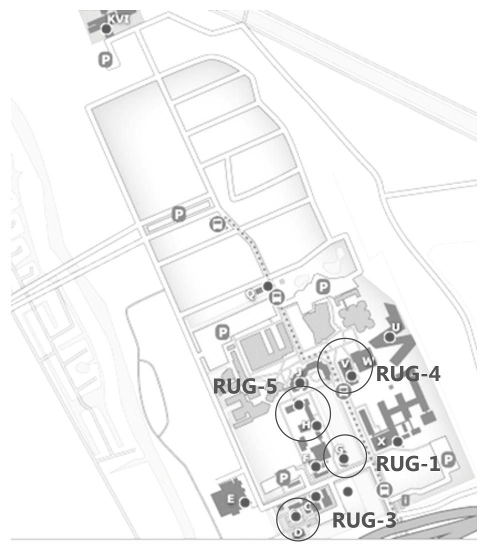
The University of Groningen (RUG) provides high quality research and education, and ranks among the best universities in Europe. RUG is internationally oriented, respects differences in ambition and talent and cooperates actively with business, the government and the public. RUG enjoys an international reputation as a leading research university with a wide range of degree programmes covering Bachelor, Master and PhD levels. An interdisciplinary approach to research and knowledge forms the basis of these programmes.

Since the inception in 1614 RUG has had an international character. By attracting genuine talent, irrespective of the country of origin. RUG ensures quality of teaching and research. In addition, the interaction between international and Dutch talent inspires and stimulates exchange of knowledge. An increasing number of international students are coming to RUG and more and more Dutch students want to be part of an international environment. Faculties are Arts; Behavioural & Social Sciences; Economics & Business; Law, Mathematics & Natural Sciences; Medical Sciences; Philosophy; Spatial Sciences and Theology & Religious Studies.

A- UMCG (Academic hospital) **C**- Inner city



Z- Zernike



Notes:
- text university profile provided by RUG through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- photo Life Sciences building (next page) by Gerard Kingma
- more information: http://www.rug.nl/

present

RUG Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	16%
good	57%
reasonable	26%
moderate	1%
bad	
very bad	
	100%

AGE	% m2
< 1900	5%
00s	2%
10s	4%
20s	2%
30s	
40s	
50s	1%
60s	9%
70s	36%
80s	21%
90s	12%
> 2000	8%
	100%

goals

past		future	strategy
5%	representative	23%	*18%*
32%	meeting place	46%	*14%*
63%	plain & efficient	31%	*-32%*

1. support user goals more effectively (follow changes in education/research)
2. support culture change (for instance after reorganization)
3. support identity user (faculty, department or institution that uses the building)

€

total income	515	mln €	
total expenditure	486	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	222	570	
insurance value	1.100	2.820	
book value campus*	255	650	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	20	50	4%
energy & water	9,0	23	

CREM

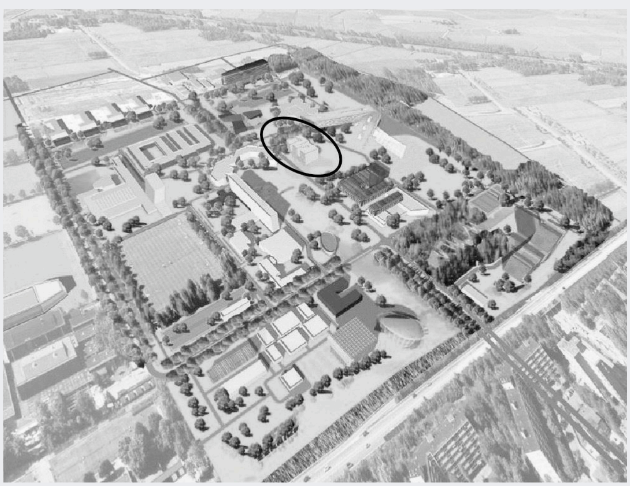
users

students	23.480		
staff	total	academic	supporting
head count	3.870	1.960	1.920
fte	3.280	1.710	1.570
office space (m2 ufa) / staff member			20,5
office space (m2 ufa) / fte			24,2
educational space (m2 ufa) / student			1,8
- lab space / academic staff member			6,3

m2

gross floor area	390.000	*m2 gfa*
usable floor area	241.000	*m2 ufa*
ufa / gfa	62%	
rented m2	7%	from external parties
let out m2	2%	to external parties
land property	120	hectares
% office space	33%	(100 % = no)
% educational space	17%	
% specific space	19%	
- % lab space	10%	

Campus strategy

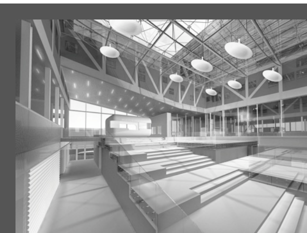


With buildings at many locations in Groningen the university is integrated with the city. The largest concentration of buildings can be found at Zernike campus, which is located at northwest of Groningen. Many historical buildings are academic icons in the inner city, adding to the 'student city character' of Groningen. Another location accommodates the academic hospital UMCG, northeast of the inner city. RUG owns the medical faculty building (the academic hospital is no longer university property). In the past decade RUG initiated many projects to transform buildings, add landmarks and expand or upgrade existing buildings.

While the Zernike campus is becoming the place to study and work for increasingly more students and employees, these user groups still consider the inner city their campus. This has limited the ambition to add more functions like housing and retail & leisure to the Zernike campus and emphasized the 'univer-city of Groningen' as the RUG campus model.

Based on questionnaire 2007, www.rug.nl

future



TUD Delft University of Technology

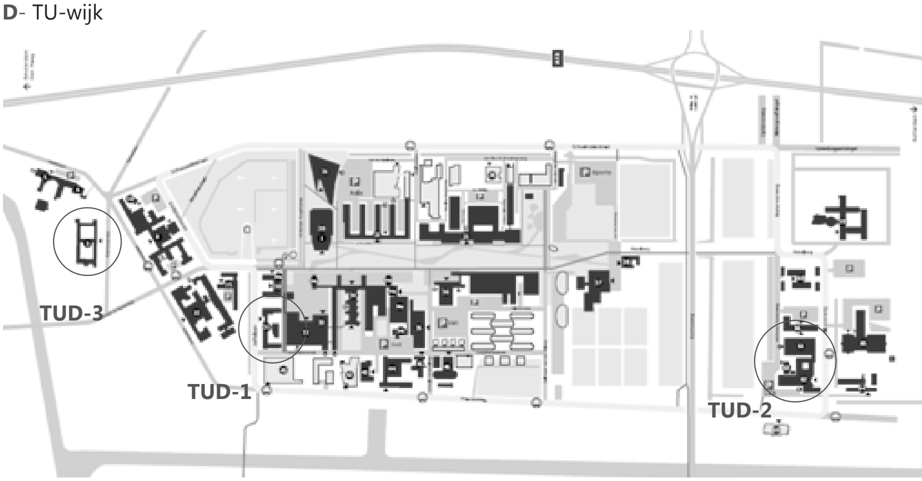
size **M** | type **β** | founded **1842** | location **Delft**

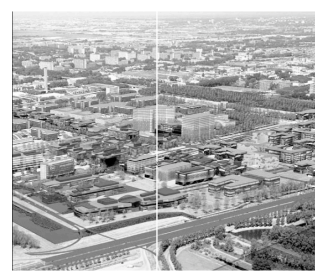
University profile

Delft University of Technology (TU Delft) is a modern university with a rich tradition, founded in 1842. Faculties are Aerospace Engineering; Applied Sciences; Architecture; Civil Engineering and Geosciences; Electrical Engineering, Mathematics and Computer Science; Industrial Design Engineering; Mechanical, Maritime and Materials Engineering; Technology, Policy and Management. These eight faculties are among the topmost of technological development, contributing to scientific advancement in the interests of society. All programmes encourage creative and independent thinking and focus on problem solving. The student body has about a hundred nationalities.

The multidisciplinary Delft Research Initiatives (DRIs) Energy, Mobility & Infrastructures, Health and Environment tackle challenges faced by society, industry and policy-makers. TU Delft recognizes valorisation of knowledge as an important part of the strategy and maintains close links with (inter)national industry. The university has partnerships with leading universities and is also a member of the IDEA league with Imperial College London, ETH Zurich, RWTH Aachen and ParisTech.

D- TU-wijk





north ·········•········· centre ·········•········· south ·········•·········Technopolis / Science Port Holland

Notes:
- text university profile provided by TUD through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://ww.tudelft.nl/

present

TUD Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	11%
good	39%
reasonable	3%
moderate	37%
bad	9%
very bad	
	100%

AGE	% m2
< 1900	
00s	
10s	3%
20s	
30s	
40s	0
50s	15%
60s	28%
70s	37%
80s	4%
90s	7%
> 2000	7%
	100%

goals

past		future	strategy
10%	representative	10%	
10%	meeting place	20%	*10%*
80%	plain & efficient	70%	*-10%*

1 support user goals more effectively (follow changes in education/research)
2 increase flexibility: non-territorial offices for staff / spaces used by multiple users
3 increase occupancy and frequency rates

€

total income	488	mln €
total expenditure	473	mln €

values	*mln €*	*€ / m2 gfa*	
WOZ value	309	620	
insurance value	2.100	4.210	
book value campus*	217	430	*buildings & land

	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	66	132	14%
energy & water	9,0	18	

CREM

users

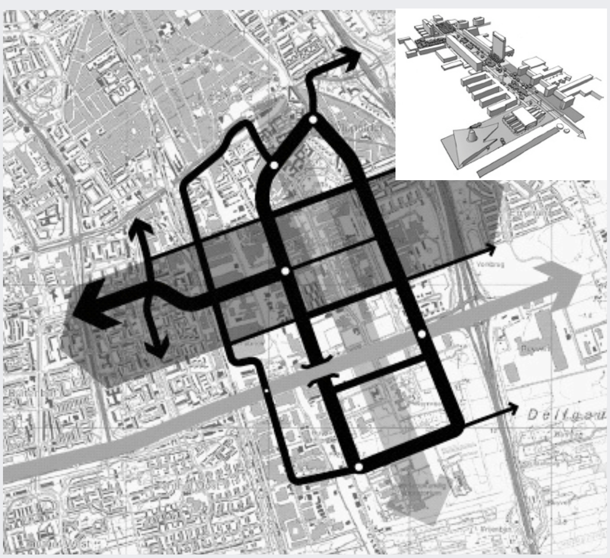
students	13.680		
staff	total	academic	supporting
head count	5.330	3.070	2.260
fte	4.710	2.720	1.980

office space (m2 ufa) / staff member	20,0
office space (m2 ufa) / fte	22,6
educational space (m2 ufa) / student	4,1
- lab space / academic staff member	4,5

m2

gross floor area	499.000	*m2 gfa*
usable floor area	317.000	*m2 ufa*
ufa / gfa	64%	
rented m2		from external parties
let out m2	12%	to external parties
land property	162	hectares
% office space	34%	(100 % = no)
% educational space	18%	
% specific space	18%	
- % lab space	12%	

Campus strategy

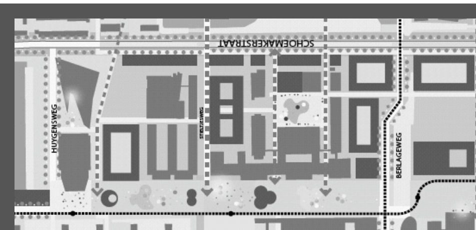


The campus was historically part of the inner city of Delft, gradually moving to the south when student numbers were increasing in the beginning of the twentieth century. The main goal of the 2030 campus vision is to make the campus an integrated part of the city of Delft by increasing density – of floor area and people – and allowing other and related functions on the large campus.

Anno 2011 the campus has three areas – North, Centre and South – with different characteristics and strategies. North is closest to the inner city with cultural heritage buildings that are (re)considered for university and university-related functions. Centre with more than 75% of campus floor area will become more dense and lively with student housing, related businesses and educational institutions and more facilities to share. South is becoming Science Port Holland – developed in collaboration with the municipalities of Delft and Rotterdam – adding large related businesses and stimulating university-industry interaction.

Based on TUD Campus Vision 2030, 2010

future



TUE Eindhoven University of Technology

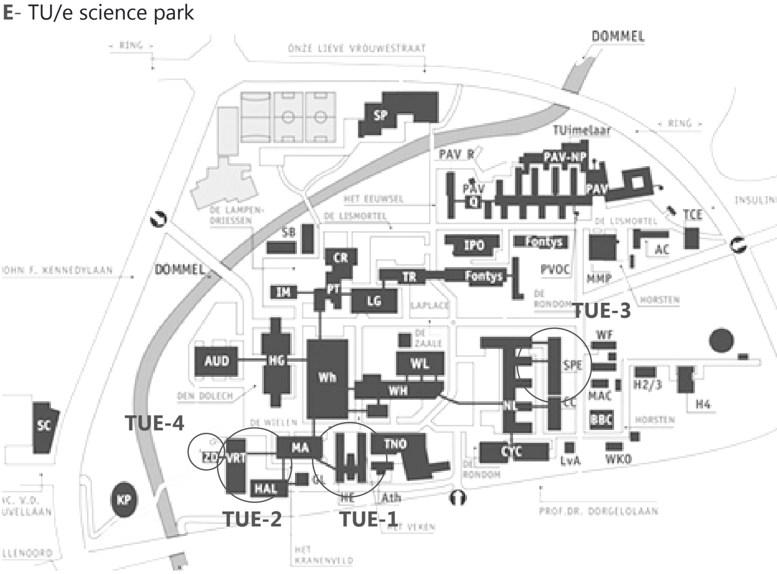
size	type	founded	location
S	**β**	**1956**	**Eindhoven**

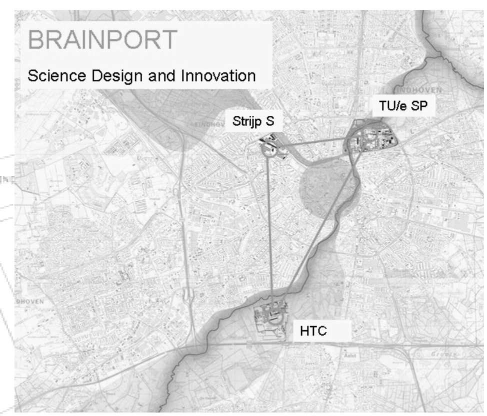
University profile

Eindhoven University of Technology (TU/e) aims to contribute to the advancement of engineering science, development of societal and technological innovations and increase in welfare and prosperity in the Eindhoven region, the Netherlands and the world. The Eindhoven region has a global reputation as an international top technology region with a strong concentration of high-tech companies, R&D and higher educational institutions. As the main driving force behind the region's internationally oriented knowledge economy TU/e is known as the university 'Where innovation starts'.

The education model combines classes, lectures and self-tuition with design-oriented teamwork assignments, practical research and lab work, project learning and final projects in industry or university research. Faculties are Applied Physics; Architecture, Building and Planning; Biomedical Engineering; Chemical Engineering and Chemistry; Electrical Engineering; Industrial Design; Industrial Engineering & Innovation Sciences; Mathematics and Computer Science; Mechanical Engineering, Biomedical Engineering Sciences and Broadband Telecommunication.

E- TU/e science park





Notes:
- text university profile provided by TUE through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://w3.tue.nl/

present

TUE Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	10%
good	10%
reasonable	10%
moderate	10%
bad	20%
very bad	40%
	100%

AGE	% m2
< 1900	
00s	
10s	
20s	
30s	
40s	
50s	11%
60s	45%
70s	16%
80s	4%
90s	8%
> 2000	17%
	100%

goals

past		future	strategy
20%	representative	30%	*10%*
15%	meeting place	40%	*25%*
35%	plain & efficient	30%	*-5%*

1 support user goals more effectively (follow changes in education/research)

2 stimulate innovation / collaboration (staff-staff, staff-students, student-student)

3 more quality for user (more luxurious, representative)

€

total income	265	mln €	
total expenditure	258	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	311	930	
insurance value	987	2.930	
book value campus*	202	600	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	28	84	11%
energy & water	6,5	19	

CREM

users

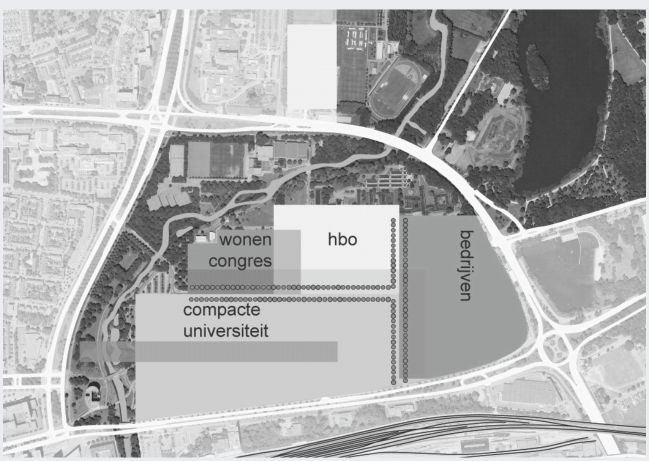
students	7.190		
staff	total	academic	supporting
head count	2.840	1.690	1.150
fte	2.580	1.580	1.000

office space (m2 ufa) / staff member	28,7
office space (m2 ufa) / fte	31,6
educational space (m2 ufa) / student	5,1
- lab space / academic staff member	10,0

m2

gross floor area	337.000	*m2 gfa*
usable floor area	226.000	*m2 ufa*
ufa / gfa	67%	
rented m2		from external parties
let out m2	10%	to external parties
land property	85	hectares
% office space	36%	(100 % = no)
% educational space	16%	
% specific space	24%	
- % lab space	15%	

Campus strategy



Campus 2020 strategy

TUE is situated in the middle of Brainport Eindhoven, with High Tech Campus, Creative City Strijp-S and the Automotive Campus. TUE's campus is university terrain first, but also increasingly the home base for other parties – which TUE wants to emphasize with a more open, contemporary, compact, green campus with more space for entrepreneurs, businesses and student housing, and better connected to the city.

Together with the municipality of Eindhoven TUE has made a development strategy for TU/e Science Park, the new name for the campus. TU/e Science Park has five different zones with different functions: education and research (Compact Campus), student housing and conferences ("wonen / congres"), other higher education institutions (Fontys: hbo), businesses and a green area with water (Dommeldal). Another green, pedestrian zone ("Groene Loper") will connect most of the university buildings, to create an attractive place to meet for students, staff and entrepreneurs.

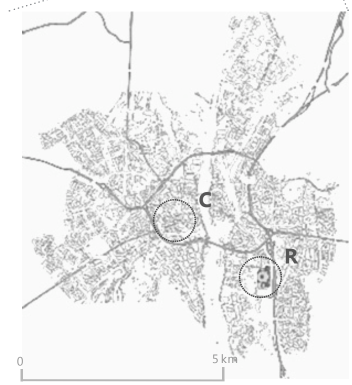
Based questionnaire 2007, TUE 2009, TUE Campus 2020

future

UM

Maastricht University

size	type	founded	location
S	β ϒ	1976	Maastricht

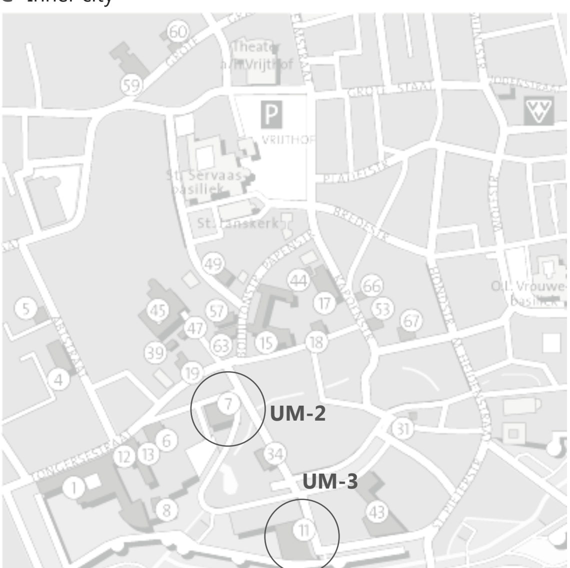


University profile

Maastricht University (UM) is a Dutch university with a strong European and international outlook. Cherishing and stimulating talented people and creating opportunities for innovative education and research relevant to society's needs, are core values of UM. As a student-oriented research university UM focuses on a distinctive portfolio of English taught degree programmes, high-quality research around a limited number of research topics, active collaboration with companies and institutions and contributing to the development of the (EU)region Maastricht belongs to.

UM has gained a worldwide reputation with its unique Problem-Based Learning (PBL) approaches, generating students who are independent, enterprising problem-solvers. PBL guarantees a personal learning environment and intensive contacts with teaching/ research staff at all levels. Education and research of UM are concentrated around three themes: life sciences, innovation and governance. Faculties are Health, Medicine & Life Sciences; Psychology; Economics and Business Administration; Law (European and International Law); Culture & Social Sciences and Humanities & Sciences.

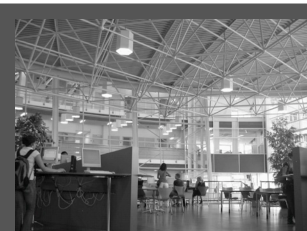
C- Inner city



R- Randwyck

Notes:

- text university profile provided by UM through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.maastrichtuniversity.nl/



present

UM Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	18%
good	39%
reasonable	40%
moderate	3%
bad	
very bad	
	100%

AGE	% m2
< 1900	16%
00s	
10s	
20s	
30s	
40s	
50s	0%
60s	
70s	14%
80s	29%
90s	19%
> 2000	21%
	100%

goals

past		future	strategy
3%	representative	3%	
41%	meeting place	41%	
56%	plain & efficient	56%	

1 save accommodation costs

2 less m2 per user

3 support user goals more effectively (follow changes in education/research)

€

total income	312	mln €
total expenditure	300	mln €

values	*mln €*	*€ / m2 gfa*	
WOZ value	171	930	
insurance value	296	1.610	
book value campus*	188	1.030	*buildings & land

	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	20	111	7%
energy & water	2,8	15	

CREM

users

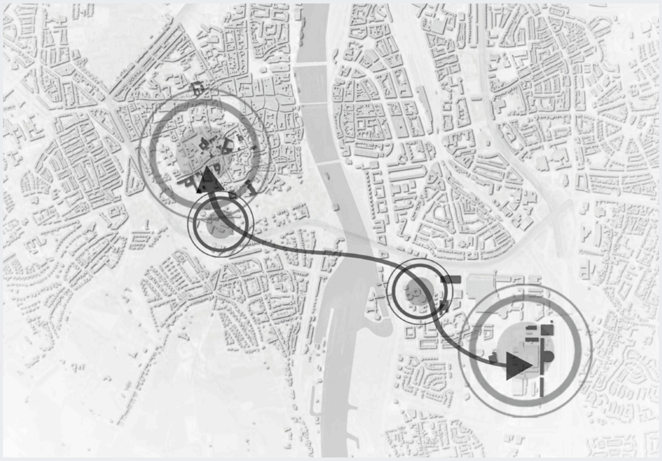
students	11.370		
staff	total	academic	supporting
head count	3.210	1.680	1.530
fte	2.700	1.440	1.260

office space (m2 ufa) / staff member	12,6
office space (m2 ufa) / fte	15,0
educational space (m2 ufa) / student	2,3
- lab space / academic staff member	7,4

m2

gross floor area	183.000	*m2 gfa*
usable floor area	99.000	*m2 ufa*
ufa / gfa	54%	
rented m2	7%	from external parties
let out m2	2%	to external parties
land property	24	hectares
% office space	41%	(100 % = no)
% educational space	26%	
% specific space	12%	
- % lab space	10%	

Campus strategy



UM has two campuses, the collection of heritage buildings in the inner city of Maastricht and the Randwyck Life and Science campus that includes the academic hospital. As one of the youngest universities, UM has always aimed at flexible workplace concepts for education and research with a relatively small footprint and basic quality, also benefitting from the quality of the buildings and the quality of life in the city of Maastricht.

In the past years the university has shifted the strategy to creating more public space and meeting places – also trading quantity for quality – to encourage community building and to stimulate collaboration and innovation. Founding University College Maastricht also showed how this university model, accommodated in a former monastery (UT-3), successfully created a social and intellectual community that contributes to university goals. In the next decade the challenge is to accommodate growth.

Based on questionnaire 2007, UM 2009

future

UT University of Twente

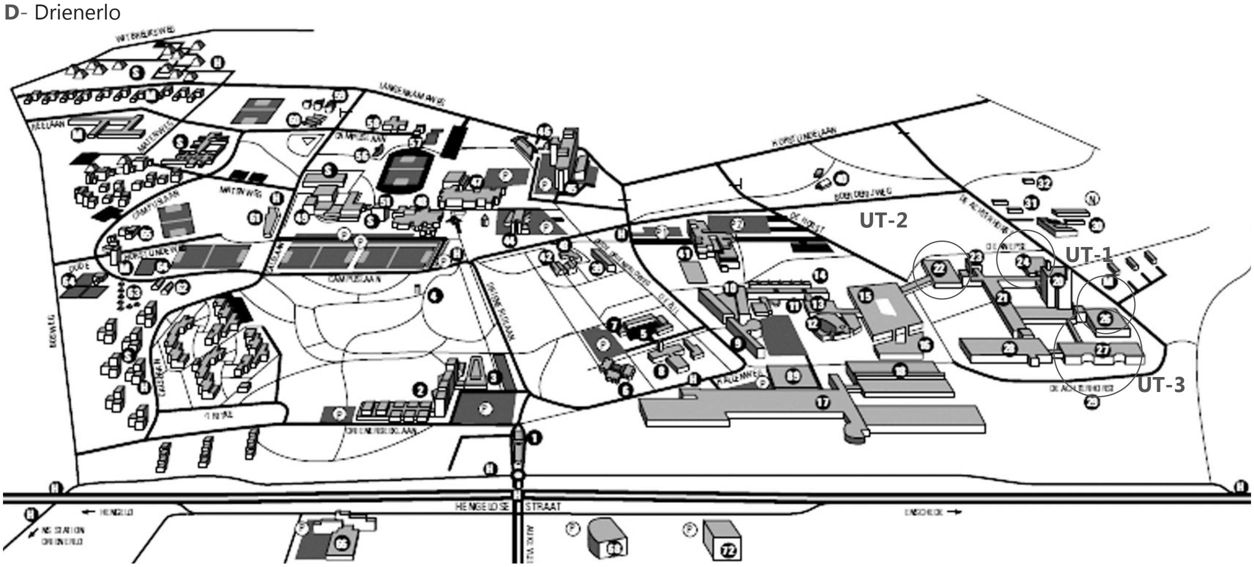
size	type	founded	location
S	β	1961	Enschede

University profile

The University of Twente (UT) is a young and innovative research university which is committed to academic excellence. Education at UT ranks top in the Netherlands, and a recent survey by the European Union has put the impact of UT's technological research in the 6th place, Europe-wide. Apart from academic development, UT strongly encourages entrepreneurship in its students. The result is clearly shown in the more than 600 companies that are located on or around the university campus. UT also values the strong relation to industry and the regional economy. Faculties are Behavioural Sciences; Electrical Engineering; Mathematics and Computer Science; Science and Technology; Engineering Technology and the School of Management and Governance.

UT is the only university in the Netherlands with a full residential campus. The 1,4 million square meters (346 acres) provide a save academic and social setting for students to quickly become an active members of a thriving community. Extensive sporting facilities, film and music studios, stages and more, run by a very active and professional Student Union, guarantee rewarding leisure time. The campus is covered by one of the worlds most extensive and fastest wireless networks.

D- Drienerlo

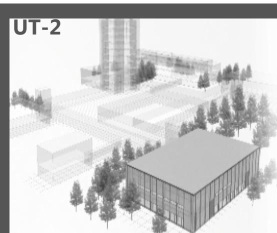


Notes:

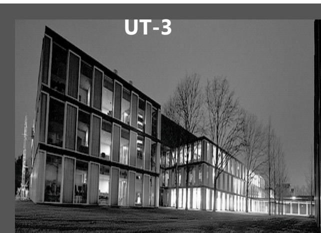
- text university profile provided by UT through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.utwente.nl/

UT-1

UT-2



UT-3



present

UT Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	4%
good	51%
reasonable	9%
moderate	36%
bad	1%
very bad	
	100%

AGE	% m2
< 1900	
00s	
10s	
20s	
30s	
40s	
50s	
60s	47%
70s	34%
80s	5%
90s	13%
> 2000	1%
	100%

goals

past		future	strategy
5%	representative	10%	*5%*
15%	meeting place	25%	*10%*
80%	plain & efficient	65%	*-15%*

1 more attention to safety and security requirements

2 less m2 per user

3 save accommodation costs

€

total income	268	mln €	
total expenditure	251	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	124	590	
insurance value	451	2.130	
book value campus*	182	860	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	27	127	11%
energy & water	5,8	27	

CREM

users

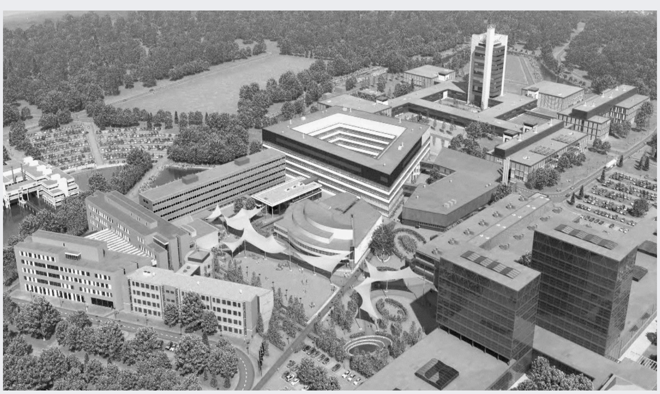
students	7.760		
staff	total	academic	supporting
head count	2.630	1.480	1.150
fte	2.320	1.370	960

office space (m2 ufa) / staff member	17,5
office space (m2 ufa) / fte	19,8
educational space (m2 ufa) / student	2,3
- lab space / academic staff member	13,4

m2

gross floor area	212.000	*m2 gfa*
usable floor area	132.000	*m2 ufa*
ufa / gfa	62%	
rented m2	6%	from external parties
let out m2	11%	to external parties
land property	138	hectares
% office space	35%	(100 % = no)
% educational space	13%	
% specific space	28%	
- % lab space	18%	

Campus strategy

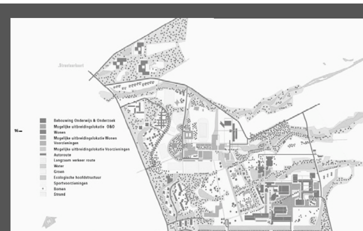


The age profile of the campus shows that more than 80% of the floor area was built in the sixties or seventies and functionally and technically obsolete – some of these buildings lost their use permit. Since 1995, when the university became owner of the campus, the campus strategy has aimed at renovating many of these buildings.

Anno 2011 the campus shows many renovated buildings like the Horst complex, illustrated in appendix II with redevelopment projects UT-1 and UT-2 and new extension UT-3. Recently, the university has also added a state-of-the-art laboratory for nanotechnology (MESA+). All of these buildings are located at the new Education & Research centre of the campus to create a meeting place for social and intellectual encounters. The scale of the whole campus would be too large for that. Other strategic goals are reducing the footprint and saving accommodation costs, also by intensifying use of (expensive) facilities.

Based on questionnaire 2007, www.utwente.nl 2010

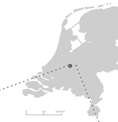
future



UU

Utrecht University

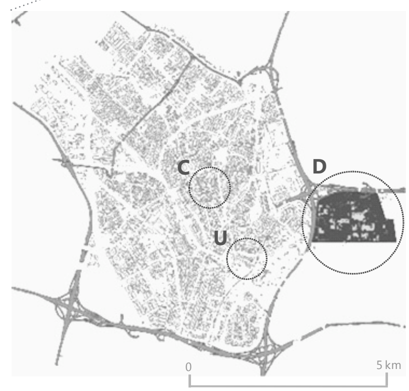
size L — type α β ϒ — founded 1636 — location Utrecht



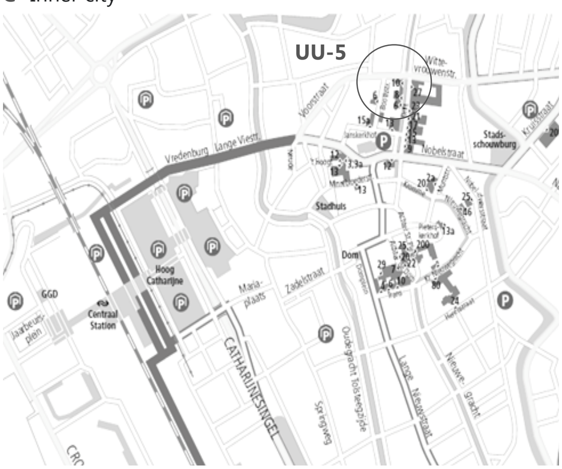
University profile

Founded in 1636 and centrally located, Utrecht University is one of Europe's leading research universities, recognised internationally for its high-quality, innovative approach to both research and teaching and illustrated by the high position in many international rankings. The quality of research is reflected in the list of Nobel Prize winners. UU participates in large-scale research programmes, such as climate, genomics and pharmaceutics.

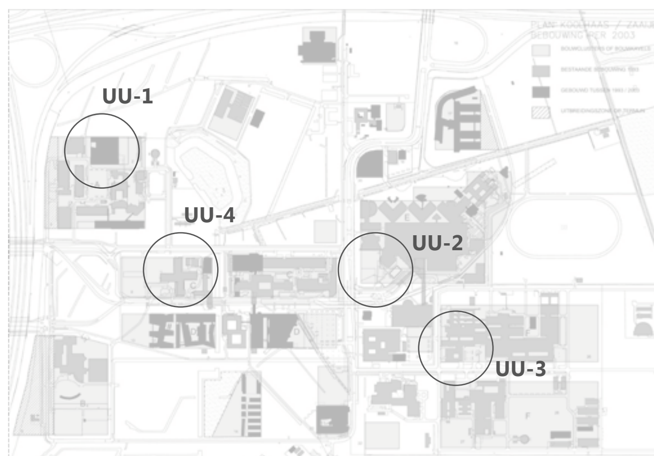
Inter-disciplinary research, personal teaching and the benefits of an international environment are the main principles of education and research. Teaching methods are characterized by an undergraduate phase where the focus lies on training in academic skills and acquisition of subject specific knowledge. Specialization takes place in graduate degree programmes and is organized in graduate schools. Students are offered research, professional, or teacher-training programs. Faculties are Humanities; Social and Behavioural Sciences; Law, Economics and Governance; Geosciences; Medicine; Veterinary Medicine; Science; Utrecht University College.



C- Inner city



D- De Uithof



Notes:

- text university profile provided by UU through VSNU
- photos and maps used with permission of university and photographer Hans van Leeuwen
- buildings indicated on the maps can be found in appendix II
- more information: http://www.uu.nl/

present

UU Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	1%
good	28%
reasonable	25%
moderate	15%
bad	25%
very bad	6%
	100%

AGE	% m2
< 1900	15%
00s	
10s	3%
20s	
30s	
40s	
50s	
60s	20%
70s	19%
80s	16%
90s	11%
> 2000	16%
	100%

goals

past		future	strategy
18%	representative	18%	
17%	meeting place	49%	*32%*
65%	plain & efficient	33%	*-32%*

1 support user goals more effectively (follow changes in education/research)
2 save accommodation costs
3 achieve or maintain minimum quality for use permit ("safe and healthy workplace")

€

total income	695	mln €	
total expenditure	708	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	518	760	
insurance value	1.302	1.910	
book value campus*	474	690	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	77	113	11%
energy & water	12,2	18	

CREM

users

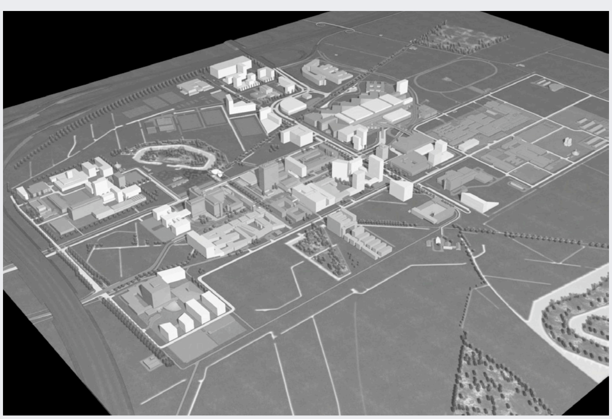
students	29.300		
staff	total	academic	supporting
head count	6.320	3.240	3.080
fte	5.180	2.830	2.350

office space (m2 ufa) / staff member	18,1
office space (m2 ufa) / fte	22,1
educational space (m2 ufa) / student	1,9
- lab space / academic staff member	3,6

m2

gross floor area	683.000	*m2 gfa*
usable floor area	388.000	*m2 ufa*
ufa / gfa	57%	
rented m2	3%	from external parties
let out m2	4%	to external parties
land property	302	hectares
% office space	29%	(100 % = no)
% educational space	14%	
% specific space	27%	
- % lab space	10%	

Campus strategy



While some universities are selling their inner-city buildings, Utrecht University has done the exact opposite: they have acquired property around their historical heritage, for instance in the street Drift, in the historical inner city of Utrecht. For their university college they have acquired a military terrain to accommodate education, research, student housing and other facilities.

For campus De Uithof the strategy is to intensify use of existing buildings, to add more functions to the campus and to create the place to meet for students, staff and visitors. While the past strategy has added architectural icons to the campus – adding to the image of the university – the current strategy is aiming at implementing flexible concepts for education and research, reducing the footprint, saving costs and stimulating interaction on campus. More student housing, (espresso) bars and restaurants have already led to a more lively campus.

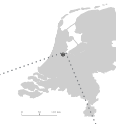
Based on questionnaire 2007, UU 2007, UU 2009

future

UvA

University of Amsterdam

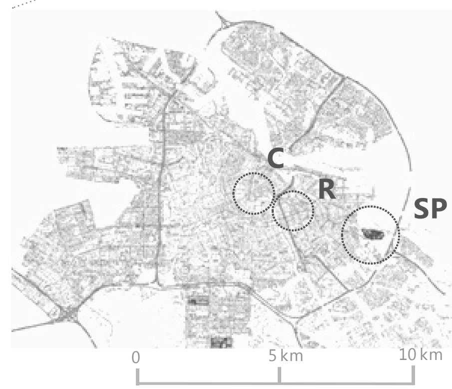
size **L** | type **α β ϒ** | founded **1632** | location **Amsterdam**



University profile

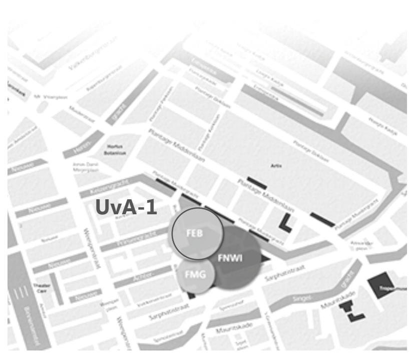
The Universiteit van Amsterdam (UvA) combines the intellectual challenge of a comprehensive academic curriculum with Amsterdam's vibrant and cosmopolitan environment. International rankings show that UvA has a top position for excellent education and research. Faculties are Humanities; Social and Behavioural Sciences; Economics and Business; Law; Sciences; Medical sciences; Dentistry. These seven major faculties have their campuses all over the city, some are located in historic buildings on the world renowned canals of Amsterdam and others are situated in state-of-the-art laboratories and hospitals.

The city of Amsterdam is the home of many international commercial enterprises, but also of leading cultural and media companies. These provide challenging internships and career opportunities for students and encourage them to seek out inspiration outside their chosen field of study. Many students come from abroad, which makes for an international ambiance. UvA offers challenging honours programmes: recently the two Amsterdam universities (UvA and VU) founded Amsterdam University College.

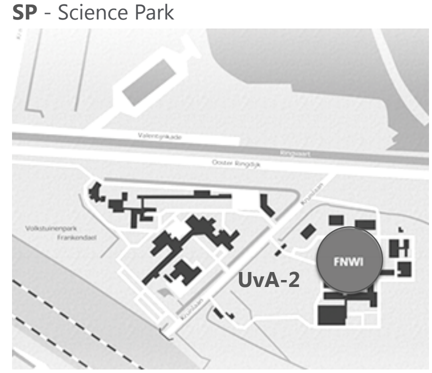


C- Inner city

R - Roeterseiland



SP - Science Park



Notes:
- text university profile provided by UvA through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- images ABC building by Allford Hall Monaghan Morris Architects
- more information: http://www.uva.nl/

present

UvA Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	5%
good	5%
reasonable	20%
moderate	20%
bad	20%
very bad	
	100%

AGE	% m2
< 1900	4%
00s	
10s	
20s	
30s	
40s	
50s	
60s	
70s	64%
80s	18%
90s	10%
> 2000	4%
	100%

goals

past		future	strategy
10%	representative	5%	*-5%*
20%	meeting place	35%	*15%*
70%	plain & efficient	60%	*-10%*

1 increase occupancy and frequency rates

2 less m2 per user

3 support user goals more effectively (follow changes in education/research)

€

total income	568	mln €	
total expenditure	545	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	170	420	
insurance value	412	1.010	
book value campus*	244	600	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	-	-	
energy & water	8,4	21	

CREM

users

students	23.490		
staff	total	academic	supporting
head count	4.490	2.570	1.930
fte	3.720	2.090	1.630
office space (m2 ufa) / staff member			19,2
office space (m2 ufa) / fte			23,2
educational space (m2 ufa) / student			1,6
- lab space / academic staff member			5,0

m2

gross floor area	406.000	*m2 gfa*
usable floor area	252.000	*m2 ufa*
ufa / gfa	62%	
rented m2	11%	from external parties
let out m2	1%	to external parties
land property	37	hectares
% office space	34%	(100 % = no)
% educational space	15%	
% specific space	15%	
- % lab space	10%	

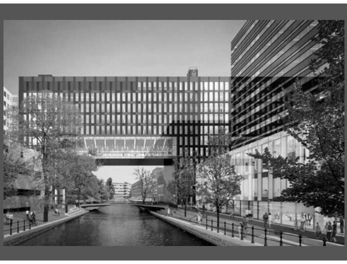
Campus strategy

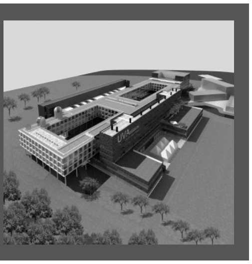
UvA was historically part of the inner city of Amsterdam and currently has three clusters: inner city, Roeterseiland and Science Park (Watergraafsmeer). UvA is gradually moving the faculties from buildings all over the city to these clusters that allow more flexible concepts and shared use of facilities.

