Managing the University Campus

Measuring the maturity level of campus management

AR3R030	**Graduation thesis**
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PREFACE

This thesis presents a research concerning the topic of managing the university campus. This thesis is developed during one academic year started on September 2014, within the master track of the department of Real Estate & Housing in the Architecture, Urbanism & Building Sciences programme at Delft University of Technology. This topic of this research arose from the gap in knowledge about the maturity level of campus management, especially in a different context (international). The aim is to explore the factors which influence the performance of university assets, and how to measure their maturity level of campus management by developing a maturity model. This tool will support decision making in campus management, and support institutions in creating added value with their assets.

This graduation research will focus on developing an assessment tool, which can be used to measure the maturity of campus management of an institution, and how this shows in their assets (performance). This developed model will be tested on a case in China, in order to understand more about the applicability of the tool in a different context, and at the same time explore the situation in China. The goal of this research is to create a measurement tool which can be used in other cases, to understand their situation by a (quick)scan.

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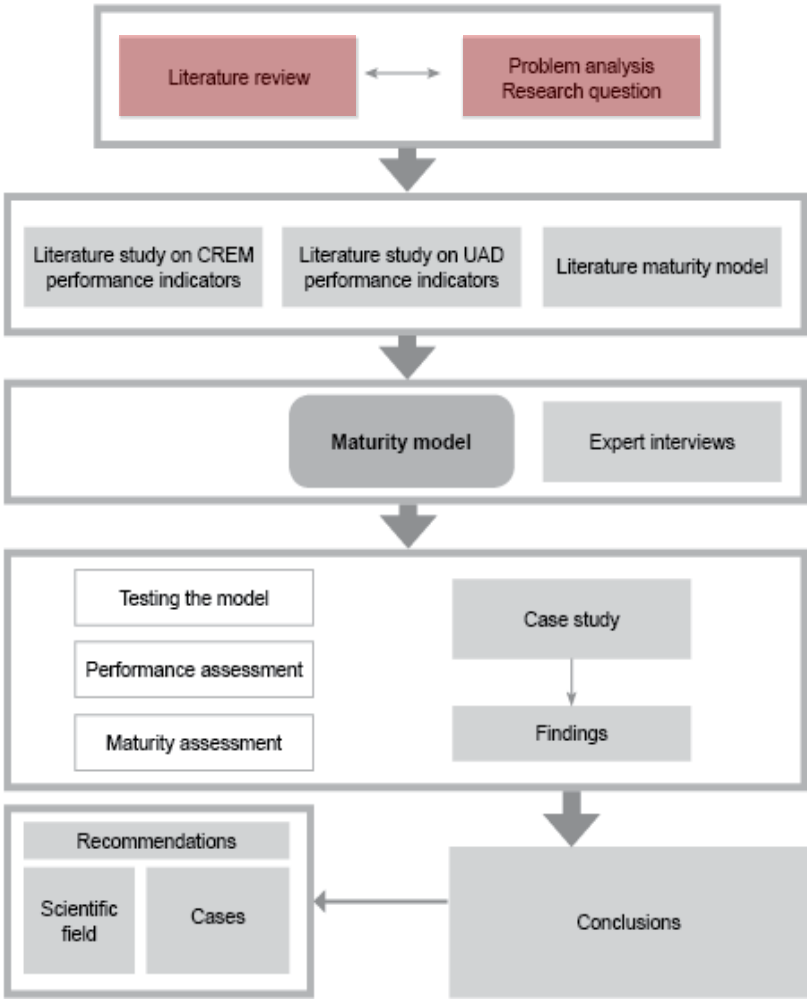
Chapter 1

Research introduction

In this chapter the purpose of the topic is explained. The development of a maturity model as an assessment tool is needed to understand the current state of campus management.



1. INTRODUCTION

This graduation research is derived from a personal interest of the Chinese context of universities. Because little is known about the strategic campus management in China, in comparison with Western countries, I want to explore this field. The research is two-fold; First it is important to explain about the problems which China is facing concerning the higher education sector. Second, because the graduation research needs an academic focus, there will be a focus on real estate management. This graduation research will focus on developing an assessment tool, which can be used to measure the maturity of strategic management of an institution, and how this shows in their assets (performance). This developed model will be tested on a case in China, in order to understand more about their situation. The aim of this research is the possibility to use this 'tool' in other cases, and conduct a (quick)scan.

1.1 PROBLEM STATEMENT

MATURITY OF CAMPUS MANAGEMENT

The main function of university Institutions is to produce human capital and providing students and staff with a helpful environment that will enhance their learning, and becoming more creative. It is for institutions a challenging task to match demand with their assets. Resources have to be put for the right use to update the portfolio to changing demand, now and in the future. An efficient application of these resources will prevent a drain on available funds. Campus management is therefore essential to create added value. Campus management is part of strategic management in the organization. Strategic thinking helps an institution to anticipate on future changes in demand, and how to match this demand with the assets. Strategic thinking is related to the different steps in the DAS-frame (Designing an accommodation strategy) (De Jonge, 2008):

1. determining the current match: "what we need" versus "what we have"
   Assessing the current portfolio to determine the current match, from the perspectives of the stakeholders and demand derived from the current primary processes
2. "what we (might) need in the future" versus "what we have now"
   Exploring changing demand and determining the future match between current portfolio and future demand, derived from the changing primary processes- based on the changing context and the changing goals of the stakeholders
3. weigh and select alternatives for "what we should or could have"
   Generating future models designing alternatives for the portfolio of the future, based on assumptions in changing demand
4. step-by-step plan: plan of approach for the transformation of the portfolio
   How to transform current supply into the future supply

These could also be referred to as steps or management tasks in an iterative process of finding the match that has the highest added value. In order to match the supply with the demand it is necessary to know the condition of the current supply. That is why an assessment tool is needed to assess the maturity in campus management of an institution, and how this is related to the physical outcome (performance). This is why this research will focus on developing an assessment tool which can measure the level of maturity in campus management. Such a ruler does not (yet) exist. This tool can help institutions to determine their mismatches, now and in the future, and support decision-making. The current existing assessment tool is

based on the ranking system, which measures the quality of learning and teaching, the international outlook, the research output and influence and the industry income (Amity-University, 2014), but not on the strategic campus management level and their performance in terms of functional, financial, physical and strategic perspective.
Maturity is also difficult to measure in different contexts, such as Asia (Musa, 2012), Africa (Njungbwen & Udo, 2011) where information is difficult to find and where the term Corporate Real Estate Management is unknown. This supports the reason to develop such a tool to map down the situation in a different context.

PERFORMANCE LEVEL

Measuring the maturity level of an institution is two-fold. An institution can *claim* they have a high level of campus management, based on the assessment. But does it show as *evidence* in the outcome of their institution? This is where the tool will also test the institution on physical evidence. In order to understand the campus management it is important to know what the mission and goals are of universities. What determines the performance of an institution? Den Heijer determined the 'key performance indicators' (2011) which affect the performance of a university. These performance indicators are from the perspective of productivity, profitability, competitive advantage and sustainable development on building level. This research wants to explore more factors which can complement the list on building level and urban level, but also in a different context. These factors are the factors which will be assessed in the maturity model.

***Problem statement**:*
No clear assessment method for measuring the performance of a university and their level of maturity in campus management, which can support their decision-making.

Not only on building level, but also on urban scale.

1.2 OBJECTIVES

The objective of this thesis is to developing a 'ruler' which can assess the maturity of campus management and the performance of an institution, which can be used in other cases. This developed model will be tested on applicability and limitations. This tool will help institutions to understand their current level of campus management, and supports decision-making to reach a certain goal. Furthermore, the tool will be two-fold: There will be an applicability for cases in which data is hard to collect or time-consuming, this will be the quick-scan list of variables. The extensive list will contain all the variables affecting the performance of the performance and belongs to cases where data collecting is more time-consuming, but also possibly easier to collect (due to e.g. of distance).

The academic objective of this research is focused on improving campus management. By managing existing assets and potential future assets effectively across their life cycle, added value will be created by matching the vision and mission of the institutions. Improvement of campus management will enhance competitiveness and attractiveness of the campus by matching (new)demand with (current)supply.
CREM has proven to be successful in other organization areas such as hospitality and industry, but very limited in practice and implementation in educational institutions, especially in a non-western context. By

developing a tool which can be used in a different context, awareness can be created by introducing the concept of CREM, which could result in positive effects when implementing the tool and help them to support decision-making.

1.3 RESEARCH QUESTIONS

How can the maturity level of campus management of a university be determined in order to create added value in terms of performance [1], and support decision-making?

1) How can the level of maturity of a university be determined (strategic thinking)?

- Development of the maturity model, based on existing literature.
- What levels in the model can be determined?

2) What determines the performance of a university?

- What components can be determined in the model related to the discipline of Corporate Real Estate Management?
- What components can be determined in the model related to the discipline of Urban Area Development?
    - Relation city development (urban planning) with campus development
    - Urban factors which influences the performance of a university

3) Testing the model: a case in Hong Kong (The Chinese University in Hong Kong)
a Dutch case (FMVG TU Delft)

- Measuring the level of maturity and the physical outcome
- Developing a quick-scan list and extensive list of variables by placing the variables towards the time and energy needed to collect the data and the importance of variables
- What is the level of maturity in strategic thinking of the higher education institution using the developed model (in 1) as assessment tool?
- How do these strategies show in actual physical evidence in the assets?

3) Conclusion & Discussion

- How is the validity, credibility, reliability, feasibility of this model?
    - What improvements are recommended?
- Case: What advise can be given for the case to add value on area and building level to support institutional goals (based on the SWOT-analysis as result from the test)?

Goal:
Developing a tool to assess the maturity of campus management: This tool assesses the current level of campus management, and the actual outcome on physical level (evidence). This tool can support decision making to improve campus management.

Test the applicability of the maturity model by looking at an organization in the Netherlands, and on a case in China;
SWOT-analysis to understand what should be improved in order to add value with their assets.

1.4 TARGET GROUP

CREM is 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 (Jensen, Voordt, & Coenen, 2012, p. 182). In order to determine what added value real estate can create it is necessary to have insight of the interests of the involved stakeholders. These are set up in a power-interest matrix(Ambrosini, Johnson, & Scholes, 1998, p. 153). The stakeholders are divided in the four perspectives according to the DAS frame(Jonge, 2008, p. 19): the policy makers, controllers, technical managers and users. The stakeholders with a focus on the university are the policy makers (director, government) and the users (employees/students). The stakeholders with a focus on real estate are the controllers (asset managers) and the technical managers (facility/ maintenance manager).

	Stakeholder	Objectives	Variables	Influence on strategy
Policy makers	Board of directors	Improving quality of place Supporting image Supporting culture Stimulating innovation Stimulating collaboration Reducing costs Branding Security	Occupancy costs per office Operating costs per office Image Security level	Control over strategy, formulating goals, decisions, mission Flexibility in managing the portfolio
	Government	Rules and regulations for campus development Quality of education Improving competitiveness city	Taxes Policy Education fee	Regulation Restrictions on RE strategy
Controllers	Public controller	Maximizing efficiency Increasing real estate value Reducing costs	Cash flow	Control over cash flow
	Asset manager	Maximizing value of real estate Reducing asset costs	Occupancy costs/m2 Operating costs/m2 Energy costs/m2 Footprint/m2	Control over RE Control over amount of space Implement flexibility
Technical management	Maintenance manager	Reducing maintenance costs Improving performance building Controlling risk Reducing footprint	Performance indoor climate building Location Logistics Technical adaptability	Technical innovation (indoor climate) to improve performance

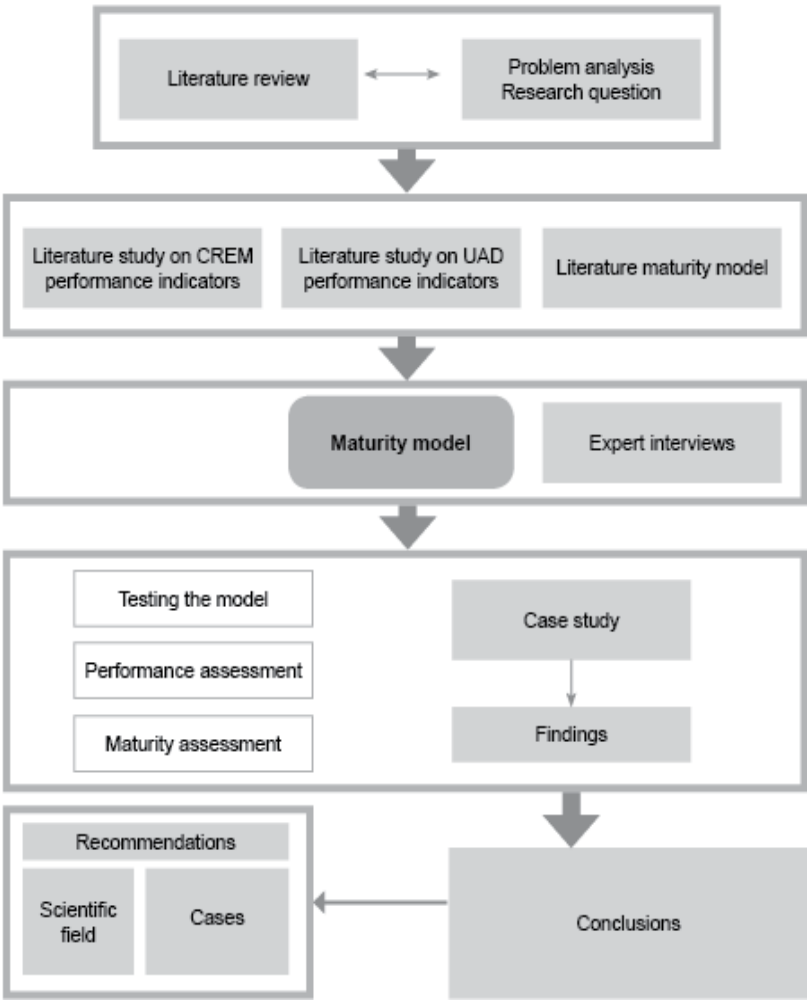
	Facility manager	Improving efficiency Workplace innovation Employee satisfaction Location, image, indoor climate, logistics, accessibility Controlling risk Reducing footprint	Image Satisfaction employees Efficiency of building in terms of logistics, accessibility	Workspace innovation Study place innovation Implement flexibility
Users	Employees	Good working environment Flexible working environment Good indoor climate Good accessibility (location, distance) Possibility to work as efficient as possible Increasing user satisfaction Supporting user activities	Performance indoor climate of building Distance to office Quality of location, facilities, environment	Workspace innovation Flexibility in working space, and way of working
	Students	Good working environment Study places Good indoor climate Good accessibility (location, distance) Facilities (housing, sport, hospitality, recreative) Increasing flexibility Increasing user satisfaction Supporting user activities	Performance indoor climate Number of facilities Accessibility	Satisfaction Workspace innovation

Table 1: Objectives involved stakeholders

Chapter 2

Research design

In this chapter the design of the research is explained. The methodology, the type of research, the sources, the timeline and expected results will be described.