This strategy adds to the strategic goals to intensify use of space, to reduce the footprint per user and to accommodate education and research more efficiently and effectively. At the same time, this will create lively communities with student housing, sports facilities and retail and leisure, additional to Amsterdam's quality of life. UvA has focused on renovating their inner city property to meet current and future demand, restoring cultural heritage that adds to their image and emphasizes their rich history. Collaborating with VU for a new Dentistry building (ACTA) and for the Amsterdam University College highlights their network approach.

Based on questionnaire 2007, UvA 2009 and www.uva.nl

future





UvT Tilburg University

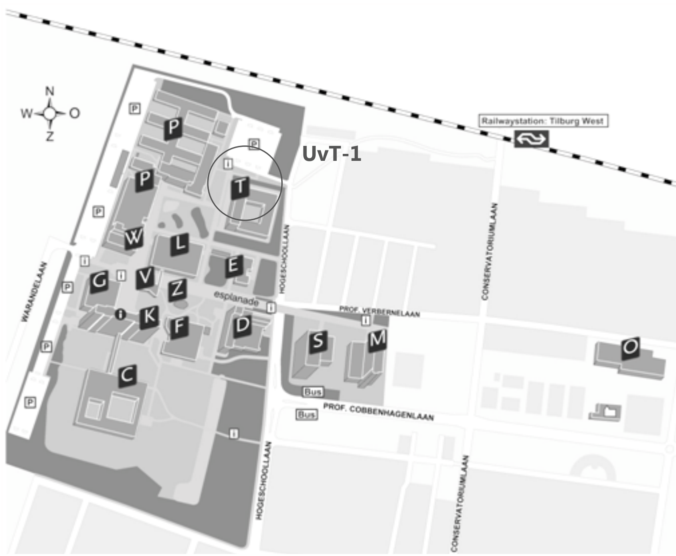
size	type	founded	location
S	ϒ	1927	Tilburg

University profile

Tilburg University (UvT) is a specialised research university concentrating on Economics, Business, Law, Social Sciences, Psychology and Humanities. The university was founded in 1927 and is specialized in Social Sciences and Humanities. In its educational and research programmes, the university is committed to addressing important issues in society at national and international levels. It does so by training people for positions of high responsibility in society and by contributing to socially sustainable solutions. UvT draws on a rich tradition, which nourishes the role of philosophy of life in its academic education and research.

As of 2008 Tilburg University offers a Liberal Arts Programme: a three-year multi-disciplinary undergraduate programme taught in English, for students with broad interests who want to be challenged at utmost. Faculties are Economics and Business; Administration, Law; Social and Behavioural Sciences; Humanities (Communication, Culture, Philosophy and Religion); Catholic Theology and TiasNimbas Business School - the business school of Tilburg University and Eindhoven University of Technology (TUE).

T- Tilburg campus



Notes:

- text university profile provided by UvT through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.tilburguniversity.edu/



present

UvT Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

CONDITION	% m2
excellent	12%
good	41%
reasonable	31%
moderate	13%
bad	4%
very bad	
	100%

AGE	% m2
< 1900	
00s	
10s	
20s	
30s	
40s	
50s	
60s	20%
70s	33%
80s	13%
90s	24%
> 2000	11%
	100%

goals

past		future	strategy
27%	representative	8%	*-19%*
40%	meeting place	59%	*19%*
33%	plain & efficient	33%	

1 achieve or maintain minimum quality for use permit ("safe and healthy workplace")
2 stimulate innovation / collaboration (staff-staff, staff-students, student-student)
3 support user goals more effectively (follow changes in education/research)

€

total income	150	mln €	
total expenditure	142	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	97	800	
insurance value	208	1.720	
book value campus*	94	780	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	12	98	8%
energy & water	1,7	14	

CREM

users

students	11.200		
staff	total	academic	supporting
head count	1.680	920	760
fte	1.350	770	590
office space (m2 ufa) / staff member			18,4
office space (m2 ufa) / fte			23,0
educational space (m2 ufa) / student			1,4
- lab space / academic staff member			

m2

gross floor area	121.000	*m2 gfa*
usable floor area	72.000	*m2 ufa*
ufa / gfa	60%	
rented m2		from external parties
let out m2	9%	to external parties
land property	20	hectares
% office space	43%	(100 % = no)
% educational space	22%	
% specific space		
- % lab space		

Campus strategy

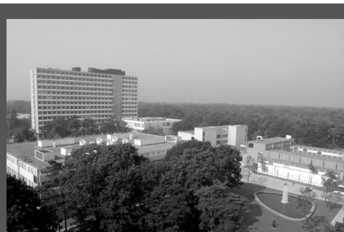
Strategy

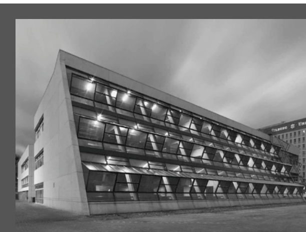
UvT accommodates education and research on a relatively compact campus with pedestrian zones (and parking on the edges), which has made it easier to share space between faculties than at other Dutch universities. This advantage has contributed to a relatively low footprint per user. Nonetheless, the campus strategy is exploring more flexible concepts to support the changes in learning and working.

Tilburg campus was one of the first to implement a new library concept. In the past ten years they have tested new studying concepts like Learning Centre Montesquieu and transforming the library into a knowledge centre. They acknowledged the changing population on campus and have taken the responsibility to create a home for the many international students, facilitating their social needs on campus and in the city of Tilburg. UvT applies a network campus model, stimulating more social and intellectual interaction and innovation on campus.

Based on questionnaire 2007 and www.uvt.nl

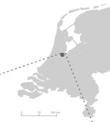
future





VU Vrije Universiteit Amsterdam

size **L** type **α β ϒ** founded **1880** location **Amsterdam**

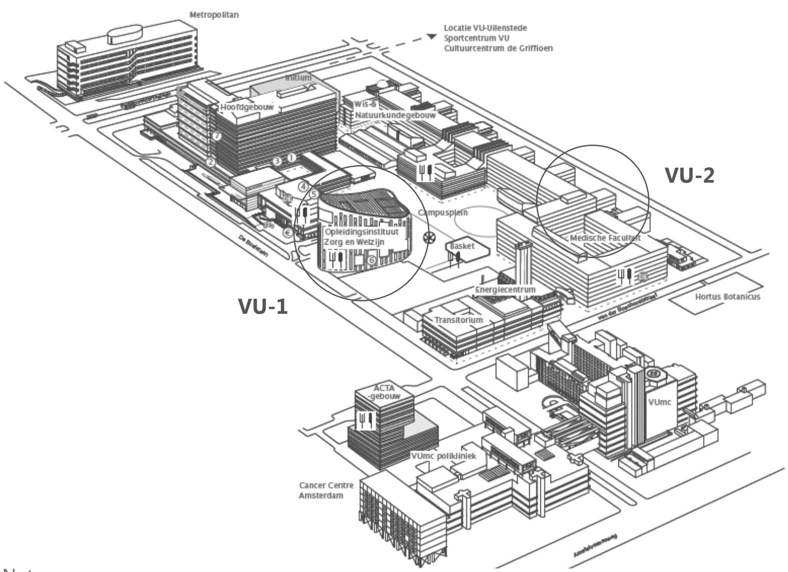


University profile

In 1880 Vrije Universiteit (VU) was founded as a private initiative: the first Dutch university that is not controlled by church or state. Internationally VU does not use the English translation "Free University", but VU University Amsterdam, abbreviated as VU. For many years VU was maintained solely by private donations. VU also has a teaching hospital, VU University Medical Center (VUmc), situated closely to the campus. VU has always received funds from the community, so VU believes that it is the university's responsibility to give something back.

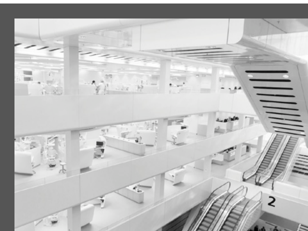
The idea that academic endeavour is more valuable when it makes a contribution to the world, inspires VU in research and education. Faculties are Arts; Earth and Life Sciences; Economics and Business Administration; Dentistry; Human Movement Sciences; Law; Medicine; Philosophy; Psychology and Education; Sciences; Social Sciences; Theology. For education VU also collaborates with universities of applied sciences Windesheim and Inholland and with UvA for Dentistry. Together UvA and VU founded Amsterdam University College (AUC), which offers an international liberal arts and sciences bachelor programme.

V- VU campus



Notes:

- text university profile provided by VU through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.vu.nl/



present

VU Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

goals

past		future	strategy
20%	representative	20%	
20%	meeting place	60%	*40%*
60%	plain & efficient	20%	*-40%*

1 support user goals more effectively (follow changes in education/research)
2 stimulate innovation / collaboration (staff-staff, staff-students, student-student)
3 accommodate meeting places

€

total income	421	mln €	
total expenditure	408	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	188	590	
insurance value	425	1.330	
book value campus*	187	580	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	28	88	7%
energy & water	9,2	29	

CREM

users

students	18.590		
staff	total	academic	supporting
head count	3.850	2.130	1.720
fte	3.150	1.740	1.410
office space (m2 ufa) / staff member			15,7
office space (m2 ufa) / fte			19,2
educational space (m2 ufa) / student			1,7
- lab space / academic staff member			7,9

m2

gross floor area	320.000	*m2 gfa*
usable floor area	173.000	*m2 ufa*
ufa / gfa	54%	
rented m2	3%	from external parties
let out m2	2%	to external parties
land property	14	hectares
% office space	35%	(100 % = no)
% educational space	19%	
% specific space	20%	
- % lab space	13%	

CONDITION	% m2
excellent	8%
good	3%
reasonable	73%
moderate	14%
bad	1%
very bad	1%
	100%

AGE	% m2
< 1900	
00s	
10s	
20s	
30s	
40s	
50s	
60s	50%
70s	41%
80s	
90s	2%
> 2000	7%
	100%

Campus strategy

In the past 120 years VU grew from just five students and five professors in 1880 to more than 20.000 students and 10.000 staff being employed by VU and VUmc in 2010. Yet, there still is only one campus. This highlights the strategic goals to stimulate collaboration and innovation between different scientific disciplines and to increase flexibility by shared and multi-functional use of space.

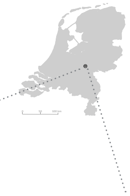
In the next decade VU will continue to transform the campus into a place to meet for science, education and business. The ambitious plan includes an additional 250.000 m2 gfa for educational facilities, offices, housing and sports facilities. There is extra attention for (improving) the quality of public space and sustainability. Most of the existing buildings will be demolished or extensively renovated. The municipality of Amsterdam, the academic hospital and private parties will work together on realizing this campus vision.

Based on questionnaire 2007, VU 2009 and www.vu.nl, January 2010.

future

WU Wageningen University

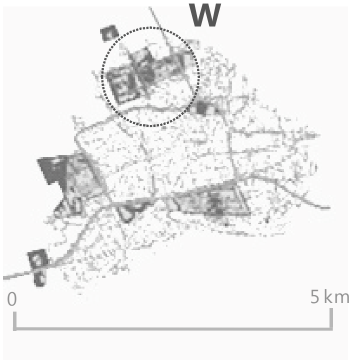
size **S** | type **β** | founded **1918** | location **Wageningen**



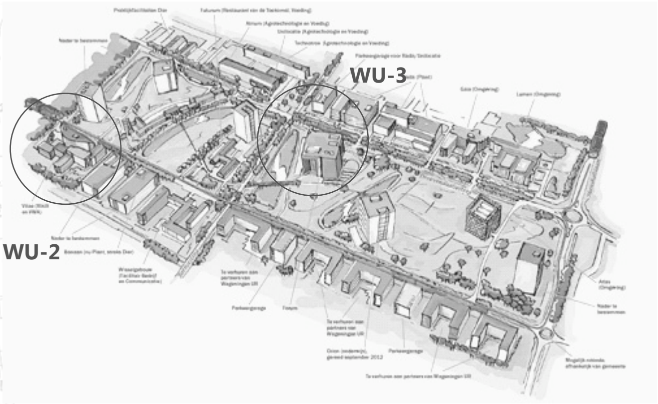
University profile

Wageningen UR (University and Research Centre) is an international knowledge institute with the mission 'to explore the potential of nature to improve the quality of life'. Wageningen University is one of three partners within Wageningen UR. Besides the university, there are several specialised research institutes and Van Hall Larenstein university of applied sciences. Wageningen UR combines fundamental, strategic and applied research with education at Bachelor, Master and PhD levels. Departments are Agrotechnology & Food Sciences, Animal Sciences, Plant Sciences, Social Sciences and Environmental Sciences.

During recent decades Wageningen UR has evolved into one of the world's leading centers and ranks number one in Europe in life sciences, food and environment, attracting students from more than 100 countries. Research institutes are Food & Biobased; Livestock; Central Veterinary; Alterra (for green living environment); Plant Research International; Applied Plant Research; LEI (business and social-economic knowledge about agriculture, food and the environment); IMARES (Marine Resources and Ecosystem Studies); RIKILT (Food Safety).



W- Wageningen campus



Notes:
- text university profile provided by WU through VSNU
- photos and maps used with permission of university
- buildings indicated on the maps can be found in appendix II
- more information: http://www.wur.nl/

present

WU Campus profile

Notes:
data is provided by the university and from the year 2007 for comparison; how campus changed since 2007 can be found in strategy text; strategy text written by author based on documents, interviews and questionnaires 2007-2010

goals

past		future	strategy
10%	representative	20%	*10%*
30%	meeting place	40%	*10%*
60%	plain & efficient	40%	*-20%*

1 support user goals more effectively (follow changes in education/research)
2 increase occupancy and frequency rates
3 save accommodation costs

€

total income	224	mln €	
total expenditure	218	mln €	
values	*mln €*	*€ / m2 gfa*	
WOZ value	208	510	
insurance value	600	1.470	
book value campus*	183	450	*buildings & land
	total in mln €	*€ / m2 gfa*	*% expenditure*
costs of ownership	29	71	13%
energy & water	6,0	15	

CREM

users

students	5.240		
staff	total	academic	supporting
head count	5.890	3.020	2.870
fte	5.140	2.780	2.360
office space (m2 ufa) / staff member			13,0
office space (m2 ufa) / fte			14,9
educational space (m2 ufa) / student			5,0
- lab space / academic staff member			6,6

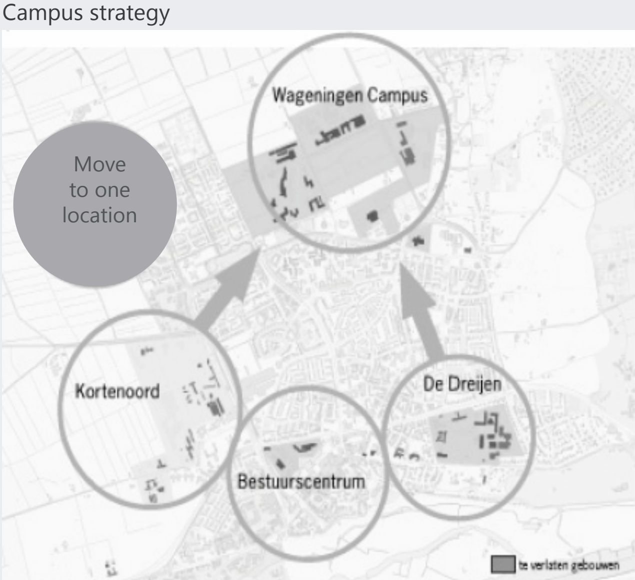
m2

gross floor area	410.000	*m2 gfa*
usable floor area	260.000	*m2 ufa*
ufa / gfa	63%	
rented m2		from external parties
let out m2	2%	to external parties
land property	186	hectares
% office space	29%	(100 % = no)
% educational space	10%	
% specific space	43%	
- % lab space	18%	

CONDITION	% m2
excellent	4%
good	51%
reasonable	9%
moderate	36%
bad	1%
very bad	
	100%

AGE	% m2
< 1900	
00s	
10s	
20s	2%
30s	2%
40s	
50s	18%
60s	16%
70s	28%
80s	10%
90s	20%
> 2000	4%
	100%

Campus strategy



The main goal of the campus strategy is to concentrate the majority of activities on one Wageningen campus. Since the merger an ambitious campus goal has been leading: reducing the floor area with more than 30%, also by gradually moving all campus activities to one location. The mission of Wageningen UR also applies to their sustainable campus strategy: they are incorporating innovative solutions to reduce the ecological footprint in their campus projects.

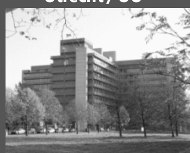
However, the increasing student numbers have led to planning additional volumes on the Wageningen campus. Flexible use of both educational and research facilities is promoted among all users of all departments and research institutes. This efficiency strategy enables an inspirational park concept with many open spaces, ponds, significant landmarks, an art plan, business zones and a traffic plan – also to handle parking. Wageningen UR accommodates a network university model.

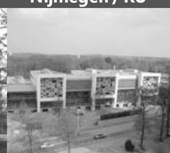
Based on questionnaire 2007, WUR 2009, WUR 2010 and www.wur.nl

future

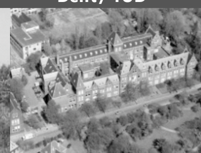

Student housing development, Delft
Photo: DUWO

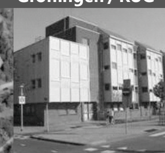
Appendix II
Dutch university projects

UU-4
Utrecht / UU


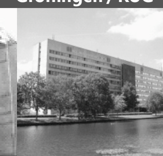
RU-1
Nijmegen / RU


RUG-3
Groningen / RUG


TUD-3
Delft / TUD


RUG-2
Groningen / RUG


UU-5
Utrecht / UU


RUG-5
Groningen / RUG


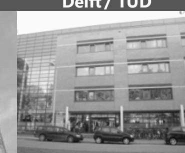
WU-2
Wageningen / WU


UT-1
Enschede / UT


UT-3
Enschede / UT


WU-1
Wageningen / WU


EUR-1
Rotterdam / EUR


TUD-1
Delft / TUD


RUG-4
Groningen / RUG


LEI-1
Leiden / LEI


UvA-1
Amsterdam / UvA


TUD-2
Delft / TUD

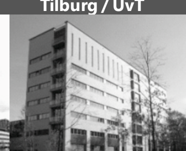

UT-2
Enschede / UT


VU-2
Amsterdam / VU

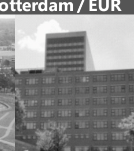

RUG-6
Groningen / RUG


UU-3
Utrecht / UU

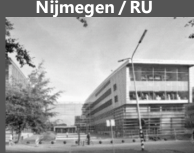

VU-1
Amsterdam / VU


UvT-1
Tilburg / UvT


WU-3
Wageningen / WU


EUR-3
Rotterdam / EUR


RUG-1
Groningen / RUG


RU-2
Nijmegen / RU


UvA-2
Amsterdam / UvA


UU-1
Utrecht / UU


TUE-1
Eindhoven / TUE


UU-2
Utrecht / UU


TUE-3
Eindhoven / TUE

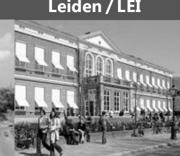

TUE-4
Eindhoven / TUE


UM-2
Maastricht / UM


UM-1
Maastricht / UM

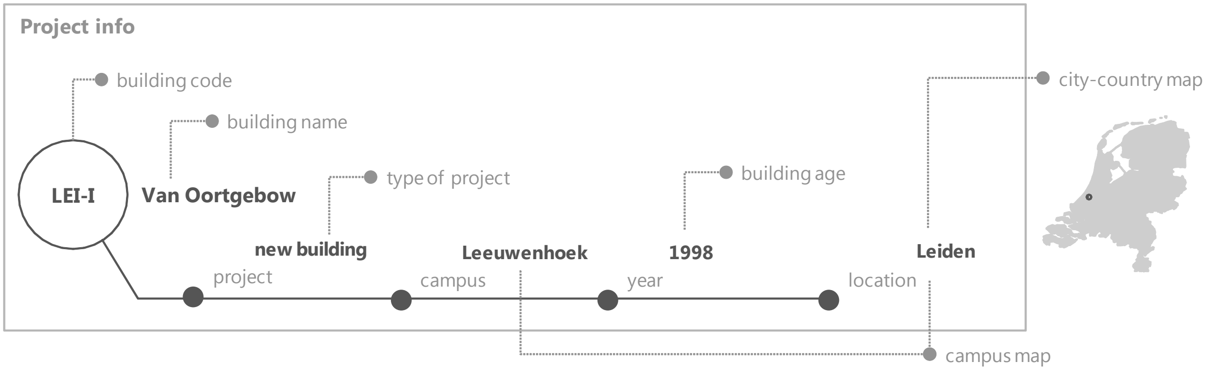

EUR-2
Rotterdam / EUR


TUE-2
Eindhoven / TUE


LEI-2
Leiden / LEI


UM-3
Maastricht / UM


Reader's guide appendix II

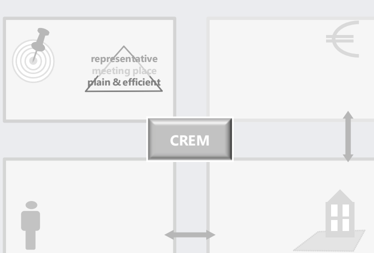


Main functions

Project image

This appendix contains one pages of information for thirty-nine campus projects, including their location on campus maps, photos and a project profile that summarizes data from four different perspectives – strategic, functional, physical and financial – why this project (goals), for whom this project (users), of what size and with which space types (m2) and what are the investment costs and operating expenses (€, price level in October 2009). All information is provided by the Dutch campus managers and their staff. The project data was collected in the period 2005-2009, using spreadsheet formats to assure comparable data. Chapter 7 and appendix VII contain more information about the data collection and the used abbreviations and definitions.

Project profile



Strategic data: indication of the quality ambition (using the Maslow pyramid) and the top 3 goals, selected from a list (or added).

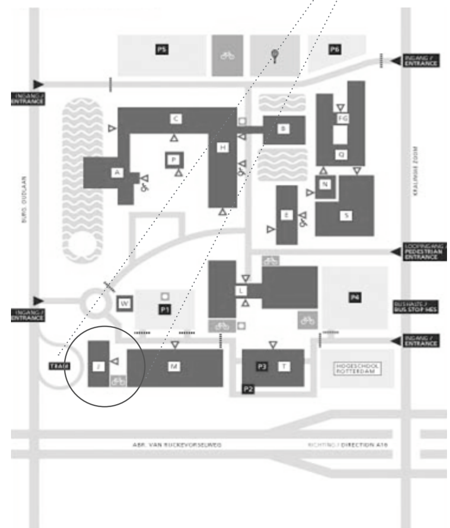
Financial data: construction and investment costs, based on NEN2631; price level October 2009, converted using MBK indices.

Functional data: students and staff supplied by campus managers, based on brief or estimations; space use calculated based on users and specified floor area.

Physical data: gross ('bruto') and usable ('nuttig') floor area based on NEN2580 (gfa=bvo, ufa=no); space use specified with a standardized list (nine categories) with education, office and specific space as the largest and most defining space types.

EUR-1 J building

project type	campus	year	location
new building	Woudestein	1999	Rotterdam



The 'J building' was built in 1999 to accommodate Rotterdam School of Management (RSM) and a number of EUR related research institutes. With post-experience students as the main user group the quality ambition – at that time – was higher than in the average EUR faculty building. The footprint per student was also relatively high, also adding to higher student expectations.

With nine floors of office space, meeting rooms and small lecture rooms this building is flexible in use – potentially suitable for many other (external) user groups. This adds to the EUR strategy to create a flexible campus. The ambition was to create a place to meet that supports the identity of RSM. Evaluations after five years showed an increase in user satisfaction.

Project profile

goals

meeting place
plain & efficient

"effective meeting place"

1	support user goals more effectively / improve customer satisfaction
2	more quality for user (match with changing demand)
3	support identity university / attract (more) students & staff members

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	138.000	12,8	18,5
*	energy & water	127.000	11,8	17,0
*	cleaning	154.000	14,3	20,6

* is prognosis, maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	15,2	1.410	2.030
investment costs	22,6	2.090	3.030

all costs price level October 2009

CREM

users

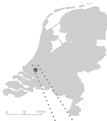
	number	
students	176	
staff (*head count*)	93	
staff (*fte*)	68	
educational space (m2 ufa) / student		11,7
office space (m2 ufa) / staff member		27,4
office space (m2 ufa) / fte		37,5

largest user
RSM - Rotterdam School of Management

m2

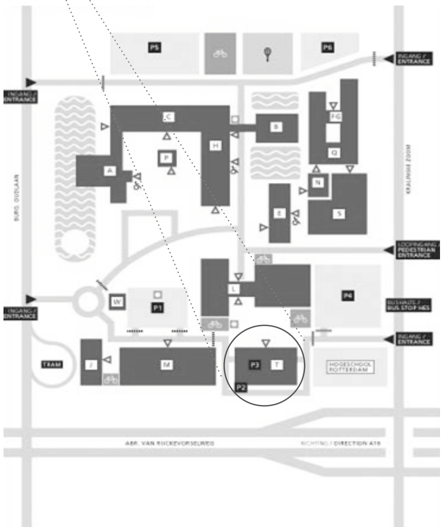
gross floor area	10.800	*m2 gfa*
useable floor area	7.470	*m2 ufa*
ufa / gfa	69%	
number of floors	9	
% office space	34%	(100 % = m2 ufa)
% educational space	28%	
% specific space	2%	

Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.eur.nl/efb/cio



T building EUR-2

Rotterdam location — **2005** year — **Woudestein** campus — **new building** project type



Project profile

goals

"effective meeting place"

meeting place
plain & efficient

1	support user goals more effectively / improve customer satisfaction
2	increase income / decrease expenditure on level organisation
3	support identity user (faculty, department or institution that uses the building)

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	368.000	8,0	16,6
* energy & water	537.000	11,6	24,2
* cleaning	404.000	8,8	18,2

* is prognosis, maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	52,8	1.140	2.380
investment costs	72,5	1.570	3.270

all costs price level October 2009

CREM

users

	number
students	6.888
staff (*head count*)	793
staff (*fte*)	665
educational space (m2 ufa) / student	0,5
office space (m2 ufa) / staff member	17,1
office space (m2 ufa) / fte	20,4

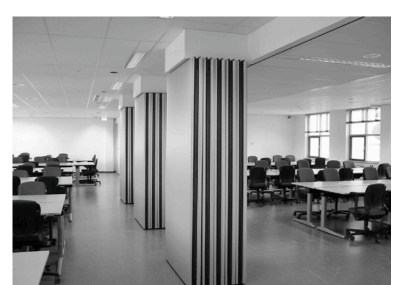
largest user
Erasmus University RSM

m2

gross floor area	46.100	*m2 gfa*
useable floor area	22.200	*m2 ufa*
ufa / gfa	48%	
number of floors	19	
% office space	65%	(100 % = m2 ufa)
% educational space	17%	
% specific space	2%	

This 'T building' (2005) is one of the largest buildings in the project database. This new faculty building for Business (Rotterdam School of Management) and Psychology is 75 meters high and a new landmark building on the Woudestein campus. Architects of OD 205 created an efficient building, designed to accommodate almost 7000 students and 800 staff members.

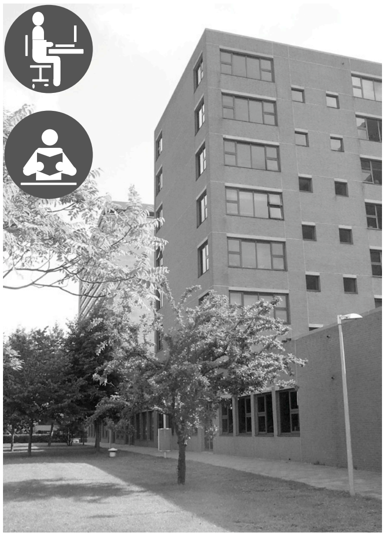
Apart from the goal to better support students and staff members and add to customer satisfaction, the decision to rent out the upper five floors (of 19 floors in total) to external parties was taken to increase the university income and to reduce university's total costs of ownership. The project includes a parking garage with 500 parking places.

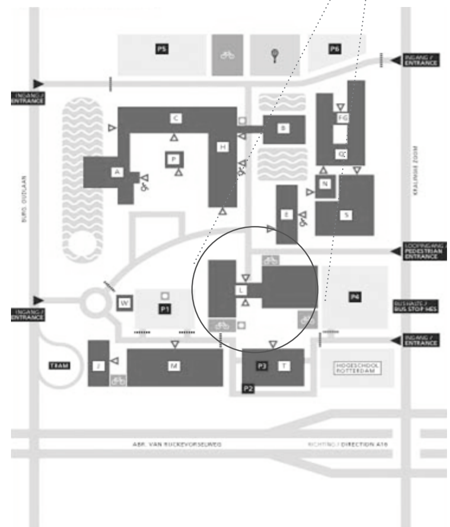


Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.eur.nl/efb/cio

EUR-3 L building

new building	Woudestein	1990	Rotterdam
project type	campus	year	location





Dating from 1990, this building was planned when the Dutch government – and not Erasmus University – was owner of the university campus and decided about investments in new buildings. The investment level, goals and ambitions should be interpreted in that perspective, even though the costs are converted to price level October 2009 for comparison with other projects.

In the past twenty years the building has been used by many students, also because of the large university restaurant in the building – almost 2100 m2 usable floor area with a capacity of about 950 seats. The building has eight stores with offices and lecture halls and accommodates different faculties. In 2010 the largest user is the Erasmus School of Law with almost 5000 students. However, these students also use educational facilities in other EUR buildings.

Project profile

goals

meeting place
plain & efficient

"effective meeting place"

1. accommodate growth (students, research institutes etc.)
2. save accommodation costs

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	199.000	12,0	15,2
energy & water	193.000	11,6	14,7
cleaning	182.000	11,0	13,9

* maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	22,1	1.330	1.690
investment costs	36,2	2.180	2.760

all costs price level October 2009

CREM

users

	number
students	5.679
staff (*head count*)	537
staff (*fte*)	352

educational space (m2 ufa) / student	0,3
office space (m2 ufa) / staff member	12,0
office space (m2 ufa) / fte	18,3

largest user
Erasmus School of Law

m2

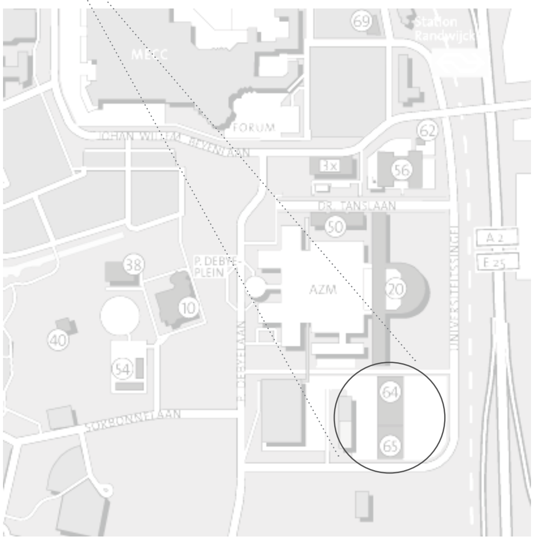
gross floor area	16.600	*m2 gfa*
useable floor area	13.100	*m2 ufa*
ufa / gfa	79%	
number of floors	8	
% office space	51%	(100 % = m2 ufa)
% educational space	15%	
% specific space	0%	

Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.eur.nl/efb/cio

UNS 60 building UM-1

Maastricht location	**2004** year	**Randwyck** campus	**new building** project type



Project profile

goals

meeting place
plain & efficient

combination of plain and efficient & "effective meeting place"

1. accommodate growth (students, research institutes etc.)
2. support user goals more effectively / improve customer satisfaction
3. increase income: make building rentable to a third party

€

		annually	*€ / m2 gfa*	*€ / m2 ufa*
*	maintenance	81.000	7,6	15,5
*	energy & water	110.000	10,3	21,0
*	cleaning	158.000	14,8	30,2

* is prognosis, maintenance costs including user costs

	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	8,6	810	1.650
investment costs	15,1	1.400	2.870

all costs price level October 2009

CREM

users

	number
students	968
staff (*head count*)	200
staff (*fte*)	155
educational space (m2 ufa) / student	1,8
office space (m2 ufa) / staff member	13,0
office space (m2 ufa) / fte	16,7

largest user
Faculty of Health, Medicine and Life Sciences

m2

gross floor area	10.700	*m2 gfa*
useable floor area	5.250	*m2 ufa*
ufa / gfa	49%	
number of floors	7	
% office space	49%	(100 % = m2 ufa)
% educational space	33%	
% specific space	3%	(including laboratories)

This project added a new building to the existing building of the Faculty Health, Medicine and Life Sciences on campus Randwyck, adjacent to the University Hospital (AZM) in Maastricht. The building's name UNS 60 is derived from the address Universiteitssingel 60. The main goal of this project was to accommodate growth with more floor area.

Quality ambition was plain and efficient to make it a feasible project. The building was designed as a flexible working environment – that can be divided in compartments – to allow other user groups, including external parties, to rent parts of the building. Post-occupancy evaluations among students and staff showed high satisfaction rates in the first years of use.

Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
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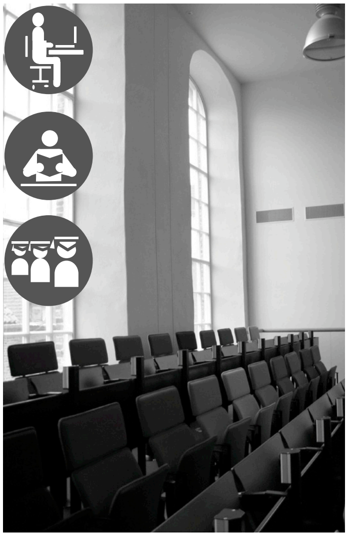
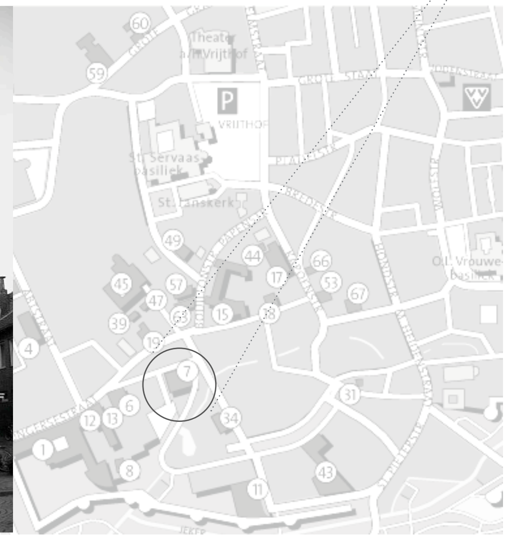
- photos and maps used with permission of university
- more information:
  http://www.maastrichtuniversity.nl/web/Main/AboutUM/VisitMaastrichtUniversity.htm

UM-2 Bonnefantestraat 2

project type	campus	year	location
renovation	**Inner city**	**2005**	**Maastricht**





This 2005 project replaced the entire interior of a 1627 monastery, while leaving the main structure essentially unchanged. In the past centuries the ancient building has had many functions: from barracks to dwellings for thirty families, from Bonnefante museum to library of the university from 1982. After this restoration project the Student Services Centre (SSC) became the largest user of the building.

Goals were facilitating the users more effectively, adding quality and supporting the university image. With an espresso bar and many student facilities this building is a meeting place in the inner city of Maastricht. Evaluations show that students are very satisfied with the new function.

Project profile

goals

plain & efficient — "plain and efficient"

1	support user goals more effectively / improve customer satisfaction
2	more quality for user (match with changing demand)
3	support identity university / attract (more) students & staff members

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	73.000	14,6	35,9
* energy & water	67.000	13,3	32,7
* cleaning	68.000	13,6	33,2

* is prognosis, maintenance costs including user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	4,9	970	2.400
investment costs	7,4	1.480	3.630

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	160
staff (*fte*)	110
educational space (m2 ufa) / student	
office space (m2 ufa) / staff member	8,5
office space (m2 ufa) / fte	12,4

largest user
Student Services Centre

m2

gross floor area	5.000	*m2 gfa*
useable floor area	2.040	*m2 ufa*
ufa / gfa	41%	
number of floors	4	
% office space	67%	(100 % = m2 ufa)
% educational space	5%	
% specific space	13%	

Notes:

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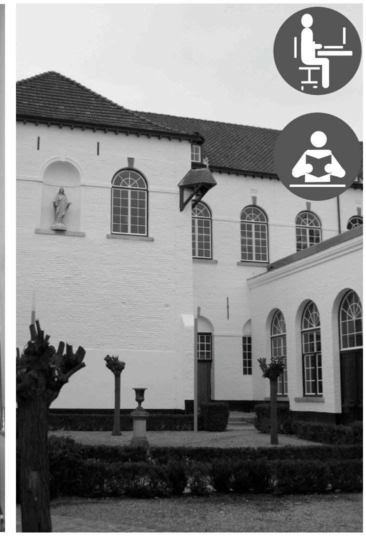
- more information: http://www.maastrichtuniversity.nl/web/Main/AboutUM/VisitMaastrichtUniversity.htm

Zwingelput 4 UM-3

Maastricht location — **2006** year — **Inner city** campus — **renovation** project type



Project profile

goals

meeting place
plain & efficient

"effective meeting place"

1	support user goals more effectively / improve customer satisfaction
2	stimulate innovation / collaboration (staff-staff, staff-students, student-student)
3	more quality for user (match with changing demand)

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	72.000	15,1	32,8
*	energy & water	43.000	8,9	19,4
*	cleaning	60.000	12,6	27,5
	* is prognosis, maintenance costs including user costs			
		total in mln €	€ / m2 gfa	€ / m2 ufa
	construction costs	4,3	900	1.960
	investment costs	6,6	1.370	3.000
	all costs price level October 2009			

CREM

users

	number	
students	300	
staff (*head count*)	30	
staff (*fte*)	24	
educational space (m2 ufa) / student		5,7
office space (m2 ufa) / staff member		10,7
office space (m2 ufa) / fte		13,3
largest user		
University College Maastricht		

m2

gross floor area	4.770	m2 gfa
useable floor area	2.190	m2 ufa
ufa / gfa	46%	
number of floors	4	
% office space	15%	(100 % = m2 ufa)
% educational space	77%	
% specific space		

This project accommodates University College Maastricht (UMC) in an old monastery, renovating the interior, respecting the historical value and preserving the cultural heritage. Creating flexible and state-of-the-art learning facilities, allowing wireless access inside and outside of the building from the delivery in 2006.

The university encourages the use of the building throughout the day, until late in the evening, even for social purposes like watching movies or playing music together, to stimulate community building. Underlying goal is the belief that social interaction is the basis of intellectual interaction, which supports the goals of UMC.

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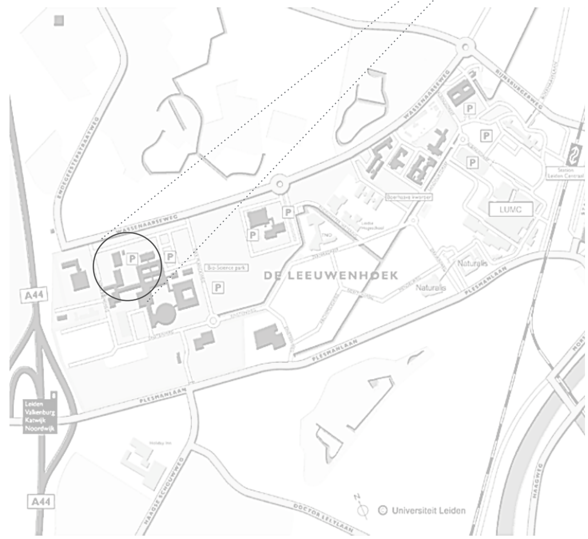
LEI-1 Van Oort building

project type	campus	year	location
new buiding	Leeuwenhoek	1998	Leiden



This project (1998) added a new laboratory building to the Leeuwenhoek campus of Leiden University, even though most of the usable area is office space. The Faculty of Science uses the building, designed by architect Van Egeraat. Physics and Astronomy moved research activities from the inner-city campus to Leeuwenhoek campus to stimulate collaboration between different scientific disciplines.