2. RESEARCH DESIGN

This chapter will explain about the research design and the methods which will be used in the research. First the timeline of the research will be explained and the different products which will be derived from the results of each phase. Second the research methods to answer each sub-question will be explained. This chapter focuses on the case study and the case study selection, but also the plan on how to conduct qualitative research through interviews. Third, the method of data collection will also be explained, and which resources and tools will be used to collect the information. Lastly the planning and expected results will be described.

2.1 RESEARCH DESIGN

The graduation research is divided in different phases. In each phase there will be a different focus on gathering information relating to the case.

P1 In this phase existing literature will be consulted in order to state the problem. This is actually the research proposal including its research questions, relevance of the research, methods and research design.

P2-3 Theoretical framework: The research will start with a literature review in order to answer the sub questions relating to the theory of what components in the disciplines of REM and UAD determine the performance of an institution. Furthermore, literature concerning on how to develop a maturity model is consulted.

P3-P4 The maturity model will be developed in order to assess the level of strategic thinking and the actual implementation of strategies on building level. The components which are of influence on the performance of an institution will be tested with expert interviews, to optimize the maturity model. Furthermore, these factors will be placed into the different levels of the model.

P4-P5 In this phase there the maturity model will be tested on a case in China. 1)Because the goal of the research is to create understanding of CREM in Chinese institutions and their performance and 2)To test the applicability of the model, and to test if the model can be used in (international) cases. The case is selected based on similar governance, management structure and status so the findings gained from this research could be generalized to a bigger sample (China).

The result of this phase is to formulize an advise on case level consisting of a SWOT-analysis and points where they can improve their management.

The result in academic level is a tool which can function as a measurement tool to assess the maturity of CREM and the evidence on building level (performance)

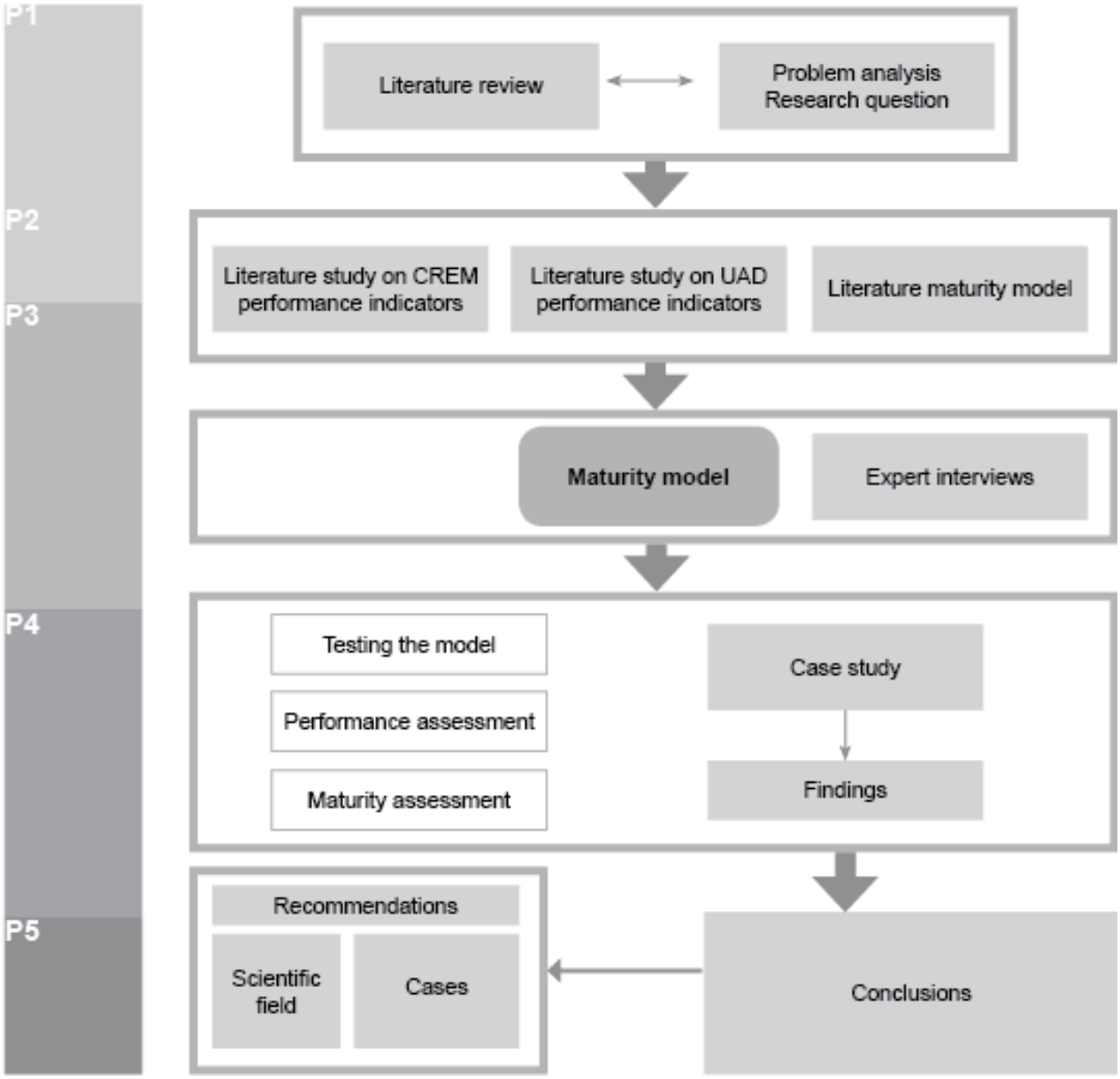


Figure 1: Research design in phases

2.2 RESEARCH FRAMEWORK

The research will involve the development of an assessment tool, which functions as a ruler for the performance of an institution. In order to identify the components which are of influence on the performance and thus the competitive advantage of a university, a literature review will be done.

Variables with impact on the performance of a university				
Variable	Set A (object/ person)	Set B values	Method	Explanation
Urban factors	Literature Experts in academic field	Performance indicators related to campus development	Journals, books, reports Expert interviews (FMVG TU Delft)	The urban factors which are of influence on the performance of an institution, factors which add value on the performance
Physical factors	Literature Experts in academic field	Performance indicators related to the real estate assets	Journals, books, reports Expert interviews (FMVG TU Delft)	The physical factors which are of influence on the performance of an institution, factors which add value on the performance
Management factors	Literature Experts in academic field	Strategic management factors related to gaining competitive advantage	Journals, books, report Expert interviews (FMVG TU Delft)	Management of (financial) resources Management of assets Strategic thinking (goal focus) Future focus, awareness

2.3 CONCEPTUAL MODEL

The campus management is divided in managing the campus area and the management of the buildings. The performance of a university is dependent on the strategic management of an institution, and the outcome in the physical component. The management factors are related to the quality assurance of the environment, but also the services of the university. It concerns the management of resources, and how this is used (financial and physcial management of the assets), but also strategically which is related to mission and goal focus. The physcial factors which influences the performance, and thus the competitive advantage of an institution are related to the physcial outcome of the strategies conducted by the university. These are shown in the quality of the campus area in terms of accessibility, mobility, infrastructure, attractiveness and safety. The building factors are shown by the quality of the building and facilities, the comfort level, the condition, the footprint.

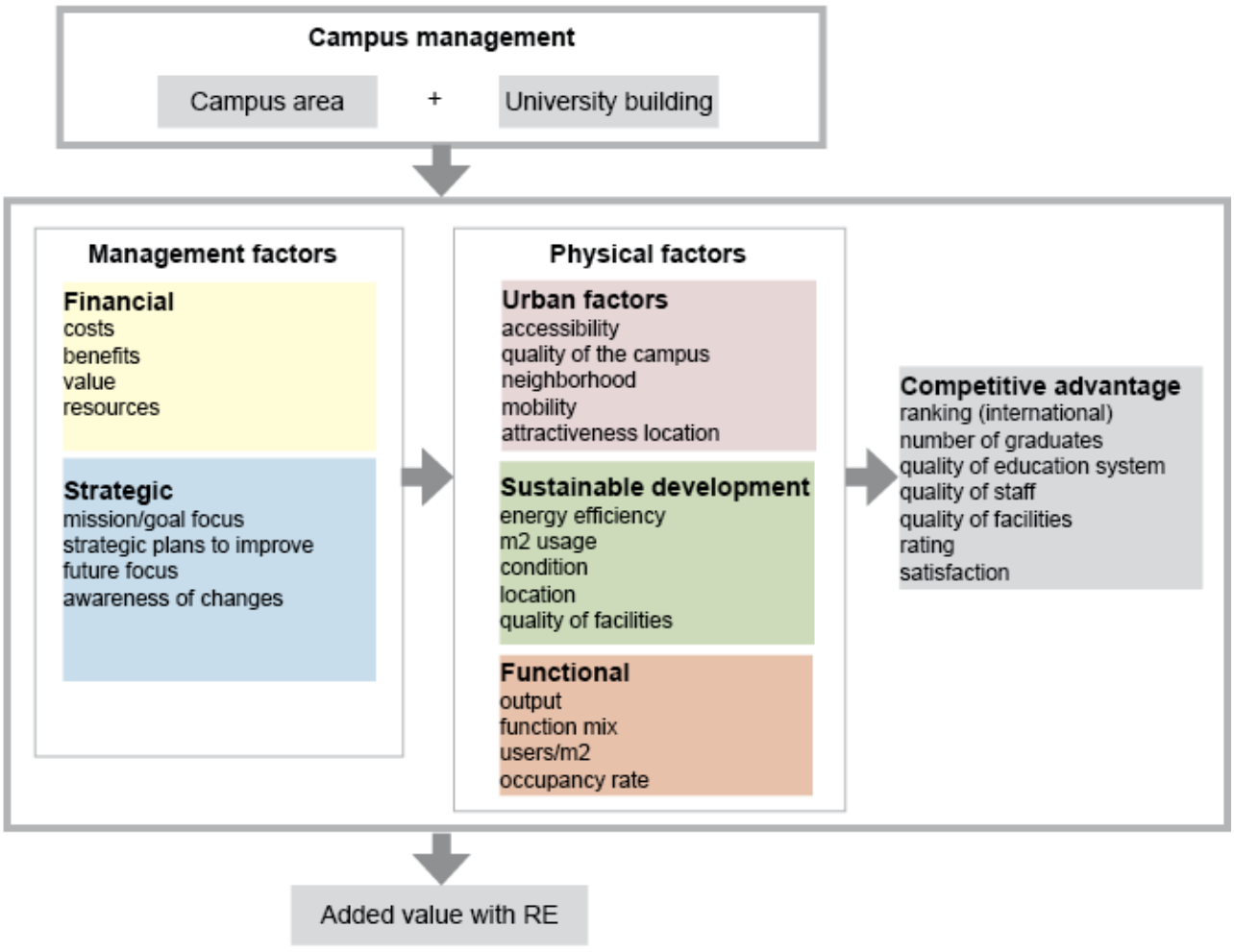


Figure 2: Research design in phases

2.4 METHODOLOGY

LITERATURE REVIEW

- Literature will be used to determine the factors of management and urban development which influence the performance of a university
- Existing literature will be consulted in order to state the problem in China relating to the campus management
- Existing literature about CREM and UAD will be reviewed and a maturity model will be developed in order to assess the performance of the Chinese universities. In this maturity model the different levels will be distinguished in terms of maturity and implementation level of Corporate Real Estate Management, so that the universities can be categorized in these levels.

CASE STUDY APPROACH

The method to of research is through a case study approach. A case study is an intensive study of a unit for the purpose of understanding a larger class of (similar) units, wherein a unit connotes a spatially bounded phenomenon observed at a single point in time or over some delimited period of time (John Gerring, 2004). Based on these similarities a *generalization* of the findings to the whole portfolio will be possible when doing research on a selected sample of cases. The focus is on the embeddedness of the case in its context.
The way of developing theories are in this research based on specific observations and thus inductive.

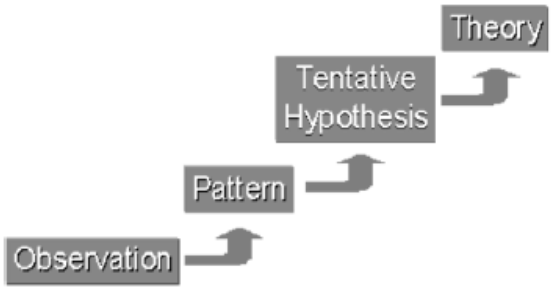


Figure 3: Inductive way of developing a theory theory (Van der Voordt, 2014, p. 20)

THE PLACE OF CASE STUDY IN THE WHOLE RESEARCH TIMELINE

1. First the tools to assess the performance of the universities will be developed based on existing theory. The key performance indicators of CREM and UAD will be used and placed into a categorization of five levels. This models is called the 'maturity model'.
2. The assessment tool will be used to assess the performance of the institution with its determined variables. In order to find the required information it is necessary to consult financial reports, yearly reports, statistics and information derived from interviews with certain people such as facility managers or policy makers of the institution.
3. A SWOT-analysis can be made for the selected institution, to understand on which facets the institution can be improved.

CASE SELECTION

Dutch case

The Dutch case is selected based on expertise and time management. The facility management of TU Delft will be consulted during the development of the maturity model. The variables which are obtained from

literature research will be questioned for importance and ranking the variables from 'key variable' to 'side info'. Furthermore the FMVG will be consulted in measuring the maturity of campus management of TU Delft as a case itself.

Hong Kong case

Hong Kong lies in the context of East-Asia, and is called a development state. The same goes for the other East-Asian countries such as Japan, South-Korea and Singapore. Characteristics of a developmental state are a relative state autonomy, with a powerful state bureaucracy, a weak and subordinated civil society, effective management of nonstate economic interests and repression, legitimacy and performance (Huff, Dewit, & Oughton, 2001, p. 712). They are also focused on continuous reputation building, are characterized by rapid economic growth, with a strong governance in collective providence such as infrastructure, education and housing.

A strong governance will have influence on the city development (how a city will look like) and thus also the campus development.

The selection of the case has been done carefully because the case should represent a larger population (J. Gerring & Seawright, 2008). The specific selection criteria:

- Universities with an international focus
- Universities with a focus on improving their competitive advantage
- Universities with a similar education system as Western countries (BSc, MCs, phD degree)
- Public universities
- Universities which appear in the world rank top 100 of Times higher Education 2014, since these rankings are based on an assessment of 5 components (Amity-University, 2014): international outlook, research, industry income, the learning environment and research influence)

Based on the criteria a test case from a different context (Hong Kong) will be selected. The case on which will be focused is The Chinese University of Hong Kong. The choice on this case is based on certain factors:

- Hong Kong was governed by England. The development of universities in Hong Kong are based on Western education (influence of England). Because Hong Kong is an example case for Chinese universities (influence of HK) (Yawei Chen, 2014), a pilot case in HK is for this reason generalizable to a bigger sample.
- Due to restrictions of data obtaining possibilities. A Hong Kong university is more accessible for foreign researchers because of the language barrier. The expectation is that they possess the knowledge of the English language more than the Chinese universities.

2.5 RESEARCH DESIGN OF THE MATURITY MODEL

The developed maturity model will consist of two parts: The part in where the maturity level of campus management can be determined, based on the *strategic thinking* of a university. This involve taking into account trends, but also being aware of their (current) state. The second part involves the actual implementation of all the strategic plans of the university, and how this shows in *evidence.* This part is to measure the actual effectiveness, which will be explained using the *performance indicators*.

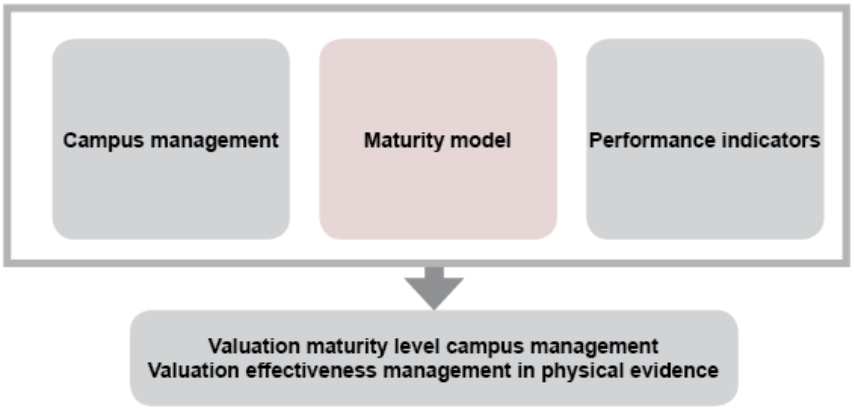


Figure 4: Research application of the maturity model

If we take for example the strategic component, which is determined by the level of innovation, level of goal focus and level of anticipating future trends, the model can be used to value the maturity level of campus management of a university. If the level of maturity for a certain university is high (level 4-5), this will show in physical evidence such as a high innovation level, a high goal focus coupled with clear strategies and plans. Their planning will show they take measures on anticipating the future, improving the current state of their assets to reach added value in the future. There is also a willingness of investing in for example sustainability, but also innovation.

ADDED VALUE OF THE CASE

The added value of the case can be derived in several purposes:

- Research and academic value: The goals of this research is to create a maturity model to assess the maturity level of campus management. The value of this model is that it can be used in further researches concerning a different case. This will help to create understanding in a different context. The developed model should be tested on applicability, validity and reliability, and this can be done by using the developed model to conduct a quick scan on a certain case. After this phase the model can be optimized for further use in the academic world.
- Social value: The model will to create understanding about new segments of unknown parts of the world, where CREM on university level is unknown. This thesis will first help to create understanding about the situation in China (Hong Kong) by conducting a quick scan. Based on this scan the performance level of this institution can be determined, next to their maturity level of campus management. Understanding the condition of the Chinese campus helps to support further decisions to benefit all the stakeholders. To create social value the key stakeholders are not only the users but also the city. A university can bring benefits to city level by attracting foreign students, enhancing the image of a city but also improving the competitiveness of a city.

2.6 QUALITY STANDARDS

A research has to deal with certain issues:
Reliability: The results of the research are repeatable, if the variables and context is kept the same. Then the research findings are consistent. It is possible that in different occasions the result will be different, for example by choosing another university outside the case selection criteria.
Validity: The conclusions generated through this research may be difficult to generalize, since there are a lot more factors than mentioned in the selection criteria, which will have influence on the results. The findings from one university cannot all be generalized to a larger population, but it is possible to give some statements. This will be taken into account in when formulizing the conclusion. In terms of validity of the tool, the tool can be used for other cases as well.
The validity of the theory obtained will take place through triangulation, which means that information is validated by two or more sources (by literature and expert interviews)
Credibility: The study is conducted objectively, but the data collected will be used to categorize in some order, which will be done with a subjective view of the researcher. Moreover, the data collected from facility managers may be not credible, when they tend to overpraise their university.
Applicability: The goal of this research is to develop an assessment tool which can be used for different cases. The model will be tested on a case in the Netherlands (FMVG) and in a case in China, where data is harder to collect.

2.7 DATA COLLECTION METHOD

LITERATURE

For the collection of literature different sources will be used. On-line sources which will be used are, googlescholar, sciencedirect, TUDelft library, scopus, springerlink, university website, educational websites (e.g. OECD)
Keywords: higher education, CRE, corporate real estate, education, globalization,
Other literature are books, articles, journals, reports

SEMI-STRUCTURED INTERVIEWS

For the collection of data concerning the factors which influence the performance of the universities expert-interviews will be used. This can take place with the facility management of TU Delft (FMVG). Questions concerning the performance indicators will be presented to them, and their opinion and extra suggestions will be used to revise the maturity model.
For the collection of information concerning the case, to test the model, digital interviews will be used in the form of open and closed questions emailed to the managing staff of the selected university. Also reports, statistics, journals are the most important resources of data.

INTERVIEW QUESTIONS

- Do you think that the physical campus in a university is seen as another resource to reach the institutional visions and goals, such as the development of the education and the positioning of the university among others?

- Integrate universities with the urban territory, responding to institutional goals?
- Do you think the governance and real estate policies established by universities and government makes it difficult to implement their plans?

2.8 EXPECTED RESULTS

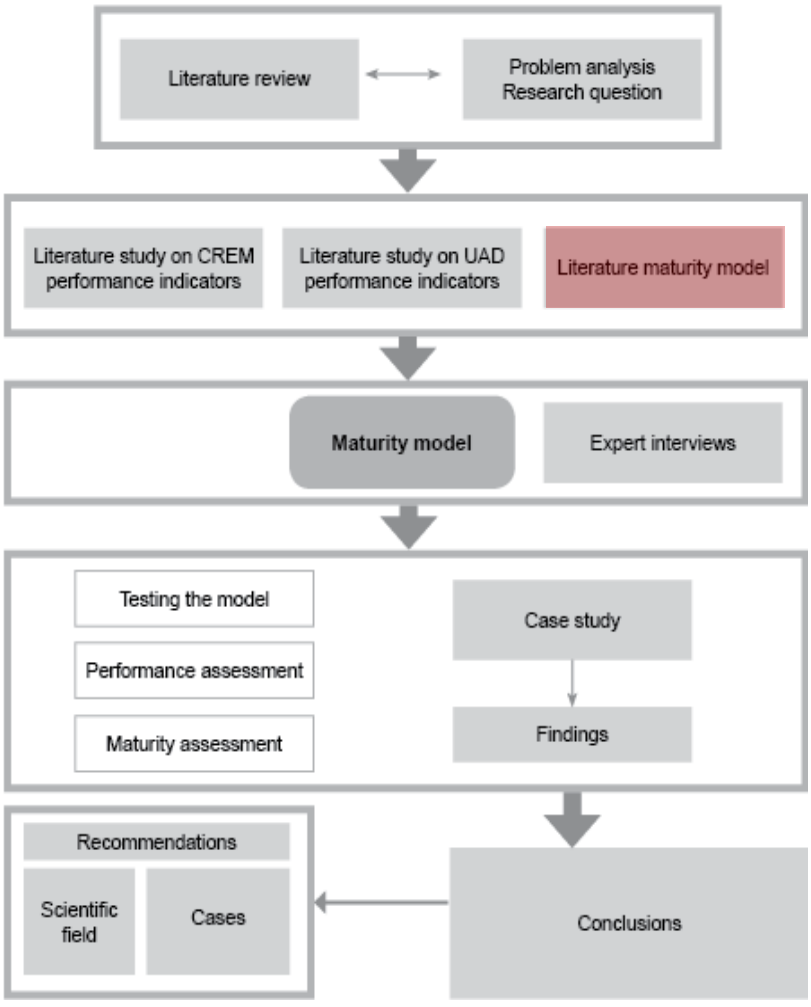
The result of the graduation research will be an assessment of the university campuses in East-Asia. For some campuses there will be an in-depth case study. Based on the conclusions of the assessment a comparison can be made with western countries. The expected findings for this research case are:

- The physical asset of Asian universities are not being used (enough) for institutional goals such as enhancing the competitiveness.
- Little awareness of the added value of CREM on university campuses
- Current assets does not match the current and future demands of students/employees/policy makers
- Demand will differ strongly from Western countries
- In relation to the urban development is expected that the city strategy is linked with the campus strategy in East-Asia. This strategy will differ from Western countries in terms of size and goals. For example, the maturity of campus development is in Asian countries quite recent, which makes it possible to develop a whole new university campus including its infrastructure and urban planning. In Western countries the universities descends from long history which makes the campus development more integrated into the existing urban structure (Yawei Chen, 2014).
- Governance will have strong impact on the city development and thus its campus development

Chapter 3

Theoretical framework: Maturity model

This chapter explains the theoretical framework concerning the setting up of a maturity model. Based on the variables the own maturity model will be developed and explained. The maturity model will be used to test on different cases (ch.6).



3. MATURITY LEVELS

3.1 THEORY MATURITY MODELS

MASLOW PYRAMID

The variables of the maturity model are based on the framework of campus management. In order to assess the campuses some levels of needs should be determined. The pyramid of Maslow is used in order to translate these needs to real estate needs (A. C. Den Heijer, 2011, p. 93).

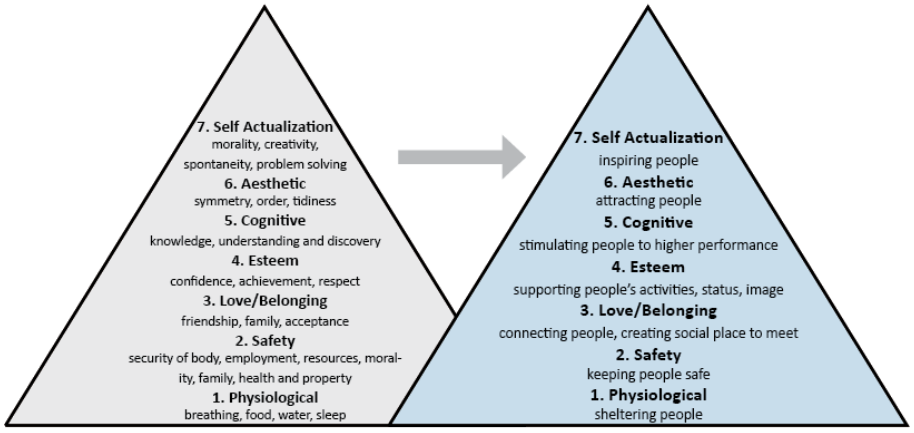


Figure 5: Maslow pyramid translated in real estate needs (A. C. Den Heijer, 2011) based on Van der Voordt

Based on this pyramid the needs for a university campus could be determined:

1. Basic needs: The need for shelter and safety. The building should provide protection against weather influences and serve the basic needs with providing facilities for food, sanitary use, climate regulation etc.
2. Esteem: all the basic needs + providing social places to meet and connect people and creating places which supports the activities of the students/employees.
3. Self-actualization & Enhancement: The working environment must facilitate opportunities for students/employees to develop their abilities as best they can. Stimulation of creativity, motivating, productivity, attracting people.

MATURITY MODEL

In order to assess the performance of the university it is important to range them in levels of maturity. First the tool to assess the performance of the universities will be developed. The key performance indicators of den Heijer will be used and placed into a categorization of five levels. This models is called the 'maturity model'. In order to determine the maturity of an institution existing literature is consulted.

Dounos and Bohoris (2009) suggested a combined use of the total quality management (TQM) principles and the key concepts of the CMMI for process improvement in higher education institutions. The CMMI (Capability Maturity Model Integrated)

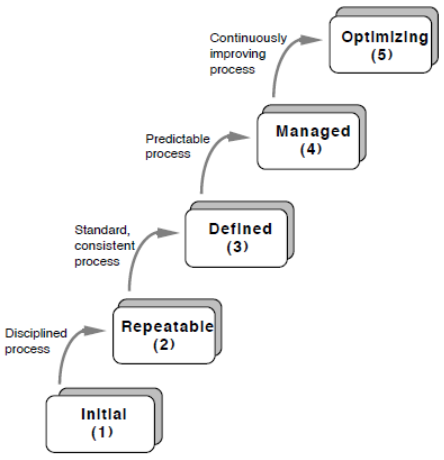


Figure 6 : The Five Levels of Process Maturity (Paulk, Curtis, Chrissis, & Weber, 1993, p. 8)

was developed by both the U.S. Department of Defence and Software Engineering. The model is worldwide used in 94 different countries to elevate performance, 12 national governments invest in CMMI to support economic development in their countries, and the model is translated in 10 different languages (CMMI-Institute, 2014).