Other goals were reducing the floor area and saving costs by sharing space and flexible use of relatively expensive research facilities. Post-occupancy evaluations in the first years of use showed positive results for both of these goals.

Project profile

goals

representative
meeting place
plain & efficient

"representative and image-building"

1	support identity university / attract (more) students & staff members
2	stimulate innovation / collaboration (staff-staff, staff-students, student-student)
3	less m2 per user

€

		annually	€ / m2 gfa	€ / m2 ufa
	maintenance	90.000	13,1	21,6
*	energy & water	125.000	18,0	29,7
	cleaning	85.000	12,3	20,2

* is prognosis, maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	-	-	-
investment costs	16,2	2.340	3.870

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	
staff (*fte*)	
educational space (m2 ufa) / student	
office space (m2 ufa) / staff member	
office space (m2 ufa) / fte	
largest user	
Faculty of Science	

m2

gross floor area	6.930	*m2 gfa*
useable floor area	4.190	*m2 ufa*
ufa / gfa	61%	
number of floors	6	
% office space	57%	(100 % = m2 ufa)
% educational space	4%	
% specific space	27%	(including laboratories)

Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.leidenuniv.nl/loc/

Kamerlingh Onnes LEI-2

Leiden location — **2004** year — **Inner city** campus — **new+renovation** project type

Project profile

goals	
representative meeting place / plain & efficient	*"representative and image-building"*
1	support user goals more effectively / improve customer satisfaction
2	more quality for user (match with changing demand)
3	support identity university / attract (more) students & staff members

€	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	225.000	11,0	18,7
* energy & water	384.000	18,7	31,7
* cleaning	295.000	14,3	24,3
* is prognosis, maintenance costs including user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	-	-	-
investment costs	53,9	2.630	4.456
all costs price level October 2009			

CREM

users	number	
students	4.286	
staff (*head count*)	411	
staff (*fte*)	292	
educational space (m2 ufa) / student		0,5
office space (m2 ufa) / staff member		11,3
office space (m2 ufa) / fte		15,9
largest user		
Leiden Law School		

m2		
gross floor area	20.500	*m2 gfa*
useable floor area	12.100	*m2 ufa*
ufa / gfa	59%	
number of floors	4	
% office space	38%	(100 % = m2 ufa)
% educational space	19%	
% specific space		

This 2004 project comprises the renovation of the physics laboratory Kamerlingh Onnes, built in 1865. For this project – designed by Hans Ruijssenaars Architecten – the old and the new were combined. The largest user is Leiden Law School, with educational facilities for more than 4200 students and office space with 450 workplaces of 10,3 m2 usable floor area each.

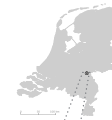
Historically, the building accommodated physics, chemistry and anatomy laboratories and it was named after famous physicist Heike Kamerlingh Onnes (1853-1926), a professor at Leiden. Together with Lorentz he developed this laboratory into one of the most advanced in Europe. In 1913 he received the Nobel Prize for physics. This project added new life to this cultural heritage building, supporting the image of the university and adding more quality for current students and staff.

Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- extra source: "Vier eeuwen geschiedenis in steen" (2005)
- more information: http://www.leidenuniv.nl/loc/

RU-1 Gymnasion

new building	Heyendaal	2003	Nijmegen
project type	campus	year	location



This large new building that has been used since 2003, accommodates the University Sports Centre with state-of-the-art facilities for all students and staff members of Radboud University. It also includes a bar and space for student associations. The office space is efficiently organised and adaptable for change. The project also covered a parking garage, designed as part of the building to preserve the green character of the rest of the campus.

Other goals of the project were to create a flexible working environment and a place to meet. Evaluations show that the building is a lively place on the Heyendaal campus, contributing to social interaction and campus life in the evening.

Project profile

goals

meeting place
plain & efficient

"effective meeting place"

1	support user goals more effectively / improve customer satisfaction
2	increase flexibility: adaptability / multifunctional use
3	stimulate innovation / collaboration (staff-staff, staff-students, student-student)

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	209.000	5,8	9,6
*	energy & water	265.000	7,4	12,2
*	cleaning	621.000	17,2	28,5

* is prognosis, maintenance costs excluding user costs

	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	40,2	1.110	1.840
investment costs	58,7	1.640	2.690

all costs price level October 2009

CREM

users

	number
students	12.000
staff (*head count*)	2.890
staff (*fte*)	
educational space (m2 ufa) / student	0,3
office space (m2 ufa) / staff member	0,9
office space (m2 ufa) / fte	

largest user
University Sports Centre

m2

gross floor area	36.000	*m2 gfa*
useable floor area	21.800	*m2 ufa*
ufa / gfa	61%	
number of floors	6	
% office space	12%	(100 % = m2 ufa)
% educational space	14%	
% specific space	23%	

Notes:
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- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.ru.nl/voorzieningen/overzicht/adressen_gebouwen/

Huygens RU-2

Nijmegen	**2006**	**Heyendaal**	**new building**
location	year	campus	project type

Project profile

goals		
meeting place / plain & efficient	"effective meeting place"	
1	support user goals more effectively / improve customer satisfaction	
2	more quality for user (match with changing demand)	
3	support identity university / attract (more) students & staff members	

€	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	1.250.000	25,0	46,6
* energy & water	-	-	-
* cleaning	-	-	-
* is prognosis, maintenance costs including user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	85,1	1.700	3.170
investment costs	132,7	2.650	4.940
all costs price level October 2009			

CREM

users	number	
students	1.491	
staff (*head count*)		
staff (*fte*)	812	
educational space (m2 ufa) / student		2,3
office space (m2 ufa) / staff member		
office space (m2 ufa) / fte		13,6
largest user		
Faculty of Science		

m2		
gross floor area	50.100	*m2 gfa*
useable floor area	26.900	*m2 ufa*
ufa / gfa	54%	
number of floors	-	
% office space	41%	(100 % = m2 ufa)
% educational space	13%	
% specific space	22%	(including laboratori

This 2006 project created a large new building for the Faculty of Science, designed by AGS Architekten. The Huygens Building, named after one of the greatest Dutch physicists Christiaan Huygens, is a prominent, transparent and open building on the Heyendaal campus, illustrating the open network relation with society.

One of the goals was to facilitate the integration of education and research, also by adding more public space to encourage interaction between students and staff and to stimulate collaboration between different scientific disciplines. Investments in sustainable innovations – thermal storage and concrete core activation – added to the goal to reduce energy use. The building still has flexibility for growth.

Notes:

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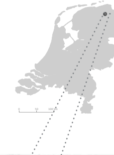
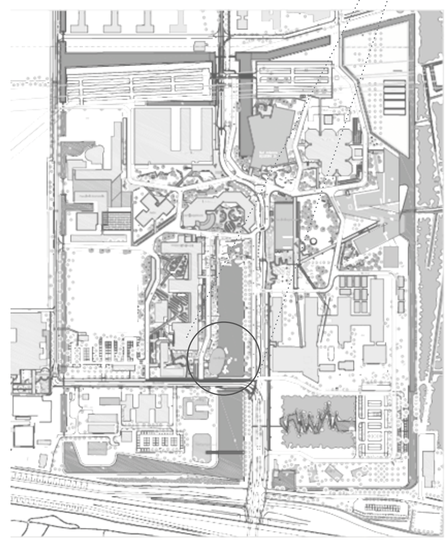
- more information: http://www.ru.nl/voorzieningen/overzicht/adressen_gebouwen/

RUG-1 Zernikeborg

new building	Zernike	2003	Groningen
project type	campus	year	location





The Zernikeborg (2003) is an iconic building at the entrance of the RUG Zernike campus, at the north of the city of Groningen. Zernikeborg accommodates the Donald Smits Center for Information Technology, the virtualization room CAVE (Computer Assisted Virtual Environment), a supercomputer (Blue Gene), offices for staff, teaching rooms and some of the central servers of the University.

Evaluations show that users are satisfied with this building that supports their identity. Zernikeborg is designed by INBO Architects and broke with the tradition of concrete and aluminium buildings on the Zernike campus. The façade is covered with ceramic bricks. It has become a landmark on the Zernike campus.

Project profile

goals

representative meeting place / plain & efficient — "representative and image-building"

1	support identity university / attract (more) students & staff members
2	more quality for user (match with changing demand)
3	support user goals more effectively / improve customer satisfaction

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	112.000	21,5	38,7
*	energy & water	110.000	21,1	37,9
*	cleaning	66.000	12,7	22,8

* is prognosis, maintenance costs including user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	10,1	1.940	3.480
investment costs	11,5	2.210	3.960

all costs price level October 2009

CREM

users

	number	
students	170	
staff (*head count*)	86	
staff (*fte*)		
educational space (m2 ufa) / student		2,0
office space (m2 ufa) / staff member		15,8
office space (m2 ufa) / fte		

largest user
Center for Information Technology (CIT)

m2

gross floor area	5.220	*m2 gfa*
useable floor area	2.910	*m2 ufa*
ufa / gfa	56%	
number of floors	6	
% office space	47%	(100 % = m2 ufa)
% educational space	11%	
% specific space	19%	(including laboratories)

Notes:

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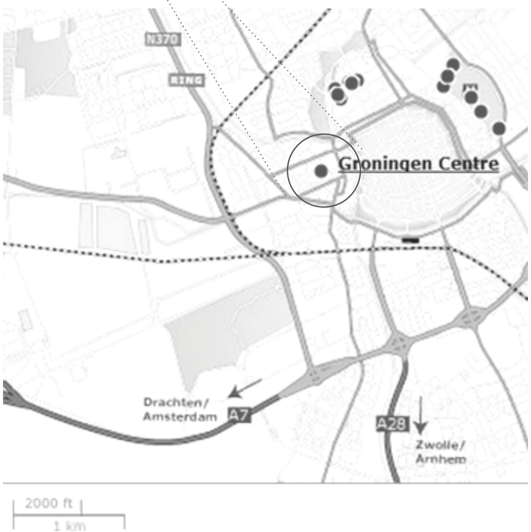
- more information: http://www.rug.nl/corporate/universiteit/gebouwen/index

Education building RUG-2

Groningen location — **2005** year — **Inner city** campus — **transformation** project type



Project profile

goals

"plain and efficient"

plain & efficient

1 support user goals more effectively / improve customer satisfaction

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	25.000	14,7	29,2
	energy & water	13.000	7,1	14,0
	cleaning	17.000	10,0	19,8

* is prognosis, maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	1,1	640	1.270
investment costs	1,3	740	1.490

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	
staff (*fte*)	
educational space (m2 ufa) / student	
office space (m2 ufa) / staff member	
office space (m2 ufa) / fte	
largest user	
Faculty of Law	

m2

gross floor area	1.730	*m2 gfa*
useable floor area	870	*m2 ufa*
ufa / gfa	51%	
number of floors	5	
% office space	16%	(100 % = m2 ufa)
% educational space	76%	
% specific space		

This project (2005) involves a renovation and transformation of an office building (2006) into
a building for education. This building in the inner city of Groningen has lecture halls and other educational facilities for two faculties. However, these are flexible facilities for many types of university activities.

Most important goal of this project was to support changing user demands and to improve user satisfaction by adding more space. The project is an example for more transformation projects, with a relatively low investment level per m2, adding to a 'plain & efficient' quality ambition and providing extra space for students.

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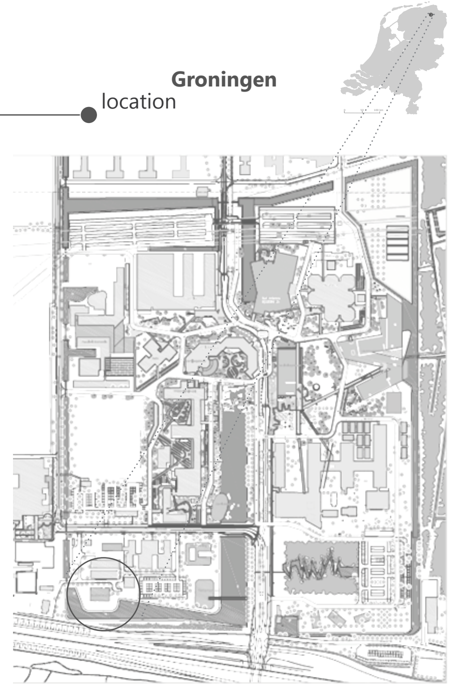
- more information: http://www.rug.nl/corporate/universiteit/gebouwen/index

RUG-3 Storage library

project type	campus	year	location
extra floors	**Zernike**	**2006**	**Groningen**



Adding floors to an exisiting building, this project (2006) created extra storage space for the university library. The investment level shows that RUG succeeded in keeping the costs per m2 relatively low. The building also accommodates some staff members with office space that is flexible in use.

Goals of the project were adding more quality for the user – in this case the university library – and supporting their activities more effectively. With this project the university aims at increasing the user satisfaction. The building is located on the Zernike campus.

In 2009 part of the office space was transformed into more storage space, which illustrates the flexibility of the building for other types of use.

Project profile

goals

meeting place
plain & efficient

"effective meeting place"

1	more quality for user (match with changing demand)
2	support user goals more effectively / improve customer satisfaction

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	12.000	3,8	4,6
energy & water	-	-	-
cleaning	10.000	3,1	3,8

* is prognosis, maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	1,7	540	650
investment costs	2,1	660	810

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	
staff (*fte*)	
educational space (m2 ufa) / student	
office space (m2 ufa) / staff member	
office space (m2 ufa) / fte	

largest user
University Library

m2

gross floor area	3.160	*m2 gfa*
useable floor area	2.600	*m2 ufa*
ufa / gfa	82%	
number of floors	3	
% office space	35%	(100 % = m2 ufa)
% educational space		
% specific space		

Notes:

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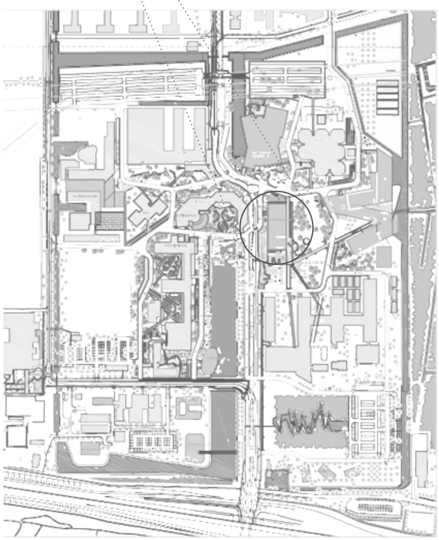
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.rug.nl/corporate/universiteit/gebouwen/index

Bernoulliborg RUG-4

Groningen	2007	Zernike	new building
location	year	campus	project type



Project profile

goals	
representative meeting place plain & efficient	"representative and image-building"
1	support identity university / attract (more) students & staff members
2	save accommodation costs
3	support identity user (faculty, department or institution that uses the building)

€	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	172.000	14,3	23,3
energy & water	166.000	13,8	22,6
cleaning	129.000	10,7	17,5
* is prognosis of maintenance costs excluding user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	19,2	1.600	2.610
investment costs	26,5	2.210	3.600
all costs price level October 2009			

CREM

users	number	
students	537	
staff (*head count*)	248	
staff (*fte*)	176	
educational space (m2 ufa) / student		2,9
office space (m2 ufa) / staff member		14,5
office space (m2 ufa) / fte		20,4
largest user		
Faculty of Mathmatics and Science		

m2		
gross floor area	12.000	*m2 gfa*
useable floor area	7.350	*m2 ufa*
ufa / gfa	61%	
number of floors	8	
% office space	49%	(100 % = m2 ufa)
% educational space	21%	
% specific space	2%	(including laboratories)

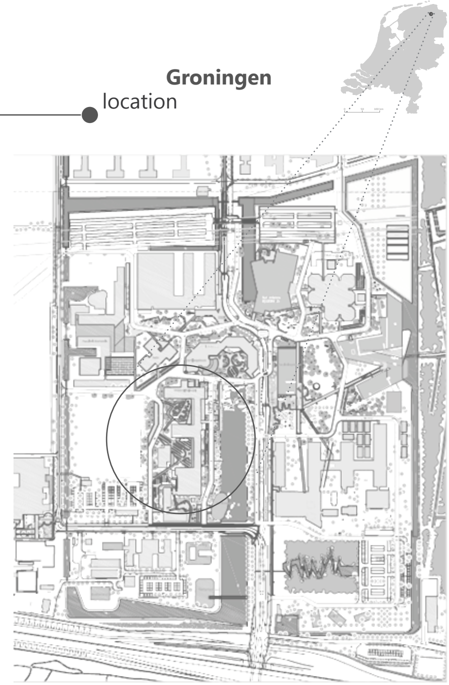
Bernoulliborg building (2007) is a construction project for the central departments of the Faculty of Mathematics and Natural Sciences and the departments of mathematics, computer science and artificial intelligence. It is designed to support the identity of both the university and the faculty. A few years after use, the RUG claims that reactions of the faculty community and visitors comfirm this – supporting the goals of the building.

Another goal of this building was to reduce accommodation costs and to stimulate innovation and collaboration between different user groups. The building accommodates a robot laboratory (100 m2) and some large lecture halls with a total capacity of more than 600 seats. It provides a library with 140 study places and a restaurant with 200 seats. The office space consists of 380 workplaces - about 9,4 m2 usable floor area (ufa) per workplace.

Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- extra source: All data in text provided by RUG
- more information: http://www.rug.nl/corporate/universiteit/gebouwen/index

RUG-5 FEB offices

workplace concept	Zernike	2007	Groningen
project type	campus	year	location



Project profile

This project (2007) represents a trend in university buildings: rethinking the academic workplace. It includes the upgrading process for ten floors of office space for the Faculty of Economics and Business (FEB). Note: the temporary vacancy on (the right side of) the bottom three floors is not included in the data. The project involves 650 workplaces and 6625 m2 (10,2 m2 per workplace).

As goals of this project were (in order of priority) to stimulate innovation and collaboration between different users and user groups, to support culture change and to support the changed user demands more effectively. Goals to increase flexibility and reduce accommodation costs were also mentioned, but not as primary goals.

goals

meeting place
plain & efficient
"effective meeting place"

1	stimulate innovation / collaboration (staff-staff, staff-students, student-student)
2	support culture change (for instance after reorganization)
3	support user goals more effectively / improve customer satisfaction

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	246.000	22,8	32,1
energy & water	231.000	21,4	30,2
cleaning	132.000	12,2	17,2

* is prognosis of maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	11,0	1.020	1.430
investment costs	14,5	1.340	1.890

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	548
staff (*fte*)	
educational space (m2 ufa) / student	
office space (m2 ufa) / staff member	12,1
office space (m2 ufa) / fte	

largest user
Faculty of Economics and Business

m2

gross floor area	10.800	*m2 gfa*
useable floor area	7.660	*m2 ufa*
ufa / gfa	71%	
number of floors	11	
% office space	87%	(100 % = m2 ufa)
% educational space		
% specific space	1%	

Notes:
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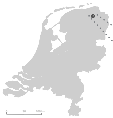
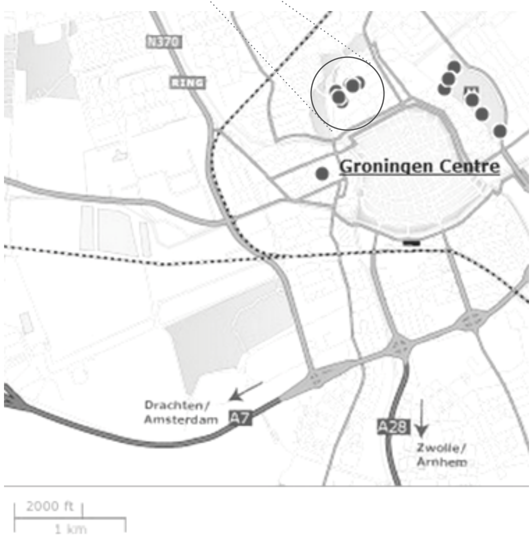
- more information: http://www.rug.nl/corporate/universiteit/gebouwen/index



GMW education RUG-6

Groningen location | **2008** year | **Inner city** campus | **extension / extra floors** project type



Project profile

goals

meeting place
plain & efficient
"effective meeting place"

1	increase flexibility: adaptability / multifunctional use
2	more quality for user (match with changing demand)
3	stimulate innovation / collaboration (staff-staff, staff-students, student-student)

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	17.000	11,2	14,4
energy & water	13.000	8,5	11,0
cleaning	15.000	9,3	12,0
* is prognosis of maintenance costs excluding user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	2,9	1.860	2.400
investment costs	3,9	2.505	3.235
all costs price level October 2009			

CREM

users

	number
students	350
staff (*head count*)	
staff (*fte*)	
educational space (m2 ufa) / student	3,4
office space (m2 ufa) / staff member	-
office space (m2 ufa) / fte	-
largest user	
Faculty of Behavioural and Social Sciences	

m2

gross floor area	1.560	*m2 gfa*
useable floor area	1.210	*m2 ufa*
ufa / gfa	78%	
number of floors	2	
% office space		(100 % = m2 ufa)
% educational space	98%	
% specific space		

This is a relatively small project that creates additional space for the faculty of Behavioural and Social Sciences (abbreviated GMW in Dutch). This project adds two floors of educational facilities for about 350 students to an existing building (third and fourth floor) to accommodate growth on the campus (Hortusbuurt) in the inner city of Groningen.

An important goal was to stimulate flexible use by different user groups, for different purposes and adaptable in time – when demand changes. The project created a place to meet with more quality for the users, encouraging collaboration between students and staff and among these user groups. In 2010 half of the building was transformed into office space, which illustrates the functional flexibility of the buiding.

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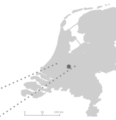
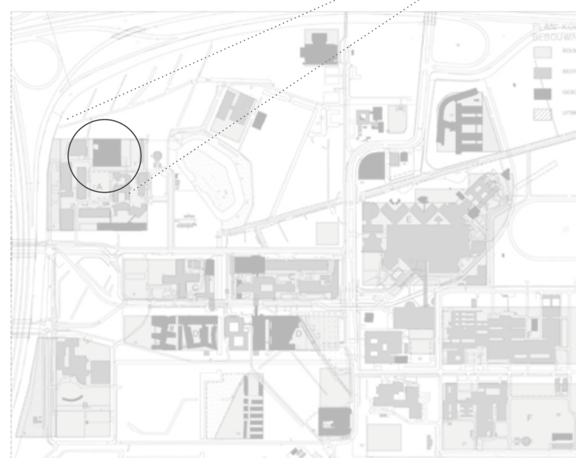
- more information: http://www.rug.nl/corporate/universiteit/gebouwen/index

UU-1 NITG building

new building	De Uithof	2002	Utrecht
project type	campus	year	location





The NITG (Geoscience) building has had a vital and successful role in the merger of a number of TNO divisions, which were accommodated throughout the Netherlands. The collaboration with the Utrecht University resulted in this building on campus De Uithof. Early evaluations showed that it is flexible for organizational changes. The large atrium and transparency in the design encourage collaboration and innovation.

Apart from supporting a culture change, early evaluations showed that the users were proud of their building and enthusiastic about the new working environment. A lease for twenty years has made the project feasible for the university. The project development process was open and flexible, because of the mutual agreements on costs and benefits for the university.

Project profile

goals

representative meeting place / plain & efficient — "representative and image-building"

1. support culture change (for instance after reorganization)
2. support user goals more effectively / improve customer satisfaction
3. support identity user (faculty, department or institution that uses the building)

€

	annually	€/m2 gfa	€/m2 ufa
* maintenance	75.000	4,5	7,2
energy & water	118.000	7,0	11,2
cleaning	170.000	10,1	16,1

* is prognosis, maintenance costs including user costs

	total in mln €	€/m2 gfa	€/m2 ufa
construction costs	28,3	1.680	2.670
investment costs	44,9	2.660	4.250

all costs price level October 2009

CREM

users

	number
students	340
staff (*head count*)	357
staff (*fte*)	
educational space (m2 ufa) / student	4,4
office space (m2 ufa) / staff member	12,4
office space (m2 ufa) / fte	

largest user
TNO - NITG (part of Utrecht Centre of Geosciences)

m2

gross floor area	16.900	*m2 gfa*
useable floor area	10.600	*m2 ufa*
ufa / gfa	63%	
number of floors	3	
% office space	42%	(100 % = m2 ufa)
% educational space	14%	
% specific space	28%	(including laboratories)

Notes:
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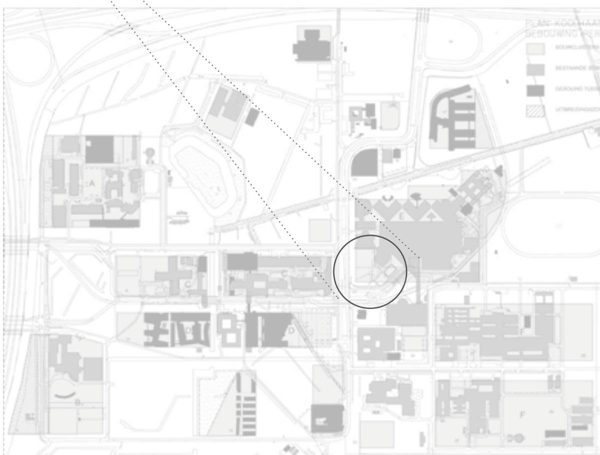
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university and photographer Hans van Leeuwen
- more information: http://www.uu.nl/university/utrecht/NL/CultuurenArchitectuur/

Utrecht location — **2005** year — **De Uithof** campus — **new building** project type

Hijmans van den Bergh

UU-2



Project profile

goals	
representative meeting place / plain & efficient	"representative and image-building"
1	support user goals more effectively / improve customer satisfaction
2	stimulate innovation / collaboration (staff-staff, staff-students, student-student)
3	support culture change (for instance after reorganization)

€	annually	€ / m2 gfa	€ / m2 ufa
maintenance	-	-	-
energy & water	-	-	-
cleaning	-	-	-
	total in mln €	**€ / m2 gfa**	**€ / m2 ufa**
construction costs	26,4	1.840	2.780
investment costs	38,5	2.690	4.060
all costs price level October 2009			

CREM

users	number	
students	6.802	
staff (*head count*)	162	
staff (*fte*)		
educational space (m2 ufa) / student		0,8
office space (m2 ufa) / staff member		15,8
office space (m2 ufa) / fte		
largest user		
Faculty of Medicine		

m2		
gross floor area	14.300	*m2 gfa*
useable floor area	9.500	*m2 ufa*
ufa / gfa	66%	
number of floors	5	
% office space	27%	(100 % = m2 ufa)
% educational space	55%	
% specific space		

This project aimed at supporting a culture change at Utrecht University by accommodating many medical departments in one building, adjacent to the university hospital UMCU. Pre-medical education, biomedical sciences and two training centres use the same facilities in this building, encouraging collaboration and innovation.

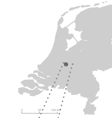
The building includes space for practicing clinical skills, learning environments and office space to share and a multifunctional restaurant with integrated study places, also used as an informal place to meet and work. The university invested in high quality to accommodate a large student population on a relatively small footprint per person.

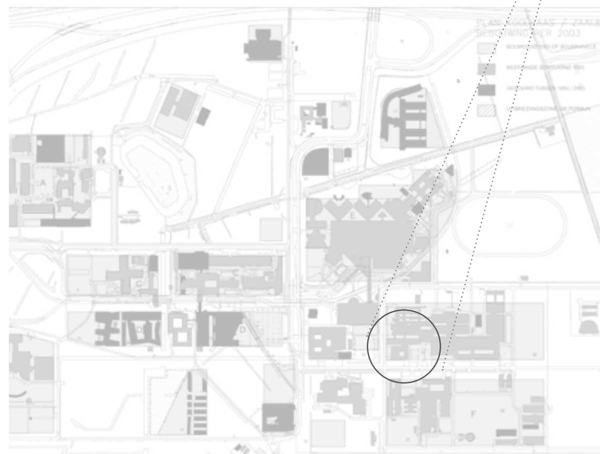
Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university and photographer Hans van Leeuwen
- photo interior: Jannes Linders
- more information: http://www.uu.nl/university/utrecht/NL/CultuurenArchitectuur/

UU-3 **Jeanette Donker-Voet**

project type	campus	year	location
new building	**De Uithof**	**2006**	**Utrecht**





The main goal of this project (2006) for the Faculty of Veterinary Medicine was to merge three animal clinics with their laboratories, restaurants and facilities in one building. The new building includes a central pharmacy and drug preparation areas. Other goals were improving operating efficiency, adding to certified standards for health, safety and sustainability and stimulating shared use and collaboration between different user groups.

Compared to the former accommodation this project is characterized by more flexibility with multifunctional space, more representative facilities and more transparency in the area of the pharmacy, restaurant, and coffee bar. This has added to the image of the faculty and created a place to meet for students, staff members and visitors.

Project profile

goals

plain & efficient — *"plain and efficient"*

1	support user goals more effectively / improve customer satisfaction
2	more quality for user (match with changing demand)
3	support identity university / attract (more) students & staff members

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	147.000	23,3	36,1
	energy & water	-	-	-
	cleaning	86.000	13,6	21,2

* is prognosis of maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	25,5	4.050	6.270
investment costs	26,2	4.160	6.450

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	155
staff (*fte*)	
educational space (m2 ufa) / student	-
office space (m2 ufa) / staff member	6,4
office space (m2 ufa) / fte	-

largest user
Faculty of Veterinary Medicine

m2

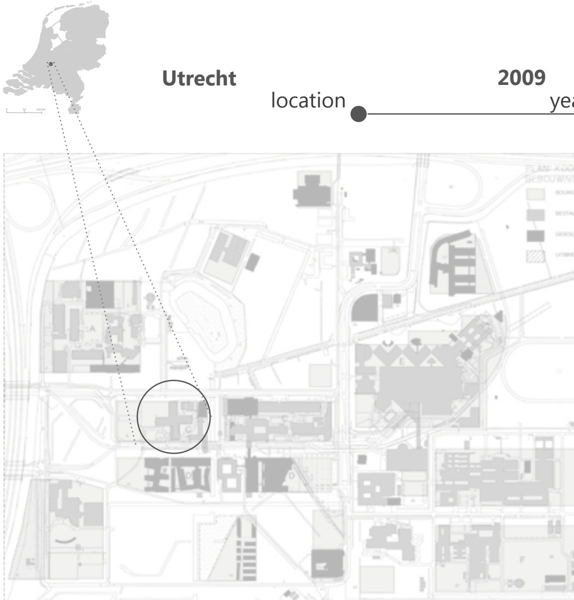
gross floor area	6.310	*m2 gfa*
useable floor area	4.070	*m2 ufa*
ufa / gfa	64%	
number of floors	4	
% office space	24%	(100 % = m2 ufa)
% educational space	3%	
% specific space	45%	(including laboratories)

Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university and photographer Hans van Leeuwen
- more information: http://www.hv.uu.nl/donkervoet/index.htm

Kruyt building UU-4

Utrecht	2009	De Uithof	maintenance
location	year	campus	project type



Project profile

goals

plain & efficient — *"plain and efficient"*

1	more quality for user (match with changing demand)
2	support user goals more effectively / improve customer satisfaction
3	support identity user (faculty, department or institution that uses the building)

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	1.903.000	38,5	80,6
energy & water	-	-	-
cleaning	410.000	8,3	17,3

* is prognosis of maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	-	-	-
investment costs	19,3	390	810

all costs price level October 2009

CREM

users

	number	
students	350	
staff (*head count*)	450	
staff (*fte*)		
educational space (m2 ufa) / student		5,6
office space (m2 ufa) / staff member		14,4
office space (m2 ufa) / fte		-

largest user
Faculty of Science, Biology department

m2

gross floor area	49.400	*m2 gfa*
useable floor area	23.600	*m2 ufa*
ufa / gfa	48%	
number of floors	12	
% office space	27%	(100 % = m2 ufa)
% educational space	8%	
% specific space	47%	(including laboratories)

The project involves maintenance and upgrading of the 1974 Hugo Rudolph Kruyt building used by the Faculty of Science. This is an eleven-storey laboratory building of 45.000 m2 gross floor area (bvo). The core of the building is used as circulation space to access the four wings. This project consists of two parts: the upgrading of the central area on each floor, to create an attractive meeting place and the maintenance of the installations, to extend the lifetime with ten years and to reduce operating risks.

Consequently, the building will need additional investments in the next decade – also to reduce energy use. But in the meantime this project added more quality to the working environment for the faculty community.

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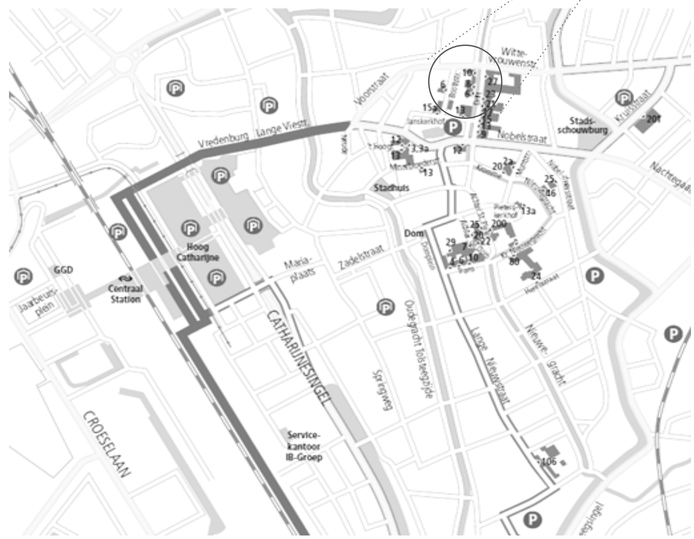
- photos and maps used with permission of university and photographer Hans van Leeuwen
- more information: http://www.hv.uu.nl/kruytproj/index.htm

UU-5 Drift 10

acquisition + renovation	Inner city	2008	Utrecht
project type	campus	year	location



As part of the UU campus strategy for the inner-city campus, building Drift 10 was acquired to concentrate education-related facilities, the library and office space for the Humanities faculties on one location. This project accommodates employees of the Faculty of Behavioural Sciences alongside Drift 4-8 and opposite to university building at Drift 21-23 and the library at Drift 25, which is also recently renovated.

Adding to the goals of reducing costs and reducing the footprint by more efficient space use, the building offers 7 m2 workplaces to nearly hundred employees. Less quantity is combined with higher quality of the new working environment.

Project profile

goals

plain & efficient — *"plain and efficient"*

1	support user goals more effectively / improve customer satisfaction
2	more quality for user (match with changing demand)
3	save accommodation costs

€

		annually	*€ / m2 gfa*	*€ / m2 ufa*
*	maintenance	-	-	-
	energy & water	30.000	24,1	38,2
	cleaning	12.000	9,8	15,4

* is prognosis of maintenance costs excluding user costs

	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	-	-	-
investment costs	1,7	1.340	2.120

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	93
staff (*fte*)	80
educational space (m2 ufa) / student	-
office space (m2 ufa) / staff member	7,0
office space (m2 ufa) / fte	8,2

largest user
Faculty of Behavioural Sciences, (Art) History department

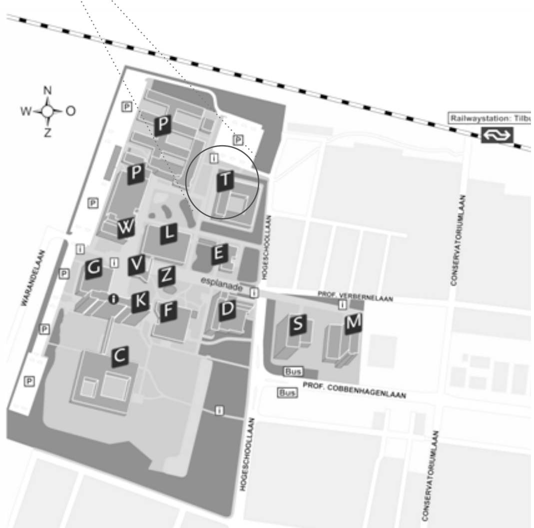
m2

gross floor area	1.300	*m2 gfa*
useable floor area	800	*m2 ufa*
ufa / gfa	63%	
number of floors	5	
% office space	83%	(100 % = m2 ufa)
% educational space	2%	
% specific space		

Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- maps used with permission of university and photographer Hans van Leeuwen
- more information: http://www.hv.uu.nl/drift10/index.htm

Tias building UvT-1

location	year	campus	project type
Tilburg	2002	Tilburg campus	new building



Project profile

goals

representative meeting place / plain & efficient — "representative and image-building"

1. support identity user (faculty, department or institution that uses the building)
2. increase income: make building rentable to a third party
3. support user goals more effectively / improve customer satisfaction

€

	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	111.000	10,1	18,2
energy & water	79.000	7,1	12,8
cleaning	108.000	9,7	17,6

* is prognosis, maintenance costs including user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	16,4	1.480	2.680
investment costs	22,6	2.030	3.690

all costs price level October 2009

CREM

users

	number	
students	444	
staff (*head count*)	263	
staff (*fte*)		
educational space (m2 ufa) / student		4,7
office space (m2 ufa) / staff member		12,4
office space (m2 ufa) / fte		

largest user
TIasNimbas Business School (post-doctoral education)

m2

gross floor area	11.100	*m2 gfa*
useable floor area	6.130	*m2 ufa*
ufa / gfa	55%	
number of floors	8	
% office space	53%	(100 % = m2 ufa)
% educational space	34%	
% specific space		

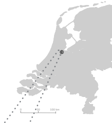
This project was initiated in 2000 to accommodate TiasNimbas, the business school of Tilburg University and Eindhoven University of Technology. With post-experience students as the main user group the quality ambition was high, supporting the image of the business school. On top of that, the business school invested in high-quality furniture to add to that goal.

With eight floors of office space, meeting rooms and lecture rooms this building is flexible in use – adding to the goal to increase income by making it rentable to external parties. Evaluations after two years of use showed higher satisfaction rates among students and staff.

Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.plattegronduvt.nl/photo.html

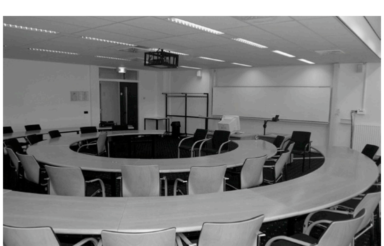
UvA-1 REC E faculty

project type	campus	year	location
new building	Roeterseiland	1999	Amsterdam



Dating from 1991, this building was planned when the Dutch government – and not the University of Amsterdam – was owner of the university campus and decided about investments in new buildings. The investment level, goals and ambitions should be interpreted in that perspective, even though the costs are converted to price level October 2009 for comparison with other projects.

The name REC E is an abbreviation for building E on the Roeterseiland campus (REC). Space standard for offices in the brief was more than 20 m2 per fte, which show that this project was planned decades ago. Evaluations in 2005 indicated that the building was still of reasonable technical quality, but functionally it lacked meeting rooms for group work. Anno 2010 the Faculty of Economics & Business is the largest user of the building.



Project profile

goals

meeting place
plain & efficient
"effective meeting place"

1	accommodate growth (students, research institutes etc.)
2	stimulate innovation / collaboration (staff-staff, staff-students, student-student)
3	more quality for user (match with changing demand)

€

	annually	*€ / m2 gfa*	*€ / m2 ufa*
maintenance	279.000	21,1	41,4
energy & water	167.000	12,6	24,7
cleaning	128.000	9,7	19,0
N.B. maintenance costs including user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	21,7	1.650	3.220
investment costs	31,2	2.370	4.630

all costs price level October 2009

CREM

users

	number	
students	2.583	
staff (*head count*)	353	
staff (*fte*)	305	
educational space (m2 ufa) / student		0,4
office space (m2 ufa) / staff member		14,4
office space (m2 ufa) / fte		16,7

user
Faculty of Economics & Business

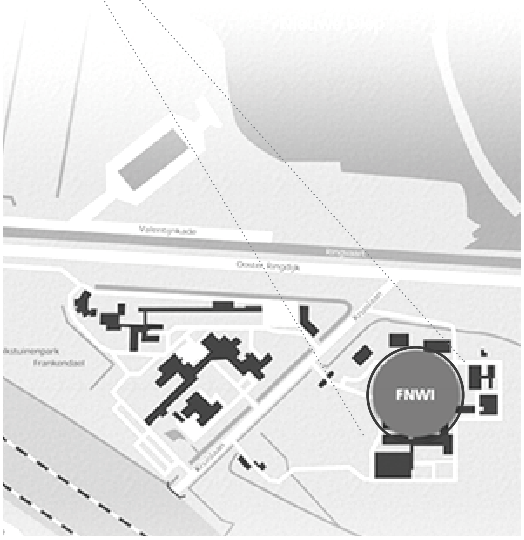
m2

gross floor area	13.200	*m2 gfa*
useable floor area	6.730	*m2 ufa*
ufa / gfa	51%	
number of floors	13	
% office space	76%	(100 % = m2 ufa)
% educational space	14%	
% specific space	1%	(including laboratories)

Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- maps used with permission of university
- more information:http://www.uva.nl/over_de_uva/contact/alfabetische-lijst.cfm

FNWI faculty UvA-2

Amsterdam	2010	Science Park	new + renovation
location	year	campus	project type



Project profile

goals		
	meeting place / plain & efficient	"effective meeting place"
1	create one location for the whole faculty	
2	support user goals more effectively / improve customer satisfaction	
3	support identity user (faculty, department or institution that uses the building)	

€	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	2.474.000	35,2	52,7
* energy & water	1.161.000	16,5	24,7
* cleaning	1.036.000	14,7	22,1
* are prognoses, maintenance costs excluding user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	120,2	1.710	2.570
investment costs	186,3	2.650	3.970
all costs price level October 2009			

CREM

users	number	
students	2.170	
staff (*head count*)	1.500	
staff (*fte*)	1.160	
educational space (m2 ufa) / student		3,0
office space (m2 ufa) / staff member		8,9
office space (m2 ufa) / fte		11,5
user		
Faculty of Science		

m2		
gross floor area	70.300	*m2 gfa*
useable floor area	46.900	*m2 ufa*
ufa / gfa	67%	
number of floors	5	
% office space	28%	(100 % = m2 ufa)
% educational space	14%	
% specific space	35%	(including laboratories)

This large project comprises both adding new buildings and renovating existing buildings for the Faculty of Science. Because of the size – more than 70.000 m2 – this project is divided in phases.

Adding to the goal of clustering the faculty on one location and reducing the footprint, areas with similar functions were created to encourage shared use and to stimulate collaboration and innovation.

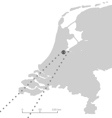
Public space, teaching rooms, restaurant and library study facilities are located on the lower floors, the research institutes are accommodated on the floors above. The building contains a substantial amount of laboratory space.

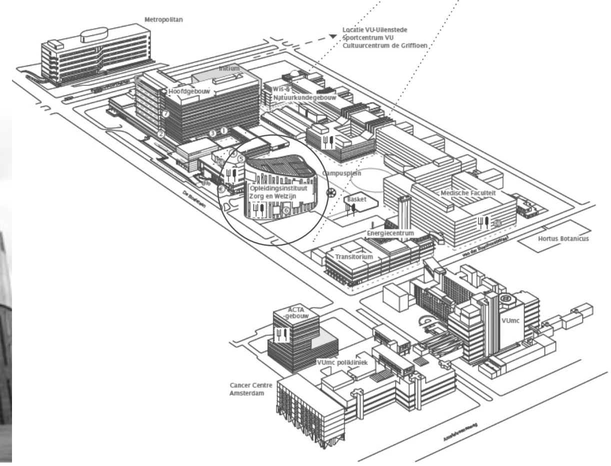
Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- maps and images by photographer Peter Kers used with permission of university
- more information:http://www.uva.nl/over_de_uva/contact/alfabetische-lijst.cfm

VU-1 **OZW building**

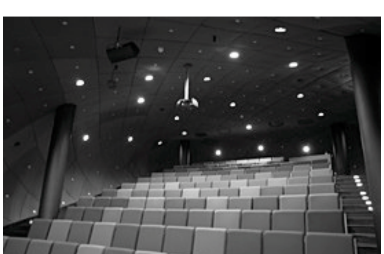
project type	campus	year	location
new building	VU campus	2006	Amsterdam





With the goal to accommodate medical or related faculties (cure, care and welfare) this project aimed at stimulating collaboration between academic and professional programmes and students of different courses. VU joined forces with VU Medical Centre, Inholland university of applied sciences and ROC ASA for this project.

As a result, this landmark building – designed by Jeanne Dekkers Architecture – includes lecture halls, educational facilities, office space and a fitness centre for shared use. The building with its colourful interior, meeting places and transparency supports the identity of the user groups, which was acknowledged in early evaluations.



Project profile

goals

representative / meeting place / plain & efficient — "representative and image-building"

1	collaborate with other institutions (education, research, hospitals)
2	support identity university / attract (more) students & staff members
3	support identity user (faculty, department or institution that uses the building)

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	797.000	39,7	63,8
*	energy & water	400.000	19,9	32,1
*	cleaning	375.000	18,7	30,1

* is prognosis, maintenance costs including user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	-	-	-
investment costs	39,9	1.980	3.190

all costs price level October 2009

CREM

users

	number
students	3.669
staff (*head count*)	294
staff (*fte*)	207

educational space (m2 ufa) / student	1,8
office space (m2 ufa) / staff member	9,0
office space (m2 ufa) / fte	12,8

largest user
Inholland University (professional higher education)

m2

gross floor area	20.100	*m2 gfa*
useable floor area	12.500	*m2 ufa*
ufa / gfa	62%	
number of floors	13	
% office space	21%	(100 % = m2 ufa)
% educational space	52%	
% specific space	4%	

Notes:

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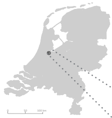
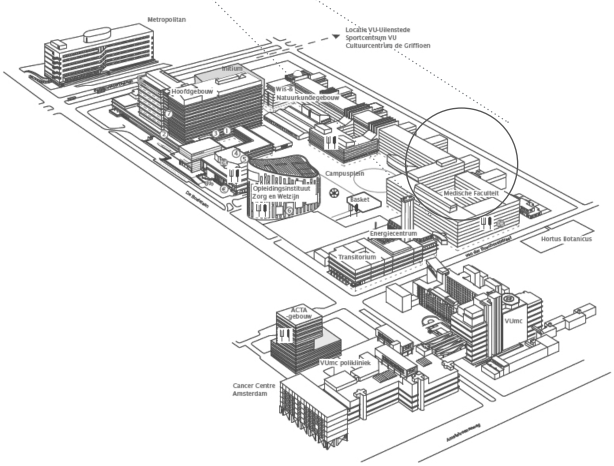
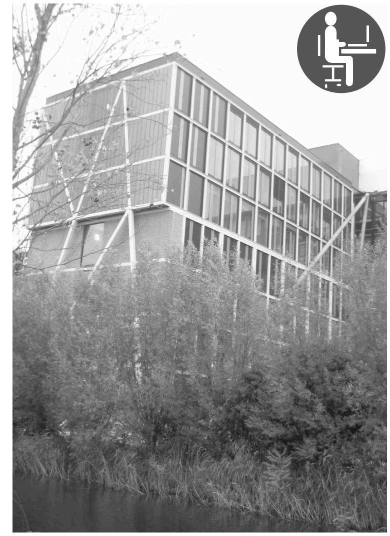
- costs converted to price level October 2009 for comparison of projects
- maps used with permission of university
- extra source: www.inholland.nl
- more information: http://www.vu.nl/



W&N faculty VU-2

location	year	campus	project type
Amsterdam	**2008**	**VU campus**	**extra floors**





Project profile

goals

meeting place
plain & efficient

"effective meeting place"

1. support user goals more effectively / improve customer satisfaction
2. more quality for user (match with changing demand)
3. stimulate innovation / collaboration (staff-staff, staff-students, student-student)

€

	annually	€ / m2 gfa	€ / m2 ufa
maintenance	-	-	-
energy & water	-	-	-
cleaning	22.000	13,2	30,3

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	3,4	2.090	4.780
investment costs	3,8	2.350	5.390

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	52
staff (*fte*)	51
educational space (m2 ufa) / student	-
office space (m2 ufa) / staff member	11,3
office space (m2 ufa) / fte	11,6

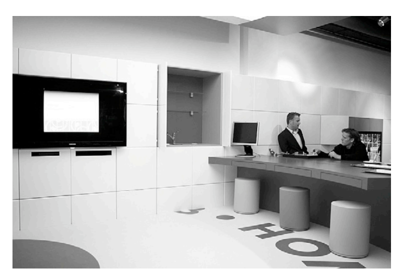
largest user
Faculty of Mathematics and Physics

m2

gross floor area	1.620	*m2 gfa*
useable floor area	700	*m2 ufa*
ufa / gfa	44%	
number of floors	3	
% office space	83%	(100 % = m2 ufa)
% educational space		
% specific space	1%	

This project added three floors of offices to an existing faculty building (nr. 4 on the campus 3D-map). This limited extension of / on the Mathematics & Physics building was realised together with the renovation project of section B of the same building. The extension is connected to existing installations and uses existing facilities such as the entrance hall, lifts, toilets and archives.

This project adds 76 workplaces to the existing building, plus 8 flexible workplaces in the horizontal circulation space. With 7,7 m2 usable floor area per workplace this office space is efficiently organized. Nonetheless, supporting the users more effectively and stimulating collaboration were higher on the list of goals than reducing the footprint.



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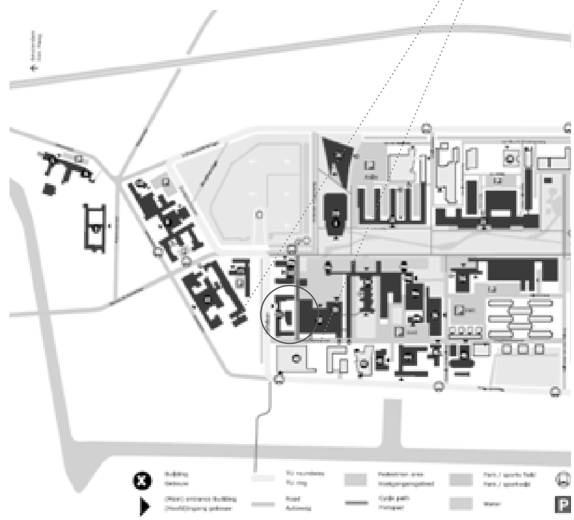
- maps used with permission of university
- more information: http://www.vu.nl/

TUD-1 **TBM faculty**

project type	campus	year	location
new building in 2 phases	**TU campus (centre)**	**2000**	**Delft**



Project profile

This project (2000) added more than 13.000 m2 to an existing building (1992) to accommodate the growth of the Faculty of Technology, Policy and Management (TPM). Yet, the flexible extension was designed to allow many types of users, inclusing external parties, if the building would no longer be needed for university purposes. The goal to provide more quality for the user was combined with the ambition to reduce the footprint at the time of the project – including some sustainable solutions.

However, an evaluation in 2005 already showed that the building was too small for the rapidly growing faculty – acknowledged by the campus managers and faculty community. Anno 2010 it is still in use by the faculty TPM that even attracted many more students in the past five year, adding to a very low footprint per user.

goals

meeting place
plain & efficient

"effective meeting place"

1	accommodate growth (students, research institutes etc.)
2	more quality for user (match with changing demand)
3	increase flexibility: adaptability / multifunctional use

€

	annually	*€ / m2 gfa*	*€ / m2 ufa*
maintenance	273.000	20,5	31,8
* energy & water	124.000	9,3	14,4
cleaning	133.000	10,0	15,5

* is prognosis, maintenance costs including user costs

	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	22,4	1.680	2.610
investment costs	26,0	1.960	3.040

all costs price level October 2009

CREM

users

	number	
students	962	
staff (*head count*)	352	
staff (*fte*)	270	
educational space (m2 ufa) / student		1,7
office space (m2 ufa) / staff member		13,1
office space (m2 ufa) / fte		17,1

largest user
Faculty of Technology, Policy & Management

m2

gross floor area	13.300	*m2 gfa*
useable floor area	8.580	*m2 ufa*
ufa / gfa	65%	
number of floors	6	
% office space	54%	(100 % = m2 ufa)
% educational space	19%	
% specific space		

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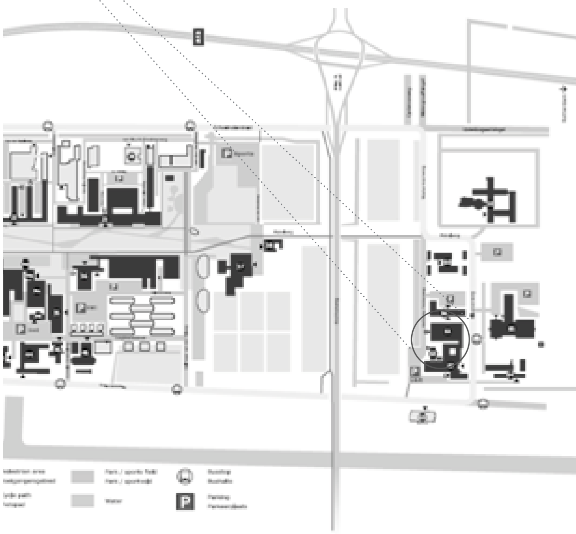
- more information: http://www.tudelft.nl

L&R extension TUD-2

Delft location · **2002** year · **TU campus (south)** campus · **new building** project type



Project profile

goals

"plain and efficient"

plain & efficient

1	accommodate growth (students, research institutes etc.)
2	support user goals more effectively / improve customer satisfaction
3	more quality for user (match with changing demand)

€

	annually	*€ / m2 gfa*	*€ / m2 ufa*
maintenance	146.000	27,4	41,3
energy & water	107.000	20,2	30,5
cleaning	-	-	-
N.B. maintenance costs including user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	8,8	1.650	2.490
investment costs	12,8	2.400	3.630
all costs price level October 2009			

CREM

users

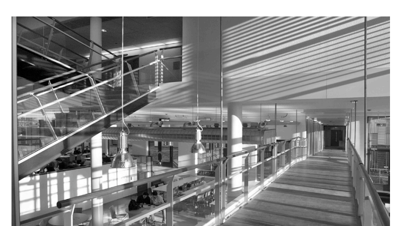
	number
students	12
staff (*head count*)	144
staff (*fte*)	
educational space (m2 ufa) / student	2,4
office space (m2 ufa) / staff member	15,5
office space (m2 ufa) / fte	
largest user	
Faculty of Aerospace Engineering	

m2

gross floor area	5.320	*m2 gfa*
useable floor area	3.520	*m2 ufa*
ufa / gfa	66%	
number of floors	4	
% office space	63%	(100 % = m2 ufa)
% educational space	1%	
% specific space		

Increasing student numbers and more (contract) research staff – externally funded – were reasons to initiate this project to add more usable space to the building of the Faculty of Aerospace Engineering. This project (2002) added about 5300 m2 on a site between the existing high-rise faculty building and the hangar.

The extension is a four-storey building, designed by Rudy Uytenhaak Architects and completed in November 2002. The flexible building accommodates professors, their staff and faculty-related research institutes. It has a restaurant that serves the whole faculty and students and staff of adjacent buildings.



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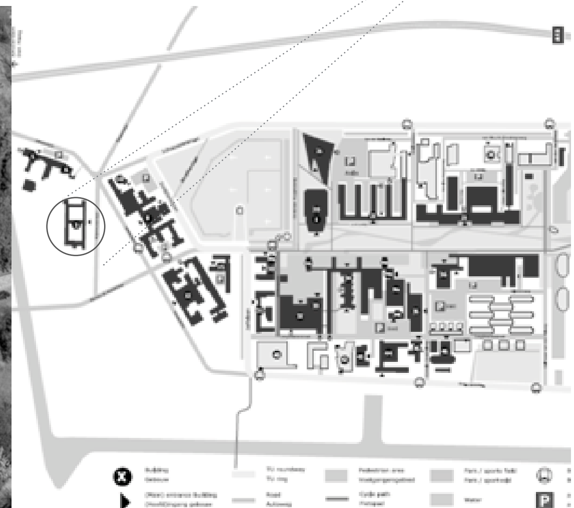
- more information: http://www.tudelft.nl

TUD-3 Mijnbouwstraat 120

project type	campus	year	location
renovation	TU campus (north)	2009	Delft



The Mijnbouwstraat building has been university property for more than one hundred years. At the same time this renovation project (2009) aimed at conserving cultural heritage of the university and accommodating related functions close to the university. The income from rent can reduce the total costs of ownership on the campus. The renovation project consisted of three parts: a shell restoration, a replacement of installations and interior painting.

Anno 2010 the renovated building offers accommodation to the Science Centre Delft (www.sciencecentre.tudelft.nl) and to starters from the university, like Senz Umbrellas. It has a function as an incubator for innovative applications and as a bridge between technology and society.

Project profile

goals

representative
meeting place
plain & efficient

"representative and image-building"

1	preserve cultural heritage
2	save accommodation costs
3	increase income: make building rentable to a third party

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	55.000	4,0	6,6
	energy & water	-	-	-
	cleaning	-	-	-

* is prognosis of maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	7,6	550	900
investment costs	8,0	580	960

all costs price level October 2009

CREM

users

	number
students	
staff (*head count*)	
staff (*fte*)	
educational space (m2 ufa) / student	-
office space (m2 ufa) / staff member	-
office space (m2 ufa) / fte	-

largest user
Science Centre Delft

m2

gross floor area	13.800	*m2 gfa*
useable floor area	8.380	*m2 ufa*
ufa / gfa	61%	
number of floors	3	
% office space	32%	(100 % = m2 ufa)
% educational space	1%	
% specific space		

Notes:

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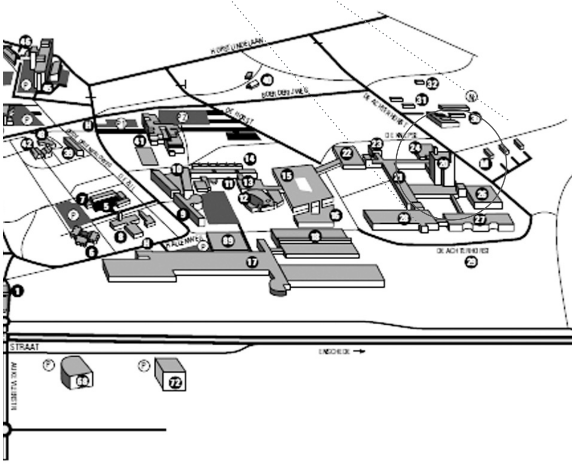
- more information: http://www.tudelft.nl

Twente	2004	Drienerlo	redevelopment halls
location	year	campus	project type



Project profile

goals		
plain & efficient	"plain and efficient"	
1	achieve minimum quality (for use permit)	
2	save accommodation costs	
3	accommodate growth (students, research institutes etc.)	

€	annually	€ / m2 gfa	€ / m2 ufa
maintenance	-	-	-
energy & water	-	-	-
cleaning	-	-	-
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	-	-	-
investment costs	14,8	1.670	2.560
all costs price level October 2009			

CREM

users	number	
students	1.200	
staff (*head count*)	40	
staff (*fte*)		
educational space (m2 ufa) / student		3,0
office space (m2 ufa) / staff member		10,7
office space (m2 ufa) / fte		
largest user		
Biomedical Technology		

m2		
gross floor area	8.900	*m2 gfa*
useable floor area	5.800	*m2 ufa*
ufa / gfa	65%	
number of floors	2	
% office space	7%	(100 % = m2 ufa)
% educational space	63%	
% specific space		

This redevelopment project (2004) is part of the "Horst complex" that has been used for research, development and test facilities for many UT faculties since 1968. Architects Van Mourik and Du Pon transformed these functionally and technically obsolete halls into more transparent and flexible buildings for education and research. Adaptability was very important: a lecture hall can easily be transformed to a room for group work.

An extra floor was added – doubling the usable floor area – to accommodate growth and the indoor climate was improved to meet the current requirements for the place to work and study. The goal to make these buildings functional again was achieved. Early evaluations in 2006 showed satisfied users.

Notes:

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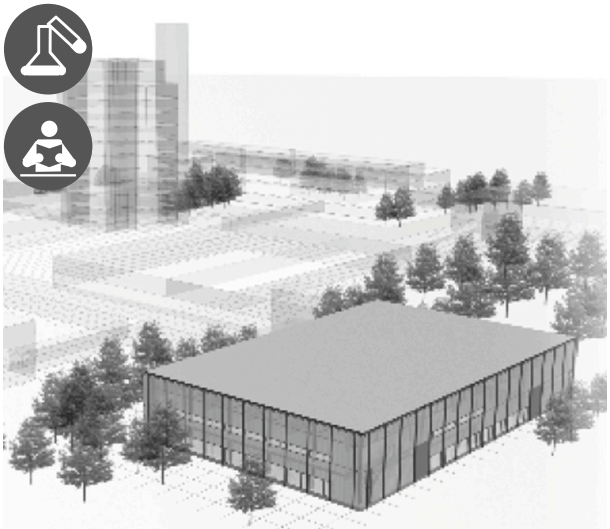
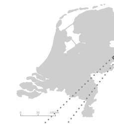
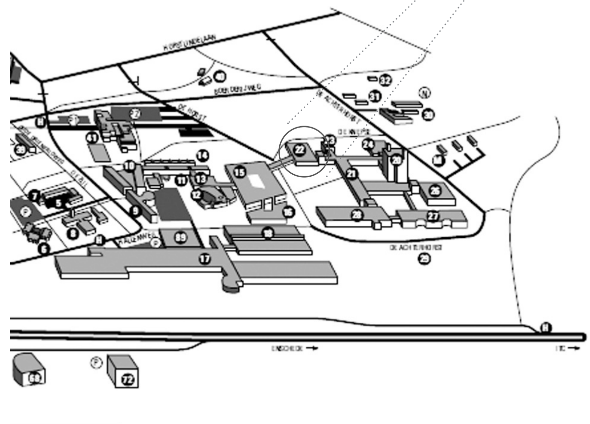
- more information: http://www.utwente.nl/3d-campus-en

UT-2 Westhorst

project type	campus	year	location
redevelopment hall	**Drienerlo**	**2005**	**Twente**







Project profile

This redevelopment project (2005) is part of "Horst complex", like UT-1. This project followed UT-1 by transforming another hall from 1968 into predominantly laboratory space. To double the floor area an extra floor was added to accommodate many different labs in one building such as the virtual reality lab, a laser lab and a wind tunnel. The building also includes educational facilities and office space, which was enabled by redesigning the facades to allow more daylight into the building.

After the project the UT got back the use permit for previously obsolete floor area. Other goals were to reduce the footprint per user and to save accommodation costs. Early evaluations in 2006 showed satisfied students and satisfied support staff.

goals

plain & efficient — *"plain and efficient"*

1. achieve minimum quality (for use permit)
2. less m2 per user
3. save accommodation costs

€

	annually	€ / m2 gfa	€ / m2 ufa
maintenance	-	-	-
energy & water	-	-	-
cleaning	-	-	-

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	-	-	-
investment costs	11,5	2.410	3.830

all costs price level October 2009

CREM

users

	number	
students	55	
staff (*head count*)	50	
staff (*fte*)		
educational space (m2 ufa) / student		8,5
office space (m2 ufa) / staff member		8,9
office space (m2 ufa) / fte		

largest user
Faculty of Engineering Technology

m2

gross floor area	4.800	*m2 gfa*
useable floor area	3.020	*m2 ufa*
ufa / gfa	63%	
number of floors	2	
% office space	15%	(100 % = m2 ufa)
% educational space	16%	
% specific space	65%	(including laboratories)

Notes:
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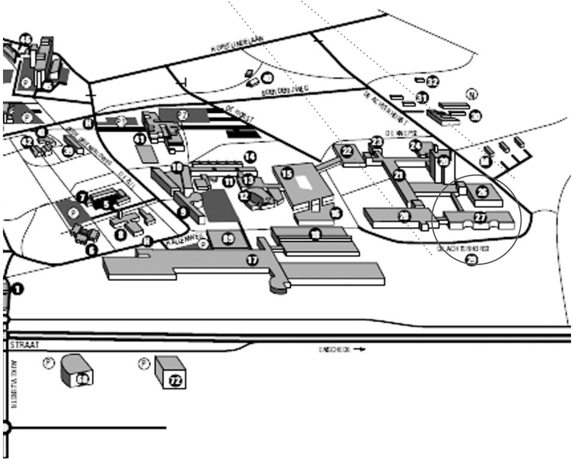
- photos and maps used with permission of university
- more information: http://www.utwente.nl/3d-campus-en

Twente location · **2007** year · **Drienerlo** campus · **new building** project type

Meander UT-3



Project profile

goals	
representative meeting place / plain & efficient	"representative and image-building"
1	replacing former accommodation
2	support user goals more effectively / improve customer satisfaction
3	increase flexibility: adaptability / multifunctional use

€	annually	€ / m2 gfa	€ / m2 ufa
maintenance	-	-	-
energy & water	-	-	-
cleaning	-	-	-
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	13,2	1.290	2.090
investment costs	18,8	1.840	3.000
all costs price level October 2009			

CREM

users		number
students	61	
staff (*head count*)	237	
staff (*fte*)		
educational space (m2 ufa) / student		
office space (m2 ufa) / staff member		11,6
office space (m2 ufa) / fte		-
largest user		
Faculty of Applied Sciences		

m2		
gross floor area	10.200	*m2 gfa*
useable floor area	6.280	*m2 ufa*
ufa / gfa	62%	
number of floors	3	
% office space	44%	(100 % = m2 ufa)
% educational space		
% specific space	53%	(including laboratories)

Meander (2007) is a new building with offices and laboratories, with two floors to use and one floor for installations. The building has a concrete structure – construction glass for the façade – and a meandering shape. It is equipped with electric blinds. The building is connected to the adjacent buildings with a long corridor.

Goal of the project was to replace the former accommodation of the Faculty of Applied Sciences in order to support these users more effectively. Yet, it is designed as an adaptable, flexible building to accommodate multiple functions and different user groups in time. While the main function is laboratory, the building also has 35% office space with 300 workplaces of about 9 m2 usable floor area.

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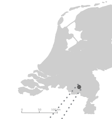
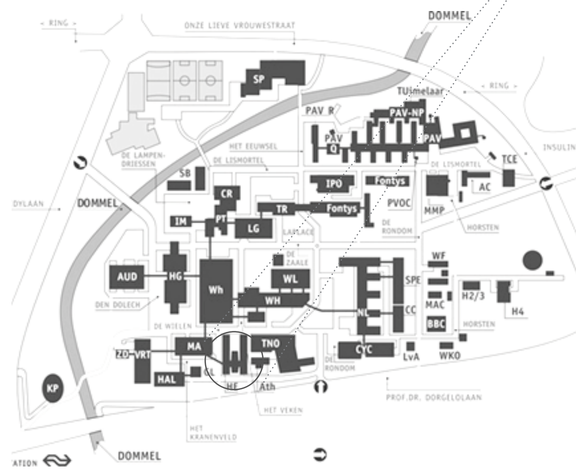
- more information: http://www.utwente.nl/3d-campus-en

TUE-1 Helix

new building	TU/e science park	1998	Eindhoven
project type	campus	year	location





Reacting to the changing demands of the Faculty of Chemical Engineering and Chemistry this project started in 1996, just after the university got ownership of their own campus. The building consists of a mix of office, education and laboratory space. The latter is the dominant function: more than 40% is high-tech laboratory.

One of the goals was to support the image of the faculty, but the quality ambition was plain and efficient to keep the investment level relatively low. Early evaluations showed that this building indeed supported the image of the faculty. Another goal was to reduce the floor area in favour of quality – a new faculty building.

Project profile

goals

plain & efficient — *"plain and efficient"*

1	more quality for user (match with changing demand)
2	support user goals more effectively / improve customer satisfaction
3	support identity user (faculty, department or institution that uses the building)

€

	annually	*€ / m2 gfa*	*€ / m2 ufa*
maintenance	613.000	20,5	35,8
energy & water	1.079.000	36,1	62,9
cleaning	344.000	11,5	20,0
N.B. maintenance costs excluding user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	43,6	1.460	2.550
investment costs	62,5	2.090	3.660
all costs price level October 2009			

CREM

users

	number	
students	700	
staff (*head count*)		
staff (*fte*)	350	
educational space (m2 ufa) / student		3,9
office space (m2 ufa) / staff member		
office space (m2 ufa) / fte		15,4
largest user		
Faculty of Chemical Engineering & Chemistry		

m2

gross floor area	29.900	*m2 gfa*
useable floor area	17.100	*m2 ufa*
ufa / gfa	57%	
number of floors	6	
% office space	32%	(100 % = m2 ufa)
% educational space	16%	
% specific space	44%	(including laboratori

Notes:

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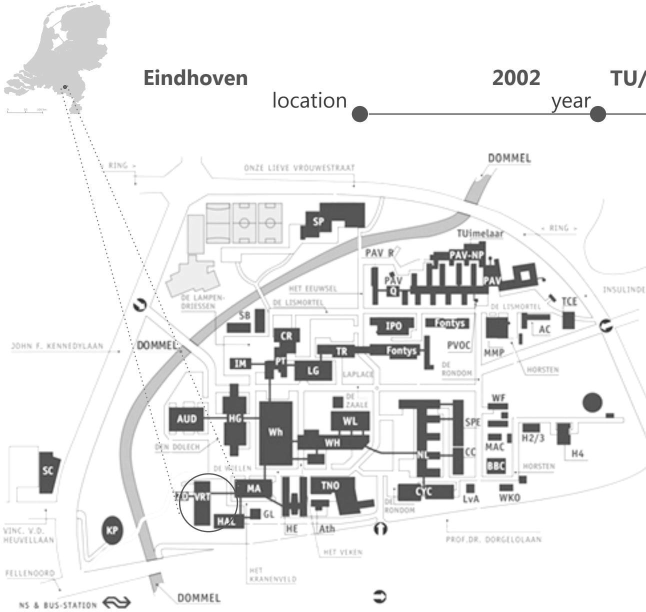
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://w3.tue.nl/nl/diensten/dh/gebouwinformatie_campus_tue/helix/

Vertigo, faculty BK

TUE-2

location	year	campus	project type
Eindhoven	**2002**	**TU/e science park**	**redevelopment**



Project profile

goals

representative meeting place

plain & efficient

"representative and image-building"

1. support identity user (faculty, department or institution that uses the building)
2. increase flexibility: adaptability / multifunctional use
3. more quality for user (match with changing demand)

€

	annually	*€ / m2 gfa*	*€ / m2 ufa*
maintenance	391.000	15,0	24,7
energy & water	308.000	11,8	19,4
cleaning	344.000	13,2	21,7
N.B. maintenance costs including user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	28,1	1.080	1.770
investment costs	38,0	1.460	2.400
all costs price level October 2009			

CREM

users

	number	
students	1.957	
staff (*head count*)	336	
staff (*fte*)	222	
educational space (m2 ufa) / student		2,2
office space (m2 ufa) / staff member		10,8
office space (m2 ufa) / fte		16,3
largest user		
Faculty of Architecture, Building and Planning		

m2

gross floor area	26.000	*m2 gfa*
useable floor area	15.800	*m2 ufa*
ufa / gfa	61%	
number of floors	11	
% office space	23%	(100 % = m2 ufa)
% educational space	27%	
% specific space	29%	(including laboratories)

In 2002 a former Chemistry building was transformed into a new building for the Faculty of Architecture, Building and Planning. Apart from adding to the faculty's image, the building was designed for flexible use: multifunctional and adaptable. Early evaluations in 2005 showed that this paid off: the building could easily be adjusted for other functions.

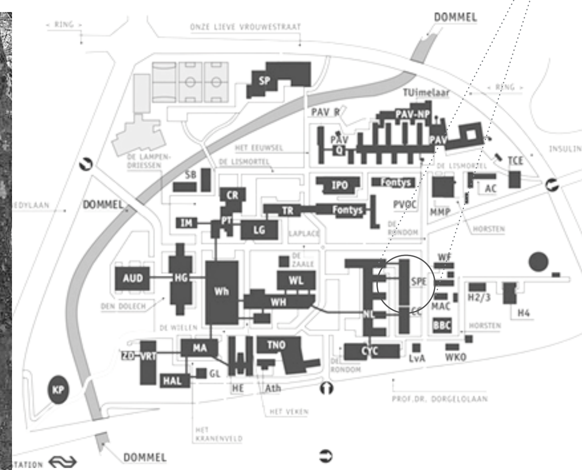
More quality for the user was much appreciated by the user. Less quantity was something to get used to, like the smaller workplaces. Non-territorial offices did only work for parttime employees. However, the first steps were taken to change the academic office. The project aimed at improving the indoor climate and saving energy costs at the same time. Post-occupancy evaluations – in the first years of use – indicated that both goals were achieved.

Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://w3.tue.nl/nl/diensten/dh/gebouwinformatie_campus_tue/vertigo/

TUE-3 Spectrum

project type	campus	year	location
new building	**TU/e science park**	**2002**	**Eindhoven**



Project profile

This 2002 project resulted in a state-of-the-art laboratory building with clean rooms for different types of research. With Spectrum TU/e added a high-tech and high quality laboratory to the campus, especially for the Physics and Electrical Engineering faculties. This four-storey building consists of 88% high-tech laboratory space to support research more effectively.

These factors explain the high investment level, which is quite common for laboratories and should be assessed in relation to the (extra) benefits. Apart from the laboratory space, the building also provides the research staff 30 workplaces of 9 m2 usable floor area.

goals

	representative / meeting place / plain & efficient	"representative and image-building"
1	state-of-the-art research facility	
2	more quality for user (match with changing demand)	
3	support user goals more effectively / improve customer satisfaction	

€

	annually	*€ / m2 gfa*	*€ / m2 ufa*
maintenance	165.000	21,2	37,1
energy & water	365.000	47,0	82,2
cleaning	45.000	5,9	10,3
N.B. maintenance costs excluding user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	22,2	2.860	5.020
investment costs	31,5	4.070	7.120
all costs price level October 2009			

CREM

users

	number	
students		
staff (*head count*)	25	
staff (*fte*)	24	
educational space (m2 ufa) / student		
office space (m2 ufa) / staff member		9,9
office space (m2 ufa) / fte		10,3
largest user		
Faculty of Applied Physics		

m2

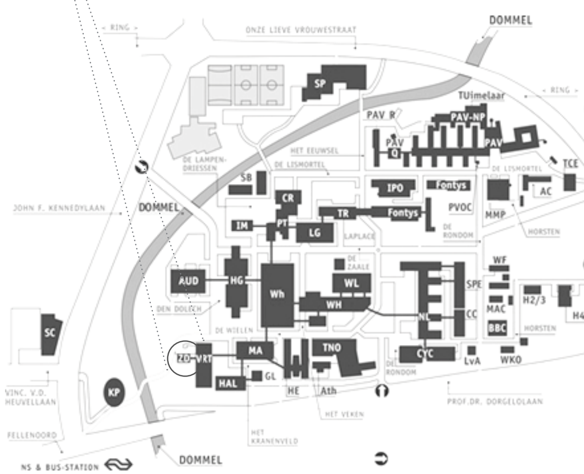
gross floor area	7.760	*m2 gfa*
useable floor area	4.430	*m2 ufa*
ufa / gfa	57%	
number of floors	4	
% office space	6%	(100 % = m2 ufa)
% educational space	0%	
% specific space	88%	(including laboratories)

Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://w3.tue.nl/nl/diensten/dh/gebouwinformatie_campus_tue/spectrum/

Black Box TUE-4

Eindhoven	2006	TU/e science park	redevelopment
location	year	campus	project type



Project profile

goals	
representative / meeting place / plain & efficient	"representative and image-building"
1	more quality for user (match with changing demand)
2	support identity university / attract (more) students & staff members
3	support user goals more effectively / improve customer satisfaction

€	annually	€ / m2 gfa	€ / m2 ufa
* maintenance	153.000	88,3	195,2
energy & water	339.000	195,6	432,6
cleaning	42.000	24,4	54,0
* is prognosis of maintenance costs excluding user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	2,3	1.350	2.980
investment costs	2,8	1.590	3.520
all costs price level October 2009			

CREM

users	number	
students		
staff (*head count*)	500	
staff (*fte*)		
educational space (m2 ufa) / student		-
office space (m2 ufa) / staff member		0,3
office space (m2 ufa) / fte		-
largest user		
employees TU/e		

m2		
gross floor area	1.730	*m2 gfa*
useable floor area	780	*m2 ufa*
ufa / gfa	45%	
number of floors	3	
% office space	21%	(100 % = m2 ufa)
% educational space	32%	
% specific space		

This is a redevelopment project, a transformation from (just) education into a multifunctional building – referred to as 'multicultural' for all TU/e users. In the past, this building was part of the chemistry faculty and it also temporarily served as a TNO building. Because of its architectural value and prominent position on the TU/e campus, the university chose for redevelopment.

The ground floor has a grand café with an outdoor terrace. On the two upper floors there are lecture rooms of different sizes. The large lecture hall has a capacity of 100 seats, suitable for teaching, presentations and movies. The three smaller rooms have a capacity of about 30 seats and are suitable for education, meetings and conferences. The building has a connecting bridge to the adjacent building (Vertigo, see TUE-2).

Notes:

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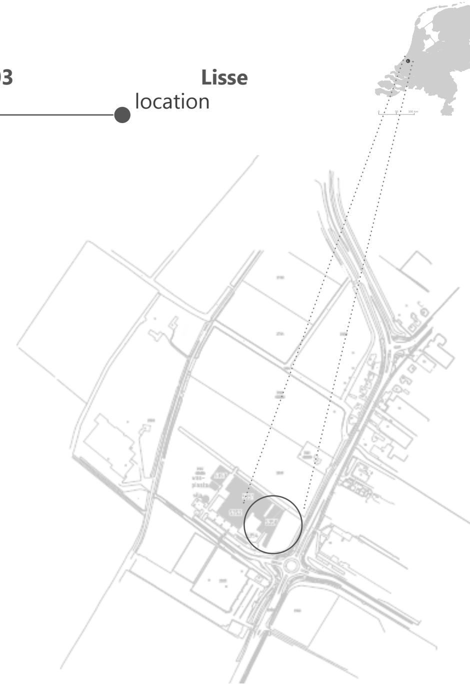
- photos and maps used with permission of university
- more information: http://w3.tue.nl/nl/diensten/dh/gebouwinformatie_campus_tue/de_zwarte_doos/

WU-1 Main building Lisse

project type	campus	year	location
new building	Lisse terrein	2003	Lisse



Apart from their main campus Wageningen University has buildings on many locations in the Netherlands, including Lisse. The new main building was finished in 2003, accommodating 65 fte of the Plant Sciences Group on 940 m2 usable office space – 14,5 m2 per fte. The building also contains high-tech and low-tech laboratory space.

Goals were to support the user activities more effectively, to save accommodation costs and to support the image of the users. Post-occupancy evaluations – comparing the new to the old building in 2005 – showed higher satisfaction rates among staff and much lower energy costs: just one third of the previous situation. The building is flexible for other types of use and users.

Project profile

goals

meeting place
plain & efficient
"effective meeting place"

1	support user goals more effectively / improve customer satisfaction
2	save accommodation costs
3	support identity user (faculty, department or institution that uses the building)

€

	annually	€ / m2 gfa	€ / m2 ufa
maintenance	59.000	21,8	30,5
energy & water	27.000	10,3	14,5
cleaning	24.000	8,9	12,5
N.B. maintenance costs excluding user costs			
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	4,1	1.540	2.160
investment costs	4,7	1.770	2.470
all costs price level October 2009			

CREM

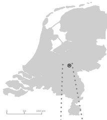
users

	number
students	
staff (*head count*)	
staff (*fte*)	65
educational space (m2 ufa) / student	
office space (m2 ufa) / staff member	
office space (m2 ufa) / fte	14,5
largest user	
Plant Sciences Group	

m2

gross floor area	2.680	*m2 gfa*
useable floor area	1.920	*m2 ufa*
ufa / gfa	71%	
number of floors	2	
% office space	49%	(100 % = m2 ufa)
% educational space		
% specific space	32%	(including laboratories)

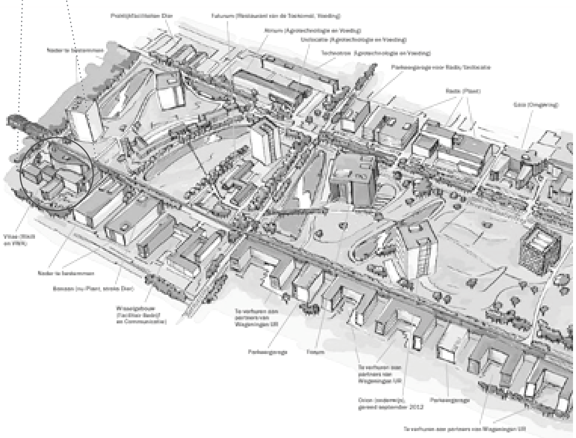
Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.wageningencampus.wur.nl/NL/campus_in_vogelvlucht/



Rikilt building

WU-2

location	year	campus	project type
Wageningen	**2009**	**Wageningen campus**	**new building**



Project profile

goals

	meeting place plain & efficient	"effective meeting place"
1	support user goals more effectively / improve customer satisfaction	
2	more quality for user (match with changing demand)	
3	support identity user (faculty, department or institution that uses the building)	

€

	annually	€ / m2 gfa	€ / m2 ufa
maintenance	-	-	-
energy & water	-	-	-
cleaning	-	-	-
	total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
construction costs	6,3	1.120	1.800
investment costs	8,8	1.560	2.520
all costs price level October 2009			

CREM

users

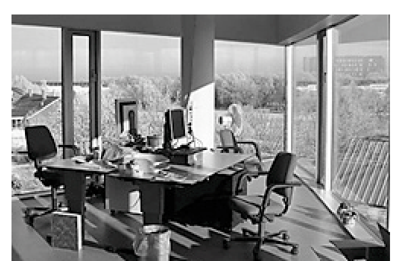
	number	
students		
staff (*head count*)	154	
staff (*fte*)	154	
educational space (m2 ufa) / student		
office space (m2 ufa) / staff member		8,8
office space (m2 ufa) / fte		8,8
largest user		
DLO - research institute		

m2

gross floor area	5.650	*m2 gfa*
useable floor area	3.520	*m2 ufa*
ufa / gfa	62%	
number of floors	4	
% office space	38%	(100 % = m2 ufa)
% educational space		
% specific space	45%	(including laboratories)

This 2009 project adds an office and laboratory building of approximately 5700 m2 to the Wageningen University campus. The building accommodates the Food and Consumer Product Safety Authority (abbreviated as VWA in Dutch), which needed extra space next to their existing building.

Apart from the goals to better support the users and add to user satisfaction, the extra space was also created to save costs, to reduce m2 and to stimulate collaboration and innovation. This project has a substantial amount of high-tech laboratory space for a relatively low investment per m2. The new building has connecting bridges to the existing building.