The five maturity levels defined by Dounos and Bohoris are (2009, p. 6):

- 1st maturity level: The university environment is chaotic, unstable and unpredictable. The quality management system which supports the specific process is non-existent or does not work properly and the success of the process depends on the heroic efforts of the academic people who intuitively or self motivating manage to monitor the quality initiatives of the other academic institutions.
- 2nd maturity level: planning and implementation of the specific process, namely of the other academic institutions' best practice review, are based on previous experience of the academic authorities and process progress is tracked. The academic organisation through the establishment and incorporation of its policy and strategy into the important aspects of this specific process develops procedures to implement the process.
- 3rd maturity level: process is controlled systematically producing not only repeatable results through the implementation of its well documentation, which reviews successfully the best practices of other academic institutions, but also the necessary mechanisms to adopt the results of these reviews configuring the academic quality goals and educational priorities ensuring continuous competitive advantage of the institution against the others.
- 4th maturity level: level of the establishment of process measurement programmes. The development of a database system is used to store all the benchmarking process evaluation results which come from the specific benchmarking process statistic measures. These measures control the benchmarking process ability to meet its design requirements and the objectives of its use.
- 5th maturity level: common causes of benchmarking process variation are understandable meaning that the process can be changed statistically achieving the established quantitative process improvement objectives, reflecting best practice and also reflecting changing academic objectives. The main reasons of non-conformances of benchmarking process towards meeting certain academic quality goals are identified, analysed and successfully confronted.

Another focus of CRE Development in organizations is defined by Joroff.
The primary concern of CREM is the management of a corporation's real estate portfolio by aligning the portfolio and services to the needs of the core business (processes), in order to obtain maximum added value for the businesses and to contribute to the overall performance of the corporation (Dewulf, Krumm, & Jonge, 2000). Within CREM, Joroff defines five stages

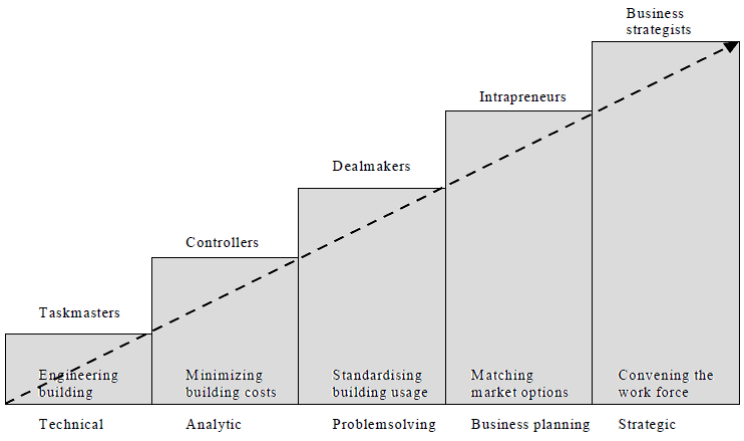


Figure 7: The Five stages of CRE Development (Joroff, Louargand, Lambert, & Becker, 1993)

of CRE Development (Joroff et al., 1993).
Joroff indicates that organizations undergo a transformation from a technical role to an added value on strategic level. This transformation can be divided in five stages of CRE competency shifts. The phase in which an organization falls, is an indicator for the added value of the business.

1. Taskmasters- Supply the corporation's physical space as required. The first phase has a technical focus, the specific task is to realise and maintain the building. The next stage can only be obtained when technical quality is satisfied.
2. Controllers- Satisfy need to better understand and minimize real estate costs. In this phase obtaining information about accommodation costs and controlling these costs stands central.
3. Dealmakers- solve real estate problems in ways that create financial value for business units. Offering optimal accommodation (organisational, financial and functionality) by connecting demand and supply. Create added value for the users of the building. The dealmaker is demand-focused, advising and proactive. Cost reduction by standardization and obtaining financial efficiency (financing and risk).
4. Intrapreneurs- operate as an internal real estate company, proposing real estate alternatives to the business units that match those of the firm's competitors. Realizing added value for the whole organization. Mostly the real estate organization has a separate division and is responsible for costs and benefits. Demand-driven, advising and proactive. Obtaining financial efficiency (financing and risk).
5. Business strategists- anticipate business trends, and monitor and measure their impacts. These units contribute to the value of the corporation as a whole by supporting the companies' core competencies with real estate strategies that optimize business results. Decision-making has a strategic nature. The strategist is demand-driven, shows leadership, is proactive and influences the business strategy extremely.

The five stage described above are cumulative rather than sequential.

Sustainability in corporate real estate management has been lately recognized as an integral part of almost every business. Ventovuori developed a generic sustainability maturity model for CREM based on research on 18 present sustainable CREM practices. The model demonstrates the value of implementing sustainable CREM. The sustainability stages demonstrated by Ventuvuori are (2014, p. 130):

1. Recognise & Minimum comply: The bottom line demonstrates the recognition of the added value of sustainability.
2. Plan & Initiate: Experimental phase. Environmental concerns will become more important.

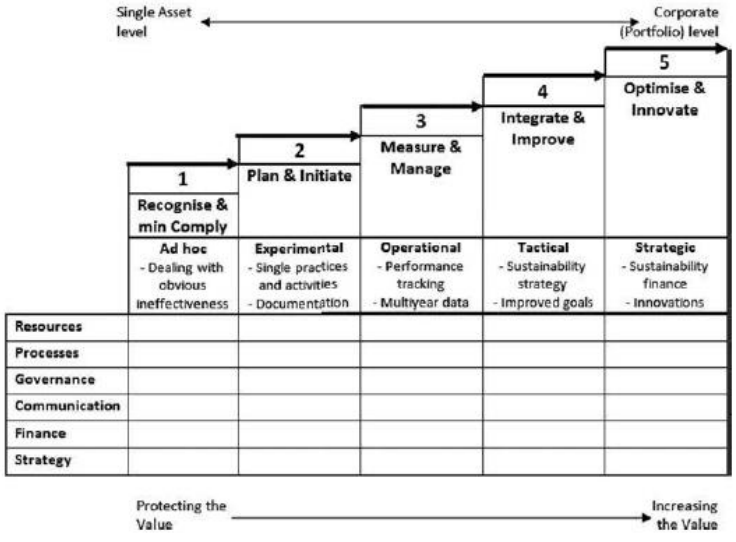


Figure 8: The Five stages of Sustainability (Ventovuori, Masalskyte, Andelin, & Sarasoja, 2014)

3. Measure & Manage: Operational- In the beginning, sustainability specialists are mostly motivated to implement new practices and take responsibility for that.
4. Integrate & Improve: Tactical level- Social aspects are included when a company strives for commitment and full responsibility. People will become committed to sustainability and the rest of the employees will engage as well.
5. Optimise & Innovate: At the highest level commitment refers to full awareness and responsibility of every single employee. Furthermore, innovations take place.

The findings are summarized in a matrix:

	CMMI (CMMI-Institute, 2014; Paulk et al., 1993)	CMMI combined with TQM (Dounos & Bohoris, 2009)	Joroff model (Joroff et al., 1993)	Sustainability model (Ventovuori et al., 2014)
1	Initial: No evidence/don't know	The university environment is chaotic, unstable and unpredictable	Taskmaster: technical focus, supply of physical space.	Recognise & Minimum comply
2	Repeatable: They have plans	Based on previous experience of the academic authorities and process progress is tracked. planning and implementation of the specific process	Controller: minimize real estate costs.	Plan & Initiate
3	Defined: On their way	Process is controlled, ensuring continuous competitive advantage of the institution	Dealmaker: create financial value, offering optimal accommodation by connecting demand and supply.	Measure & Manage
4	Managed: Close to good/acceptable	Control of the process to meet requirements and the objectives	Intrapreneur: proposing real estate alternatives to the business units that match those of the firm's competitors. Demand-driven, advising and proactive. Obtaining financial efficiency.	Integrate & Improve
5	Optimizing: Fully done/ future prospect	Reflecting best practice and also reflecting changing academic objectives	Business strategist: anticipate business trends, and monitor and measure their impacts. Demand-driven, shows leadership, is proactive and influences the business strategy.	Optimise & Innovate

Table 2: Summary of findings from theory

3.2 THE CAMPUS MANAGEMENT MATURITY MODEL

DAS FRAME

In order to develop the campus management maturity model, the literature concerning the theory of maturity models will be combined with the four campus management components (strategic, functional, financial and physical). The key indicators for measuring the maturity of campus management are related to the strategy of designing an accommodation by de H. de Jonge (2008)(see figure). In this strategy the different steps are explained through the thinking in strategic 'steps'. The key indicators are:

- Awareness
- Developing plans/strategies
- Exploration of future changes
- Anticipation on future changes
- Implementation level of plans/strategies

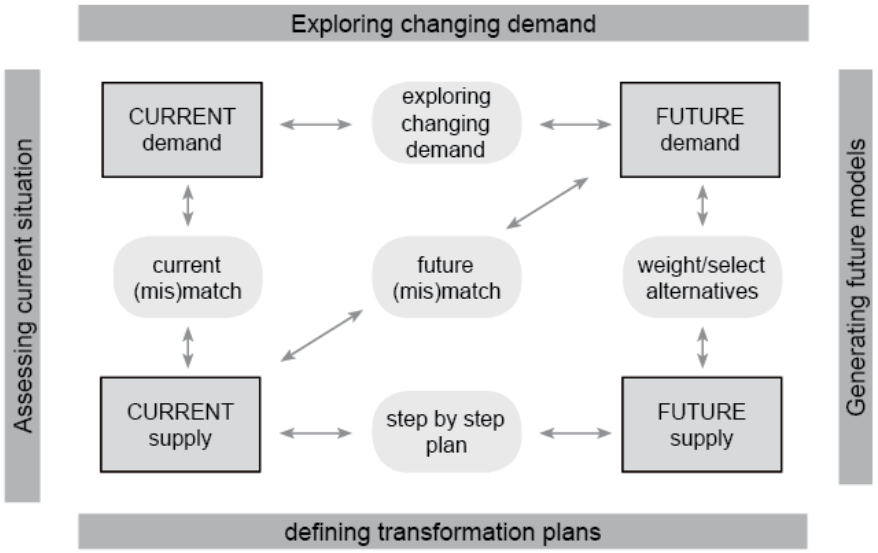


Figure 9: DAS-frame (De Jonge, 2008)

To link the different maturity levels with the DAS-frame the result will be:

Level 1= no awareness of current supply and demand
Level 2= awareness of current supply and problems= mismatch
Level 3= plans to improve current supply based on current demand
Level 4= awareness of future trends and changing demand
Level 5= step by step plan to implement, weighting and selecting of alternatives/ generation of future models

MATURITY LEVELS OF CAMPUS MANAGEMENT

In order to connect the different theory of maturity levels with the performance levels of university campuses, it is necessary to determine the characteristics of each level and connect these with the performance indicators. Assembling of the different components into the different levels:

1: Initial (No evidence, don't know): in this level we can assume that there is no significant evidence of strategic management on campus level. This will show in no competitive focus and only providing a campus on physical level, which is only the necessary square meters. Nevertheless, this level supports continuous operation in the institution, without focus on future changes. There is also none or little focus on the attractiveness of the campus and does not act as a 'campus city'.
2: Repeatable (They have plans): This levels indicates that there is awareness of the current state of their institution. They already facilitated the basic needs and have plans to improve their buildings and campuses in order to minimize costs on physical level and enhancing their competitiveness. This level has mostly their evidence on the management level, in which 'they have plans' but no physical evidence to prove it (yet).
3: Defined (On their way): There is a presence of a management team concerning the real estate (facility management). The plans they had in level 2 is now implemented. This level will show more physical evidence in ensuring their institutional goals. This is the starting phase of the implementation of their strategic management, so there is no evidence yet if there is actual improvement of the performance in order to support their goals. However, there is physical evidence in executing the plans, which will show in a higher focus on quality and attractiveness on the facilities/education/campus.
4: Managed (Close to good/ acceptable): Full implementation of the strategic plans. Proactive in new plans to support institutional goals. Evidence on physical level will show in good facilities, a sustainable building and reduced building costs. On managing level there is evidence to retain this state, and even new plans on how to improve this state.
5: Optimizing (Fully done/ future prospect): The strategic plans are fully complied and tested. Performance is maximized in current state. On management level the institution has awareness for future changes and trends and anticipation for this. On physical level there is evidence of implementation of these plans in premature state (testing phase).

The five levels defined in this paragraph will be further elaborated concerning the four different perspectives. The question on how to create added value, connected to the primary stakeholders and the performance indicators, will be elaborated.

3.3 ADDING VALUE ON ORGANISATIONAL LEVEL

The added value on campus management level is explained from the four different perspectives. The list varies from goals that focus on efficiency to goals that focus on effectiveness. Added value in campus management can be reached by connecting different stakeholder perspectives that confronts needs with costs and organisational goals with the physical consequences.

STRATEGIC PERSPECTIVE

The strategic management of a campus is determined by the level of goal focus and operational focus. The focus is directly linked to the competitive advantage of a university. The definition of competitive advantage was first described by Ansoff (1965, p. 79) as the properties of individual products/markets which will give the institution a strong competitive position. Added value can be achieved when an institution has a strong competitive position, which is linked to a high performance.

When an organization has no strategic focus at all, it typically only focuses on providing the space for the academic purpose. An institution which thinks beyond this, wants to improve their competitive advantage by achieving academic excellence, obtaining international reputation and status. This can be achieved by improving the quality of education, but also the buildings and campus. They have objectives to place themselves on the international ranking map. A better quality of the teachers and the courses provided will enhance the reputation of an institution. A high quality of facilities, buildings provided will support the activities and enhance user satisfaction. A high maturity level of strategic management is defined by high motivation, proactive and innovative vision of an institution. This also implies the use of new tools such as internationalisation, marketing and promotion for enhancing competitive advantage (Naidoo, 2010). Stimulating innovation such as sustainable concepts, introducing new ways of working on campus, making university buildings more suitable for external users, new office concepts to stimulate collaboration, to support the (changing) culture, or to improve the quality of place will bring added value on the university campus. At the same time it will enhance the efficiency by reducing costs and reducing the footprint (Jensen et al., 2012, p. 189).

A specific definition of the different levels of strategic management:

Level 1	no awareness of current supply and demand, there is no strategic, nor operational improvement focus. They are not aware of competitors, but also don't find that important
Level 2	awareness of their competitors, but no focus on competing.
Level 3	There is a 'campus vision'- plans to improve current supply based on current demand to ensure competitive advantage
Level 4	awareness of future trends and changing demand, proactive in competing with the competitors, and they want to stand out
Level 5	Generating future plans for continuous improvement. High level of innovation and goal focus.