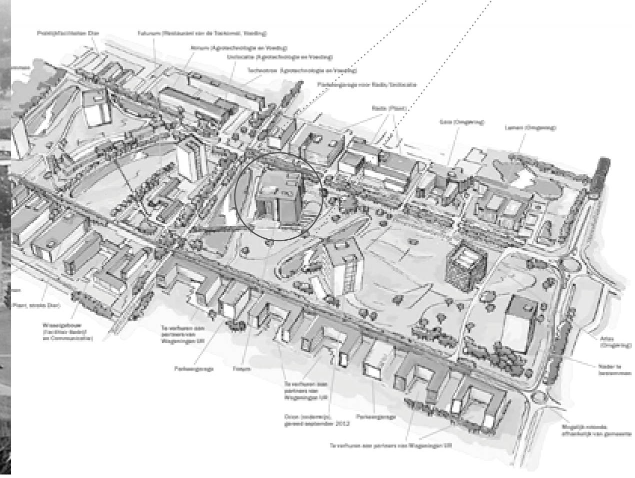


Notes:

- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.wageningencampus.wur.nl/NL/Gebouwen/vitae/

WU-3 Forum building

new building	Wageningen campus	2007	Wageningen
project type	campus	year	location



The main goal of this project was to create a new building to accommodate most of the Bachelor students, supporting the educational activities effectively with state-of-the art facilities and efficiently by encouraging shared use. The eight-storey building includes the central library and a large restaurant for the university. It also serves as accommodation for Van Hall Larenstein, a related university of applied sciences.

Early evaluations showed that students and staff members were satisfied about the building. Yet, shortly after the project was finished the university was confronted with rapidly increasing student numbers, requiring extra capacity and putting pressure on the existing facilities.

Project profile

goals

representative
meeting place
plain & efficient

"representative and image-building"

1	support identity university / attract (more) students & staff members
2	more quality for user (match with changing demand)
3	encourage shared use of educational facilities, restaurant and library

€

		annually	€ / m2 gfa	€ / m2 ufa
*	maintenance	600.000	17,0	28,6
	energy & water	521.000	14,8	24,9
*	cleaning	230.000	6,5	11,0

* are prognoses, maintenance costs excluding user costs

	total in mln €	€ / m2 gfa	€ / m2 ufa
construction costs	54,0	1.530	2.580
investment costs	75,9	2.150	3.630

all costs price level October 2009

CREM

users

	number
students	3.000
staff (*head count*)	130
staff (*fte*)	130
educational space (m2 ufa) / student	2,7
office space (m2 ufa) / staff member	28,7
office space (m2 ufa) / fte	28,7

largest user
Wageningen University - Bachelor education

m2

gross floor area	35.300	*m2 gfa*
useable floor area	20.900	*m2 ufa*
ufa / gfa	59%	
number of floors	8	
% office space	18%	(100 % = m2 ufa)
% educational space	39%	
% specific space	4%	(including laboratories)

Notes:
- text by author based on data provided by university for benchmark studies 2005-2010
- costs converted to price level October 2009 for comparison of projects
- photos and maps used with permission of university
- more information: http://www.wageningencampus.wur.nl/NL/Gebouwen/Forumgebouw/

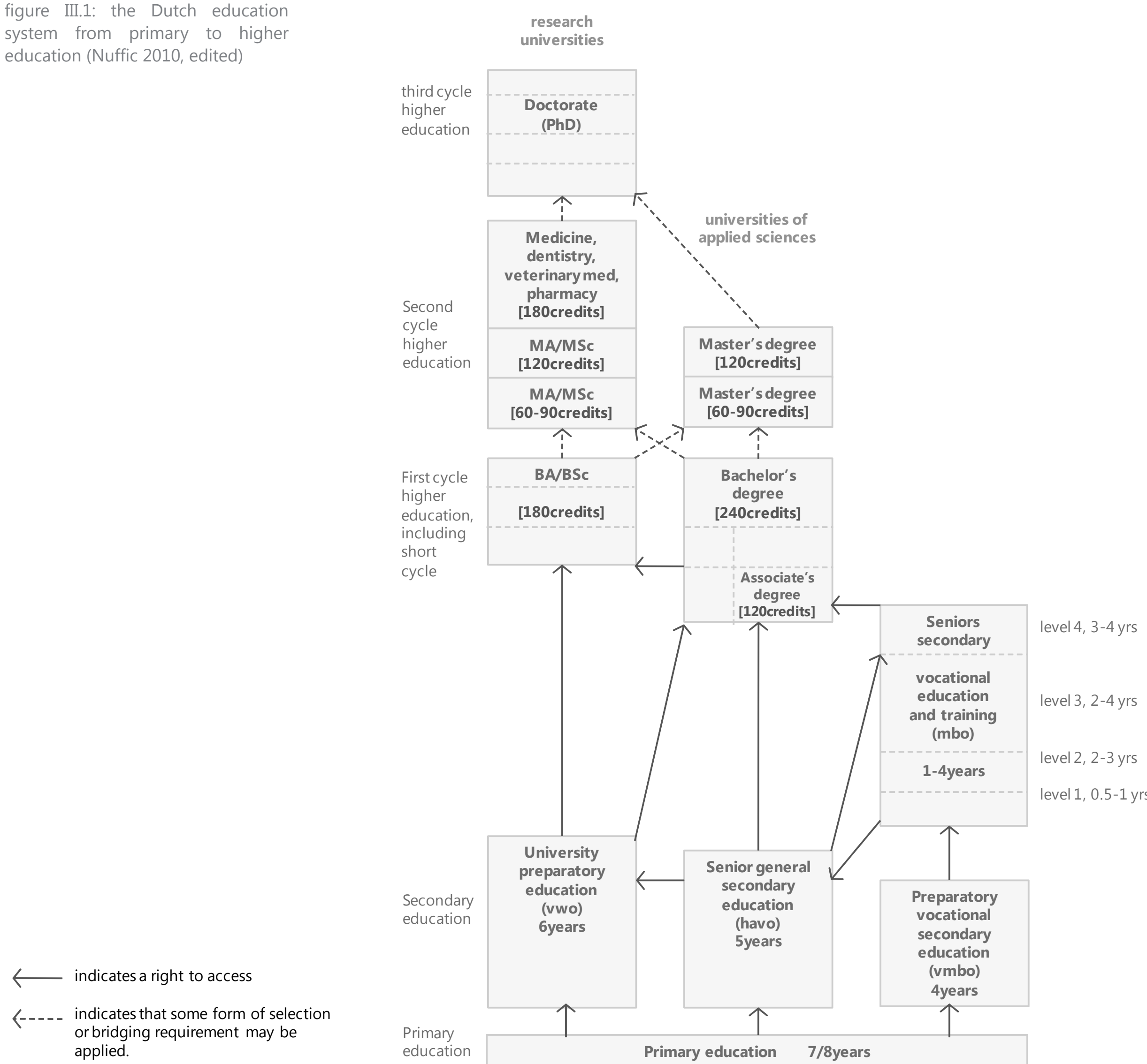
Photo: DUWO

APPENDIX III
Dutch higher education system, funding and student enrolment

The Dutch education system: from primary education to higher education

The Netherlands has a binary system of higher education, consisting of higher professional education and university education. Higher professional education (in Dutch hoger beroepsonderwijs or HBO) is provided by universities of applied sciences and is geared towards the acquisition of vocational qualifications and training. University education (in Dutch wetenschappelijk onderwijs or WO) is provided by the 14 research universities. These combine teaching with academic research, attaching great importance to linking them. Teaching at a research university provides training in academic disciplines and prepares students for the pursuit of an academic or professional career (www.vsnu.nl, October, 2010).

figure III.1: the Dutch education system from primary to higher education (Nuffic 2010, edited)



The higher education system in the Netherlands is based on a three-cycle degree system, consisting of a bachelor, master and PhD. Two types of programmes are offered: research-oriented degree programmes offered by research universities, and professional higher education programmes offered by universities of applied sciences.

the three-cycle structure at the Dutch research universities

The Dutch research universities began introducing the three-cycle structure (Bachelor, Master and doctorate) already in 2002, and all study programmes have by now been organised accordingly. The first cycle, Bachelor's degree programmes leading to a Bachelor of Arts (BA) or a Bachelor of Science (BSc), takes three years and 180 ECTS credits. The second cycle, Master's degree programmes leading to a Master of Arts (MA) or a Master of Science (MSc), takes one to two years and accordingly between 60 and 120 ECTS credits. The third cycle, the doctorate, in the Netherlands usually takes four years. No ECTS credits are given during the third cycle. Although attending courses may be part of a doctorate, a PhD in the Netherlands mainly involves carrying out research. (www.vsnu.nl, October, 2010).

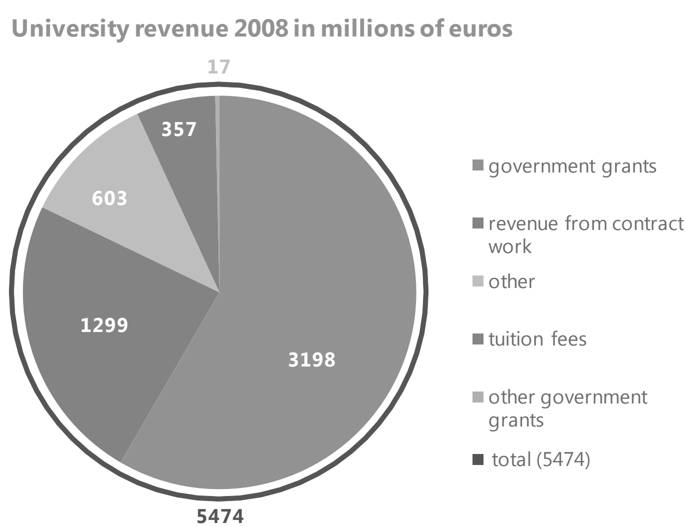
funding of research universities

The formula used for allocating the central government grant among the universities (the 'first flow of funds') was adjusted in 2000 to place more emphasis on performance-based criteria. Under the Performance-based Funding System (PBM), 50% of the teaching component of the central government grant is now allocated on the basis of the number of degree certificates awarded. There is also a basic provision for teaching, and part is allocated according to the number of first-year students. As in higher professional education, the central government grant also covers expenditure on accommodation and benefit payments for staff.

Important for campus management: the universities are free to spend these funds as they wish, in keeping with their statutory tasks. Negotiations on the pay and conditions of university personnel were decentralised in 1999. Payments are also made from the central government grant for the universities to the academic hospitals in connection with the work performed there by medical faculty staff. Tuition fees form an additional source of income for the universities (see figure III.2). University funding makes a distinction between funds for teaching, and funds for research.

University research is funded from three different sources: the central government grant, which includes an amount for research (the first flow of funds); funding for specific projects from the Netherlands Organisation for Scientific Research (NWO) (the second flow of funds); and finally, grants and research contracts from other sources (the third flow of funds).

figure III.2: revenue in millions of euros of all Dutch research universities in 2008, based on figures CFI (VSNU 2010b)



The latter consists mainly of funding from national and international government agencies and organisations, and research funded by non-profit institutions. The business community accounts for around 15% of this category of funding (Eurydice 2010).

enrolment figures in Dutch higher education – from past to future

The two figures below show that in 2008 total enrolment in higher education is more than six times higher than in 1950 and that enrolment is still increasing towards more than 800.000 students in 2030. The research universities are indicated as 'academic (WO)' and the universities of applied sciences as 'professional (HBO)' in figure III.3 and figure III.4.

figure III.3: past enrolment numbers at Dutch higher education institutions - academic (WO) and professional (HBO) from 1950 to 2008 – retrieved from www.cbs.nl in July 2010

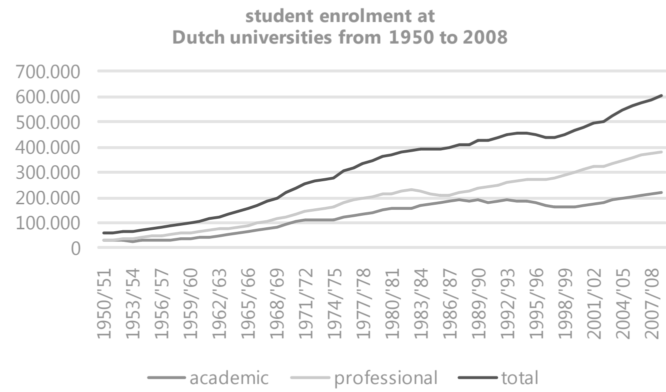
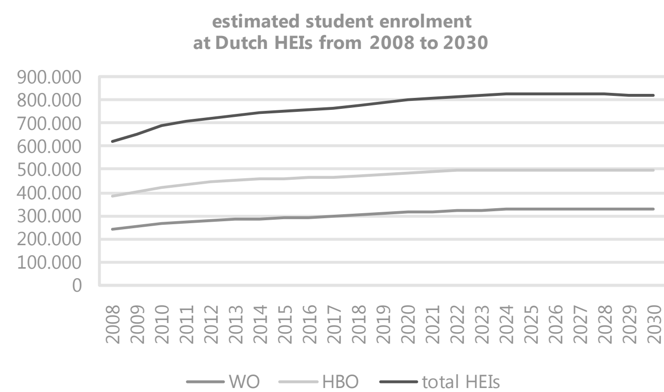


figure III.4: estimated future enrolment numbers at Dutch higher education institutions - academic (WO) and professional (HBO) from 2008 to 2030 – retrieved from www.trendsinbeeld.monocw.nl (OCW 2010b)



Delft University of Technology
Photo: TU Delft

APPENDIX IV
International associations and networks

There are many international networks of campus managers or associations that provide information to policy makers and campus managers about trends and references. In this appendix the international networks are introduced with background information, some data and links to their websites. As an introduction table IV.1 shows the international tertiary education enrolment figures the growth percentage between 1999 and 2006.

Students enrolled in higher education all over the world

table IV.1: student numbers in tertiary education (OECD 2009, data 2006) indicate an ever-increasing population to accommodate on campuses of higher education institutions (HEIs) rounded to .000, - full-time and part-time students

Country	Enrolment in 2006	growth 2006 versus 1999
Australia	1,040,000	23%
Austria	253,000	0%
Belgium	394,000	12%
Canada	1,015,000	-15%
Czech Republic	337,000	46%
Denmark	229,000	20%
Finland	309,000	18%
France	2,201,000	9%
Germany	2,289,000	10%
Greece	653,000	68%
Hungary	439,000	57%
Iceland	16,000	86%
Ireland	186,000	23%
Italy	2,029,000	13%
Japan	4,085,000	4%
Korea	3,204,000	13%
Luxembourg	2,700	-1%
Mexico	2,447,000	33%
Netherlands	580,000	23%
New Zealand	238,000	42%
Norway	215,000	15%
Poland	2,146,000	53%
Portugal	367,000	3%
Slovak Republic	198,000	61%
Spain	1,789,000	0%
Sweden	423,000	26%
Switzerland	205,000	31%
Turkey	2,343,000	146%
United Kingdom	2,336,000	12%
United States	17,487,000	27%
data extracted on 25 Jun 2009 12:51 UTC (GMT) from OECD.Stat		
TOTAL in OECD countries	49,457,000	22%

Apart from the approximately 50 million students in higher education institutions in OECD countries, there are an additional 16 milion students in Southeast Asian countries, like Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Socialist Republic of Vietnam (SEAMEO, 2009). Student numbers at Chinese universities reach over six million (source: wikipedia).

Overview of networks and links to their websites

country	*relevant links and websites*	
Netherlands	HOI - association of campus managers VSNU - association of universities	 www.vsnu.nl
United States	SCUP – society for college & university planning, APPA – facilities managers for educational facilities, NACUBO – business officers	www.scup.org www.appa.org www.nacubo.org
United Kingdom	AUDE – Association of University Directors of Estate, SAUDE (Scottish), HEFCE – Higher Education Funding Council England	www.aude.ac.uk www.hefce.ac.uk
OECD countries	OECD - Organization for Economic Development CELE - Centre for Effective Learning Environments IMHE Institutional Management Higher Education	www.oecd.org www.oecd.org/edu/facilities
Nordic countries	NUAS - Nordic Association of University Administrators (Nordic countries are Norway, Sweden, Denmark, Finland, Iceland and their associated territories)	www.nuas.org
Sweden	Akademiska Hus	www.akademiskahus.se
FInland	real estate companies for (1) Helsinki, (2) Espoo (Aalto – University Properties) and (3) the rest of the Finnish universities NUAS - Nordic Association of University Administrators	www.hykoy.fi www.aaltonet.fi www.sykoy.fi
Germany	HIS – Hochschul-Informations-System GmbH Länder is German for state or federal state	www.his.de
Austria	BIG stands for Bundesimmobiliengesellschaft, that manages and owns a portfolio of 21 Austrian universities	www.big.at
Belgium	VLIR - association of Belgian universities	www.vlir.be
Australia, New Zealand, Hong Kong, Singapore	TEFMA - Australasian Tertiary Education Facilities Management Association for Australia, New Zealand, Hong Kong, Singapore	www.tefma.com
South-Africa	HEFMA - the South-Africa Higher Education Facilities Management Association	www.hefma.com

Some of these networks are introduced below. This selection was also determined by the available information in English online.

United States – SCUP and APPA

In the US almost 4400 higher education institutions – universities and colleges – accommodate more than 17 million students on an estimated 6,0 billion m2 net assignable floor area (equals about 7 billion m2 gfa). Since 1974 this is a nearly five-fold increase from the 1,3 billion reported at that time. During the same period student enrolment increased from 11,5 to 17,3 million students (www.scup.org, June 2009). These numbers show that the footprint of these universities increased, probably also because of the growth of the research function and number of staff members to accommodate.

The existence of two very large professional associations – SCUP for campus planners and APPA for facility management, both with thousands of active members – shows that they ground their policies on many evidence-based research projects, annual benchmarks on key (facilities) performance indicators and other comparative studies on many common issues. Many APPA and SCUP publications indicate that American universities are convinced that their attractiveness for excellent knowledge workers and talented students is linked to state-of-the-art facilities, inspiring places to work and vibrant campus and city life.

APPA was founded in 1914 as a learning forum for those engaged in the improvement and maintenance of educational buildings and grounds, APPA has a long history of effectively meeting the needs of its members and acting as a catalyst to their growth and advancement. APPA promotes excellence in the administration, planning, design, construction, maintenance, and operations of educational facilities. APPA helps educational facilities professionals transform their institutions into more inviting and supportive learning environments. This furthers the recognition and value of the field, highlighting the direct impact facilities have on the recruitment and retention of students, faculty, and staff (www.appa.org, June 2009).

As an information source for campus and facilities managers, APPA supplies many evidence-based publications and tools to ground the strategic value of educational facilities. Impressive numbers of respondents in annual benchmark studies (Facilities Performance Indicators, FPI) and well-defined frameworks for data collection make their conclusions valuable to international universities. In the United States, APPA is related to NACUBO and SCUP. The National Association of College and University Business Officers (NACUBO) specifically represents chief business and financial officers through advocacy efforts, community service, and professional development activities. The association's mission is to advance the economic viability and business practices of higher education institutions in fulfillment of their academic missions (www.nacubo.org). With NACUBO focusing on the business officer – from the organisational perspective – and APPA focusing on the facilities managers – choosing a physical perspective – SCUP functions as a bridge between both.

This Society for College and University Planning (SCUP) acknowledges the mix of resources that universities decide on to achieve their goals and generates tools for an integrated approach. APPA and SCUP share some of their annual benchmarks. In 2006 NACUBO, SCUP and APPA organised a collective conference Campus of the Future in Hawaii, which was successful with more than 4000 participants from more than 40 countries.

The Society for College and University Planning (SCUP) is a community that provides its members with the knowledge and resources to establish and achieve institutional planning goals within the context of best practices and emerging trends. SCUP was established in 1965. It is a community of planners who serve higher education. The society supports all functional areas involved in planning - from academics to facilities, from administrative and financial operations to student life, and from the campus architects to those hired to support the institution's many planning projects (www.scup.org, June 2009).

SCUP's facilitates opportunities for its members to share best practices in integrated planning on campuses. SCUP also conducts many benchmark studies, including the Campus Facilities Inventory (CFI), which generated management information for all higher education institutions involved. There are many links from APPA and SCUP to associations of campus managers in other countries, like TEFMA (Australasia) and

HEFMA (South Africa). For comparing data it is important to emphasize that there are huge differences in types of higher education institutions in the USA, both in quality as in size. The same goes for their campuses. The group of fourteen Dutch research universities is a more homogeneous group.

United Kingdom – HEFCE and AUDE

In the UK around 160 higher education institutions accommodate 1,5 million students (in fte) and numerous staff members on 25 million m2 gross space (gfa) and significant site and land resources. The numbers emphasize the huge size of the sector, equivalent to some 20 per cent of the whole UK office market. The annual revenue costs are £1.67 billion, a third of which goes on repair and maintenance. A further £1.9 billion is spent on capital improvements of buildings. The backlog maintenance liability is about £4.3 billion and the annual CO2 emissions weigh an estimated 2.0 million tonnes (EMS 2008).

These data are some of the results from the EMS database – Estate Management Statistics – that HEIs in the UK annually update with new values of a range of performance indicators. The latest EMS report states that all of these values have moved up progressively over this period. Figures of the last five years show a sector in growth, with the biggest change in the 90 per cent increase in capital expenditure, against a backdrop of income and full-time equivalent (FTE) student numbers increasing by about 30 per cent and 10 per cent respectively (EMS 2009). This illustrates a context that can be recognized in the Netherlands and many other countries. For many campus managers this is all the more reason to internationally join forces to get attention for – collectively acknowledged – "potential threat to the local, regional and national knowledge economy".

In addition, it is interesting and in accordance with all the current trends on the "green campus" that CO2 emissions are mentioned in the summarized core data. The fact that UK institutions annually record many energy and environmental performance indicators, makes it easier for institutions of other countries to benchmark their data. More specifics of EMS can be found in the next sections.

HEIs in the UK are very varied, from those competing at world class level, to those whose primary focus is on regional development and supporting their local community. In property terms, university estates are similarly varied; ancient universities like Oxford and Cambridge have internationally important heritage buildings and very different property portfolios to universities in major urban conurbations, those in the green belt and universities in redevelopment areas. Many higher education institutions have a mixture of property in terms of age and type, from historic through to very modern. It is true to say that across the country, the majority of HEIs have a large number of buildings dating from the 1960's and 70's, which are now in need of major refurbishment or replacement. The Dutch situation is similar, which is shown in the figures in previous chapters.

Driving forces behind all the management information that British universities collectively generate, are HEFCE, HEFCW, SFC and AUDE. The Higher Education Funding Council for England (HEFCE) distributes public money for teaching and research to universities and colleges. In doing so, it aims to promote high quality education and research, within a financially healthy sector. The Council also plays a key role in ensuring accountability and promoting good practice (www.hefce.ac.uk). HEFCW is the Welsh equivalent, SFC the Scottish Funding Council.

AUDE is the Association of University Directors of Estates. AUDE promotes excellence in the strategic planning, management, operation and development of Higher Education estates and facilities. AUDE's members are the Universities and Higher Education Institutions of the United Kingdom, represented by the Director of Estates, or equivalent (www.aude.ac.uk). Similar to the associations APPA and SCUP in the USA, AUDE has built a tradition in collecting campus data for the benefits of both individual institutions and the higher education sector as a whole. The increased pressure on transparency of decision-making – in primary and secondary processes – and accountability for the expenditure of public resources, encourages institutions to participate. In the UK nearly all HEIs participate, which is an astonishing achievement that adds to the value of the results. AUDE has international links, in particular with its equivalent organisation APPA in the USA, the Australasian Association TEFMA, The Southern African Association HEFMA and with colleagues in European universities.

OECD Countries

For OECD countries the Centre for Effective Learning Environments (CELE) gathers knowledge and cases. CELE, formerly OECD Programme on Educational Building, promotes the exchange and analysis of policy, research and experience in all matters related to educational building. The planning and design of educational facilities – schools, colleges and universities – has an impact on educational outcomes, which is significant but hard to quantify. Building and running those facilities accounts for a substantial part of public educational expenditure in OECD countries. Information and communication technologies have the potential to transform the way in which they are used.

CELE has three objectives: (1) improve the quality and suitability of educational buildings, (2) ensure that the best use is made of the resources devoted to planning, building, running and maintaining educational buildings and (3) give early warning of the impact on educational building of trends in education and in society as a whole. CELE's work is conducted through a set of activities determined by the Centre's Board of Participants. Its mission is to ensure that the maximum educational benefit is obtained from past and future investment in educational buildings and equipment, and that building stock is planned and managed in the most efficient way (www.oecd.org/edu/facilities, June 2009).

Nordic countries (Denmark, Sweden, Norway, Finland, Iceland) - NUAS

NUAS is the Nordic Association of University Administrators, an active network for professional cooperation. The aim of NUAS is to enhance contacts and to establish networks between the Nordic universities at all administrative levels. NUAS cooperates with the Nordic Council of Ministers, other organizations and authorities in order to promote the Nordic educational community. Specialist seminars in different adminstrative sectors are regularly arranged by twelve planning groups within the association. Annual seminars for university directors are arranged on topical issues within the field of higher education. Some of the seminars are held in English. NUAS annually publishes the directory "Institutions of Higher Education in the Nordic Countries. International Educational Coordinators". At the request of the Nordic Council of Ministers, NUAS has conducted a number of surveys on issues related to the Nordic educational community (www.nuas.org, October 2010).

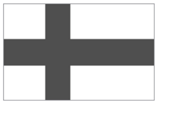
Sweden – Akademiska Hus

Together higher education institutions in Sweden enroll more than 420.000 students. Swedish universities do not own but rent their university buildings. Akademiska Hus is the leader in the provision of premises for higher education and research and has properties at 32 locations throughout the country, divided among six regional companies. The Group Head Office is in Gothenburg. The Company was founded in 1993 when the market for government properties was deregulated. It is a private company, but the state is 100% shareholder.

Up until 1993 Akademiska Hus belonged to the National Board of Public Building. In conjunction with Akademiska Hus becoming an independent company the law stipulating that universities and colleges were required to lease their properties from a state-owned company was repealed. The first ten years of Akademiska Hus's history were devoted to the build-up and powerful expansion of its properties, above all to meet the increase in the number of students. It succeeded in implementing this cost effectively and without any capital contribution from the state. Next to an annual report Akademiska Hus also published a sustainability report 2009.

Akademiska Hus is the largest property company in Sweden. The company carries on its operations - planning, construction, ownership and management - in six regions, from Kiruna in north to Malmö in the south. The rentable floor space is 3.2 million m2 and the estimated market value of the properties is SEK 46,351 million in 2008 (about 5 billion euro). The Akademiska Hus business concept is to be the leader in creative environments for higher education and research. Akademiska Hus is specialised in creative environments. The term 'creative environment' refers to a setting that offers inspiration and conditions for growth where both the physical and mental surroundings are a source of stimulation. Akademiska Hus's most important tenant category is universities and colleges. Other tenants include research institutes and research-intensive companies as well as companies, public authorities and other organisations that have a strategic link to our campuses and which contribute to creating an attractive totality (www.akademiskahus.se, June 2009 and October 2010).

FInland – three real estate companies



In conjunction with the reform of Finnish universities in 2009, the Finnish Government decided to capitalise the new, independent universities by transferring to them the ownership of their current premises, which were previously state-owned. For this purpose, the Government established three property investment companies and assigned two-thirds of their ownership to the universities, with the remaining one-third being retained by the Government (Senate Properties). One of the three property investment companies, Helsingin Yliopistokiinteistöt Oy, is part of the University of Helsinki Group (www.hykoy.fi, October 2010).

The three Government established property investment companies manage the campuses for universities in three different areas: (1) Helsingin Yliopistokiinteistöt Oy (Hykoy) for the universities in Helsinki, (2) Aalto – University Properties for the universities in Espoo, with campuses west of Helsinki and (3) Suomen Yliopistokiinteistot (Sykoy) for the rest of the Finnish universities. In English these companies are also referred to as University Properties of Helsinki Oy, University Properties of Aalto Oy and University Properties of Finland Oy. Their collective property comprises 1,8 million m2 university buildings (Niemi 2010).

As an example of campus management goals the objectives of Helsingin Yliopistokiinteistöt Oy are summarized below, as principles for the company's operations: the university must have access to reasonably priced premises appropriate for its operations; the value of the properties must be preserved in the long term, and their management and control must be cost-effective; the equitable treatment of the universities must be ensured an the arrangement must support the objectives of the university reform (www.hykoy.fi, October 2010).

Germany - HIS

The Higher Education Information System (HIS) supports German institutions of higher education (universities and universities of applied sciences) and their administrations as well as higher education policy-makers in their efforts to fulfil their tasks effectively (www.his.de). The focus of HIS is on activities as a software house for higher education administration, within the area of higher education research through empirical studies and other forms of expertise and in the area of higher education development with the central topics of higher education organisation, construction and building.

HIS was founded in 1969 by the Volkswagen Foundation as a non-profit organisation and was taken over in 1975 with the Federal and state governments as shareholders. The owners and funders of HIS have remained the Federal State and the Länder, the former holding one third and the latter two thirds of the organisation’s capital stock. HIS is conceived of as an element of the German higher education system. This concept secures a long-term not-for-profit performance profile, which takes its lead from the needs of the higher education sector.

HIS has been offering IT support to higher education administrations for over thirty years. Over 220 higher education institutions in Germany use HIS software, which HIS offers with support and consultancy concerning the optimisation of administration processes and organisational structures. As higher education research institute with a large volume of relevant data - e.g. on the educational behaviour of potential students, students and graduates - HIS can provide planning agencies at both state-level and the level of individual higher education institutions with sound and flexible planning and steering information. In 1986, HIS took over the tasks of the disbanded central archive for higher education construction. Since then, works on construction and resource planning for higher education have become part of HIS’ core performance profile (www.his.de, October 2010).

Austria - BIG

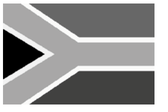
With property assets of around nine billion euros is the BIG one of the major real estate owners in Austria. Core business is the management, including management of real estate from new construction to demolition. The BIG is a priority service for the Republic of Austria, their subordinate departments and outsourced companies. Main customers or tenants are the Federal Ministry of Education, Arts and Culture (BMUKK), the Austrian Universities, the Federal Ministries of Justice (BMJ), finance and home affairs. The portfolio consists of 300 school locations, 21 universities and official buildings, such as tax offices, courts and prisons or police stations. The task of BIG is to act in a market economy, to optimize costs and operations and to arouse awareness among users that space costs money (www.big.at, October 2010).

“Australasia” - Australia, New Zealand, Hong Kong, Singapore - TEFMA

The Australasian Tertiary Education Facilities Management Association (TEFMA) was established in October 2003 as an independent association of facilities managers operating in the tertiary education sector of Australia, New Zealand, Hong Kong and Singapore. TEFMA was formed from AAPPA which was the Australasian chapter of the US parent APPA, which is The Association of Higher Education Facilities Officers. APPA is an international association dedicated to maintaining, preserving, and promoting the quality of educational facilities. TEFMA has a similar raison d'etre to APPA and has a strategic partnership with them. TEFMA also has a strategic partnership with AUDE, the United Kingdom association of University Directors of Estates in and HEFMA, the Southern Africa Higher Education Facilities Management Association.

TEFMA assists facilities managers in universities, colleges and other educational institutions in the Asia-Pacific region by promoting excellence in the planning, construction, maintenance, operations and administration of educational facilities. TEFMA serves the education community by conducting research, developing educational programs, holding conferences and workshops, producing publications, developing guidelines, and serving as a central information source for its members. TEFMA promotes engagement with industry through its Business Partner membership category. TEFMA has some 550 members representing 65 tertiary education institutions in Australasia (www.tefma.com, October 2010).

South-Africa - HEFMA



The Higher Education Facility Management Association of Southern Africa has developed from TIMCON: The Tertiary Institutes Maintenance Conference, which was established to serve as an annual forum for the mutual discussion and education of Maintenance and Facility Managers at the higher education institutions in South Africa. The need to develop this institution to a more permanent association for the benefit of the Facility Managers of the higher education institutions of the Southern African countries lead to the establishment of HEFMA in 2000. The year 2005 saw the inaugural HEFMA 2004 Benchmarking Report. This report is the culmination of a significant team effort between HEFMA and TEFMA (the Tertiary Education Facilities Management Association from Australasia). These reports concentrated on the total operational costs of buildings by benchmarking five operational areas, namely building maintenance, grounds maintenance, cleaning and waste management, energy and security (www.hefma.org, October 2010).

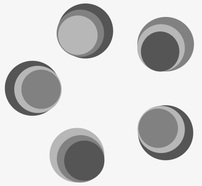
Student housing, Amsterdam
Photo: DUWO

APPENDIX V
Future models for campus and city

In chapter 5 and 6 many scenarios and models were introduced and described. This appendix contains more specific information about these scenarios and future models for the university and campus. In table V.1 the four scenarios of the Netherlands in 2040 are specified. On the next pages the future models for the university campus are specified, introduced by table V.2.

Four scenarios for people and cities

table V.1: four scenarios for the Netherlands in 2040 - main scenario characteristics (CPB 2010) – used by permission – for more information www.nl2040.nl

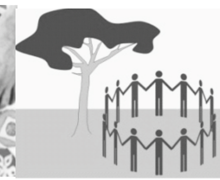
Main scenario characteristics				
	Talent Towns	Cosmopolitan Centres	Egalitarian Ecologies	Metropolitan Markets
				
City size, in population	100k – 200k	2 – 8 m	100k – 500k	> 10 m
Technology, knowledge				
Direction ICT	Communication	Communication	Information	Information
New GPT	None	Research-oriented	None	Application-oriented
Innovation	Direct applications, strong competition	Radical, firm – university links	Applied and incremental	Fundamental and applied, within firms
World economy				
BRICs	Manufacturing	Manufacturing hubs	Inward orientation	Some metropolises
United States	Top-end innovation and design	GPT, services	IT products and local varieties	Many metropolises
EU (including the Netherlands)	Business services	High-end services	Local varieties	Few, autonomous metropolises
Place of business				
Agglomeration	Scattered	Concentrated	Medium city size, local varieties	Highly concentrated
Infrastructure	Virtual + air connections	Between and within cities, high quality	Regional	Locally, high quality
People				
High-skilled workers	Talent is rewarded	Talent is highly rewarded and benefits from interactions	Moderate wages	High wages due to benefits from interactions
Income inequality	High due to specialisation	Very high due to size and specialisation	Low due to absence size of specialisation	High due to size
Vulnerability to shocks	High – specific human capital and city output	High – specific human capital and large city output	Limited	Low

Four scenarios for higher education combined with three campus strategies

As part of the sustainable campus research (Den Heijer et al. 2010; TU_Delft 2010) twelve future models for the university and campus were described. A future model is a combination of a strategy (A-B-C) and a supposed scenario for higher education (1-2-3-4) as introduced in chapter 6 and summarized in table V.2.

This appendix contains brief descriptions – by the author – of the resulting twelve future university campus models, characterized in bullets and with narrative text. More features can be derived from the characteristics of the chosen strategy (in m2, use, and goals of euro) as described in chapter 6 or from the supposed scenario as described in chapter 5.

table V.2: linking the campus strategies A-B-C to four scenarios 1-2-3-4: twelve university-campus models



	1. global market global competition	**2. global solidarity global collaboration**	**3. transatlantic region regional competition**	**4. regional community regional collaboration**
	knowledge for sale	**knowledge to share**	**knowledge for yourself**	**knowledge applied locally**
A - back to the future	A1 university college closed campus, 'members only'	A2 traditional university open campus, but university use only	A3 national university gated, safe campus for group of individuals	A4 community college our campus village
B - intellectual agora	B1 closed network university, campus to share with invited guests	B2 open network university, campus to share with many partners	B3 university as local market place, campus as 'shopping centre for individual growth'	B4 university as local place for knowledge exchange, campus as town centre with social function
C - clicks & mortar	C1 virtual university, pay to study online	C2 open source virtual network	C3 gaming setting, play with peers to win	C4 our virtual community (in low density areas)

Note: All future models in next pages were composed using the results of the research project "Towards a sustainable campus", financed by Agentschap NL (Den Heijer et al. 2010; TU Delft 2010)

A. Back to the future

A1 - Members only campus

Features:

- (1) knowledge for sale, (A) exclusive campus
- 'closed network version' of university college
- 'members only or by invitation only': closed campus
- campus used exclusively by the university
- high tuition / high prices for knowledge exchange
- knowledge development is an investment
- status setting is important for branding
- the core business - education and research - is exclusively a task of the university

Exclusiveness is the key word for both knowledge and the use of the campus: students pay high tuition fees to get access to knowledge and university buildings. Status and branding of the university name are important, also for alumni. Knowledge is developed in close collaboration with businesses and industry – also privately funded – and research results are shared only within these partners, including patents and exclusive rights to use knowledge. Sustainability goals are threatened by a strong demand for individual territory, the relatively low occupancy rates of buildings and a large footprint per user. What is exclusiveness worth to the university? An example of the 'members only campus' is a business school with high tuition fees, a strict selection procedure and a curriculum that focuses on individual growth of students and a competitive advantage for alumni in the labour market.

photo: faculty club Ghent University

global competition

A2 - New network university

Features:

- (2) knowledge to share, (A) exclusive campus
- Transition model from traditional university to network university
- University allows more users on campus, but still owns and manages university buildings
- More society-oriented education and research
- Student housing is university task
- Patents stay within university
- University is 'still relatively autonomous node in network

Faculties, schools and departments are increasingly sharing space: classrooms, lecture halls, conference rooms, libraries and restaurants. The campus is a city with the Chairman of the Executive Board as mayor and the deans and heads of departments as aldermen. Sustainability issues are mainly a university responsibility and managed top-down. With more users and more shared facilities the campus will be used more intensively. However, shared use also requires better space management systems to schedule the activities of more user groups. This affects the freedom of use ('whenever') for individual users or user groups, but at the same time it saves resources – which contributes to the profitability and the sustainable development of the university. Sharing more facilities can also contribute to productivity, because it will stimulate interaction between different users – students and staff.

global collaboration

photo: Industrial Design, campus TU Delft photo: Université Paris Sorbonne - Paris

regional competition

regional collaboration

photo: Drienerlo campus University Twente

A3 - My gated community

Features:

- (3) knowledge for yourself, (A) exclusive campus
- Gated campus
- (Increasingly) private territory
- Dutch, like-minded group of individuals
- Sometimes based on a particular religious belief or similar background
- Generic examples: professional education with strong regional enrolment
- Specific examples: boarding school, girls school, Christian college
- Status from the group of individuals: women, regional groups, religious groups etc.
- ‘Do everything yourself’ to be independent of others in regional system

The campus is mostly private territory, closed for unauthorized persons. Students are focused on individual growth and they consider the reputation of the university very important for their own competitive advantage after graduation. The university is acting autonomously – independent from other universities. In fact there is competition with other regional and national institutions to be the best or largest. This type of university collaborates with related businesses in the regional economy, for mutual benefits and opportunities for private funding. Alumni will also profit from this interaction: they often work for the same related businesses after the graduate. Examples are universities that customize their courses and specialties to the local economy

A4 - Our village

Features:

- (4) knowledge applied locally, (A) exclusive campus
- Education and (applied) research in close collaboration with local businesses
- Cooperation between education, thematically between university, colleges and vocational institutions
- Public funding also coming from town by contributing to local community
- Status of social life - caring for one another, strong community ties
- ‘Do everything yourself’ in network
- Dutch alternative of American community college

The campus is a village, owned by the university, which controls all activities on campus: a form of park management. Students and staff members are the inhabitants of this campus village – they form a strong community and they are prepared to share. This model is suitable for many sustainable solutions that are dependent on the willingness of people to share facilities. Collaboration between parties in different types of education are feasible – research universities not only involve universities of applied sciences, but also vocational education and training (in the Netherlands this means collaboration between MBO-HBO-WO or LTS-MTS-HTS-TU). There are relations between educational programs and shared use of laboratories and workshops is encouraged, stimulating collaboration and innovations and reducing the footprint of each institution.

B. Intellectual agora

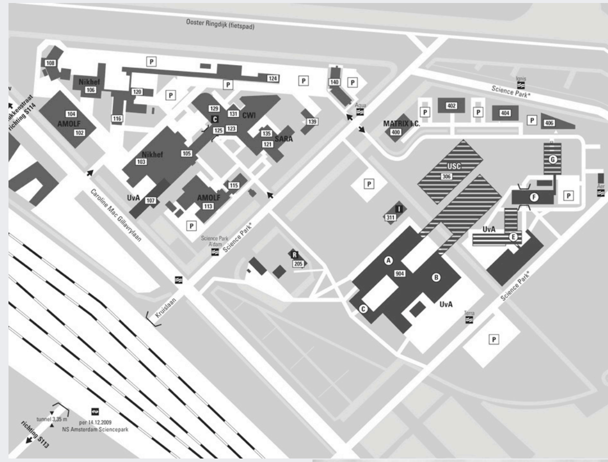
B1 - Business and Science Park

Features:

- (1) knowledge for sale, (B) network campus
- Collaboration only with “Invited guests” or paying partners
- University or college is not necessarily owner, user and manager of land and buildings
- Club access only for campus community
- Global economic network with equal status of selected institutions
- International business and science park - members only

Interaction between universities and related businesses takes place on a business & science park with mutual benefits. Shared use, shared ownership of the campus and shared management tasks are emphasizing the collaboration between these parties, also for primary tasks like creating knowledge and applying knowledge. Collectively deciding on a more sustainable campus is more complex – because of all the parties involved and the challenge to divide costs and benefits equally – but this model also has more opportunities to reduce the footprint by sharing more space.

map: UvA Science Park, Watergraafsmeer, Amsterdam



global competition

global collaboration

B2 - Homebase for academic gypsies

Features:

- (2) knowledge to share , (B) network campus
- Act local, think global
- Boundaries between campus and city disappear: “univer-city’
- Network collaboration between different universities: exchange of students & staff
- Economic collaboration, not only private parties but also public partners
- funding from Ministries of Economic Affairs and Infrastructure, next to Ministry of Education

The campus is a home base for an increasing number of travelling students, professors and researchers. The low occupancy rate of workplaces encourages a workplace concept that trades individual territory for more flexible use. This also stimulates the (multidisciplinary) collaboration at the workplace, between faculty members of the same and different departments, adding to serendipity in science. The campus is a city and the city is increasingly becoming a campus: blurring boundaries between city and campus. The population of this city/campus (univer-city in English) consists of more and more different, multicultural user. The city and university use their collective qualities to attract more people. Managing the campus – especially space planning to increase occupancy rates - becomes more challenging. More opportunities and willingness to share can contribute to a more sustainable campus.

photo: University of Amsterdam in inner city photo: educational facilities shared between academic and professional students - Vrije Universiteit (VU) and Hogeschool Inholland

regional competition

regional collaboration

photo: retail and leisure in inner city of related to the neighbouring university (Groningen)

B3 - campus to share in closed network

Features:

- (3) knowledge for yourself, (B) network campus
- Campus as a local marketplace
- Campus as “shopping centre for individual growth”
- Cooperation with regional universities and colleges as partners
- (Increasingly) private funded
- Focus on strengthening international market in Dutch league
- Cooperation based on common characteristics: region, theme, religion or scientific discipline

The university campus is mostly private areas, shared only with parties within the university or with local partners that share the economic goals. There is a strong local network of guest professors, local businesses and opportunities for internships. Funding is becoming more private than public. Applied research is carried out in close collaboration with the local and regional businesses. Relations with local schools are strong and these schools use the university’s facilities frequently and for a fee. Regional clusters are self-containing systems and the partners that form these clusters are proud of it. The campus is a regional market place of knowledge – knowledge for sale.

B4 - Our region

Features:

- (4) Knowledge applied locally, (B) network campus
- Intensive collaboration with local private and public parties
- ‘Community service’: universities and colleges take economic and social responsibility in the city and region
- Local university as place for knowledge exchange
- Campus has economic value but also a social and cultural function
- Sharing ownership and management tasks
- Exchange with local schools, customized to local needs
- Many available companies to combine learning and working

The campus is a village in shared ownership – by a local ‘association of owners’. The local community is proud of the fact that knowledge, resources and skills are shared with the group. Happiness is more important than profit. Social problems are solved in a local network of schools and employers. The system depends on many volunteers and is subsidized by the local government. All parties involved are willing to reduce the collective footprint by adjusting their own behaviour – for instance by giving up their individual territory or exclusive ownership of specific facilities. Regional clusters are self-containing systems and the partners that form these clusters are proud of it. The campus is a regional market place of knowledge – knowledge to share.

C. Clicks and mortar

photo: work where you want - student working at MIT building

C1 - Academic Internet store

Features:

- (1) knowledge for sale, (C) virtual campus
- Knowledge for sale on the internet
- Market-oriented, highly individual, English
- Master Degree Online
- Pay to study online at a virtual university
- Virtual campus requires workplaces elsewhere
- work where you want

Students and professors share knowledge through a closed network - a network environment that requires a tuition fee to get access. The student considers it an academic shopping centre for courses that build an individual, customized curriculum. The researcher considers it a closed library with research data of (preferred) partner institutions. Even though a virtual campus seems to be the most sustainable campus model for the university, this campus model still requires workplaces off-campus, which also require m2, energy and financial resources to build and maintain Which concept is more sustainable: 300 students in a lecture room or 300 students at 300 different workplaces with 300 laptops downloading the lecture from Blackboard or using YouTube? But the (reduced) mobility of these 300 students also plays a role in this equation. Of course, didactic arguments are most important in this comparison. Collaborating without a campus also requires ICT solutions and workplaces that are safe and healthy. Physical social networks can be replaced by virtual networks like Facebook.

global competition

global collaboration

C2 - Open source campus

Features:

- (2) knowledge to share , (C) virtual campus
- Open source university
- Lectures and instructions on www.youtube.com
- Various practical exams and excerpts online, shared in open networks
- social networks even more popular
- ITunes U - lectures free download (possibly image)
- Need for collaboration still requires a small campus as a place to (physically) meet

Students and teachers share knowledge through an open network - an academic network environment with a variety of free lectures from leading international universities. The challenge is to guide students in this huge amount of 'shared knowledge'. Professors are teaching students and researchers to find reliable information for their academic questions in the massive amount of data. The campus as a meeting place remains important. but it is much smaller and much less focused on creating private workplaces. The campus offers many places for informal and formal meetings and is increasingly public space. A market square could be the centre of the small campus that can be an integrated part of the city. Examples are universities that reduced their physical campuses and put their educational courses on YouTube or iTunes U – free to download for anyone who is interested.

photo: work where you want – outside

photo: work where you want - students working together at a bar

regional competition

regional collaboration

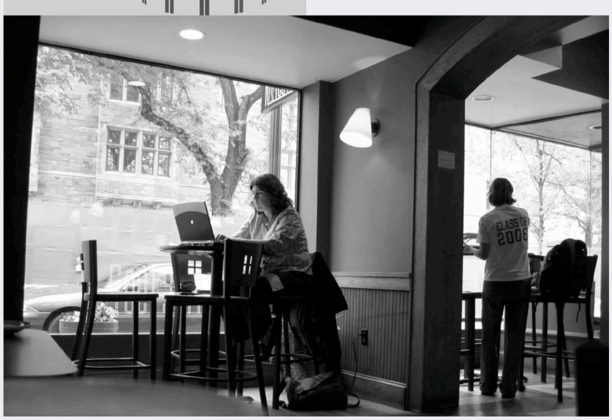


photo: work where you want – students working at a coffee bar close to campus Yale

C3 - My closed virtual network

Features:

- (3) knowledge for yourself, (C) virtual campus
- Internet-minded local
- like-minded are connected with private networks
- Possibly through ‘game setting’ - also to promote competition
- Dutch or in a language that belongs to the specific target group
- www.marktplaats.nl or www.ebay.com for knowledge and services

Students, professors and businesses exchange knowledge and products through a local closed network - a virtual market place for knowledge exchange (with a price). Student use this network to shop for ‘educational credits’ and paid assignments for businesses. Professors and researchers use this network for contract education and research – applied to regional problems and local needs. The researcher offers his services to local businesses and local government. Even though this virtual network appears to be sustainable, what should also be considered – like in model C1 – is the fact that each knowledge worker needs to work ‘somewhere’ and ‘somewhere’ will also use m2, energy and other resources.

C4 - Our open virtual community

Features:

- (4) knowledge applied locally, (C) virtual campus
- Village Network
- Local community - chat / Skype
- Not to replace but to complement strong physical community
- Within universities are that are project-based “open virtual communities”
- Researchers and students work together, even virtually through Blackboard communities, but also exchange knowledge on Facebook
- Public twittering with peers on topical issues
- using Apps to locate each other 24/7

In sparsely populated areas, a virtual network of colleagues, students and/or professors may be the only way to find each other or to talk to each other. Coincidental encounters require a certain density, vitality and physical setting. A small critical core of the campus – which could be a small town centre, a local bar or a cultural centre - is important as a place to meet for all members of the community (students, residents, employers, professors, guests). This smaller campus to share is certainly more sustainable, if it is intensively used . Management and ownership of both the virtual and physical campus can be shared with all parties involved, also to commit them to the collective model.

BK City, Delft University of Technology
Photo: TU Delft (RtH)

APPENDIX VI
Project BK city – background, facts & figures

Project profile

Faculty of Architecture **TUD-4**

Delft	**2008**	**TU campus (north)**	**renovation**
location	year	campus	project type

goals

representative
meeting place
plain & efficient

"representative and image-building"

1 re-accommodate faculty after fire

2 increase flexibility: adaptability / multifunctional use

3 support identity user (faculty, department or institution that uses the building)

€

		annually	*€ / m2 gfa*	*€ / m2 ufa*
	maintenance	907.200	25,0	34,0
*	energy & water	681.000	19,0	25,0
	cleaning	361.300	10,0	13,0
	* is prognosis, maintenance costs including user costs			
		total in mln €	*€ / m2 gfa*	*€ / m2 ufa*
	construction costs	-	-	-
	investment costs	50	1.400	1.900
	all costs price level October 2009			

CREM

users

	number	
students	3.040	
staff (*head count*)	1.029	
staff (*fte*)	462	
educational space (m2 ufa) / student		4,2
office space (m2 ufa) / staff member		5,2
office space (m2 ufa) / fte		11,7
largest user		
Faculty of Architecture		

m2

gross floor area	36.000	*m2 gfa*
useable floor area	26.900	*m2 ufa*
ufa / gfa	69%	
number of floors	3	
% office space	20%	(100 % = m2 ufa)
% educational space	47%	
% specific space	2%	(including laboratories)

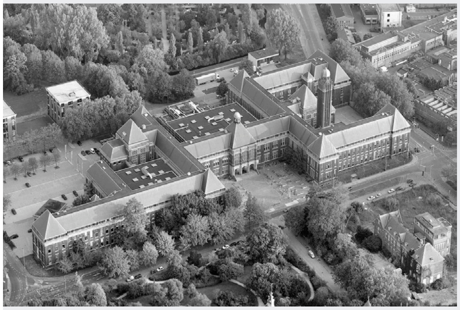
This appendix contains background information about the project BK city, focussing on the new concepts for the campus of the future that were implemented and tested in the more than two years of use. An introduction of this project can be found in a multi-page text box in chapter 7. The epilogue also contains some reflections on both process and project as lessons for campus management in the future. More information and articles about this project can be found using the following link www.bk.tudelft.nl/bkcity.

The text below is written by the author of this book, Alexandra den Heijer, on personal title and in her role of member of the project organisation (chair brief team). Part of the text was previously published in the book "The Making of BK City, Bouwkunde, een jaar na de brand", in a Dutch and edited version. This appendix ends with evaluations of the project, two years after use (November 2010).

Never miss the opportunity of a crisis: reinvent the whole faculty

After a fire that completely destroyed TU Delft's Faculty of Architecture building on May 13, 2008, a team of academics and architects worked with impossible deadlines to refurbish a huge cultural heritage building (> 300,000 sqft) – that was selected from five alternatives to become BK City – within 6 months for 3300 students and more than 800 employees. The brief for this project had to be ready within two weeks after the start of the project June 2, 2008. But the homework was done: the faculty had two recent documents that described the vision on the faculty accommodation: how many square meters of which function, specified in goals and required quality.

Never miss the opportunity of a crisis. Indeed, we thought: "Now that we have lost everything, we have everything to gain: let us change everything that did not work in the old building and implement trends in international campus design." This was quite a challenge, but everyone got so much energy from the idea of an extraordinary group process and the collective mission.



From old to new in gross surface – a reduction of 15%

No faculty attaches more value to the quality of accommodation than an Architecture faculty. The building as a showcase for the organization is nowhere as relevant. How to combine faculty demands for a high quality with 'the inconvenient truth' of limited resources? By reducing the floor area in favour of quality. Fewer meters with more quality is a trend in international campus strategies. Similarly, at BK city: the burned Berlageweg building contained 42.000 m2 gross floor area and the 'new' building at Julianalaan offered 32.000 m2.

We were facing a space reduction of 25%, while the old building at Berlageweg was already too small for the growing population. Two glasshouses of about 4000 m2 of gross floor area (gfa) in total were added to the 32,000 m2 of the existing Julianalaan building. The total of 36,000 m2 was still 15% less than the 42,000 of the Berlageweg building. How did we manage to solve that?

Much more usable area than before – enlarging spaces and use of corridors

Firstly, the team tried to create as much usable area as possible, including making functional use of circulation space. The large scale of the rooms also helped, but the wide corridors appeared to be a problem. As a solution the corridors were used to accommodate informal meetings - something that did fit into the policy to encourage social interaction. This solution added to the usable area of the building, allowing more programme in the building. On the second floor the studio space also showed that accommodating students in larger spaces also contributed to more usable floor area – because the circulation space is perceived as part of the functional area. New concepts with more flexible use of space ensure improved occupancy and frequency rates. Less territory for individual users and specific users groups provided much more flexibility and facilitates more users in the building. It is also very flexible for the rapid changes in the student population and flexible labour force with many visitors and guest professors. This is evident in the new office concept: all activities of employees are supported in different parts of the working environment, with matching facilities and high-quality furniture. The layout of the building enables different zones with different characteristics and designs. The existing building structure was respected, also for planning reasons – leaving the layout like it has been for decades and avoiding discussions about the size of offices.

BK City in ten functions

More than 50% of BK City Julianalaan consists of either studio space or office space for employees. But there is much more. Lecture halls, educational facilities, library, faculty laboratories, conference rooms, restaurants and other public spaces, and room for storage. Each of these functions was reconsidered – what can we improve compared to the old Berlageweg building, which new concepts can be applied and how many m2 can we share on campus, even with increasing numbers of students?.

table VI.1: transition in floor area from Berlageweg in 2008 – just before the fire - to BK City Julianalaan 2008, two months after use

2008/09	functions	Berlageweg 2008	Julianalaan 2008	Julianalaan 2008 / Berlageweg 2008	
2 months in use, space use according to brief	1. studio space	5680	7840	+38%	student back at the faculty
	2. office space	6300	6340	+1%	but more flexible concept
	3. lecture halls	1090	1110	+2%	and same capacity
	4. library	650	870	+34%	with more places to study
	5. educ. facilities	3580	3250	-9%	more sharing, better use
	6. laboratories	860	660	-23%	more sharing at TU level
	7. conference	1100	770	-30%	more sharing at TU level
	8. restaurants	380	690	+82%	multi-functional use
	9. public functions	1220	2050	+68%	more places to meet
	10. storage	3300	1240	-62%	(start with) less after fire
	total (usable)	24160	24820	+3%	more usable space (flexible use)

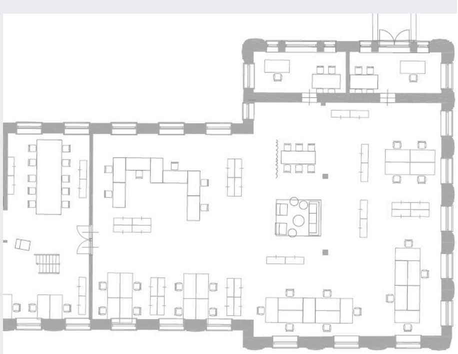


figure VI.1: example of a new office concept - no individual territory, but supporting every activity (floor plan, BK city, Delft University of Technology, 2008)

function (1) studio space

“The student must return to the faculty. We must rebuild a community”. With that statement Dean Wytze Patijn already started a culture change long before the fire. Studies in the old building had already to pilot projects of improved studio concepts, on the sixth and eighth floors for Bachelor students and on the thirteenth floor for Master students. Early evaluations showed more satisfied students. Before the fire the faculty was about to introduce that studio concept on a larger scale. How large that scale would be after the fire, no-one would have expected.

The studio concept consists of tables for 8 to 10 people with storage space and basic modelling facilities. There are separate rooms for presentations that can be booked centrally. Programmatic basis for this studio space was 5,6 m2 usable floor area per workplace. The increasing numbers of students during the design process reduced this footprint to 4 m2, substantially lower than in the brief and adding to very efficient use of space.

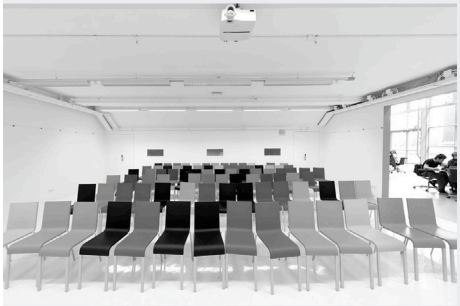
function (2) office

If one subject was high on the dean’s agenda before the fire, it was rethinking the academic office. Architecture was not unique in that matter. Universities all over the world reconsider the academic workplace. A sensitive subject that involves a cultural transformation from the traditional university with cellular offices into the more collaborative network university, with an activity-related working environment that enables group work, (informal) meetings and individual work that does not allow interruption.

Workplaces in traditional single or double offices are representatives of a university that values individual performance and specialization. But as in teaching and research universities are increasingly searching for solutions that connect instead of isolate. Nonetheless, the demand for a workplace to concentrate was accommodated – not on individual territory but to share. More cooperation and community building were important goals in the brief. At an Architecture faculty - and many other faculties – there are the many part-timers. Low occupancy of workplaces and the lack of space for concentration and consultation were reasons to change the old way of working to change. On top of that, the building did simply not allow individual territory – cellular offices – for more than 800 employees.

The new workplace concept does no longer assign territory to individuals, but to groups. This meets the need for a home base, but prevents employees to claim their own workplaces that are vacant for most of the time (research at several universities shows office occupancy rates of 20% or less). Simultaneously, the improved academic workplace was designed to better support the various activities: meetings, concentration, phone calls, informal consultations with students. The collaboration with furniture supplier Vitra emphasizes the focus on quality of the working environment. The office concept includes fully functional workplaces - according to health and safety standards - plus meeting rooms, 'silent rooms', space for informal consultations, living rooms and more territorial areas for support staff (see figure VI.1) – distinguishing front and back offices.

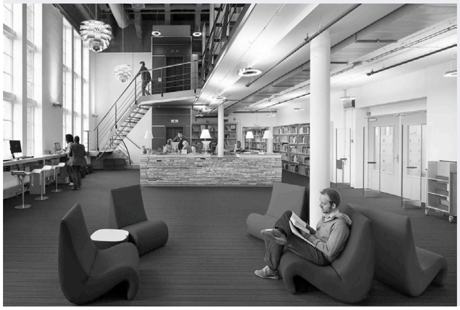
Programmatic basis for the office concepts was 12 m2 of usable floor space per workplace. Compared to other universities, this was relatively high (see chapter 7). The number of workplaces matched the number of full time equivalents (fte) in June 2008: one workplace per fte. The layout of the building contributed to a higher footprint per workplace, about 14 m2 per workplace, but this included the corridors, meeting rooms and the 'living rooms' of each department.



function (3) and teaching rooms (7) conference

At the Berlageweg building the number of lecture halls was already reduced to a minimum, using more lecture halls in other campus buildings. Smaller lecture halls were added, to accommodate the large number of student presentations and meetings. The same program was projected Julianalaan, where - coincidentally - lecture rooms of comparable size were available. In memory of the burned building, the letters (A-B-C-D-F) of the lecture halls were kept the same. Lecture room A is still the largest with a capacity of 360, similar to the old lecture hall A at Berlageweg.

Furthermore, it was decided that all lecture hall of the TU Delft could be used to schedule education of the Faculty of Architecture, also because in some periods the occupancy rates of lecture halls are very low. That space could be better used at Julianalaan. Many smaller lecture rooms were equipped as flexible spaces for multifunctional use. Attention was also paid to more quality for the increasing amount of external parties and visitors. In the old building final presentations and graduation ceremonies were accommodated in rooms that did not support the image of the faculty. The team wanted to solve that problem at the Julianalaan. Given the large number of positive responses from the many visitors so far – and the huge number of requests to accommodate conferences and seminars – the quality is now supporting the faculty's design identity.



The most representative and image supporting conference rooms are Berlage 1 and 2, decorated with Delft Blue to highlight the relation with the city of Delft. The occupancy and frequency rates of Berlage 1 and 2 are very high. Since 2008 many groups – also from other faculties – have used these conference rooms. This illustrates the university-wide demand for rooms that support the identity and core values of the university.

function (4) library

The first days after the fire there was serious doubt whether the books were saved. Luckily, we can now confidently state the library – again – has a prominent place in the building, functioning as a knowledge centre and giving access to

more than 35,000 books that were saved from the fire. At the most central locations in the building - both horizontally and vertically - not only the books can be found, but also many magazines and maps.

Increasingly the library has a function as a silent place to work and study for exams. The extra m2 of the new library give room to nearly 100 study spaces that are well used. More and more access to electronic sources, changes the character of the library. On top of that, they have digitalized many physical books. On campus all students and staff members can use the wireless network to access many digital resources.

function (5) education and practical (6) laboratories

Workshops like hand sketching and making models and ICT education require rooms with special facilities. This also applies to some faculty laboratories. Large-scale spaces, demanding technology and efficient logistics were planned in one of the glasshouses, because they did not fit in the existing building. With the assistance of faculty experts and in consultation with lecturers and professors, various layouts were discussed.

Policy at university level was to share expensive facilities and laboratories between faculties. The question was how important some of these facilities were for the faculty, and how much it was worth in terms of resources. The idea of a central hall for modelling facilities - as the heart of the building - was already at the table in the second week after the fire, at the end of May 2008. Eventually Glasshouse South shows the result.

function (8) and restaurants - other - (9) public spaces

Students and staff considered the old restaurant in the faculty building one of the least pleasant stay spaces. Besides, new restaurant concepts promoted more multifunctional use of space: eating, working in groups and social encounters. The restaurant Ketelhuis was designed according to that principle, with several meeting rooms that are flexible to use during lunch hours.

One of the biggest successes in the old Berlageweg building was espresso bar “Sterk”. This was the meeting place for students and staff. Luxurious coffee facilities, whether or not organized as a lounge or place to study, are a success at campuses around the world. The espresso bar has replaced the social function of ‘smoking areas’. At Julianalaan the design of the espresso bar is supporting the sustainability vision of the faculty: Cradle to cradle or ‘Super use’ (re-using parts of a demolished housing complex in The Hague – Carel Weeber’s Zwarte Madonna).

The espresso bar (again) is a successful concept, encouraging social interaction between employees of different departments and between students and staff. It also functions as a meeting point for guests. The visibility of the academic staff improved.

more attention to public spaces after the fire

BK-city was designed as a ‘city with much public space”. Walking from the 150-meters long main street and squares (glass houses) of BK city, visitors gradually move from public to more private space. More transparency, more community building and better cooperation in the faculty: these were important principles for the design of public areas. On an average day, walking through the corridors shows a range of the faculty's research and education activities and facilitates many unplanned encounters. The 'shopping street' has many public functions like the Bookshop, an ATM, printing services, ICT support and central entrance hall.

function (10) storage

Demand follows supply when it involves storage space. Many m2 of the old building were used as storage space, in all individual offices and in the basement. When all paper archives were burned during the fire, it was both a tragedy and an opportunity for the future.

At Julianalaan a huge basement is available for storage. But the faculty wanted to prevent that this would be filled up very soon. A physical archive is partly inevitable and partly unnecessary given the ICT possibilities. And the interest in digitizing was greater than ever. Nonetheless, reality shows that whatever a university offers as storage space will be filled.

Digitizing was also a critical prerequisite for the new workplace concept. A workplace concept without individual territory - but with group territory, like in a house - must be "clean desk" to keep it workable. Working together and sharing facilities requires strict rules. This was also applicable to storage options, both physical and digital. Many scientists admit that their offices were miniature libraries (partly) with the same books, articles and journals as the neighbours. Much of this material is not often used and much easier to retrieve, when stored digitally. But a cultural change in information management and archiving was even harder than implementing a new office concept.

Again, the faculty wanted a culture change, given the unique situation of accommodating a paperless population. Other universities (in the Netherlands and abroad) are very interested in the evaluations: better use of Blackboard, public folders on the servers, scan & mail functions on all copiers, collective archives of magazines and books. The transition to a more paperless office was also a major challenge for facility management and ICT, but even a greater challenge for the employees themselves.

BK City after 2 years – 'reversed briefing'[1]

In November 2010, BK city has been in use for two years. While a project team is working on making the building more sustainable (project link to BK City Slim), it is interesting to assess the current situation in terms of space use. In two years user demands have changed, new concepts have turned out to be more or less successful – with satisfied or dissatisfied users – and occupancy rates have illustrated either the popularity of spaces or problems in functionality.

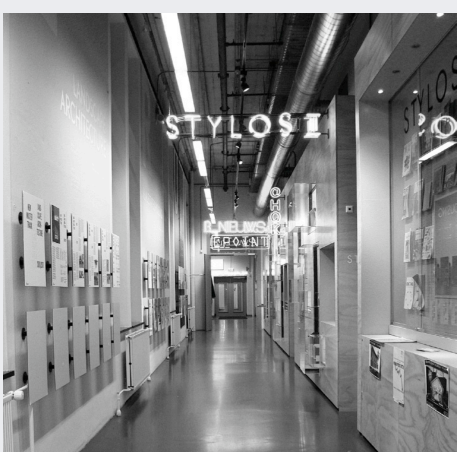
Functional assessment 2010/2011 – even more students and less office space

The new space use table (table VI.2) shows the status quo in November 2010. Remarkable changes compared to space use in 2008 are the reduction of office space, lecture halls and public functions and the expansion of studio space and the enormous growth of storage space. Potentially usable m2 are quickly 'occupied' with archives that may never be removed. It is clear that even a faculty

[1] the process of 'reversed briefing' was brought up by John Worthington, when he visited BK city at the end of 2008 ; at that time the academic staff had just moved in and the building was about to be customized to more specific user demands

table VI.2: space use from Berlageweg (2008, just before the fire) to BK City / Julianalaan 2010, two years in use (data FMVG-bk, November / December 2010)

2010/11	functions	Julianalaan 2008	Julianalaan 2010	Julianalaan 2010 / Julianalaan 2008	
2 years in use, space use adjusted according to users demands and based on ocupancy rates	1. studio space	7840	9610	+23%	more student places (about 1900 to 2264)
	2. office space	6340	5055	-20%	less workplaces (470 to 400)
	3. lecture halls	1110	450	-59%	more sharing at TU level
	4. library	870	750	-14%	actual library did not change in size
	5. educ. facilities	3250	3430	+6%	more specific educational facilities
	6. laboratories	660	550	-17%	more sharing at TU level
	7. conference	770	310	-60%	more sharing at TU level
	8. restaurants	690	720	+4%	some meeting rooms became restaurant
	9. public functions	2050	850	-59%	other functions became more public
	10. storage	1240	5180	+318%	assigning the large basement for storage
	total (usable)	24820	26910	+8%	more usable space (making use of circulation space)



that restarted without an archive can rapidly fill volumes of cellar space. In the case of BK city the huge cellar basement with its relatively low functionality for other functions encouraged the use as storage space. This might be reverted in the future – probably when the faculty needs these spaces for primary processes.

The footprint of the academic workplace has been reduced compared to the m2 of the brief.. Confronted with low occupancy rates of particular zones in the building, the heads of department allowed the faculty to transform office area into studio space (just by changing the furniture), to deal with hundreds of extra students that enrolled in the academic years after the fire and to keep most activities in one building. However, new post-occupancy evaluations should assess the employee satisfaction with the working environment, also compared to the study that was conducted in February 2009, three months after use. Nonetheless, the budget cuts and reduction of the labour force in the past two years also changed the perception of the working environment. The awareness that resources spent on the workplace are directly linked to the limited resources for education and research – and personnel costs - the state-of-mind of many academics and support staff.

After a year of use, in September 2009, a second assessment of occupancy rates showed an average 22% use of the 470 workplaces. This was the result of ten measurements on five regular working days, in the morning and in the morning. Afternoons showed higher percentages than mornings. Tuesday showed the highest percentages, Wednesday the lowest. In September 2010 this assessment was repeated, with less workplaces and a higher average percentage: 27% of the available workplaces was used at the time of the measurements (Van Herpen and Hermus 2010). In November 2010 another functional transformation replaced some workplaces with studio desks for students

At the beginning of 2011 there are 396 workplaces available for staff. The average size of the workplace is 11,2 m2 usable floor area – excluding meeting space. These workplaces are available for a flexible workforce of more than a thousand employees, equal to 462 fte (data January 2011). This means that anno 2011 there is 0,86 workplace available per fte.

For the much higher number of employees (in head count) sharing the same working environment, this is an efficient and flexible solution. Practice shows that many employees with a full-time job sit at the same desk or in the same room most of the time. The non-territorial concept pays off in terms of paperless desks in the evening, leaving the rooms ready for other users the next day.

The smaller studio desks for students have gone through a different transition, with occupancy rates of more than 40%, also after adding more than 300 seats for the academic year 2010/2011. The student population has grown in the past years and the studio concept is considered a success. With eight chairs at a studio table, but a more efficient floor plan, the faculty has 2264 seats for students at 283 studio tables at BK city. The average size of each student workplace is 4,25 m2 usable floor area. Every semester these tables are assigned to different groups of Bachelor and Master students. Some tables are assigned for flexible use. In the academic year 2010/2011 these 2264 seats are available for 1860 Bachelor students and 1180 Master students, an average of 0,75 workplace per enrolled student.

Financial assessment of the project - relatively low investment costs per m2

This project has an investment level of 1400 euros per m2 gross floor area – 50 million euro for about 36.000 m2 gross floor area. Comparing this to the investment levels of similar university projects – see chapter 7 and appendix II – shows that this is relatively low for the relatively high quality of place, the type of project, the type of building and the extensions that were built according to new construction standards. Nonetheless, it is the perception of many people that this was an expensive project. The top-end furniture in the building adds to that perception. But ironically, that furniture was part of a sponsor contract with Vitra – with low unit prices. Apparently and understandingly, adding quality to the working environment in a time of budget cuts will be criticized, independent of the (relatively low) costs of adding quality. That is a lesson for campus management in general and it emphasizes the value of informing the stakeholders about campus investments and decisions.

The next project will be making the building more sustainable, to reduce the relatively high energy costs per m2 and to make a showcase for innovative, sustainable solutions that are developed at Delft University of Technology.

Personal reflections on (the making of) BK city

It is mainly up to others to judge how successful the process and project of BK city have been. Nonetheless, I will summarise my lessons in some conclusions and recommendations – to specify what I think campus managers could learn from this project.

(1) the user acceptance of supply shaping demand

First, my view on real estate management as a match between supply and demand was challenged. Mainly because I used to believe that supply would ideally follow demand – ideally if infinite resources were available. However, in practice, financial resources are hardly ever infinite and physical resources take many resources to change. As quite a revelation to me, the BK city project shows that users are more likely to accept and appreciate their working environment when the current physical setting strongly influences – or even dictates – the floor plan and the functional possibilities, not open for much discussion or change.

(2) re-use of meaningful buildings

Secondly, this project convinced me that re-use of existing university buildings – especially cultural heritage that emphases the history of the university – is an

important strategy for many universities in global competition. While adversaries often state that talented researchers would work at a workplace without any identity at the top-ranked universities in the world, that leaves thousands of universities below the top that do not differ much on quality of research and education and can compete on quality of life, both on campus and off-campus. With BK city being closer to the historical inner city of Delft, the project can illustrate both.

(3) matching the benefits with the costs per m2 – with more users per m2

Thirdly, the strategy above can only be paid for if the benefits per m2 match the costs. With rising replacement costs for university buildings, the productivity per m2 should be increased accordingly. Apart from encouraging employees to generate more output or income, this can also be done by reducing the footprint of students, professors and other staff members, making better use of space in time and allowing external users to share space with the university.

(4) ‘quality for quantity’ helps for acceptance – having something to gain

BK city shows that campus users are more willing to accept a reduction in quantity if they get quality in return. In general, the sense of urgency of any crisis will help in the acceptance process of any unpopular intervention in the working or learning environment. During the making of BK city the economic crisis led to tighter budgets that encouraged the awareness of ‘the glass being half full’ instead of ‘half empty’ in the perception of employees. Choosing between ‘all or half’ feels like loss, choosing between ‘half or none’ feels like something to gain.

(5) having stakeholders with mandates at the table

The project organisation of BK city involved representatives from strategic (board of executives, dean, management staff), financial (controllers on university and faculty level), functional (representatives of students and employees) and physical perspectives (technical manager, project leaders), covering all relevant stakeholders. Due to the strict deadlines these persons hardly had any time or opportunity to discuss alternatives with the parties they represented, which also introduced the risk of decisions without commitment or support, which could reveal risks in the phases that followed. This was the case for introducing the non-territorial academic office concept.

(6) the importance of references for stakeholders

During the whole process of the making of BK city, the importance of references was illustrated in discussions and negotiations with many stakeholders. References of used space standards – m2 per student of comparable architecture faculties and schools, investment levels of similar projects and evidence-based best practices for every new concept that we introduced were supplied to satisfy the need to compare projects, to be transparent about the considerations and to gain trust of the community by demonstrating our expertise and experience. The latter is linked to the concept of ‘bounded rationality’: the community was very much aware of the fact that the result of the decision-making process would also be shaped by our personal preferences and ideas about the profession. Considering that a situation they could not change, the thought of being dependent on a team of academics (professors) and professionals whose reputations were at stake, did help them to accept that.

(7) 'bounded rationality' in decision-making

This project under severe time pressure also illustrated the concept of 'bounded rationality', with limited time to collect management information and allowing intuition and emotion in the decision-making process. Yet, the fact that most of the project members had been involved in campus projects or faculty policy-making for years did not make it as applicable as one would think based on the characteristics of the project. On the contrary, it was often stated that the project organisation collaborated so well (...), because of the implicitly and explicitly available background knowledge, experience in similar projects and the incentives to think beyond satisfying their own needs. This is also ascribed to the leading role of the president of the university and the faculty's dean – aiming at an optimal solution more than a satisfactory solution for all parties – valuing the organisational goals above the individual's goals. This did not happen without consequences for the satisfaction of these individuals, who resisted against some of these decisions affecting their own working environment.

The irony of being part of this BK city project – as an interruption from this research project – is still striking: this happened to the faculty that was most likely to have the internal and external network solve the problem and to take the opportunity to show what they were worth. It was the ultimate challenge to practice what we had preached for years, 'we' as researchers in real estate management and 'we' as the project team that advised the stakeholders in practice.

(8) the need and search for reliable data

From the beginning to the end the availability of reliable data was critical. In the first phase the search for dependable data on number of employees – both head count and full time equivalents – showed that different sources provide different figures. Human resource management gave me other figures than the departments themselves. The same problem arose for student numbers, also distinguishing 'enrolled students' and 'active students'. Chairing the brief team I was responsible for the programmatic requirements and the floor area that would be assigned to the departments. During that process I had to be aware of the value of a righteous division of space – for the collective acceptance of new concepts – and the risk of strategic misinterpretations or calculating behaviour, when I would ask representatives of certain functions or departments about their demands. It did help that we needed to reduce space use with more than 15% and that most members of the team – including the facility manager – were aware of the situation in the former building. The process only emphasized the value of structurally collecting dependable figures of student population and number of employees, also for post-occupancy evaluations of implemented concepts. In appendix IV the BK city project is described in numbers.

(9) a faculty of architecture as an ideal laboratory

A building for a faculty of architecture appeared to be an ideal laboratory to test new concepts. With education and research on planning, designing, realising and using the physical environment, students and employees are – in theory – most likely to be open for experiments in their own working and learning environment. At the same time, this type of community is most likely to be critical about decisions – also because they can relate to the subject in theory or practice. This become clear in the discussion about the top-quality furniture, that was appreciated but also criticized as too expensive for a faculty that needs to cut budgets, even though the furniture was part of a sponsor contract and financed with insurance money that could not have been spend on human

resources. We concluded that if this discussion starts at a faculty of architecture, it will probably start anywhere else.

(10) creative faculties are important for a lively campus

Since BK city is in use, many visitors have commented on the vibrant and creative atmosphere that the faculty community brings, even after working hours. The value of the creative class for the quality of life in a city has been subject of many publications (Florida 2002; Florida 2008). The creative class of a university – students and academic staff of design faculties or schools for other creative professions – might very well have a similar positive effect on quality of life on campus. Many students do not follow the 9-to-5 working hours and they often work in groups and on physical products that are visible and inspiring to others. These types of faculties also enrol many international students that form a social community that considers the campus their home. Because of their working hours and their type of work they are more likely to demand retail and leisure functions on campus, like espresso bars, restaurants, supermarkets and shops for materials and printing.

(11) the relativity and territorial aspects of paper - the changing academic workplace

When I started studying at Delft University of Technology in 1988 – ironically at the Julianalaan building that is now used as BK city – paper was all we had. Computers were used to program, not (yet) to make documents. Only in my last two years, we used Wordperfect 5.1 as a revolutionary text-processing tool. In the decades that followed the way students learn and the way researchers (can) work has completely changed. Nonetheless, the university still has the same buildings. After the fire I even returned to the same building in which I started my academic career. Given the revolutionary changes in the way we (can) work, the academic workplace did not change dramatically. Practice shows that this is changing now, but mostly influenced by external factors like budget cuts and goals to reduce the footprint.

One of the most provocative concepts that we implemented after the fire was the transition of a traditional territorial cellular office to an activity-related concept without individual territory. The starting point was unique: without paper archives. Almost all academic staff members lost their physical archives in the fire. As members of the project group we knew that the former building was stacked with paper and that whatever space we would offer as archive would be filled with paper. So we decided on very limited personal archives, to encourage the paperless office and sharing of books, magazines and other collective resources and – most importantly – to stimulate the use of digital sources, archives and networks.

We knew that paper archives do not only use much (usable) floor area in buildings, it also makes people more territorial: they want to be close to their archives. With the goals of making better use of existing space, of reducing the footprint and of stimulating shared use of space, reducing the paper archives seemed to have many benefits. As a researcher I would like to add that digital sources are easier to share, to find and to search on key words, which also contributes to better collaboration in education and research. Nonetheless, the culture change was and still is huge, especially for the group of staff members that have worked with a large physical archive for most of their working life.

Two years after implementing the office concept at BK city, the workplace is hardly paperless. However, the personal paper archives are much smaller and people have become much more conscious of the relativity of paper. And indeed, this book is also published on paper.

References and further reading

Publications in Dutch:
see www.bk.tudelft.nl/bkcity for books, Dutch articles, photos and movies

Publication in English:
Den Heijer, A. (2009). The Making of BK City; the ultimate laboratory for a faculty of architecture. The Architecture Annual 2007/2008. Rotterdam, 010 Publishers: 20-25.