FUNCTIONAL PERSPECTIVE

Management of the functional perspective by changing the quality and quantity of space to support the activities of users of the building aimed to enhance the productivity and output of students & staff per m². Campus decisions that aim to support primary processes more effectively, in order to improve the quality of products (publications, degrees, knowledge). Increasing the flexibility of the space will establish the possibility of multifunctional use of the space. Increasing the adaptability of the space will make space easily to transform the size or function of the space. A multifunctional use of space during the day, in which can function as different function, will enhance the productivity output/m2. It enables an institution to solve a problem in the real estate portfolio and to cope with changing demand and increase user satisfaction which will add to productivity and can also contribute to the competitive advantage of an organisation with satisfied users being (more) loyal to their employers (Jensen et al., 2012, p. 193).
A high maturity in management of the functional space is linked with a flexible use of space, but also controlling the quality of space, and measuring the satisfaction level of users. The occupancy rate will be monitored, because it can affect the satisfaction level of the user or reducing the productivity.

Level 1	no awareness of current state, and only focused on the required m2
Level 2	awareness of current supply and problems, they want to satisfy the basic technical needs of the users
Level 3	plans to connect the demand and supply
Level 4	They want to maximize output with and efficient use of m2, they are aware of changing trends
Level 5	Flexible functional space use, multifunctional use of space to maximize efficiency, generating new plans to anticipate on future trends (e-learning)

FINANCIAL PERSPECTIVE

Anheier (Anheier, 2005, p. 206) categorizes a university as a non-profit organization, with a mission of providing knowledge to the public. Whereby a profit-related organisation is focused on maximising profit, a university has broader goals and objectives and consequently, the planning and measurement of achievement is much more difficult. A non-profit organisation seeks to maximise utility. The core service of a university is education, which is named a preferred private good, which is mission-related but can be sold in private markets. A university can turn to the government and ask for grants for core funding, specific cost subsidies, preferential tax treatment. Next to the income of the education fee received from the services they provide, a non-profit organisation can achieve revenues through related businesses such as a bookstore or an in-house cafeteria.

The financial resources gained from the fees and related business need to be used to improve and update the current portfolio according to current and future changes in demands. An efficient application of the resources is necessary and if it not used and managed effectively the cost of these assets will be a drain on the available funds (Musa, 2012).
Key for this is to have a detailed overview of the costs of the institution and a financial planning which meets the organisations risk tolerances and available funds. The financial budget in any organisation is a key tool that assists strategic planning processes (Bhayat, Manuguerra, & Baldock, 2015). Budgeting is however complex and a challenging task which is affected by interest-conflicts.

Controlling financial risks (Jensen et al., 2012, p. 187) by adjusting the size and characteristics of the real estate portfolio following changes in the organisation. This will lower the chance of production loss.
Also, by reducing the overall costs (operational, personnel, real estate) there will be a higher production. The most obvious strategy is reducing the floor area.
An institution which is acquainted with budgeting has a higher maturity level in financial management.
Budget reserved for aiming to reaching goals instead of only providing the space for the core academic use.

Level 1	no awareness of current costs, and no financial plans to reduce costs, budget for required space
Level 2	awareness of current supply and problems= mismatch, budgeting plans,
Level 3	plans to improve current supply based on current demand, budget for improvement of competitive advantage (marketing), improving technical condition (energy label)
Level 4	awareness of future trends and changing demand, long-term financial planning (reducing footprint)
Level 5	step by step plan to implement, weighting and selecting of alternatives/ generation of future models

PHYSICAL PERSPECTIVE

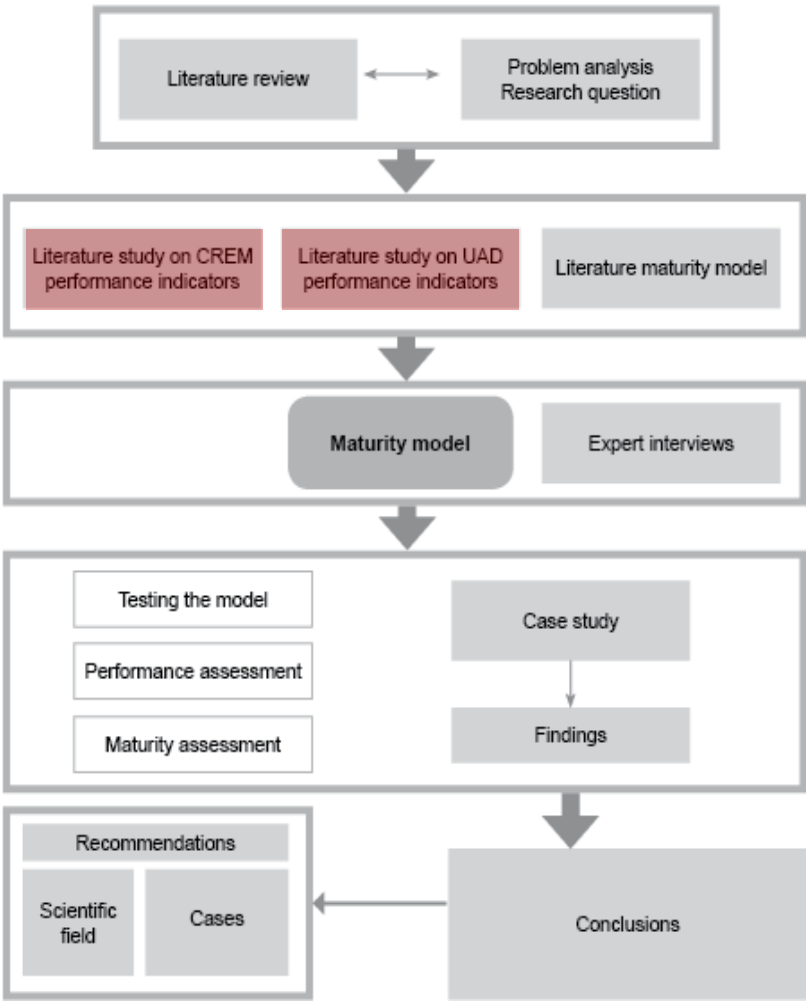
Physical management on building level is related to the technical aspects of a campus. Reducing the footprint is one of the goals of many universities, whereby in the future they want to own less floor area. The prospect for many universities the campus of the future is smaller than the current campus, adding to profitability goals by decreasing the costs. Reducing the footprint by reducing the CO_2-emission and 'greening' the campus adds to the sustainable goal as well. Maintaining the minimal quality level to allow user activities and by controlling technical risks that could hinder the primary activities.
The maturity in the physical management is determined by the awareness of the state, knowing the percentage of the campus which is in a (very) bad condition, can support further decisions such as improving the condition, or disposal of the asset. Creating strategies to reach these goals to add value starts with knowing the current state.

Level 1	The institution is not aware of the current technical state of the university and does not has goals for the future campus.
Level 2	They are aware of the current technical state of the institution and the problems. They have plans to improve the technical state of the building.
Level 3	The have explicit defined goals concerning the sustainable development of the campus, reducing the footprint. There is a presence of a 'campus vision'
Level 4	They have a future prospect of developing the campus of the future, and are aware of this changing demand.
Level 5	They have a strategy to encounter future changes in demand, and have alternative plans to meet this demand.

Chapter 4

Performance indicators

This chapter explains the variables which determines the performance of a university divided in four different perspectives of strategic, functional, financial and physical view. Furthermore, the indicators take form in two different scale levels, which is the building level and campus area level. A theoretical approach with the complementary management forms of Real Estate Management and Urban Development Management are aimed to improve the campus management.



4. THEORETICAL FRAMEWORK: PERFORMANCE INDICATORS

This chapter summarizes the major findings obtained through an in-depth literature study on the two complementary management forms of campus and area scale levels in which the real estate objects is positioned: Corporate Real Estate Management (CREM) and Urban Development Management (UDM).
The theoretical approach with the complementary use of the instruments provided by both research field are aimed to improve the campus management. This chapter will provide the variables which affects the campus performance from the building and urban level. This list will be tested on through expert interviews to make the list more accurate.

4.1 PERFORMANCE MEASUREMENT

The organizational performance of a real estate facility is measured by the difference between input and output, which means the management of resources and supporting user activities. Performance is the measurement that considers the success of a company and its activities. It provides the basis for an organisation to assess how well it is progressing towards its predetermined objectives, to identify areas of strengths and weaknesses, and to decide on future initiatives, aiming to improving organisational performance (Amaratung & Baldry, 2002).

Figure 10 shows the performance pyramid developed by Judson (1990) and adapted by Cross & Lynch (1992). The performance pyramid establishes a clear relationship between goal setting and measurement, between business strategies and implementation. Work teams focus on quality measures, whereas leadership teams focus on process or strategy. The hierarchical structure of the organization shows the focus on the different aspects of the performance. The policy makers for example focus on creating the strategies and the campus vision of the university, whereas the facility manager is the executing force of the implementation of the plans, or the advisor of these plans.

Figure 10: Performance pyramid (Cross & Lynch, 1992)

4.2 PERFORMANCE INDICATORS ON ASSET LEVEL

QUALITY OF FACILITIES

Musa & Ahmand explain the importance of the physical assets and their facilities on the teaching and learning environment. The maintenance, and innovation of physical assets and facilities are important to ensure quality and maintaining world standards, and to attract students, staff and internationals to the institutions. Since it is so cost intensive, it is a challenging job for higher education institutions to move towards a more effective process (Musa & Ahmand, 2012). The indicators are related to the quality level of the building (layout, flexibility, ability, comfort level, safety and health), to which extend the facilities supports core activities, level of user-friendly environment, maintenance level, global acceptability of facilities, environmental/ campus quality (safe& clean, hygiene, green). The findings of their research indicated that when the quality of the facilities is low, this will have effect on their productivity or the quality outcome of their work. Furthermore, an environment that is safe, clean and gives a sense of belonging and pride is needed to become a high level maintenance culture. The indicators described will help to improve the environment towards a more effective process. Maintenance, renewal and innovation determines the quality of these assets and facilities. Quality assurance of these facilities will ensure effective realisation of goals and objectives of universities (Musa & Ahmand, 2012, p. 473).

Variable	Effect on campus performance
Attractiveness campus	The aesthetics of the campus is important for the user, and if the attractiveness of the campus is low, this can show in decline in the user satisfaction.
Quality of facilities (layout, flexibility, ability, comfort level, safety and health)	The quality level affects the user satisfaction, which in turn will affect the attractiveness of the university campus. It affects the comfort level, the productivity of the user and the degree of support in activities.
Quality of campus (safety, clean, hygiene, green)	Affects the level of user satisfaction, and the attractiveness of the campus.
Level of maintenance	Affects the quality of the facilities, buildings and campus area.
Level of renewal and innovation	Affects the quality of the facilities, buildings and campus area. Innovation can improve the support in activities and enhance the productivity of the users.

Table 3: List of variables 'quality level of facilities'

KEY PERFORMANCE INDICATORS

The key performance indicators mentioned by Den Heijer (2011) are divided in four categories (strategic, functional, financial and physical component). The main variables which determine the performance are:

- *The functional perspective:* The key variable is number of users. For campus management on functional perspective it is important to determine the number of users per m² and the users output per m².
- *The financial perspective:* The key variable is money, measured in euro's. The financial costs are determined by the total income and costs of the institution and the real estate value.
- *The strategic perspective:* The key variable are goals. The strategic perspective influences the competitive advantage of an institution. The advantage is determined by the quality of education and teachers & courses and the user satisfaction.
- *The physical perspective:* The key variable of the physical perspective is m², floor area in gross floor area (gfa) and usable floor area (ufa). Besides the floor area, the technical condition of the building and the energy performance determines the physical perspective.

Variable	Effect on campus performance
Productivity	
Students & staff output	Citations, research contribution, research influence Affects the reputation/ranking
Space usage	Affects the productivity/m2, and thus the performance/m2
Profitability	
Total income & costs	A well-organized financial budget for the right use is more effective. Furthermore, more financial resources means more investing in goals= higher performance=better quality of the university
Real estate value	The real estate value does not have direct influence on the campus performance.
Competitive advantage	
Ranking	The ranking system can affect the choice of the student to enrol. Ranking is measured on certain variables such as quality of education, research output,
Quality of alumni	Affects the quality of education and the user satisfaction. Losing competitive advantage.
User satisfaction	Important for the reputation of the university. A bad user review can result in less enrolments, losing competitive advantage.
Quality of education	Affects the user satisfaction and the overall strategic performance of a university. Less enrolments, losing competitive advantage.
Sustainable development	
Energy efficiency	The energy efficiency affects the technical condition of the building, and thus the comfort level, health of the user. Furthermore, it affects the footprint of the building.
Technical condition	The technical condition affects the user satisfaction in terms of comfort & health. A bad technical condition will influence the energy efficiency negatively.

Table 4: List of variables 'Key performance indicators'

4.3 THE URBAN DIMENSION AND GOVERNANCE

KNOWLEDGE CITY, CAMPUS CITY

A university which is the source of producing and maintaining knowledge, skills and innovation plays a critical role in sustaining a cities' growth, and is key for the competitive advantage of a city. In order to sustain the growth and dynamism knowledge-based development is required (Y. Chen, 2014).

The knowledge economy is defined as following by Van Winden & Van den Berg (2007, p. 527):
"*The knowledge economy is regarded as a separate section of the economy, the one in which new (technological) knowledge is generated. It comprises advanced activities in science, technology and innovation. Central actors are universities and corporate research establishments that conduct fundamental or applied research. They produce the knowledge that ultimately leads to new products, production methods and productivity growth*."
When a city has an increased knowledge-intensity, this will show in economic progress and attracting more human resources and investments, creating high-level jobs and high growth rates and innovation levels.
The performance of nations and regions in the knowledge economy is typically measured in terms of patens, R&D spending and innovations. Other factors which are mentioned are the urban amenities and quality of life which is the key determinant to attract and retain talented people. This involves the cultural activities, amenities, an attractive built environment, high quality housing, attractive parks and surroundings, and high-quality schools which are determinants for the competitive advantage of a city.
Urban diversity is also an important feature of a city's performance: diversity of inhabitants and types of economic actors facilitates the interactions that generate new ideas. This can be measured by the diversity in terms of the percentage of the population who are of foreign descent.

Quality of life determines the choice of people to study in that place, so creating a campus with a sense of place with a relation to its hosting city has a positive impact on the competitive advantage of the university. With the increased (global) mobility of students, the quality of life has an almost equal weight as academic quality and rankings, when choosing a place to study (Studyportals, 2012)(see Appendix I). When a campus is separated from the city, it requires more resources such as residential, retail & leisure and infrastructure functions. This would involve creating a new campus city. The five main components which makes a campus a 'campus city' (A. Den Heijer & Tzovlas, 2014, p. 167):

- The academic component related to the education & research facilities: classrooms, libraries, offices, meeting rooms, laboratories, lecture halls, workshops, storage space, studios, study places, academic hospital, conference facilities
- The residential component is to housing: student housing, faculty housing, hotels, short stay housing, housing support staff, alumni housing
- Related business component: accommodation for start-ups, incubators, research institutes, service providers (catering, printing, cleaning, maintenance), other (higher) educational institutions
- Retail & Leisure: coffee bars, restaurants, cafes, bookshops, supermarket, theatres, cultural facilities, sports, day-care centres, student associations
- Infrastructure: public space, parking, bicycle paths, roads, public transport facilities. The most important feature of the infrastructure is accessibility, which involves the connectivity of a knowledge city: access to (international) airports, high-speed train, public transport and highways.

Variable	Effect on campus performance
Number of patents	Related to the research output and influence. Has a positive effect on the reputation of a university.
Amenities	Affects the attractiveness of a campus and its competitive advantage. Helps to enhance the quality of life.
Built environment	Affects the user satisfaction. A declining built environment is attached with a decreasing attractiveness of its campus.
Urban diversity	Diversity of inhabitants facilitates the interactions that generate new ideas. This has a positive effect on the creativity and diversity of a university. It is difficult to measure the direct influence of urban diversity on performance, which is why this is not a key variable.
Quality of housing	Has effect on the attractiveness of a campus. Especially for students who choose a campus based on the housing facilities. A good quality enhances the competitive advantage of a university.
Parks, public space	Affects the attractiveness of a campus and the user satisfaction. A bad maintained public space will represent decline.
Infrastructure *accessibility of campus* *public transport* *public space* *parking possibilities* *roads (pedestrian, bicycle)* *connectivity*	The infrastructural system is key for the accessibility and connectivity of the campus location. If the campus has good connections, there will be more enrolments from students who are living further away. It affects the competitive advantage of a university.

Table 5: List of variables 'Urban dimension'

THE STUDENT COMMUNITY

The study of Van den Berg & Russo focuses on the student cities in European cities and the strategic planning and management of these communities. These communities including its students could be the driving force for urban development and the potential that they offer. The findings from the nine case studies can be summarised in explaining the importance of diverse, versatile student communities, the enhancement of the quality of education facilities and to build a creative, learning city which will functions as a sustainable student city. A student-friendly city should include attractiveness of its campus and facilities, which assist the students in supporting their functioning and enhance productivity, it should include housing for students, the community should empower students, increase the opportunities of contact between students and other stakeholders and enhance the embeddedness of the university as a city. The last point is to keep the students linked to the city after the completion of studies in order to keep human capital in the city and benefit from their knowledge. Education programs are generally carried out within the building level. What remains important is that the urban dimension should not be neglected. Students are the citizens and the high-skilled working class of tomorrow, and are crucial in supporting the economy of cities or neighbourhoods. The urban dimension of education programs should be attractive, welcoming and managed locally. The exchange between cities and universities is an integral element of

urban planning. Local universities and other higher education and research centres become fundamental elements of the competitiveness of cities and regions (Van den Berg, Russo, & Lavanga, 2003, p. 3).

The human capital formed by the high-skilled working class contributes the city's performance and quality of life. This statement is supported by Y. Jiang (Jiang & Shen, 2010) where he determines the urban competitiveness factors in Chinese cities in his research. He indicates that the human capital of education and that the quality of higher education contributes to the competitiveness of a city. His theory is based on the assumption that a higher number of colleges/ graduates and a higher number of expenditure of local government on education has impact on the competitiveness of a Chinese city economically and socially.

SURROUNDING NEIGHBORHOOD AND CITY

Along with local government, universities contribute in multiple ways to modern urban society. A university is a source of knowledge-creation, revolutions in science and technology, centre of culture, the moral forces shaping the civilized society. Universities contribute to the economic health and physical landscape of cities, serving the urban economy and built environment (Perry & Wiewel, 2005, p. 3). A good example where a university contributes to the image of a city is the city of Bilbao. The successful shift from an industrial port city to a creative city is triggered by the investment in culture by the government. Together with the Guggenheim museum and three universities, these institutions contributed to the redevelopment of Bilbao, attracting many (foreign) students and tourists (Wang, Li, Wang, Qin, & Jin, 2014).

A university does not only affect the image of a neighbourhood, but is also a product which is affected by the relationship with the city and its surroundings. The strong belief of a 'university of the city' is seen as a community, removed from the chaos in the normal city, to produce knowledge and information. In the United States for example, they build campus environments (in cities) with an affinity with the purified, safe and calm life of suburbs (Perry & Wiewel, 2005). The state in which a university is related to a city is by all means dependent on the location of the institution (A. Den Heijer & Tzovlas, 2014). When a university is located outside the city, as described in the example, it is likely that they have a more 'calming' environment, in comparison of a university ín a city. A university which is located outside the city is more dependent on own amenities such as housing, related business, retail & leisure and infrastructure to stay connected to the city. A campus in a city includes retail & leisure, where a gated community is a campus in a city which has its own amenities. A university city is a city in where the campus buildings are spread in different buildings over the city, including their own amenities. The full list of campus types can be found in Appendix II.

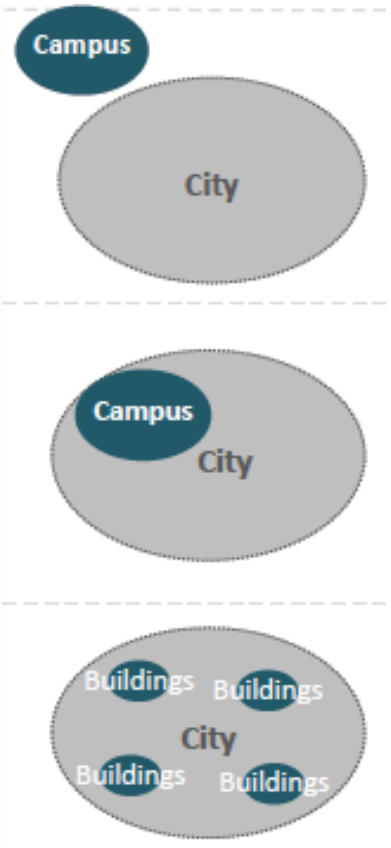


Figure 11: Location campus in relation to the city (A. Den Heijer & Tzovlas, 2014, p. 170)

The quality of the surrounding neighbourhood is also an important matter and is crucial for the attractiveness of a campus. When the surrounding neighbourhood is declining, the attractiveness of a university can be threatened. This is why a university cares for the quality of their surroundings. Safe

streets, good transportation, attractive housing choices are beneficial for gaining competitive advantage of the campus location.

POSITION OF THE UNIVERSITY IN URBAN DEVELOPMENT

University leaders are able to embed their institutional development agendas into large citywide redevelopment agendas based on the arts, entertainment, sports facilities, and tourism. University real estate development strategies that are closely linked to larger urban development agendas require leadership, planning and risk management. Public-private partnersships with citywide range of actors including private investors, federal agencies and municipal and state governments. The university uses it economic power and social influence to acquire property for needed facilities and to negotiate favourable development contracts for the expansion and redevelopment of the campus (Perry & Wiewel, 2005, p. 289). The position of a university is very important in terms of reaching their goals and mission concerning a crime-free, vital urban development, which enhances the quality of student life, and attracts top students and teachers. Because such a power position is not always applicable for most of the universities, this variable is not the determining factor for the performance level of an institution. A power position will only enhance the possibilities in reaching goals by putting influence on urban development and getting access to funding.

Variable	Effect on campus performance
Neighbourhood	Affects the attractiveness of the campus. A declining neighbourhood has a negative effect on the attractiveness of the university.
Location university in relation to city	The location of the university is determining the amenities it offers. It does not directly has influence on the performance of the university, but it is important to consider in what position the university is located before assessing the 'amenity-variable'.
Community	A community has positive effect on the university culture and image, but is a variable that is difficult to measure the effect on performance.
R&D and education spending	If the government spends a substantial amount on education, the university will have more resources to invest in reaching their goals, which means a higher performance.
Position of the university in urban development of a city (economic and social power)	The position can support a university in getting access to funding, and thus investing in their goals. This variable does not have direct influence on the performance.

Table 6: List of variables 'Urban dimension'

4.4 VARIABLES AND METHOD

In the literature study a list of variables is the result. This chapter will elaborate on the key variable list divided in the four perspectives of strategic, functional, financial and physical variables. This part contains the second part of the maturity model, which is providing the evidence on physical level. This 'evidence' is determined by the variable list that affects the performance of a campus. Each variable will be explained, complemented by the methods that can be used to obtain the information needed. Data concerning the urban factors can be done by an area analysis, which include analysing floor plans, but also conducting interviews or questionnaire with users of the campus. The data concerning the building level can be obtained through building floor plan analysis, interviews with the facility management and reading (annual) reports of the university.

Strategic variables

The quality of education is defined by the quality of the teachers and the courses provided by the university. The quality of education affects the performance of a university with an outcome of the quality of the human capital it provides. The method of measurement can be obtained through the international ranking system, where the quality of the institutions education quality is measured. Reviews of the university and courses can also be consulted. Other methods to determine the quality of education is to conduct interviews with the students, or using questionnaires. The objects of data collection lies in the users (the students) and documents containing reviews of the quality of courses and teachers.

The quality of facilities is defined by the attractiveness of the provided facilities of the university. It contains the comfort level, safety and health issues on user side. This data can be collected through questionnaires or interviews asking for the opinion of the users. The physical aspect of facility quality is based on the layout, the flexibility and ability of the floor plans of the buildings. This data can be collected through floor plan analysis, drawings and building reports.

Strategic component			
Variable	**Primary stakeholder**	**What to measure (values)**	**Method**
Quality of education *teachers* *courses*	policy makers users	user satisfaction degree of quality	objective data review reputation monitor
Quality of facilities *lecture rooms* *classrooms* *conference rooms* *libraries* *study places* *meeting places* *canteen/cafe* *shops*	policy makers user technical manager	user satisfaction attractiveness layout flexibility safety level comfort level health level	data analysis (report, review) building/floor plan analysis

Functional variables

The students & staff output is defined by the productivity of the university by its users. This contains the number of patents obtained, the research output (citations, journals, publications, diplomas) per m². The data concerning the output can be collected through annual reports from the university, other objective reviews about the university.

The space usage is defined by the amount of users per m² and the occupancy rate of the facilities. This data can be obtained through previous research reports concerning the space usage by the university themselves, or when this is not the case, conduct such a research yourself by observing the university. However, this method is very time and energy consuming.

The functional mix of the university is defined by the amount of mixed use and flexible use of floor space of facilities and the percentage it occupies in m². To collect such data floor plans have to be analysed.

Functional component			
Variable	**Primary stakeholder**	**What to measure (values)**	**Method**
Students & staff output *number of patents* *research output*	users	publications & diplomas/ m2 number of patents	data analysis (annual report) annual reports
Space usage *occupancy rate*	users	students/m2 employees/m2 energy costs/m2	data analysis in-field monitoring
Functional mix	users	multi-functional space use use by different user groups	maps, floor plans reports

Financial variables

The total income of a university are defined by the funding the university receives from the government, the tuition fees, interest and investment income, research grants, endowment income and other income.

The total expenditure is defined by the staff costs, interest& finance costs, operating expenses (includes energy costs), depreciation and other finance costs such as activities and education services(Higher-Eduation-Statistics-Agency, 2015). The data concerning the total income and expenditure can be found in annual reports of the universities.

Financial component			
Variable	**Primary stakeholder**	**What to measure (values)**	**Method**
Total costs	controller	euros (€)	annual report, database
Total income	controller	euros (€)	annual report, database
Real estate value	controller	market value in € land value in € campus buildings value in €	data analysis market analysis valuation tools

Physical variables A: building level

The energy efficiency is defined by the energy use & CO_2-emission per user and per m^2, footprint and energy label. The information can be found in energy report if provided by the university.
The technical condition is defined by the quality, age and materials used of the building. This can be rated in a certain condition level and can be found in technical reports. If this is not provided an inspection on location to determine the condition is needed.
The level of maintenance, level of renewal, level of (technological) innovation are defined by the frequency and the intensity of the action in what timeframe. The data can be found in technical maintenance reports, or interviews can be conducted with the responsible department (facility management).