Photo: DUWO

APPENDIX VII
Abbreviations and definitions

abbreviation or term	definition or equivalent in Dutch / English
Agentschap NL:	previously named SenterNovem (before 2009), agency of the ministry of Economic Affairs that aims to promote sustainable development and innovation
APPA:	facilities managers for educational facilities
AUDE:	association of University Directors of Estate
BE:	adult and vocational education
BIG:	Bundesimmobiliengesellschaft (BIG), company that manages and owns a portfolio of 21 Austrian universities
BK city:	BK' stands for Bouwkunde, the Dutch name for the Faculty of Architecture; 'city' symbolizes the urban character of both the building and the community; the building has an open labyrinth structure with many public or undefined areas, the community is international, multicultural and frequently changing
bvo:	equivalent to gfa, 'bruto vloeroppervlak' in Dutch, related to NEN2580
campus management:	matching the university campus with the changing context and various stakeholder's demands, adding value to the university's performance
campus manager:	person responsible for campus management at a university, in this research mostly the campus director or his/her replacement; in UK 'estate manager', in USA 'campus planner' or 'facilities manager'
CELE:	Centre for Effective Learning Environments
costs of ownership:	in this research defined as group 1 (accommodation) of NEN2748
CPB:	Netherlands Bureau for Economic Policy Analysis
CREM:	corporate real estate management
data:	facts, figures, opinions or other (research) findings used as a basis for reasoning, discussion, or calculation
Dutch university:	one of the fourteen publicly funded Dutch academic institutions for research and education; in international comparisons these universities are known as research universities
ECS:	Ministry of Education, Culture and Science (ECS)
EDBR:	Economic Development Board Rotterdam
EMS:	Estate Management Statistics
Erasmus MC:	Erasmus Medical Centre - linked to Erasmus University Rotterdam (EUR)
EUR:	Erasmus University Rotterdam
EZ:	Ministry of Economic Affairs (EZ)
FTE:	Full-time equivalent
gfa - gross floor area:	equivalent to 'bvo', 'bruto vloeroppervlak' in Dutch, related to NEN2580
HBO:	higher professional education, universities of applied sciences
HBO-raad:	Netherlands Association of Universities of Applied Sciences
HE:	Higher education
HEFCE:	Higher Education Funding Council for England
HEFMA:	the South-Africa Higher Education Facilities Management Association

HEI / HEIs:	Higher Education Institution(s)
higher academic education:	WO / Wetenschappelijk Onderwijs in Dutch
higher professional education:	HBO / Hoger Beroeps Onderwijs in Dutch
HIS:	Hochschul-Informations-System GmbH
HOBEK:	HOBEK is an abbreviation for "Hoger Onderwijs Bekostiging" in Dutch, is a funding model based on both input and output, which preceded PGM "Plaats Geld Model" that was mainly based on input.
HOI:	campus managers (directors of university real estate departments, or equivalent) in Dutch 'Huisvestingsoverleg Instellingen' - association of Dutch campus managers
IMHE:	Institutional Management Higher Education
investment costs:	total investment costs, as defined in NEN2631
IRV:	Insurance replacement value
IVH:	IVH is an abbreviation for "Integrale Verantwoording Huisvesting" in Dutch, referring to the transfer of campus ownership to the research universities in 1995
KENCES:	Dutch knowledge centre for student housing
KPI / KPIs:	key performance indicators
LEI:	Leiden University
LUCTH:	Leiden University College The Hague, part of Leiden University (LEI)
m^2:	Square metres of space
management information:	information about key performance indicators (KPIs) and answers to relevant questions for certain management tasks or supports decisions
MBK:	Misset BouwKosten (MBK) supplies index figures for the construction sector
MBO:	secondary vocational education
NACUBO:	business officers in (higher) education
NEN2580:	Dutch standards for measuring floor area (gross, net, assignable, usable) - defining bvo, nvo, vvo and no - in Dutch: bruto, netto, verhuurbaar en nuttig (vloer)oppervlak
NEN2631:	Dutch standards to specify construction costs and investment costs
NEN2748:	Dutch standards to specify facilities costs
no:	equivalent to ufa, 'nuttig oppervlak' in Dutch, related to NEN2580
NUAS:	Nordic Association of University Administrators (Norway, Sweden, Denmark, Finland and Iceland)
NUFFIC:	Netherlands organisation of international cooperation in higher education
NWO:	Netherlands Organisation for Scientific Research
OCW:	Ministry of Education, Culture and Science (OCW)
OU:	Open Universiteit Nederland (Note: Dutch name is also used in English)
PO:	primary education
PREM:	public real estate management
R&D:	Research and Development
research university:	institution for higher academic education (WO, universiteit in Dutch)
RU:	Radboud University Nijmegen

RUG:	University of Groningen
SCP:	Social and Cultural Planning Office
SCUP:	society for college & university planning
SenterNovem:	currently named Agentschap NL (since 2009), agency of the ministry of Economic Affairs that aims to promote sustainable development and innovation
SFC:	Scottish Funding Council
TEFMA:	Australasian Tertiary Education Facilities Management Association for Australia, New Zealand, Hong Kong, Singapore
TNO:	TNO is an independent research organisation - 'knowledge for business'
tool:	any instrument that is helpful in supplying management information: databases, models, websites, applications, organigram project team, brainstorms etc.
total costs of ownership:	abbreviated as TCO, covering all facilities costs as defined in NEN2748
TUD:	Delft University of Technology (also known as TU Delft)
TUE:	Eindhoven University of Technology
ufa - usable floor area:	equivalent to 'no', 'nuttig oppervlak' in Dutch, related to NEN2581
UM:	Maastricht University
university:	academic institution for higher education and research - 'research university'
university campus:	land and buildings, used for university or university-related functions, either rented or owned by the university, not necessarily on one location
university of applied science:	institution for higher professional education (HBO, hogeschool in Dutch)
university's performance:	the university's productivity, profitability and competitive advantage; this research also adds to sustainable development
UT:	University of Twente
UU:	Utrecht University
UvA:	University of Amsterdam
UvT:	Tilburg University
VLIR:	association of Dutch-speaking Belgian universities, in Dutch Vlaamse Interuniversitaire Raad; French-speaking universities are joined in CIUF, Conseil interuniversitaire de la Communauté française
VO:	secondary education
VSNU:	association of Dutch universities
VU:	Vrije Universiteit Amsterdam (Note: Dutch name is also used in English)
WO:	higher academic education - research universities
WORM:	WORM is an abbreviation for "Wetenschappelijk Onderwijs Ruimtebehoefte Model" in Dutch, which can be translated as higher academic education space demand model. WORM calculated the required floor area as output with student numbers as input. The model contained space standards and student-staff ratios for different types of faculties.
WOZ value:	value conform "Wet Waardering Onroerende Zaken" in Dutch, Real Estate Valuation in English, refers to the Dutch Real Estate Appraisal Act.
WU:	Wageningen University (part of WUR)
WUR:	Wageningen University & Research Centre

APPENDIX VIII
Related projects, methodology and results

For this book the results or many research projects were used, generated with different research methods and techniques. Some were introduced in chapter 1, others were presented throughout the book, especially in part B "Data collection and analysis". This appendix contains more details about research techniques – questionnaires, workshops and format – and the number and type of respondents, in addition to the information in the main text. Projects are summarized below in chronological order, including the publications – usually in Dutch – as a direct result of these projects.

2000 – Analysing university campus strategies

Research goal: compare different strategies to find similar problems, lessons to learn
Methodology: five interviews, document analysis
Respondents: campus managers of thirteen universities

Most important research questions:
- (How) does the campus strategy relate to the university goals?
- (How) does the university use scenarios to explore demand?
- (How) does the university apply flexibility?
- (How) does the university refer to costs and benefts?
- (How) does the university create cost-consciousness about campus matters within the university?

Results:
- Research report (De Jonge et al. 2000)
- Two-day seminar with presentations and discussions about the report and various campus strategies with campus managers and member of each executive board
- Results are used throughout this book and especially in chapter 4 and 5

Publications:
- De Jonge, H., A.C. Den Heijer and L. De Puy (2000). *Analyse Universitaire Vastgoedplannen*, Delft University of Technology.

2002 – Campus management

Research goal: elaborate on the five (management) issues of the previous research project
Methodology: thirteen interviews, document analysis
Respondents: campus managers of thirteen universities

Most important research questions about developments, uncertainty and (required and available) flexibility:
- Which developments are most influential to the campus and campus management?
- How do these developments influence the the campus and campus management?
- Which of these developments are strategic choices?
- Which of these developments are part of scenarios for the university and campus of the future?
- Which types of flexibility – spatial, technical, financial and organisational – are used or implemented to cope with uncertainty in campus management?

Most important research questions about costs, benefits and benchmarking with other institutions:
- What are the costs of the campus?
- How does the university determine the capital costs: based on historical investment or on replacement value?
- How do international universities or similar institutions determine the total costs of ownership?
- What can Dutch universities learn from benchmark studies (abroad)?

- Which steps can Dutch universities take to generate more and better (comparable) management information?

Most important research questions about user satisfaction:
- Which user groups can be identified – in age, generation, frequency of use, lifestyle, financial relation to the university?
- What are the (changing) demands of each of these groups?
- (How) does the university measure the satisfaction of each user groups?
- What are satisfiers and dissatisfiers for each user group? (introducing Maslow)
- How does the university involve these user groups in campus decisions?

Results:
- Three reports (Den Heijer 2002a; Den Heijer 2002b; Den Heijer 2002c)
- Article in Real Estate Magazine (Den Heijer and Van der Schaaf 2002)
- Support for a university-wide benchmark study (see next research project)
- Results are used throughout this book and especially in chapter 2, 4 and 5

Publications:
- Den Heijer, A. C. (2002a). U*niversitair Vastgoedmanagement, deel A: Onzekerheid & Flexibiliteit*. Delft, TU Delft, Faculteit Bouwkunde, Real Estate & Housing.
- Den Heijer, A. C. (2002b). *Universitair Vastgoedmanagement, deel B: Kosten & Baten*. Delft, TU Delft, Faculteit Bouwkunde, Real Estate & Housing.
- Den Heijer, A. C. (2002c). *Universitair Vastgoedmanagement, deel C: Klanttevredenheid*. Delft, TU Delft, Faculteit Bouwkunde, Real Estate & Housing.
- Den Heijer, A. C. and P. Van der Schaaf (2002). Benchmarking: een uitdaging voor CRE-managers. Real Estate Magazine: 14-19.

2004 – Benchmarking the (Dutch) university campus

Research goal: assessment of the feasibility of a collective benchmark process
Methodology: questionnaires, document analysis
Respondents: campus managers of thirteen universities

Most important research questions:
- How does the university register floor area – using which definitions?
- How does the university register the technical condition – using which definitions?
- How does the university register the costs of the campus – using which definitions?
- How does the university register the users of the campus – using which definitions?
- What tools does the university use to generate management information on space use, investment costs, total cost of ownership and user satisfaction?
- How does the university determine if campus goals are achieved?
- How do universities in other countries generate collective management information on the issues mentioned in the previous questions?
- What tools are required to improve campus management?

Results:
- Research report (Den Heijer and De Vries 2004a)
- Article in Facility Management Magazine (Den Heijer and De Vries 2004b)
- An overview of the most used definitions and tools for campus management at Dutch universities
- An overview of best practices (collective benchmark studies) abroad
- Comparison of required and available campus information at Dutch universities – as a starting point of a collective benchmark process, on project and campus level
- Results are used throughout this book and especially in chapter 4 and 7

Publications:
- Den Heijer, A.C. and J.C. De Vries (2004a). *Benchmarking Universiteitsvastgoed, managementinformatie bij vastgoedbeslissingen*. Delft, TU Delft, Faculteit Bouwkunde, Real Estate & Housing.

- Den Heijer, Alexandra and Jackie De Vries (2004b). "Is meten wel weten?" in *Facility Management Magazine.* Delft, TU Delft.

2005 – Benchmarking university campus projects – part 1

Research goal: generate management information about new university projects
Methodology: format to collect data of twelve new university buildings
Respondents: campus managers of thirteen universities

Most important research questions:
- Why this building (goals: adding value to performance)? List of goals provided: select and prioritize goals, or add other goals
- What is the size of this building (m2)?
- What are the functions of this building (space types)?
- For whom this building (how many users: students and staff)?
- What did it cost to realise this building (euros)?
- What will (or does) it cost to use this building (maintenance, energy, cleaning)?

Results:
- Database with twelve projects to compare on various aspects
- Research report (Den Heijer and De Vries 2005)
- Paper at ERES conference (Den Heijer 2005)
- Workshop to discuss the data, research report and the format - testing the conceptual framework (January 27, 2006 in Utrecht)
- New improved format for part II
- Results are used in chapter 3 (CREM model) and chapter 7 (project data)

Publications:
- Den Heijer, A.C. (2005). "Managing university real estate portfolios, generating management information for performance based portfolio strategies and real estate decisions." *European Real Estate Society*, June 2005, Dublin, Ireland, ERES.
- Den Heijer, A.C. and J.C. De Vries (2005). *Analyse universiteitsgebouwen, resultaten benchmark twaalf recente projecten.* Delft, TU Delft, Faculteit Bouwkunde, Real Estate & Housing.

2006 – Building knowledge cities

Research goal: exploring the role of campuses in knowledge cities (campus & the city)
Methodology: questionnaire and workshops at two-day conference "Building Knowledge Cities", organized with Habiforum on October 25-26, 2006 in Rotterdam
Respondents: urban planners of Dutch university cities and campus managers of universities

Most important research questions:
- How can / does the university and campus benefit from the (knowledge) city?
- How can / does the (knowledge) city benefit from the university and campus?
- Which functions can / do they share – in use, management and ownership: academic, residential, related businesses, retail & leisure, infrastructure?
- Results:
- Articles in Nova Terra and Real Estate Magazine (Den Heijer et al. 2006a; Den Heijer et al. 2006b)
- Overviews of shared functions at university cities – use, management and ownership
- Research report (Den Heijer and De Vries 2007)
- Presentation, proceedings and paper at Corporations & Cities conference (De Jonge and Den Heijer 2008; Den Heijer 2008; Den Heijer et al. 2008)
- Results are used in chapter 2 (changing context) and chapter 6 (future models)

Publications:
- Den Heijer, Alexandra, Jackie De Vries and Trees Raas (2006a), "Hoger Onderwijs als motor voor de stad" in *Nova Terra*, jaargang 6, nummer 4: 3-8.

- Den Heijer, Alexandra, Jackie De Vries and Trees Raas (2006b). "Bouwen aan de Kennisstad." in *Real Estate Magazine*, REM 46: 27-31.
- Den Heijer, A.C. and J.C. De Vries (2007). *Bouwen aan de Kennisstad, verslag expertmeeting, Rotterdam 25 en 26 oktober 2006,* Real Estate & Housing, Faculteit Bouwkunde, Technische Universiteit Delft.
- De Jonge, Hans and Alexandra Den Heijer (2008). "Corporations & cities, Envisioning Corporate Real Estate in the Urban Future" (introduction) in *Corporations & Cities*, Brussels.
- Den Heijer, Alexandra (2008). "Managing the University Campus in an Urban Perspective: Theory, Challenges and Lessons from Dutch Practice", *Corporations and Cities: Envisioning Corporate Real Estate in the Urban Future.* Brussels, May 26-28, 2008.
- Den Heijer, Alexandra, Jackie De Vries and Hans De Jonge (2008). "Expert Workshop: Building Knowledge Cities." in *Corporations and Cities, Envisioning Corporate Real Estate in the Urban Future,* Brussels, TU Delft.

2007 – Analysing the Dutch campus and campus strategies

Research goal:	generate management information about the current campus
Methodology:	format to collect data of fourteen Dutch university campuses, questionnaires for all Dutch campus managers
Respondents:	campus managers of fourteen universities (adding Open Universiteit)

Most important research questions:
- What is the size of the campus - m2 buildings and land – in use and ownership? (applying definitions from the Dutch NEN 2580 standard)
- What is the age and technical condition of the campus (using condition based monitoring tools and standardized definitions)
- What are the functions – space types – on campus? (applying standardized function types)
- How many users – students and staff – are accommodated on campus? (using VSNU definitions and databases)
- What is the total cost of ownership – divided in capital costs, maintenance etc.? (applying definitions from the Dutch NEN 2748 standard)
- What will (or does) it cost to use this building (maintenance, energy, cleaning)? (using CFI data)
- Which goals shaped the current campus (goals: adding value to performance)? List of goals provided: select and prioritize goals, or add other goals
- Which goals will shape the future campus (goals: adding value to performance)? List of goals provided: select and prioritize goals, or add other goals
- More specific questions: see box text for excerpt from questionnaire

Results:
- Research report (Den Heijer 2007a)
- Presentation and proceedings at NTNU conference (Den Heijer 2007c)
- 2009: interactive seminar "Campus of the Future" with boards of executives and campus managers Dutch universities (June 4-5, 2009 in Amsterdam)
- Results are used in chapter 3 (CREM model), chapter 2 and 4 (campus data), chapter 5 (developments), chapter 6 (strategies and future models), chapter 7 (trends in campus projects), chapter 8 (tools for management information), appendix I (campuses)

Publications:
- Den Heijer, A.C. (2007a). *Universiteitscampussen in Nederland, resultaten analyse 14 universiteiten.* Delft, TU Delft, Faculteit Bouwkunde, Real Estate & Housing.
- Den Heijer, Alexandra (2007c). "Managing the university campus." *Competitive campuses,* Trondheim, Norway, NTNU.

2007 – Benchmarking university campus projects – part 2

Research goal: generate management information about (more) recent university projects
Methodology: format to collect data of fourteen new and renovation projects
Respondents: campus managers of thirteen universities

Most important research questions:
- Apply the improved format to collect new project data - m2, euros, users, goals
- Add photos, maps and background information to illustrate the quality of the project
- What conclusions can be drawn from this dataset (14) plus the previous one (12), a database of 26 projects?

Results:
- Database with twenty-six projects to compare on various aspects
- Research report (Den Heijer 2007b)
- Workshop to discuss the data and reflect on the data (January 25, 2008 in Utrecht)
- Presentation for executive boards universities (February 15, 2008 in The Hague)
- New slightly improved format for part III
- Part III: adding 13 extra projects in 2009 – database contains thirty-nine projects
- Results are used in chapter 3 (CREM model), chapter 7 (project data) and appendix II (projects)

Publications:
- Den Heijer, A.C. (2007b). *Analyse universiteitsgebouwen, resultaten benchmark 26 recente projecten.* Delft, TU Delft, Faculteit Bouwkunde, Real Estate & Housing.

2008 – Faculty of the future

Research goal: generate strategic, financial, functional and physical models for future faculty
Methodology: five think tanks on strategic, financial, functional and physical aspects
Participants: expertise from academia and practice (professors, architects, consultants, real estate developers, municipalities, regional authorities)

Most important research questions:
- (1) How do we collectively develop and manage the future knowledge city?
- (2) Which trends and development in education and research will shape the university and campus of the future?
- (3) Which new physical and functional concepts will shape the campus of the future?
- (4) Which financial models are available for the campus of the future?
- (5) Which innovative process models can support realising the campus of the future?

Results:
- five reports of five think tanks
- chapter “Faculty of the future”, published as article of “Building for Bouwkunde” book (Arkesteijn et al. 2009)
- Article for Rooilijn (Arkesteijn and Den Heijer 2009)
- Results are used in chapter 6 (future models)

Publications:
- Arkesteijn, Monique, Alexandra den Heijer, Herman Vande Putte and Leentje Volker (2009), “Think Tank - Envisioning the Faculty of the Future” in *Building for Bouwkunde - Open to Ideas.* Delft, TU Delft - Faculty of Architecture: 64-71.
- Arkesteijn, Monique and Alexandra Den Heijer (2009). “De campus als stad” in *Rooilijn,* Amsterdam, UvA. 42 (4): 252-259.

Questionnaire 2007 (excerpt to illustrate)

Which goals will shape the future campus? Indicate which goals were relevant and prioritize these goal.(see chapter 4 for results)

	relevant?	priority?
support identity university / attract (more) students & staff members		
support identity user (faculty, department or institution that uses the building)		
increase income / decrease expenditure on level organization		
increase income: make building rentable to a third party		
increase income: make building marketable to a third party		
support user goals more effectively / improve customer satisfaction		
support culture change (for instance after reorganization)		
stimulate innovation / collaboration (staff-staff, staff-students, student-student)		
more quality for user (match with changing demand)		
increase flexibility: adaptability / multifunctional use		
increase flexibility: non-territorial offices for staff / spaces used by multiple users		
less m2 per user		
save accommodation costs		
additional goals:		

Questions about the campus of the future – and best practices of today:

•What is considered "the place to be" on campus, for students and employees?
•What is the best educational concept in use?
•What is the most innovative lab on campus?
•What do you consider best practices on other (international) campuses?

Given the future campus models (A) Clicks & Mortar, (B) Intellectual Agora and (C) Back to the future, adopted and adapted from Chapman (2006).

•Which model or which combination of future models applies most to your campus? Describe your specific model.

Campus management involves more and more functions and space types (not just academic, but also residential, related businesses, retail & leisure and infrastructure).

•Do you agree with this statement?

Per function type – academic (education, research and supporting processes), residential, related businesses, retail & leisure and infrastructure – you can find a list below.

•Can you mention developments, new concepts or changes in management, use or ownership of these functions at your campus?

In 2002 the most influential developments on the campus and campus management were described in a report, based on interviews with Dutch campus managers.

•What do you consider the most influential (new) developments for campus management?

Many workshops and discussion defined the connection of four CREM perspectives as the basis of campus management and consequently of (the collection of) decision support tools. My proposition is that every campus decision is about finding a balance between: physical variables (m2 in quality and quantity), financial variables (costs and benefits), functional variables (users and their satisfaction) and strategic variables (adding value to education and research).

(a) Can you mention a decision for which this applies?
(b) Can you mention a decision for which this does not apply?
(c) Do you agree with the proposition after answering question (a) and (b)?

•Which tools do you use to weigh these CREM variables for campus decision support?

•Can you describe these tools or do you have documents that describe these tools?

source:: Questionnaire 2007, translated in English

2009 – Economic risks of aging Dutch knowledge infrastructure

Research goal: describe the current state and future risks, for policy makers
Methodology: document analysis, expert opinion
Participants: campus managers, financial expert and VSNU representative
Target group: executive boards of universities, policy makers at the Ministry of Education

Results:
- presentation and discussion with members executive boards universities (November 27, 2009 in Utrecht)
- memo "Economische risico's van verouderde kennisinfrastructuur" (HOI 2010)

Publications:
- HOI (2010). Economische risico's van verouderde kennisinfrastructuur, memo on behalf of Dutch university campus managers.

2009 – Towards a sustainable campus

Research goal: describe scenarios for the future of higher education and strategies for the sustainable campus of the future (external client: Agentschap NL)
Methodology: document analysis, various workshops and a conference (see below)
Participants: campus managers and energy coordinators of all Dutch research universities and a selection of universities of applied sciences

Most important research questions:
- Given the four Agentschap NL scenarios (transformed for higher education by the research team) what do you consider the most likely future scenario?
- Given the three campus strategies – traditional, network, virtual – which is most applicable to your campus?
- Which sustainable measures – collected using mindmapping in students workshops – do you (a) already use, (b) want to implement or (c) not want to implement?
- Which measures are most effective in which future campus model?

Methodology:
- Workshop with international students on the sustainable campus (October 26, 2009 in Utrecht)
- Workshop with students on the sustainable campus (October 28, 2009 in Delft)
- Workshop with campus managers and energy coordinators on sustainable campus (October 30, 2009 in Rotterdam)
- Presentation and interactive discussion with audience and response on data (April 27, 2009 in Wageningen)

Results:
- Research report (TU Delft 2010)
- Conference paper (Den Heijer et al. 2010)
- Digital tool [link to website]
- Results are used in chapter 6 (future models introduction) and appendix IV (future models described)

Publications:
- TU Delft (2010). Naar een duurzame campus, een toekomstvisie voor hoger onderwijs, in opdracht van Agentschap NL.
- Den Heijer, Alexandra, Peter Teeuw and Kristel Aalbers (2010). "Towards a sustainable campus; Visions for the future of higher education" *ERSCP-EMSU 2010 Knowledge collaboration & learning for sustainable innovation.* Delft, TU Delft.

List of sources at Dutch universities or related institutions

List of people who were interviewed for this research – campus managers that were part of the HOI netwerk during the research process – and people who supplied data for the benchmark studies and appendices I and II. I also included former HOI members to emphasize their contributions in the early stages of this research. With your support and help I could generate the management information that we can use collectively. More acknowledgements can be found on the next page.

institution	contacts
EUR-Erasmus Universiteit Rotterdam	Kees Lansbergen (HOI), Astrid de Ruiter, Piet de Visser (former HOI)
LEI-Universiteit Leiden	Frans Dekker (HOI, chairman), Ferdy Poppelier, Job Geselschap, Ruud Boom
RU-Radboud Universiteit Nijmegen	Hans van Haren (HOI), Michel ter Berg (former HOI), Antoine Fraaij, Hans van Weert, Chris Teunissen
RUG-Rijksuniversiteit Groningen	Erika Hepping (HOI), Ruurd de Jong (former HOI), Stephan Oorburg, Pieter van Hoesel
TUD-Technische Universiteit Delft	Dick Gutlich (HOI), Freek Higler (former HOI), Gerrit Kahlman, Ronald Kuil, Martijn Bakker – for BK city: Dennis Cruyen, Floor Schepens
TUE-Technische Universiteit Eindhoven	Veronique Marks (HOI), Piet van Happen (former HOI), Karin Overdijk (former HOI), Bert Verheijen, Arno Senders, Dimitri Tsolakidis
UM-Universiteit Maastricht	Martin Geurts (HOI), Hans Beijer (former HOI), Jacques Knoppen, Jolanda Kemp
UT-Universiteit Twente	Marien Florijn (HOI), Freek Lassche (former HOI), Karen Frowijn
UU-Universiteit Utrecht	Dries Berendsen (HOI), Aryan Sikkema (former HOI), Wim Bouwhuijzen (former HOI), Jan Vernooij, Ruut van Rossen
UvA-Universiteit van Amsterdam	Salomé Bentinck (HOI), Inge Reindersma, Charles Boll, Sanne Doelman
UvT-Universiteit van Tilburg	Rob Sipkens (HOI), Ted van Loosbroek (former HOI), Arend van der Meer (former HOI), Robert Hijmans (former HOI)
VU-Vrije Universiteit	Franc van Nunen (HOI), Josja van der Veer, Ton Ruhe, Ton Steentjes (former HOI), Daniël Koningen, Maurice Clignett
WU-Wageningen Universiteit	Ad van der Have (HOI), Gerard Gielingh
OU-Open Universiteit	Jo Stefens (HOI), Nico de Bruijn
VSNU-Association of Dutch universities	Jeroen van Oort (HOI), Yvonne Groenstege (former HOI), Thea Verdonk, Martin Nieuwenhuizen
CFI-Centrale Financiën Instellingen	Rita van der Werf, Arnout ter Schuur
Agentschap NL	Mart van Melick and Casper Havers

From international universities I specifically thank Bob Simha (MIT campus planner 1960-2000), Graham Roddick (Strathclyde University and SAUDE), Eleanor Magennis and David Pollard (Strathclyde University), Lindis Burheim and Siri Blakstad (NTNU) and Lennart Ilke (Uppsala University and NUAS). For the support, data and images I also thank DUWO, Student Housing Association and in particular Jan Benschop, Noek Pouw, Mark van der Sluis – also for supplying the beautiful photos that I was allowed to use for this book. I think they highlight the atmosphere that we try to create on campus.

Union Square , San Francisco
Photo: AdH

Acknowledgements

Now that the book is finished, I can take time to look back and thank the people who helped or supported me during this process. For a perfectionist like me it has been a struggle and a very rewarding process at the same time. Doing PhD research – especially when it is combined with an academic position – tends to take all the time you have. I have many people to thank for their contribution to the research and their support in any way.

First of all, I would like to thank my employer TU Delft and the Faculty of Architecture for giving me the opportunity to do this research and reduce my educational tasks in favour of my own learning process. It really felt like the ultimate knowledge transfer to apply my research results to our own campus and our own 'new old' faculty building.

Over the years I have considered the TU Delft community as my second family and the campus my second home. I thank my colleagues at the Faculty of Architecture and at the department of Real Estate & Housing for their support and the fact that they took over some of my educational and management tasks – especially at the last stage of this research process. I thank Hans Wamelink for giving me the opportunity to finish this book – as long as it lasted – and for believing in me. I cherish the memories of our teamwork for BK city.

For this research, the support of the group of campus managers of fourteen Dutch universities (HOI) has been essential. I want to thank all (former) HOI members for their inspiration, data, references, policy documents and evidence-based knowledge. They supported this process, also as the clients of contract research and by involving their employees in the research process. A list of people who have been involved in interviews, data collection or workshops can be found on the previous page. Even at the last stage of the production of this book, all universities have provided new campus maps or photos to make the appendices a reflection of today's campus and tomorrow's ambitions. I want to express my gratitude to HOI chairman Frans Dekker (LEI). If you had not decided to come to TU Delft for the first analysis of campus strategies, I would not even have started this book. It was a privilege to have a team of practitioners to test my theories and evaluate the management information.

In the years that followed that first project, I have been applying knowledge as soon as it was produced in presentations, reports, articles and valuable discussions. The book could always wait. It was not just a matter of time management: I also believed that other ways of exchanging knowledge (than a book) had more added value. I needed my supervisors to convince me otherwise, and evidence shows that they were successful. I thank my supervisors Hugo Priemus and Theo van der Voordt for being patient, persistent and always constructive. My search for approaches, frameworks and models that would link all previous research results, took some time and some alternatives. Again, I thought that a dissertation would only add to my previous work, if it would connect many perspectives, scales and stakeholders – because I knew that only then, it would be a reflection of reality. Just when I developed the frameworks and models that are used in this book, a twist of fate brought me back to reality: the fire at the faculty and my involvement in the BK city team for the year that followed.

Hugo, thank you so much for your patience, but most of all for your unlimited inspiration, your analytical skills, constructive comments, valuable input and pragmatic approach. I have told many others how much I appreciated you as my supervisor and now I can tell you. Theo, this is a chance for me to talk about your own added value – your contribution to my performance. I am not going to draw you a value map, but will use only words for

a change. At my hardly paperless desk at home I went through your notes of the past two (almost final) manuscripts and could tell how much effort you put in helping me to finish this process. Our difference in perspectives has improved the product - I valued your role in this research and I deeply respect your positive mind and your own research production – your own added value. After my supervisors I would also like to thank the doctoral committee members who subjected my manuscript to a final test.

During this research I have met many people who started as colleagues and became friends. Jackie, we have shared an academic office and I have always admired your no-nonsense approach to research. I cherish the memories of working together on research projects and articles. Trees, thanks for your support all these years and your inspiration from practice as a campus manager in so many different knowledge cities. Monique, thank you for being so patient and understanding – you have been there for me when I needed your help. I know that I have reflected your own academic hopes and fears, but if I can, you can too.

Flavia, I can't thank you enough for all the time – and late hours – that you put in, helping me transforming a manuscript into a book. Your academic talent, creative background and positive spirit are the perfect mix for making a cover and graphic design for this type of book. I consider it a blessing that our paths have crossed and it feels like you have become part of my 'modern family', as the Colombian diva. Dennis, thanks for distracting me from my academic work – I know how easy it was – and imagine what I would have missed. The BK city project is hard to repeat, but you will think of something to do next, or I will.

Finishing a research process and producing a book takes all free time and consequently affects your private life, especially in the last few months. I want to thank my friends, parents, sisters and all other family members for their support during the whole process and during the last months in particular. I promise we will meet again soon and I will not talk about my book. Ilse, you were always there for me by phone and I am very proud of what we both achieved this year. Thanks for listening, when I needed it most. Eveline, I cherish all the days I spent at your house, playing with Stella and Ava and learning from them. Nadine, finishing this book will give us even more time to be a large modern family, with your new baby adding to the next generation of girl power.

Finally, I want to thank my husband Hans for his unconditional love, his endless support and his acceptance of the fact that I would not let him read the book. Having a professor as a husband is one thing, but having him as an extra supervisor was too much to handle, too close to home. You know you have been my inspiration, but most of all you are the love of my life. I look forward to spending more quality time together now that the book is finished. And yes, you can read it now.

Alexandra den Heijer
March 2011

Samenvatting

“Het managen van de universiteitscampus - Informatie ter ondersteuning van vastgoedbeslissingen”

Alexandra den Heijer

Hoofdstuk 1. Introductie , onderzoeksvragen en methodologie

Sinds de Nederlandse universiteiten eigenaar zijn geworden van hun vastgoed en verantwoordelijk zijn geworden voor hun eigen huisvesting – in 1995 – is campusmanagement complexer en uitdagender geworden, met meer belanghebbenden en kansen en bedreigingen om rekening mee te houden. De afnemende publieke betrokkenheid en bekostiging van universiteiten zet de interne allocatie van middelen onder druk. Investeringen in vastgoed en andere faciliteiten moeten worden afgewogen tegen investeringen in de primaire taken onderwijs, onderzoek en kennisvalorisatie, zowel op universitair als op facultair niveau. De toegevoegde waarde van campusbeslissingen wordt vergeleken met de toegevoegde waarde van het investeren in meer academische staf, meer studenten of nieuwe onderzoeksinitiatieven. Dit onderzoek richt zich op het genereren van meer ‘evidence-based’ managementinformatie ter ondersteuning van beslissingen over universiteitsvastgoed.

Informatie over de huidige Nederlandse campus laat zien dat de herinvesteringsopgave groot is. Meer dan de helft van de universiteitsgebouwen dateert uit de jaren zestig en zeventig en is zowel technisch als functioneel verouderd. Ontwikkelingen in het hoger onderwijs (en onderzoek) laten zien dat de ruimtevraag steeds minder voorspelbaar is en dat eisen aan de leer- en werkomgeving veranderen. De studenten en onderzoekers stellen hogere eisen aan hun werkplek, ook omdat de wereld hun werkterrein is geworden. Daarnaast moet de campus de doelen van de universiteit zo goed mogelijk ondersteunen – of in ieder geval niet hinderen.

Binnen deze context hebben campusmanagers, verantwoordelijk voor het vastgoed van hun universiteiten, behoefte aan (betere) informatie en tools om hun managementtaken te ondersteunen en de verschillende stakeholders beter te kunnen betrekken bij campusbeslissingen. Het gaat hierbij om bestuurders (en beleidsmakers), controllers, gebruikers en beheerders van gebouwen. Deze vier groepen stakeholders vertegenwoordigen de strategische doelen, de financiële middelen, de behoeften van de gebruikers en de fysieke aspecten van de campus. Uit onderzoek van de afgelopen jaren blijkt dat campusmanagers collectief managementinformatie willen verzamelen om huisvestingsvragen beter te kunnen onderbouwen of vastgoedbeslissingen met meer referenties te kunnen bespreken met de diverse stakeholders binnen en buiten de universiteit. Dit moet leiden tot een meer gezamenlijke en gedeelde verantwoordelijkheid voor het management van het huidige universiteitsvastgoed en de campus van de toekomst.

De probleemstelling die hiervoor werd ingeleid bevat drie veronderstellingen die in dit boek worden uitgewerkt:

- Campus management is succesvoller als de perspectieven van de vier groepen stakeholders worden betrokken bij het managementproces, waarmee de strategische doelen, de financiële middelen, de behoeften van de gebruikers en de fysieke aspecten van de campus worden meegewogen in campusbeslissingen. Deze kosten-batenanalyse in ruime zin wordt ook wel aangeduid als ‘een integrale benadering van campusmanagement’.

- Het confronteren van deze stakeholders – bestuurders, gebruikers, controllers en beheerders – met de consequenties van hun (voorgenomen) voorstellen of huisvestingsplannen moet leiden tot meer bewuste keuzes, meer draagvlak en 'beter verantwoorde campusbeslissingen'.

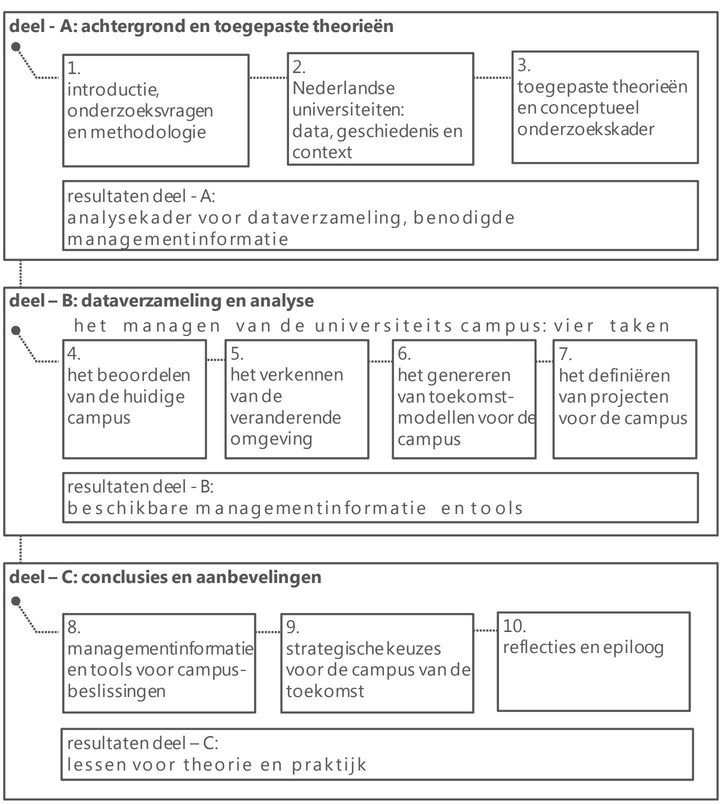
- Management informatie draagt bij aan 'een integrale benadering van campus management' en aan 'beter verantwoorde campusbeslissingen', rekening houdend met de grenzen aan rationele besluitvorming en met ruimte voor subjectiviteit, intuïtie en emotie van beslissers ('bounded rationality', Simon 1997).

Afgeleid van de probleemstelling heeft dit onderzoek de volgende centrale onderzoeksvraag:

"Hoe kunnen universiteiten strategisch campusmanagement verbeteren – met welke managementtaken, informatie en tools – met het doel beter bij te dragen aan de universitaire prestaties?"

Het doel van dit onderzoek is om de universiteiten te ondersteunen met conceptuele kaders en informatie – ondersteund met data en tools – om het campusmanagementproces beter te laten bijdragen aan de universitaire doelen.

Dit onderzoek bestaat uit drie delen: (A) achtergrond en toegepaste theorieën, (B) dataverzameling en analyse en (C) conclusies en aanbevelingen. In deze drie delen worden elf onderzoeksvragen beantwoord. Figuur i laat de onderzoeksstructuur zien met de corresponderende hoofdstuknummers.



Figuur i: onderzoekstructuur met hoofdstuknummers

Onderzoeksvragen zijn beantwoord met behulp van diverse onderzoeksmethoden en -technieken: literatuurstudie en documentanalyse met gebruik van vele elektronische bronnen – ook van internationale netwerken van campusmanagers – en interviews, enquêtes en workshops met Nederlandse campus managers. Het onderzoeksproces van de afgelopen tien jaar bevatte verschillende onderzoeksprojecten die zijn geïnitieerd, medegefinancierd en geëvalueerd door de Nederlandse universiteiten. Deze samenwerking heeft gezorgd voor een periodieke praktische toetsing van de theoretische kaders die in dit boek zijn opgenomen. De samenwerking zorgde ook voor de beschikbaarheid van data over alle campussen en nieuwe projecten. Diverse workshops, interviews en vragenlijsten waren input voor het beschrijven, verkennen en verklaren van (toekomst)ontwikkelingen op de campus. Tijdens de eerste jaren (2000-2002) lag de focus op beschrijvend onderzoek. Voor de benchmark studies (2004-2010) verschoof de focus naar verklarend onderzoek - het vinden van verklaringen van verschillen tussen universiteiten – en het leveren van input voor de strategische besluitvorming over de campus.

Deel A "Achtergrond en toegepaste theorieën"

A1 Welke definities worden gebruikt voor de belangrijkste termen in dit onderzoek?

In dit onderzoek is 'universiteit' gedefinieerd als een (deels) publiek gefinancierde, academische instelling voor wetenschappelijk onderwijs (WO) en onderzoek, te onderscheiden van het hoger beroepsonderwijs (HBO). (In het Engels wordt de term 'research university' steeds vaker gebruikt om universiteiten te onderscheiden van hogescholen, die ook de term 'university' gebruiken). Nederland heeft veertien door de overheid gefinancierde universiteiten. De term 'campus' omvat alle gebouwen en terreinen die door de universiteit of voor universiteitsgerelateerde functies worden gebruikt, hetzij gehuurd of in eigendom van de universiteit, en niet per se op één locatie.

Campusmanagement wordt gedefinieerd als het afstemmen van de campus op de veranderende context van de universiteit, de eisen van de verschilldende groepen stakeholders en bijdragend aan de prestaties van de universiteit. Afgeleid daarvan is een campusmanager – in de praktijk vaak vastgoeddirecteur of directeur van de huisvestingsafdeling – verantwoordelijk voor dit afstemmingsproces. In het Engels wordt de campusmanager ook wel 'estate manager' (UK) of 'campus planner' (USA) genoemd. Campusmanagers zijn de doelgroep van de praktijkresultaten van dit onderzoek. De theoretische inzichten zijn relevant voor onderzoekers op het gebied van (corporate) real estate management.

HOOFDSTUK 2. "Nederlandse universiteiten: data, geschiedenis en de context"

A2 Welke achtergrondinformatie over de historische en huidige context van de (Nederlandse) universiteiten is relevant?

Met ongeveer 4,5 miljoen m2 bruto vloeroppervlak en aanzienlijke grondposities in stedelijke gebieden hebben de Nederlandse campusmanagers een aanzienlijke voorraad te managen. Hun grondbezit op strategische locaties en hun cultureel erfgoed worden beschouwd als sterke punten, ondanks de relatief hoge onderhoudskosten van dit erfgoed. De technische staat van de campus wordt gezien als de belangrijkste zwakte: een groot percentage van de gebouwen dateert uit de jaren vijftig, zestig en zeventig en vereist renovatie of vervanging.

Zowel de flexibiliteit tussen ruimtetypen en de relatief hoge dichtheid van de Nederlandse campus zijn mogelijkheden om meer ruimte te delen op de campus - met interne en externe partners. Echter, de gescheiden culturen tussen verschillende gebruikers op de campus kunnen gedeeld ruimtegebruik verhinderen.

De historisch sterke verbinding tussen de stad en de universiteit geeft hernieuwde mogelijkheden, nu veel Nederlandse steden om de campus heen zijn gegroeid en voorheen perifere universiteitscampussen opeens weer kansen hebben om met de stad te integreren. Sommige universiteiten hebben nog steeds een binnenstadscampus, bijdragend aan het toekomstmodel van de zogenoemde ‘univer-city’, de stadsuniversiteit of universiteitsstad. De grotendeels plaatsonafhankelijke kenniswerker lijkt juist gevoelig te zijn voor een hoge verblijfskwaliteit en een plaats die inspireert.

Veel van de sterktes, zwaktes, kansen en bedreigingen zijn niet uniek voor de Nederlandse situatie en zijn ook van toepassing op andere organisaties dan universiteiten.

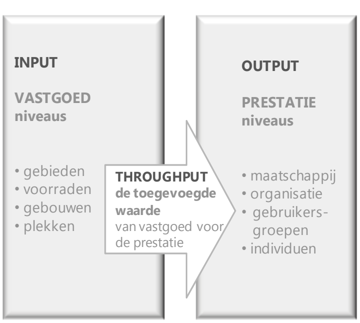
HOOFDSTUK 3 “Toegepaste theorieën en conceptueel kader”

A3 Welke theorieën zijn van toepassing op het managen van de universiteitscampus, in het algemeen en toegespitst op het genereren van management informatie voor campusbeslissingen?

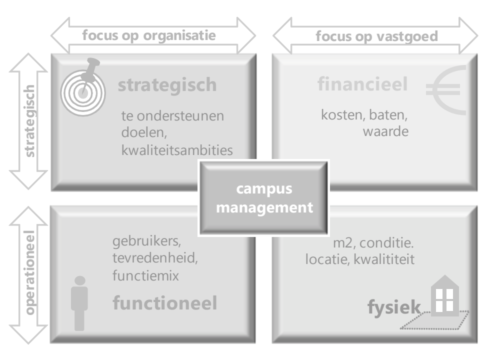
A4 Hoe kunnen deze theorieën worden geïntegreerd in een conceptueel kader?