Physical component A: Building level			
Variable	**Primary stakeholder**	**What to measure (values)**	**Method**
Energy efficiency	technical manager	energy use/m2 energy use/user CO2-emission/m2 CO2-emission/user footprint/m2 energy label	data analysis technical reports semi-structured interview
Technical condition	technical manager	age quality of building the percentage of the campus in (very) bad technical condition	technical reports condition based monitoring
Level of maintenance Level of renewal Level of (technological) innovation	technical manager	frequency timeframe intensity	data analysis technical reports annual reports interviews

Physical variables B: Urban level

The quality of built environment is defined by the quality of the surrounding neighbourhood, the campus, public space, housing and parking. The safety, hygiene and health influences this quality. The data can be obtained through conducting interviews or questionnaires with users of the campus (students, visitors & staff) and the inhabitants (concerning quality of the neighbourhood). Regularly, the quality of a campus can also be found on ranking systems, or reviews concerning the university. The quality of the built environment is one of the factors which determines the attractiveness of a university campus.
The amenities of a university campus are defined by the facilities the university provides next to the academic education & research facilities such as classrooms, libraries, offices etc. These are (student)housing, related business facilities, retail & leisure. These can be measured in values of amount, size, and percentage of the campus. To collect this data floor plans of the campus are needed to analyse.
The infrastructure is defined by the accessibility of the campus location. Accessibility refers to the inter and intraregional transportation networks and includes the functioning of the flow of people (Johansson, 1993). A good infrastructural system means good accessibility of the location, which enhances growth and the

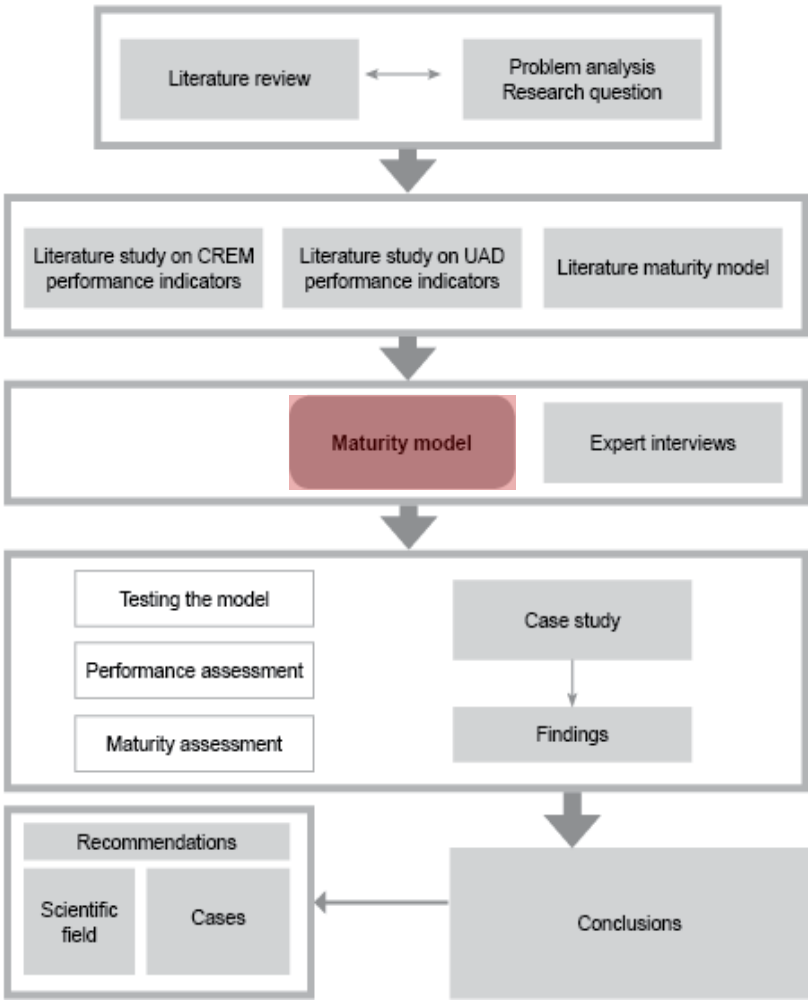
competitive advantage of a university. The provisions of public transport, the roads, the public space, parking possibilities and connectivity of the campus with other cities or amenities such as an airport is also an important matter to support the competitiveness.
This data can be found through a campus area analysis by using (road) maps, campus maps and public transport maps. In this analysis it is important to emphasize the kind of public transport the location offers, the distance to these facilities, the number of public transport lines, the frequency and to what cities/amenities the location has direct connection to.

Physical component B: Urban level			
Variable	**Primary stakeholder**	**What to measure (values)**	**Method**
Quality of built environment *neighborhood* *campus* *public space* *housing* *parking*	users	quality level attractiveness layout public space (% of campus) safety level hygiene level	data-analysis interviews city report urban/campus area analysis
Amenities *housing* *related business* *retail & leisure*	users	amount kind size (m2) % of campus distance in m/km	data-analysis drawings interviews
Infrastructure *public transport* *public space* *parking possibilities* *roads (car, pedestrian, bicycle)*	users policy makers	accessibility of the campus provisions (distance in m/km) number of parking spots (% of total users of the campus) quality of roads public space (% of campus) connectivity to other cities/airport	urban area analysis road-, campus-, public-transport maps

Chapter 5

Maturity model of campus management

This chapter explains the next step in the research following up the theoretical framework. The method chosen is to conduct several semi-structured interviews with experts from the facility department of Delft University of Technology. The choice of the interviewees are based on their expertise in the four components of the strategic, functional, financial and physical perspective. The goal is to explore what the experts find important in campus management from a different perspective.



5.MATURITY MODEL

5.1 APPLICATION OF THE MATURITY MODEL

The basis of this model can be divided in different components, existing of:

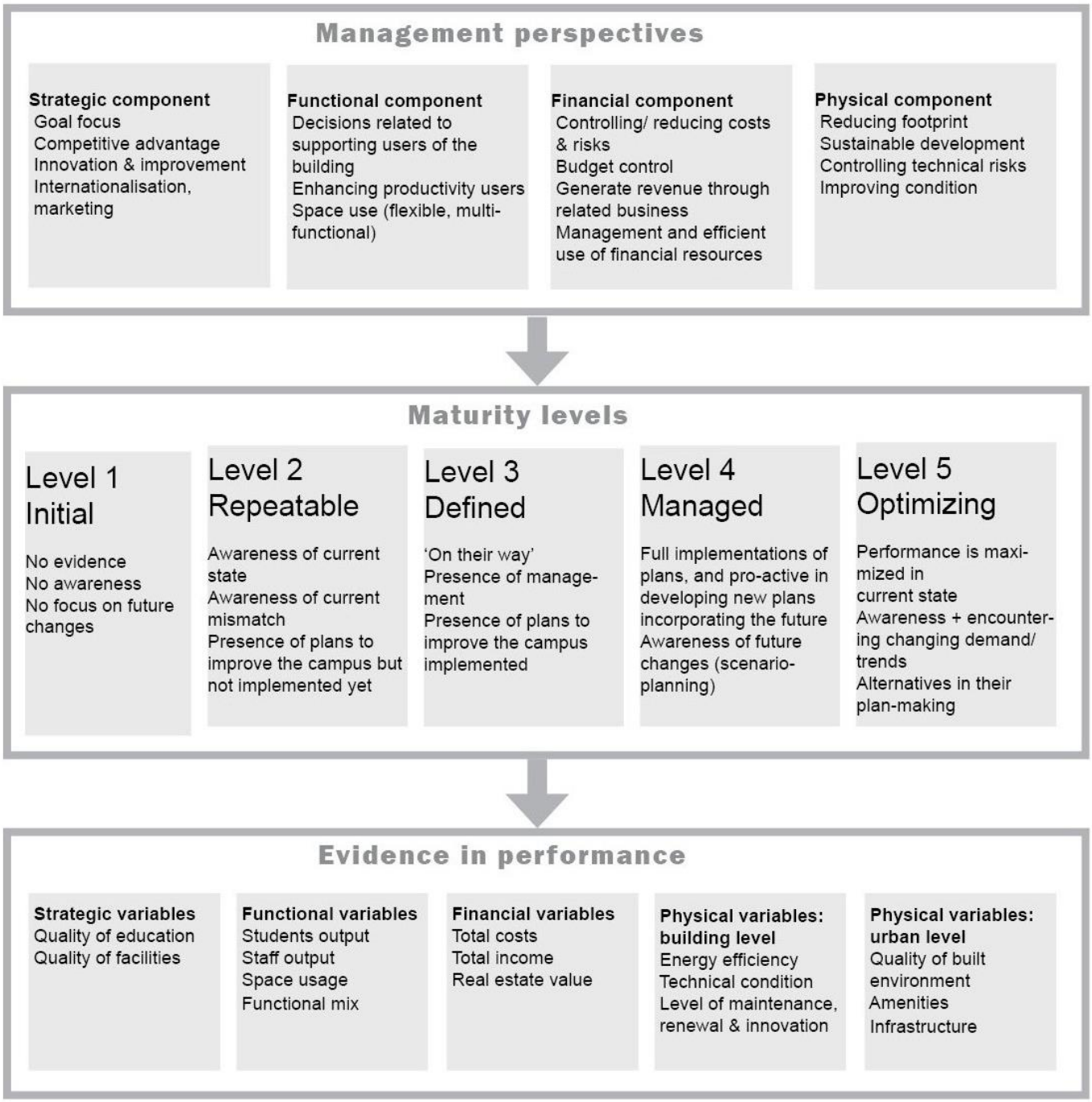
- Management/ strategic thinking of an institution/ awareness /DAS frame; future thinking and anticipation on trends
- Implementation on physical level (evidence)

The managerial component of the maturity explains the way of thinking of an institution. The possibility of mature strategic thinking of an institution is very common for example, but the physical evidence may be lacking, due to shortage of financial resources. This means not that they should be categorized in a low level of maturity. Including in the strategic thinking is also relation to the degree of governance and the impact it has on the vision and mission and its physical outcome of the buildings.

Also the awareness and incorporating future trends and changing demands of an institution can be an evidence of mature thinking. This last item will be based on the DAS-frame, where future scenarios of changing demand and supply are incorporated in the strategic management of the institution.

Examples are considerations of changing ways of learning, or are they only focussing on building new buildings in order to supply the necessary m2?

These levels can be placed into an assessment framework which can be used to measure the maturity level of institutions concerning the campus management and strategic thinking (see table 3). The table is based on the DAS frame of strategic management, where each level is the cumulative of the lower levels. The actual outcome of the campus management will show in the physical evidence, in the variables which are determined in paragraph 3.1 and 3.2. These frameworks combined act as measurement tool for the maturity of campus management and performance level of a university.


Management perspectives
Strategic component
Goal focus
Competitive advantage
Innovation & improvement
Internationalisation, marketing
Functional component
Decisions related to supporting users of the building
Enhancing productivity users
Space use (flexible, multi-functional)
Financial component
Controlling/ reducing costs & risks
Budget control
Generate revenue through related business
Management and efficient use of financial resources
Physical component
Reducing footprint
Sustainable development
Controlling technical risks
Improving condition
Maturity levels
Level 1 Initial
No evidence
No awareness
No focus on future changes
Level 2 Repeatable
Awareness of current state
Awareness of current mismatch
Presence of plans to improve the campus but not implemented yet
Level 3 Defined
'On their way'
Presence of management
Presence of plans to improve the campus implemented
Level 4 Managed
Full implementations of plans, and pro-active in developing new plans incorporating the future
Awareness of future changes (scenario-planning)
Level 5 Optimizing
Performance is maximized in current state
Awareness + encountering changing demand/ trends
Alternatives in their plan-making
Evidence in performance
Strategic variables
Quality of education
Quality of facilities
Functional variables
Students output
Staff output
Space usage
Functional mix
Financial variables
Total costs
Total income
Real estate value
Physical variables: building level
Energy efficiency
Technical condition
Level of maintenance, renewal & innovation
Physical variables: urban level
Quality of built environment
Amenities
Infrastructure

RESEARCH FRAMEWORK OF THE MATURITY MODEL

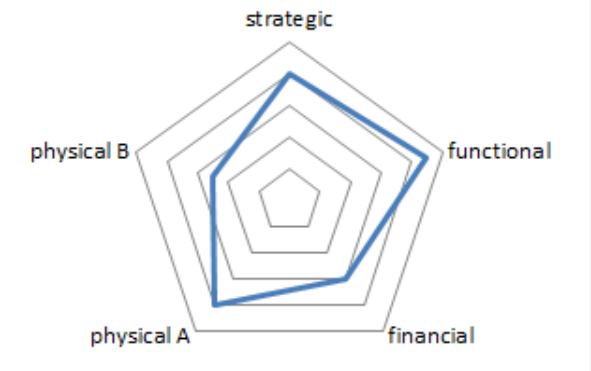
	Level 1	Level 2	Level 3	Level 4	Level 5
Campus management Strategic Functional Financial Physical	No focus No evidence	Awareness of current state Awareness of current mismatch Presence of plans to improve the campus but not implemented yet	Presence of plans to improve the campus implemented	Full implementations of plans, and pro-active in developing new plans incorporating the future Awareness of future changes (scenario-planning)	Alternatives in their plan-making Sustainability
Yes/no					
Found where	Documents, reports, website, policy makers/ facility manager				
Explanation	How actually implemented their strategies How do users feel about the final product? Ideas matched with actions? Actual implementation, management facilities, easily to assess The higher the level the more you are thinking about the users, performance, more into the complex system				
Conclusion maturity level	Level from 1 – 5 				
Physical evidence	Ranking systems, drawings, annual reports, website, users				

Table 7: Framework to conduct the testing of maturity level of campus management

Variables determent: attractiveness, quality of buildings, quality of facilities

5.2 FRAMEWORK OF THE MODEL

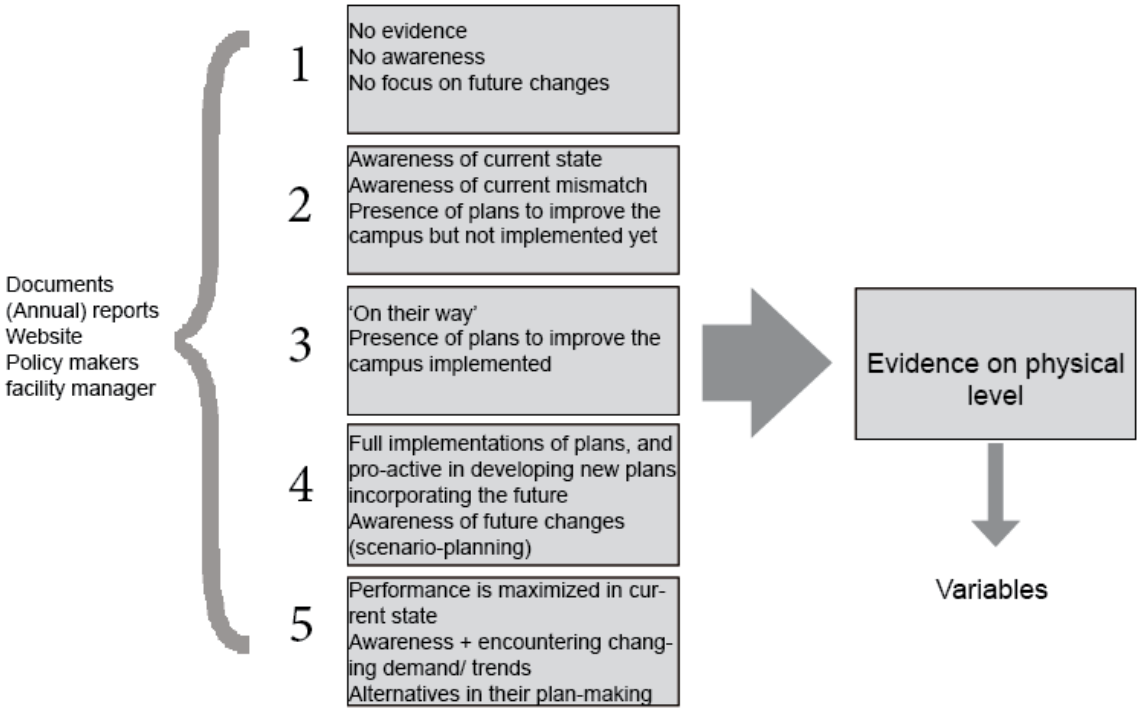
This chapter explains how the maturity model is to be applied. The short list is to apply the developed maturity model which concerns the variables which impact the performance of an institution. If one is interested in gaining more knowledge and understanding of the case, one can also add a case study analysis concerning the governance, urban planning, education system within its context. If the study is only about providing a (quick)scan, the maturity model can be used. The components are based on a study which provides a university the indicators which maximizes their performance, but which are not necessarily focussed on a certain context.