Dit promotieonderzoek maakt deel uit van het onderzoeksprogramma Real Estate Management en - meer specifiek - Public & Corporate Real Estate Management (afgekort als PREM en CREM). Dit onderzoek zal gedeeltelijk voortbouwen op de bestaande theorieën vanuit deze vakgebieden. Kern van hoofdstuk 3 zijn de kenmerken van de huidige theorieën en (hoe) zij van toepassing zijn op het campusmanagement. Dit omvat (a) theorieën over de relatie tussen vastgoedinterventies en prestaties van (groepen van) individuen, organisaties en de samenleving als geheel, (b) theorieën over ‘public’ en ‘corporate real estate management’ (CREM en PREM), toegepast op de campus management en (c) theorieën over het genereren van managementinformatie. Dit literatuuronderzoek heeft geleid tot de volgende inzichten die zullen worden gebruikt voor de dataverzameling en analyse.

1. Theorieën over vastgoedmanagement zijn gebaseerd op de veronderstelling dat vastgoed - in kwaliteit en kwantiteit en op verschillende niveaus – invloed heeft op de prestaties van individuen, organisaties en de samenleving als geheel (zie figuur ii).



Figuur ii: de basis van vastgoedmanagement: vastgoed levert toegevoegde waarde, positief of negatief, aan de prestaties



Figuur iii: de multi-stakeholder benadering van campusmanagement verbindt het strategisch, financieel, functioneel en fysiek perspectief met bijpassende variabelen

2. Vastgoedmanagement is gericht op:
   a. het meten van die invloeden ex post (het verzamelen van gegevens en het creëren van referenties voor de toekomst)
   b. het sturen van die invloeden ex ante (het nemen van beslissingen op basis van managementinformatie).

3. Vastgoedmanagement is een besluitvormingsproces:
   a. rekening houdend met alle partijen die betrokken zijn – de stakeholders;
   b. zowel aan de aanbodzijde (technisch managers, controllers) als aan de vraagzijde (gebruikers, bestuurders);
   c. van strategisch tot operationeel niveau.

Figuur iii illustreert deze multi-stakeholder benadering van het basismodel voor CREM, toegepast op campusmanagement.

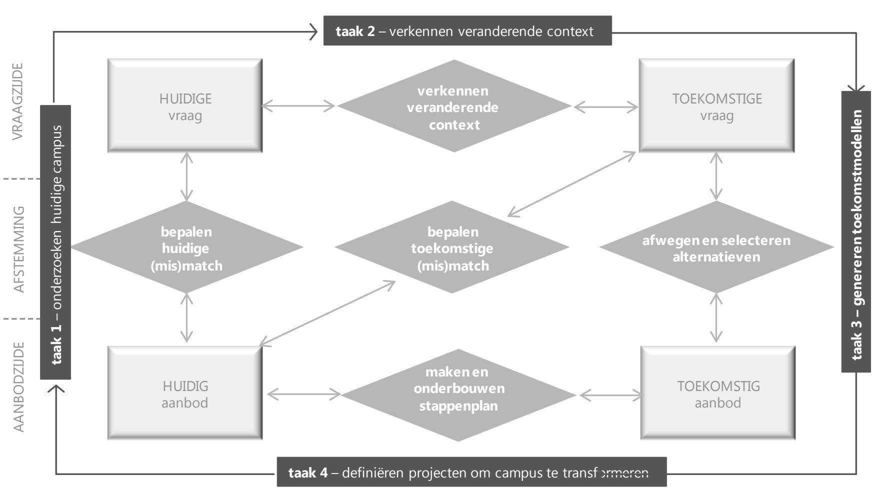
4. Vastgoedmanagement is een proces met verschillende stappen om:
   a. de huidige situatie te onderzoeken;
   b. ontwikkelingen, de veranderende vraag en mogelijke problemen en toekomstuitdagingen te verkennen
   c. mogelijke oplossingen voor de toekomst te genereren;
   d. de weg van de huidige naar de toekomstige situatie - de strategie - te definiëren

5. Deze stappen worden ook wel aangeduid als de vier 'taken' van vastgoedmanagement. Toegepast op de campus leidt dit tot de volgende managementtaken in het besluitvormingsproces (zie figuur ivv voor de relaties tussen de taken):

   (1) het onderzoeken van de huidige campus;
   (2) het verkennen van de veranderende vraag;
   (3) het genereren van toekomstige modellen voor de campus;
   (4) het uitwerken van projecten om de campus te transformeren.

6. Campusmanagers hebben voor deze taken managementinformatie nodig, gericht op de multi-stakeholder benadering, de strategische, financiële, functionele en fysieke perspectieven verbindend en gerelateerd aan bijbehorende 'key performance indicators' (KPI's).

Figuur iv: vier taken van vastgoedmanagement, toegepast op de campus - (1) het onderzoeken van de huidige campus, (2) het verkennen van de veranderende vraag, (3) het genereren van toekomstige modellen en (4) het uitwerken van projecten om de campus te transformeren



Deel B "Dataverzameling en analyse"

Het genereren van managementinformatie vanuit de vier CREM perspectieven is de rode draad geweest voor het collectief onderzoek van de afgelopen vijf jaar (2005-2010), in opdracht van de vastgoeddirecteuren van de Nederlandse universiteiten. In dit deel van het onderzoek wordt de belangrijkste onderzoeksvraag beantwoord, gericht op zowel de managementtaken als de benodigde managementinformatie. De vier taken van vastgoedmanagement zijn leidend in de hoofdstukindeling. Elk hoofdstuk beantwoordt dezelfde vraag voor een andere managementtaak: Welke managementinformatie (a) is vereist, (b) is beschikbaar en (c) moet nog worden verzameld over (B1) het onderzoeken van de huidige campus, (B2) het verkennen van de veranderende vraag, (B3) het genereren van toekomstmodellen voor de campus, (B4) het uitwerken van projecten om de campus te transformeren?

HOOFDSTUK 4 "Onderzoeken van de huidige campus"

B1 Welke managementinformatie (a) is vereist (b) is beschikbaar en (c) moet nog worden verzameld voor het onderzoeken van de huidige campus (taak 1)?

De essentie van 'het onderzoeken van de huidige campus' is om informatie over de (mis) match tussen vraag en aanbod te genereren, vanuit strategisch, financieel, functioneel en fysiek perspectief. Er zijn afgelopen jaren al veel stappen gezet in het gezamenlijk ontwikkelen van instrumenten die de benodigde managementinformatie opleveren. De informatiebehoefte richt zich op het verzamelen van referenties die vanuit alle perspectieven de zogenaamde CREM variabelen bevatten, waaronder achterliggende doelen, betrokken gebruikers, gerelateerde kosten en soorten oppervlak.

Voor de levering van de vereiste informatie, is een campusdatabase gemaakt, die gevuld met gegevens van de veertien Nederlandse universiteiten, voor de fysieke, functionele, financiële en strategische variabelen. Hoofdstuk 4 toont zowel het format van deze database als een aantal resultaten die de verschillende campussen op deze variabelen vergelijken. De campusdatabase kan onder andere huisvestingskosten en ruimtegebruik vergelijken, maar wel in de context van de verschillen tussen de verschillende voorraden.

Hoewel alle CREM perspectieven en variabelen zijn opgenomen in de campusdatabase is er nog veel te verbeteren in de objectiviteit van het meten van toegevoegde waarde. Ook is er behoefte aan meer informatie over bezettingsgraad en gebruikerstevredenheid – volgens een uniforme methode – en dat laatste wel aan de hand van alternatieven waarvan ook de financiële consequenties duidelijk zijn. Dit benadrukt de behoefte om elk van de stakeholders te kunnen confronteren met de gevolgen van hun behoeften of eisen.

HOOFDSTUK 5 "Verkennen veranderende vraag"

B2 Welke managementinformatie (a) is vereist (b) is beschikbaar en (c) moet nog worden verzameld voor het verkennen van de veranderende vraag (taak 2)?

De essentie van 'het verkennen van de veranderende context en vraag' is het genereren van informatie over hoe relevante ontwikkelingen van invloed zijn op de campus en op campus management. Uiteindelijk zou deze taak moeten leiden tot een lijst van programmatische eisen (de vraag) die kan worden vergeleken of gekoppeld aan de huidige campus (het aanbod) om zowel de huidige als toekomstige (mis)match te kunnen bepalen. In ieder geval moet het resultaat de campus manager een kwantitatieve basis te geven voor het bepalen van de toekomstige vraag: (functioneel) van het aantal gebruikers en de gewenste mix van functies voor hun activiteiten, (strategisch) de vereiste kwaliteit afgeleid van de strategische doelen, (financieel) de beschikbare middelen en (fysiek) de benodigde ruimte, zowel in oppervlakte als in capaciteit voor de verschillende soorten functies, zoals laboratoria, collegezalen, bibliotheken, enz.

De complexiteit van de steeds minder voorspelbare instroom en financiële context maken het bepalen van de toekomstige vraag alleen maar moeilijker. Het omgaan met onzekerheid vereist flexibiliteit van zowel de organisatie en de fysieke omgeving. Daarom is het ook belangrijk dat vastgoedmanagers instrumenten hebben om alle stakeholders daarbij te betrekken.

Vele studies en rapporten verkennen trends en scenario's voor de universiteit van de toekomst, maar kwantitatieve onderbouwde scenario's zijn schaars. Dit terwijl campus managers zeer concrete cijfers nodig hebben om tijdig te beslissen om te bouwen, onderhouden, verkopen, kopen, renoveren of slopen. Als gevolg van het ontbreken van concrete gegevens over deze trends en ontwikkelingen valt de campusmanager vaak terug op een extrapolatie van de huidige aantallen studenten, plus of minus een bepaald percentage voor flexibiliteit. Ook ruimtebehoeftemodellen bevatten vaak referenties van de campus van het verleden. Daarom is het van groot belang dat referenties van recente projecten nieuwe inzichten bieden op de ruimtenormen van de veranderende universiteit. Deze vraag naar actuele referenties over de toekomstige campus is dan ook onderwerp van de volgende managementtaak.

HOOFDSTUK 6 "Het genereren van toekomstige modellen voor de campus"

B3 Welke managementinformatie (a) is vereist (b) is beschikbaar en (c) moet nog worden verzameld voor het genereren van toekomstige modellen voor de campus (taak 3)?

De essentie van het management taak is 'het genereren van toekomstmodellen voor de campus', op verschillende schaalniveaus. Aan de aanbodzijde omvat dit toekomstige modellen voor de kennisstad, de campus, het gebouw en de plaatsen of functies binnen een gebouw, zoals de werkplek, collegezalen en bibliotheken. Aan de vraagzijde zijn dit veranderende doelstellingen en eisen van de gemeente, universiteit, faculteiten en individuele gebruikers op de campus: studenten en (academische) medewerkers. Fysieke modellen voor de campus van de toekomst moeten passen bij organisatorische modellen voor de universiteit van de toekomst.

In de loop der jaren zijn er veel modellen ontwikkeld voor de campus van de toekomst, fysiek, functioneel, strategisch en financieel, overeenkomend met de vier stakeholders. Scenario's voor de toekomst van het hoger onderwijs zijn de fundamenten van alle universiteits- en campusmodellen. Voorbeelden zijn de netwerkuniversiteit, de klassieke of traditionele universiteit, de business school of het university college - met een mondiale of regionale focus – meer fysieke of virtueel. Toekomstige campusmodellen zijn gekoppeld aan deze universitaire modellen en kunnen worden uitgedrukt in de CREM variabelen, zodat campusmanagers ze kunnen vergelijken met de huidige campus.

Internationaal staat de stedelijke economie steeds centraler en heeft het delen van voorzieningen met andere partijen steeds meer draagvlak. Veel toekomstmodellen zijn elders al een succes, dus ook bij deze managementtaak is het verzamelen van referenties van belang. Het analyseren van nieuwe concepten en recente projecten op uniforme variabelen is nuttig - om te leren van succesvolle concepten en om te voorkomen dat minder succesvolle concepten en modellen worden gekopieerd. Paradoxaal genoeg zal het resultaat van de volgende management taak, het uitwerken van projecten door het analyseren van projecten uit het recente verleden, veel antwoorden geven op vragen over de toekomst. Hiermee wordt bevestigd dat de toekomstige campus zowel wordt gevormd door te kijken naar de toekomst als door te leren van het verleden.

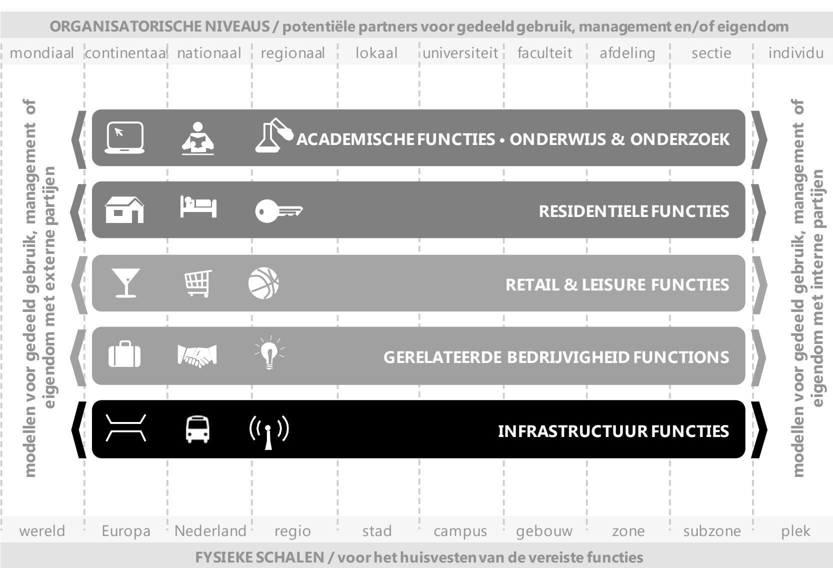
HOOFDSTUK 7 "Vaststelling van projecten om de campus te transformeren"

B4 Welke managementinformatie (a) is vereist (b) is beschikbaar en (c) moet nog worden verzameld om de huidige campus te transformeren naar de toekomstige campus (taak 4)?

De vierde taak van campusmanagement is 'het uitwerken van projecten om de huidige campus te transformeren in de toekomst campus'. In theorie en idealiter is informatie nodig over zowel de huidige campus als de toekomstige campus in dezelfde CREM variabelen.

Bij het definiëren van een nieuw project worden campusmanager gevraagd om dit te onderbouwen met het antwoord op de volgende vragen: hoeveel financiële middelen zijn ermee gemoeid en hoe draagt het bij aan de universitaire prestaties? Hier wordt gevraagd om een business case te maken van een campusbeslissing. Dit vereist een bepaalde input in CREM variabelen – ook van andere stakeholders – om de campusmanager in staat te stellen zijn gegevens te vergelijken met vergelijkbare projecten, ook van andere universiteiten. Het is belangrijk om expliciet te zijn over de veronderstelde bijdrage aan de performance van de universiteit (ex ante) en om beslissingen te evalueren in de tijd (ex post). Daarvoor heeft de campusmanager wederom referenties nodig.

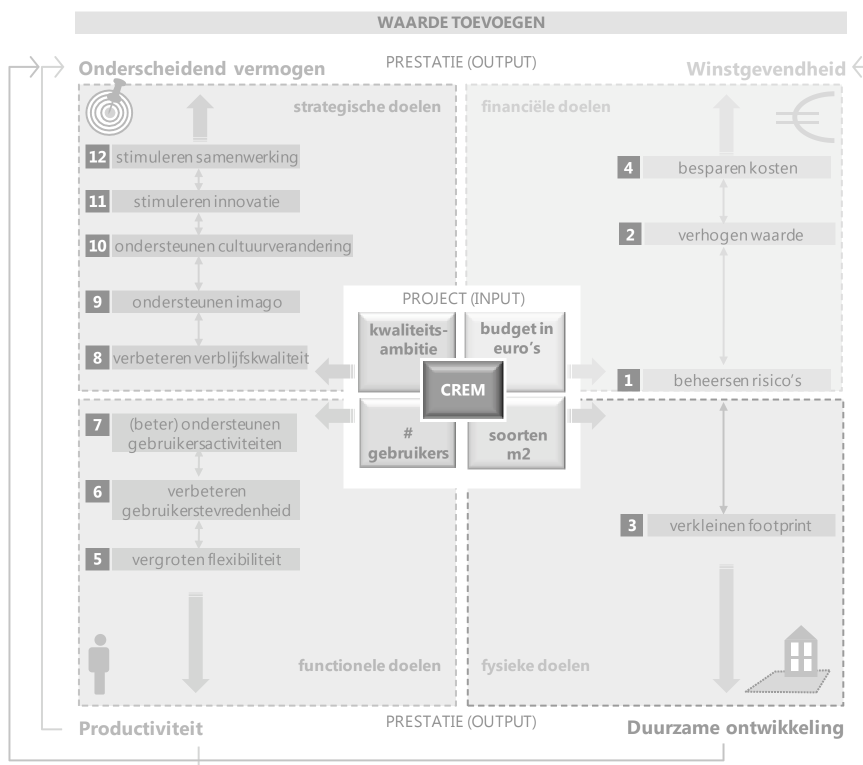
Sinds 2005 hebben de Nederlandse campus managers gegevens verstrekt voor een project database. Anno 2010 bevat de database 39 projecten van verschillende soorten projecten (zie appendix II). De resulterende database van campusprojecten is een bron van managementinformatie geworden, niet alleen de gegevens van soortgelijke projecten, maar ook om het ruimtegebruik van onderwijsgebouwen te kunnen vergelijken of een realistischer inschatting te kunnen maken van het investeringsniveau van nieuwe laboratoria. De beschikbare informatie genereert input voor de onderbouwingen van toekomstmodellen, investeringsplanningen en campusstrategieën.



Figuur v: toekomstmodellen worden samengesteld door te bepalen wat te delen – gebruik, management en/of eigendom – en met wie, op welke organisatorisch niveau en op welke fysieke schaal

Een nieuwe inventarisatie van de projecten is gepland in 2011, bij voorkeur met projecten ter illustratie van de huidige trends, zoals de implementatie van duurzame concepten en nieuwe concepten voor de academische werkplek. Met meer projecten kan meer managementinformatie worden gegenereerd over actuele ruimtenormen en bijbehorende investeringsniveaus, ook gerelateerd aan kwaliteitsambities. Ook zullen er meer evaluaties worden toegevoegd van de reeds in de database opgenomen projecten. Voorbeeldvragen zijn: in welke mate zijn de eerder gestelde doelen bereikt, in welke mate is het gebouw gebruikt als gepland, hoe tevreden zijn de beleidsmakers over de effectiviteit van nieuwe concepten en hoe tevreden zijn de gebruikers? Het proces van het toevoegen van waarde met een campusproject is geïllustreerd in figuur vi. Dit kan worden gebruikt als een hulpmiddel om een project te definiëren en bij het maken van een business case waarbij de input wordt vergeleken met de vermoedelijke output. Onderlegger is het CREM model met de verschillende perspectieven, elk gekoppeld aan een van de prestatiecriteria van een universiteit: de productiviteit, het onderscheidend vermogen (de concurrentiepositie), de winstgevendheid en de duurzame ontwikkeling.

Figuur vi: een model voor het bepalen van de toegevoegde waarde – voor het definiëren van campusprojecten (ex ante) en voor de evaluatie van campusbeslissingen uit het verleden (ex post); de pijlen tussen de twaalf manieren voor 'het toevoegen van waarde' kunnen verschillend zijn voor elk project.



Conclusies van deel B

Het proces van campusmanagement heeft betrekking op alle vier de taken die beschreven zijn in de vier hoofdstukken van deel B, hoewel niet per se beginnend met taak 1 'het onderzoeken van de huidige campus'. In de praktijk beginnen veel processen met taak 4 'het uitwerken van projecten': een faculteit vraagt meer ruimte, een nieuw laboratorium is nodig om gelijke tred te houden met internationaal onderzoek, een gebouw is in slechte staat en moet worden opgeknapt of gerenoveerd. Echter, de meeste campus managers erkennen dat deze projecten moeten worden beoordeeld in relatie tot de veranderende vraag (taak 2) en nieuwe visies op de campus (taak 3). Het uitwerken van projecten betekent ook dat ze moeten worden beoordeeld op hun bijdrage aan het toekomstmodel waarop de universiteit stuurt.

De meeste campusmanagers concluderen dan ook dat het uitwerken van projecten managementinformatie vraagt over de huidige campus (taak 1), veranderende vraag (taak 2) en modellen van de toekomstige campus (taak 3) in dezelfde CREM variabelen. Dit benadrukt ook het cyclische karakter van het managementproces en de behoefte aan informatie over dezelfde KPI's in elke stap.

Deel C - "Conclusies en aanbevelingen"

De laatste twee hoofdstukken behandelen wat de inzichten uit deel B kunnen toevoegen aan bestaande theorieën, managementinformatie, tools en strategieën voor campusmanagement. Ook verkennen deze hoofdstukken in hoeverre deze inzichten ook kunnen worden gegeneraliseerd naar vastgoedmanagement in het algemeen.

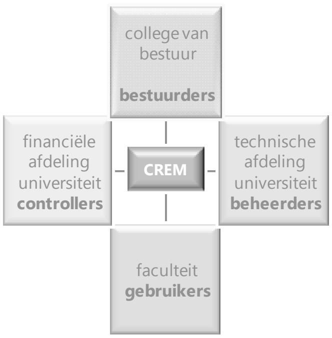
Hoofdstuk 8 "Managementinformatie en tools voor campusbeslissingen"

C1 Welke inzichten uit de praktijk kunnen worden toegevoegd aan de theorie voor campus management?

De resultaten van deel B laten zien dat campusmanagement in de praktijk gebaat is bij meer 'evidence-based' managementinformatie over de (veronderstelde) toegevoegde waarde van vastgoed op de prestaties van de universiteit. De referenties op campus- en projectniveau bieden daarvoor een eerste aanzet. Inzichten over zowel de universitaire prestatiecriteria als de twaalf manieren om daaraan bij te dragen zijn weergegeven in figuur vi. Dit bouwt voort op eerder onderzoek, waarin de hiërarchie van 'het toevoegen van waarde' is gekoppeld aan de prestatiecriteria. Dit onderzoek voegt de koppeling aan de stakeholders toe en legt een relatie met duurzame ontwikkeling, onder andere via het reduceren van de (ecologische) footprint. Het model kan worden gebruikt om af te wegen welke effecten een (voorgenomen) ingreep op de campus heeft. De weging van de prestatiecriteria speelt vanzelfsprekend een rol bij het belang dat aan elk van de elementen worden gehecht.

Uit analyses van de Nederlandse casestudies en internationale literatuur over campusmanagement blijkt dat het CREM model met de vier stakeholders enkele lagen heeft. Vanuit de oorspronkelijke versie op organisatieniveau, met de interne bestuurders, controllers, gebruikers en technisch managers kan worden uitgezoomd naar het niveau van de stedelijke omgeving met de publieke en private partijen die bijvoorbeeld op kennisstadniveau meebeslissen over de campus. Omgekeerd beslissen stakeholders binnen de universiteit ook mee over de stedelijke omgeving. Inzoomend naar het niveau van de faculteit of afdeling zijn er vergelijkbare stakeholders betrokken, wat geillustreerd wordt in figuur viii. Het generieke karakter van de stakeholders in het CREM-model – ook op stadsniveau – impliceert dat dit gelaagde karakter ook bij andere soorten

Figuur vii: de input vanuit de perspectieven van de vier CREM stakeholders is niet alleen gunstig voor managementinformatie, maar ook voor de vertegenwoordigers binnen projectteams, op alle niveaus van de besluitvorming over de campus.



vastgoedeigenaren relevant is in de besluitvorming. Figuur viii toont de lagen van de belanghebbenden die relevant zijn voor campusmanagement, afgeleid uit de literatuur en de internationale praktijk en erkend door de Nederlandse campusmanagers.

Conform de informatiebehoefte bij campusprojecten zal de multi-stakeholder benadering zich ook uiten in de organisatorische vorm die nodig is om te beslissen over de campus. Elk projectteam behoeft vertegenwoordigers (of mandaten van) alle CREM stakeholders. Met complexe campusprojecten die bijvoorbeeld de stad betrekken kan dit model ook extra lagen hebben. Deze projectteams kunnen actief zijn bij alle taken van campusmanagement: het onderzoeken van de huidige campus (vanuit verschillende perspectieven), het verkennen van de veranderende vraag (brainstormen over de eisen van de universiteit van de toekomst), het genereren van verschillende campus modellen en definiëren van projecten.

De inzichten uit de praktijk voor campus management kunnen worden samengevat door de volgende uitspraken, reflecterend op de drie veronderstellingen in de introductie die bevestigd worden door de praktijk.

- Campusmanagement vereist een multi-stakeholder benadering.
- 'Multi-stakeholder informatie' verbetert campusmanagement door bij te dragen aan beter verantwoorde campusbeslissingen.
- Dit onderzoek biedt universiteiten tools, modellen en informatie die de complexiteit van de multi-stakeholder benadering ondersteunen.

Op basis van de resultaten van dit onderzoek kunnen daarnaast de volgende conclusies worden getrokken:

1. Het campusmanagementproces kan worden georganiseerd in vier belangrijke taken: (1) het onderzoeken van de huidige campus, (2) het verkennen van de veranderende vraag, (3) het genereren van toekomstige modellen en (4) het uitwerken van projecten om de campus te transformeren.
2. Deze vier taken vormen een cyclus, zowel te gebruiken als een planningscyclus (ex ante) en als een evaluatiecyclus (ex post) voor projecten en strategieën.
3. Voor de meeste KPI's is nog meer evidence-based managementinformatie nodig, met name over de toegevoegde waarde van nieuwe functionele concepten en campusmodellen.

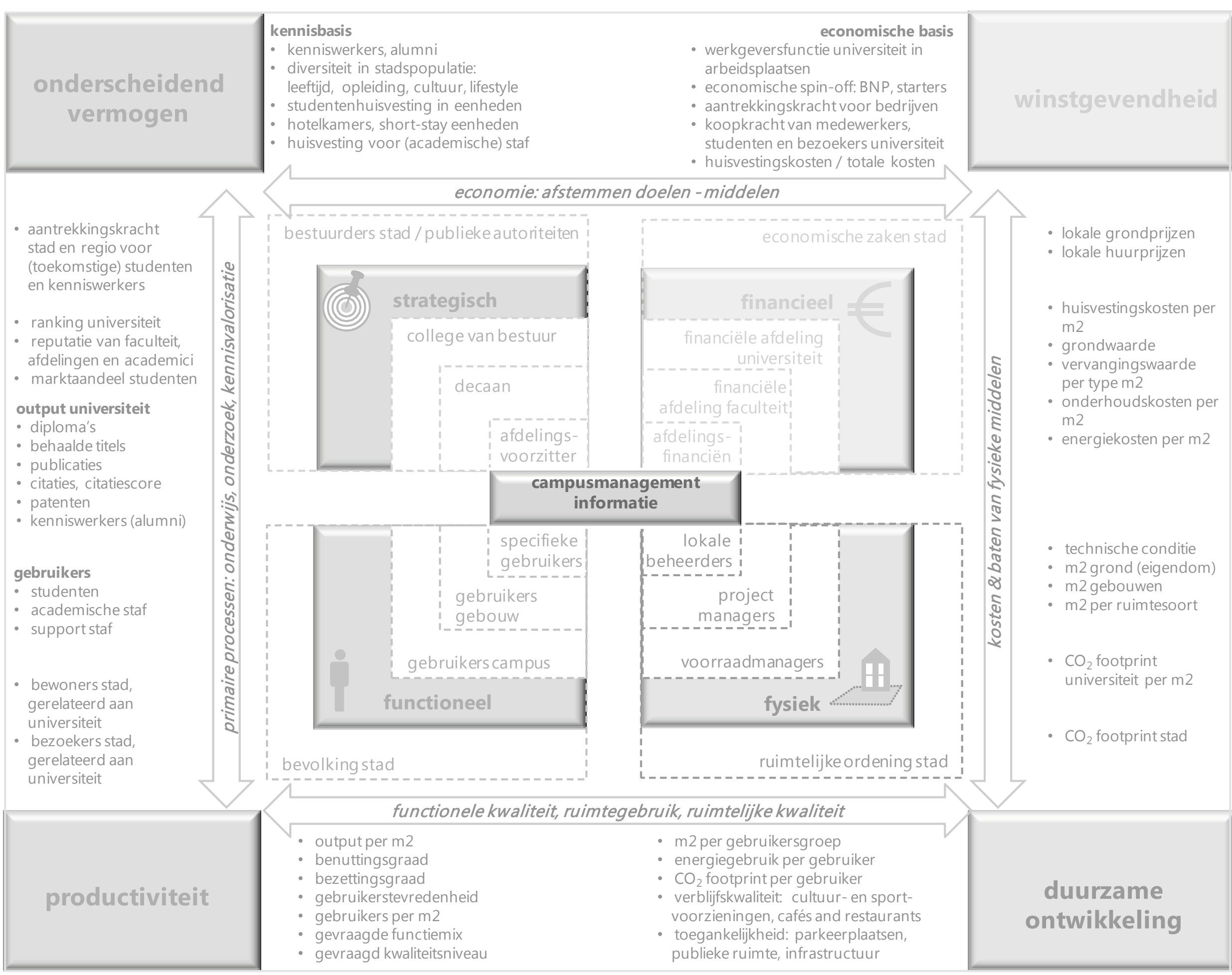
Voor het beantwoorden van de volgende onderzoeksvraag is een overzicht gemaakt van de vereiste managementinformatie voor campusbeslissingen.

C2 Welke informatie - geleverd door databases en tools - kan campusmanagement ondersteunen, in Nederland en daarbuiten?

De prestatiecriteria winstgevendheid, productiviteit, onderscheidend vermogen en duurzame ontwikkeling zijn vertaald in KPI's en variabelen die daarvoor verzameld moeten worden. Figuur viii geeft een overzicht van de campusmanagementinformatie. Deze managementinformatie is de basis voor tools en databases, zoals de campusdatabase in appendix I en de projectendatabase in appendix II. Hoewel de managementinformatie in figuur viii is toegepast op de campus, moet uit verder onderzoek blijken in hoeverre de stakeholderperspectieven en prestatiecriteria kunnen worden toegepast op vastgoedmanagement in het algemeen. Praktijkbevindingen over het genereren van managementinformatie zijn hieronder opgesomd:

4. De meeste benodigde managementinformatie richt zich op de relatie tussen vastgoedbeslissingen (input) en prestaties (output), het operationaliseren van ‘toegevoegde waarde’
5. Het model om de toegevoegde waarde van vastgoedbeslissingen te kunnen verantwoorden kan worden gebruikt ‘ex ante’, voor business cases van voorgestelde projecten of ‘ex post’, om projecten achteraf te evalueren.
6. Twaalf manieren voor het toevoegen van waarde (figuur VI) zijn gerelateerd aan de vier CREM perspectieven en bijbehorende prestatiecriteria.
7. Campusmanagement omvat verschillende schaalniveaus (stad, de campus, gebouw), inclusief bijbehorende stakeholders binnen en buiten de universiteit en hun prestatiecriteria.
8. Bij campusbeslissingen moet de input vanuit de vier CREM perspectieven (kwaliteitsambities en doelen, euro’s, m^2 en gebruikers) worden gerelateerd aan de output van de universiteit, uitgedrukt in KPI’s die gerelateerd zijn aan de prestatiecriteria.
9. Campusmanagementtheorie voorziet in een definitiekader voor de KPI’s dat kan dienen voor benchmarking.
10. Het is nuttig om gezamenlijk data te verzamelen en te delen in een groter netwerk van universiteiten, omdat professionele netwerken van campus managers al veel ervaring hebben met benchmarking.

Figuur viii: key performance indicators (KPIs) voor campusmanagement, samengevat en gekoppeld aan vier prestatiecriteria en CREM perspectieven



HOOFDSTUK 9 "Strategische keuzes voor de campus van de toekomst"

C3 Wat zijn de strategische keuzes voor de campus van de toekomst?

De strategische keuzes waarmee de universiteiten worden geconfronteerd zijn afgeleid van twaalf trends op de huidige campus, van recente projecten, uit de campusstrategieën, toekomstmodellen en internationale literatuur.

- Minder ruimte voor individueel territorium en meer ruimte om te delen.
- Kwantiteit voor kwaliteit - naar minder vloeroppervlak, intensiever gebruikt, met meer kwaliteit.
- De plaatsonafhankelijkheid van de activiteiten op de campus en de vrijheid om dan op de meest betekenisvolle plek te kunnen werken of studeren, op alle schaalniveaus.
- Nieuw leven voor oude, historische gebouwen - de herwaardering van de oude in plaats van het creëren van de nieuwe, eveneens gekoppeld aan duurzaamheidsdoelstellingen en 'kwantiteit voor kwaliteit'.
- Vermindering van de ecologische footprint van de universiteit - het goede voorbeeld voor een nieuwe generatie.

- De campus is steeds meer een stad:
  - Strategisch: de campus is uitgegroeid tot een marktplaats voor kennis;
  - Financieel: de campus moet met een hogere vloerproductiviteit de hogere exploitatiekosten dekken – wat pleit voor meer gebruikers en bijbehorende productie op minder oppervlak
  - Fysiek: minder private ruimte (individueel territorium) en meer publieke ruimte (te delen met anderen);
  - Functioneel: minder mono-functionele en meer multi-functionele ruimte, ook om intensiever ruimtegebruik te bevorderen.

- De campus wordt (steeds meer) gebruikt voor branding van de universiteit, zeker in relatie tot de eerdergenoemde plaatsonafhankelijkheid en het belang van betekenisvolle plekken voor het aantrekken en behouden van studenten en kenniswerkers.
- Partners in het hoger onderwijs en gerelateerde bedrijven zijn steeds meer bereid om ruimte, managementtaken en eigendom te delen, mede veroorzaakt door minder gunstige economische omstandigheden en de duurzaamheidsdoelstellingen.
- Beschikbare studentenhuisvesting – zeker voor internationale studenten – is van vitaal belang voor het concurrentievoordeel van de universiteit.
- Gerelateerde bedrijven zijn steeds belangrijker voor de valorisatie, innovatie en flexibele inzet van bedrijfsmiddelen – inclusief personeel en huisvesting.
- Retail & leisure is belangrijk voor het creëren van een levendige campus – ook als deze geïntegreerd is in de stad, als vitale basis voor een succesvolle kennisstad en om de internationale populatie een thuisbasis te kunnen bieden, in combinatie met de studentenhuisvesting.
- Infrastructuur moet alle functies verbinden en wordt door meer nadruk op de publieke ruimte een steeds belangrijkere opgave, ook om de bereikbaarheid te waarborgen.

In lijn met de campusmanagementbenadering vanuit de vier stakeholders moeten alle strategische keuzes worden verantwoord aan de hand van het gecombineerde effect op de universitaire prestatiecriteria: onderscheidend vermogen (concurrentievoordeel), winstgevendheid, productiviteit en duurzaamheid doelen. Sommige van deze strategische keuzes hebben betrekking op de hele campus, sommige zijn gerelateerd aan specifieke typen gebouwen of vereiste functies.

Alle strategische keuzes zijn met elkaar verbonden: de conditie van de gebouwen, het streven naar een kleinere footprint, de universiteitsdoelen, het zo goed mogelijk ondersteunen van de gebruikers en de financiële middelen die daarmee gemoeid zijn. De referenties op campus- en projectniveau kunnen helpen in de onderbouwing van vastgoedbeslissingen: ze zijn de basis van een meer expliciete en meetbare afweging. De appendices I en II tonen vele voorbeelden die kunnen worden gebruikt als managementinformatie om deze strategische beslissingen te ondersteunen.

Echter, voor elke strategische keuze of campusbeslissing is het belangrijk om een business case te maken, expliciet te zijn over de baten en lasten, met behulp van de key performance indicators (KPI's), en om te bepalen of de baten opwegen tegen de lasten.

Tot slot zijn alle aanbevelingen van dit onderzoek samengevat in tien punten:

1. Maak een selectie van de universitaire modellen (ABCD) die zich van elkaar onderscheiden op de volgende punten: concurrentie versus samenwerking, exclusieve versus medegebruik, groot versus klein, open versus gesloten en fysiek of virtueel. Deze modellen zijn te combineren voor verschillende onderdelen van de universiteit.
2. Ontwikkelen en beheer de campus als een stad - in nauwe samenwerking met de stedelijke autoriteiten, de lokale bevolking en de regionale bedrijvigheid.
3. Etaleer universitaire waarden in private en publieke ruimte – ook het laten zien van de resultaten van onderwijs en onderzoek draagt bij tot 'community building'.
4. Heroverweeg de oude gebouwen voordat nieuwe worden overwogen – intensiever gebruik van betekenisvolle gebouwen kan de relatief hogere exploitatiekosten dekken.
5. Verminder de ecologische footprint ten gunste van de kwaliteit, schaarse (financiële) middelen en duurzame ontwikkeling.

Overweeg gedeeld gebruik, eigendom en management van de campus van de toekomst:

6. voor academische functies - onderwijs en onderzoek – en de bijbehorende ondersteunende functies;
7. voor gerelateerde bedrijvigheid: incubators, spin-offs van de universiteit, aan onderwijs en onderzoek gerelateerde partners, al of niet in science parks;
8. voor woonfuncties, zoals studentenhuisvesting, short-stay faciliteiten en hotels voor (internationale) studenten en hoogleraren;
9. voor retail & leisure functies - restaurants, (espresso) bars, culturele en sportvoorzieningen;
10. voor infrastructuur functies, zoals openbaar vervoer en parkeervoorzieningen, maar ook bereikbaarheid voor voetgangers en de publieke ruimte.

Beantwoording van de centrale onderzoeksvraag

Dit onderzoek levert een reeks van conceptuele modellen, tools en databases ter ondersteuning van campus management, als antwoord op de centrale onderzoeksvraag. De besluitvorming over de campus is gebaat bij managementinformatie over de key performance indicators (KPI's) vanuit verschillende perspectieven. Deze KPI's zijn afgeleid van de prestatiecriteria productiviteit, winstgevendheid, onderscheidend vermogen en duurzame ontwikkeling. Dit zijn prestatiecriteria die ook door andere publieke en private organisaties met grote vastgoedvoorraden worden herkend. Nader onderzoek zou de toepasbaarheid van de resultaten op deze organisaties kunnen verkennen.

Verder onderzoek naar campusmanagement kan zich ook richten op het verzamelen van meer referenties, op basis van verbeterde definities, kaders en instrumenten. Dit kan samen met andere netwerken van universiteiten en campusmanagers, bijvoorbeeld in Europees verband, maar ook in samenwerking met andere sectoren met soortgelijke vastgoedportefeuilles of managementvraagstukken. Niet om meer informatie te genereren, maar om meer betrouwbare en vergelijkbare gegevens te verzamelen voor beslissingen over de campus van de toekomst, die vandaag moeten worden genomen.

Curriculum Vitae

Alexandra den Heijer was born in The Hague on March 13, 1970. She completed secondary education (VWO, Dalton Scholengemeenschap, Den Haag) in 1988 with a beta profile. She started studying Mathematics at Delft University of Technology, but switched to Architecture in the first year. She liked the broad, more applied character of the Architecture curriculum and chose a Master track that represented the management perspective on the built environment - the former equivalent of the current Real Estate & Housing track. Still drawn to the more rational and quantitative side of decision-making, she graduated combining real estate management, project management and building informatics in her Master thesis "Space management at universities of applied sciences". She got her Master of Science degree at the Faculty of Architecture in 1994.

The goal to generate more decision-support information for real estate interventions or design choices was the leading motive of the next steps in both her academic and professional career. From the start she has wanted to combine being an assistant professor at Delft University of Technology with activities in practice. Her contributions as a co-author of the book "Vastgoed Financieel" (1995-1997) about the financial perspective on real estate, the many economical courses and lectures for practitioners (1995-1999) and her work for the Government Building Agency (1996-1999) are all examples of knowledge exchange between the academic and professional world. On top of that, she played a leading role in coordinating urban development courses (1995-2002) and has supervised the Master theses of more than a hundred-and-fifty graduate students from 1995.

Given that her Master thesis was applied to higher education, she has stayed connected to that sector since the nineties. The first step was extending her graduation project with consultancy work (ICS Adviseurs, 1993-1995). In 2000 she reinforced that connection by starting the first of many research projects for the collective Dutch universities (HOI network of Dutch campus managers). In the past ten years (2000-2010) she has written many reports, articles and papers about managing the university campus. Since 2005 she gradually shifted her focus to knowledge cities – together with Habiforum and Hogeschool Inholland – and to the sustainable campus, in close collaboration with Agentschap NL and associations of higher education institutions (HBO raad and VSNU). All research results culminated in this book.

After the fire of the Architecture building in May 2008, she was a member of the BK city project organization, chairing the brief team, translating the faculty policy into innovative concepts in a team with professors and experts from practice. This project gave her the opportunity to implement and test some of her ideas about (managing) the campus of the future. About the process and result she wrote many publications and gave more than fifty presentations for various groups from national and international universities and practice (2008-2011). The insights of this project can also be found in this book.

Anno 2011 she still cherishes the combination of theory and practice in her work. Since 2009 she is a member of the supervisory board of DUWO, the largest student housing association in the Netherlands. Because of her research specialization she is often consulted about campus management issues by national and international universities. With an academic basis at Delft University of Technology she is planning to expand the international knowledge network on campus management in the next years.