Step 1: Collect data about the context
- Conduct a context research (statistics, rankings)
- Conduct a research about the problems they experience
- Collect data about the education system
- Collect data about their urban planning

Step 2: Determine what typology the university belongs to
- Urban position: in / outside the city
- 60's,70's/ residential/ science park/ medieval campus/gated community/ university city
- Private/ public university

Step 3: Asses their maturity level in campus management using the management variables
- Awareness of current state and current (mis)match
- Presence of strategies or plans to improve the campus
- Awareness of changing trends and future (mis)match
- Plans to encounter future mismatch

Step 4: Look for evidence on the outcome (physical, functional, financial, strategic)
- Urban factors (see §3.1)
- Building factors (see §3.2)



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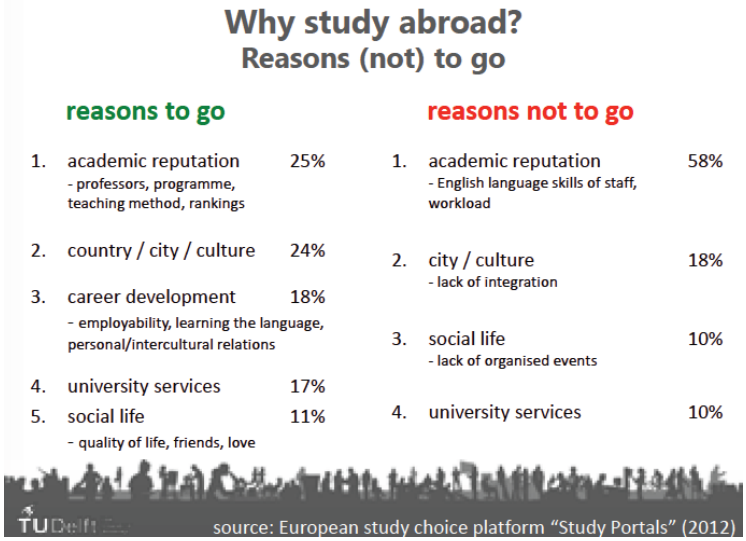
APPENDIX I

Reasons to study abroad (Studyportals, 2012)

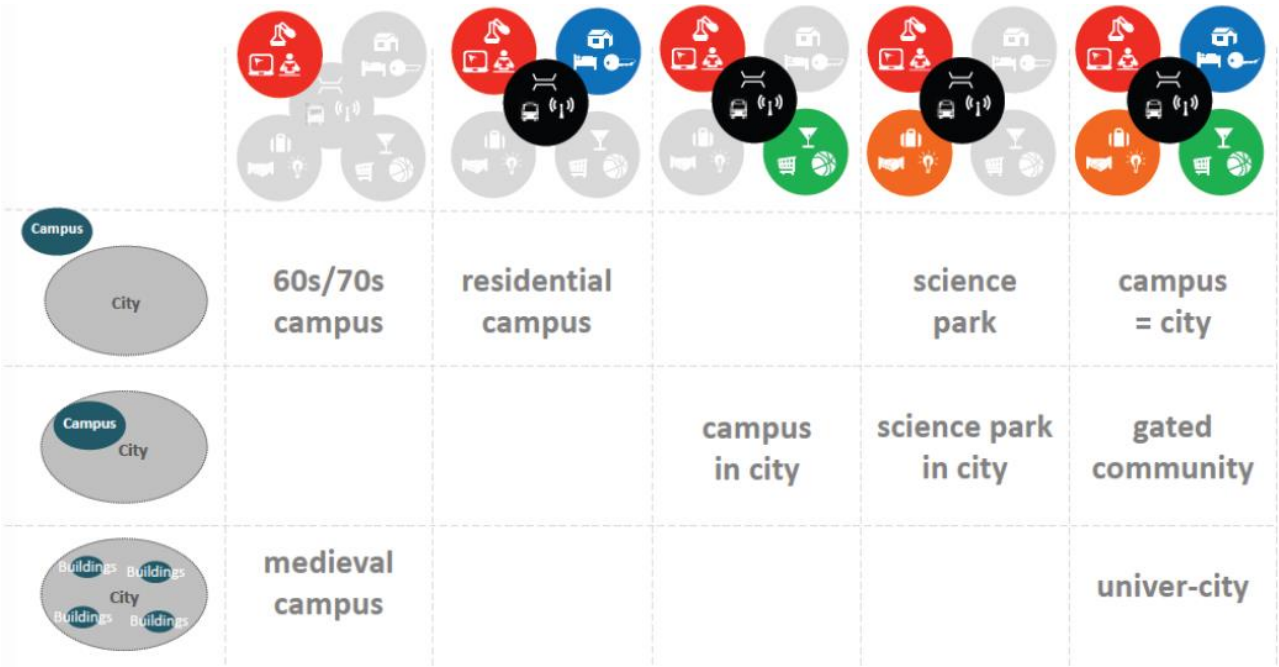


Key performance indicators (KPI's) to measure a university's performance (A. C. Den Heijer, 2011)

performance criterion	productivity	profitability	competitive advantage	sustainable development
perspective	functional	financial	strategic	physical
key variable	number of users	euros (€)	goals	m^2
stakeholders	users (students & staff)	controllers	policy makers	technical managers
KPIs	- output (diplomas and publications) per m^2 - publications per academicfte - students per m^2 - employees per m^2 - occupancy rate (capacity use of space) - frequency rate (use of space in time)	- total costs of ownership as % of total costs - energy costs per m^2 - solvency - liquidity - revenue of start-ups and patents - real estate (market) value - land value - ...	- international rankings - market share of students - quality of alumni - alumni satisfaction - student satisfaction - position on innovation index - employee satisfaction - citation score	- energy use per m^2 - energy use per user - CO_2 emission per m and user - footprint in m^2 per user - m^2 per student - m^2 laboratory per research fte - m^2 office per employee - ...

APPENDIX II: UNIVERSITY TYPES

Different types of university cities depending on the location of a university in relation to the city and its amenities (A. Den Heijer & Tzovlas, 2014)



- **ACADEMIC**
  classrooms, libraries, offices, meeting rooms, laboratories, lecture halls, workshops, storage space, studios, study places, academic hospital, conference facilities, ...
- **RESIDENTIAL**
  student housing, faculty housing, hotels, short stay housing, housing support staff, alumni housing, ...
- **RELATED BUSINESS**
  accommodation for start-ups, incubators, research institutes, service providers (catering, printing, cleaning, maintenance), other (higher) educational institutions, etc.
- **RETAIL & LEISURE**
  coffee bars, restaurants, cafes, bookshops, supermarket, theatres, cultural facilities, sports, day-care centres, student associations, ...
- **INFRASTRUCTURE**
  public space, parking, bicycle paths, roads, public transport facilities, ...

APPENDIX III: INTERVIEW PROTOCOL

INLEIDING

1. Maturity model

Het doel van deze scriptie is het ontwikkelen van een meetlat dat de volwassenheid van campus management kan meten. Het te ontwikkelen is tweeledig: eerst zal er een 'maturity model' worden ontwikkeld waarbij de volwassenheid van campus management gemeten kan worden. Deze is verdeeld in 5 niveau's:

1. Initial: Geen bewustzijn van de huidige staat en geen neiging tot verbetering van het campusvastgoed, verder hebben zij geen toekomstfocus. Doel: alleen de nodige m^2 aanbieden voor het ondersteunen van de werkzaamheden.
2. Repeatable: De universiteit is zich bewust van hun zwakheden en heeft plannen om dit te verbeteren, maar in een vroegtijdig stadium.
3. Defined: Er is een aanwezigheid van een bepaalde management afdeling dat zich bezighoudt met de verbetering van het vastgoed. De universiteit hanteert een bepaalde strategie om hun zwakheden tegemoet te komen.
4. Managed: De universiteit is zich bewust van de huidige situatie maar ook zeker van de toekomst en anticipeert hier ook proactief op door op langere termijn te plannen.
5. Optimizing: Hoogste niveau, waar een universiteit prestaties maximaliseert. Goede lange termijn planning, meerdere alternatieven in plannen, zwakheden elimineren.

Het doel van het interview is om te bepalen of er op deze niveau's nog iets aan te vullen is. Aan de hand van inzichten van experts kan er informatie en suggesties toegevoegd worden aan het model.

Vervolgens is het doel om het model te kunnen gebruiken om de volwassenheid in campus management te bepalen van een bepaalde case, maar ook in een andere context, waar Real Estate Management minder bekend is. Het meten van de volwassenheid is tweeledig. Een universiteit kan claimen dat het een hoog niveau bezit in campus management, maar het bewijs ervoor zal zich ook moeten uiten in de fysieke omgeving en gebouwen. Hierbij is het van belang om te weten wat nou belangrijke variabelen zijn die de 'performance' van een universiteit bepalen. Dit is het tweede deel van het onderzoek.

2. Bepalen van de variabelen die de performance van een universiteit beïnvloeden.

- strategic performance - functional performance - financial performance - physical performance

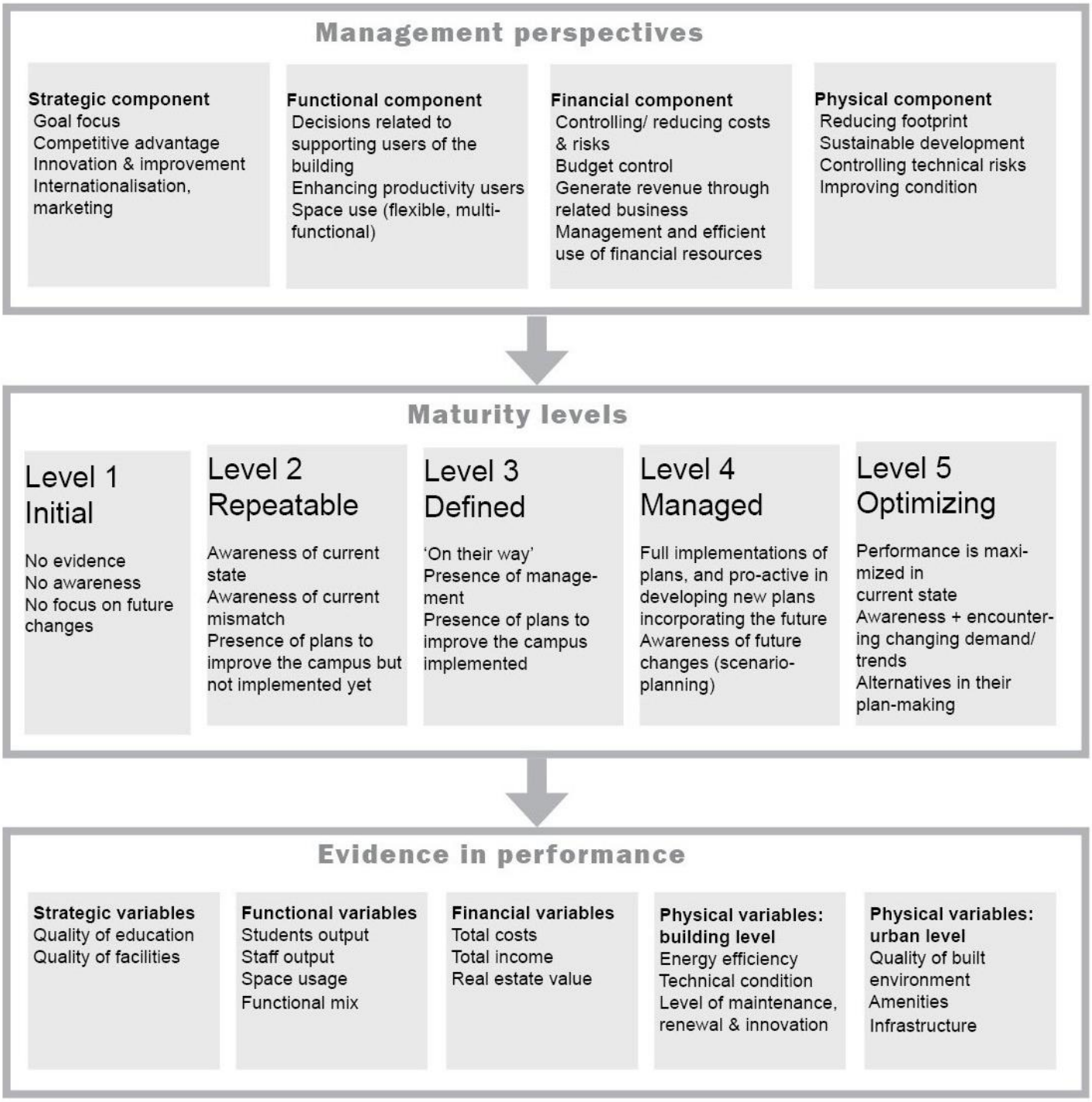
Naast het bepalen van belangrijke variabelen is het van belang om te weten hoeveel tijd en moeite erin zit voor het verzamelen van de data van het desbetreffende variabele. Dit is omdat het doel van de scriptie is om een meetinstrument te ontwikkelen dat ook gebruikt kan worden in een ander context, waar informatie soms gelimiteerd kan zijn. Dit is het quick-scan model.

3. Bepalen van de huidige staat van campus management in TU Delft, en of dit ook zichtbaar is in de fysieke uitkomst.

Aan de hand van het ontwikkelde model zal ook de huidige volwassenheid in campus management van TU Delft getoetst worden. Dit zal geschieden in enkele vragen aan de geïnterviewde.

Verder zal er ook een beoordeling van de fysieke staat van het vastgoed gevraagd worden aan de geïnterviewde.

Dit schema laat de opzet van de maturity model zien:



APPENDIX IV

Adding value on organizational level, connected to primary stakeholders, KPI's as management information to measure and related tools to measure (A. C. Den Heijer, 2011)

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