IDEA GENERATION IN UNIVERSITY CITIES

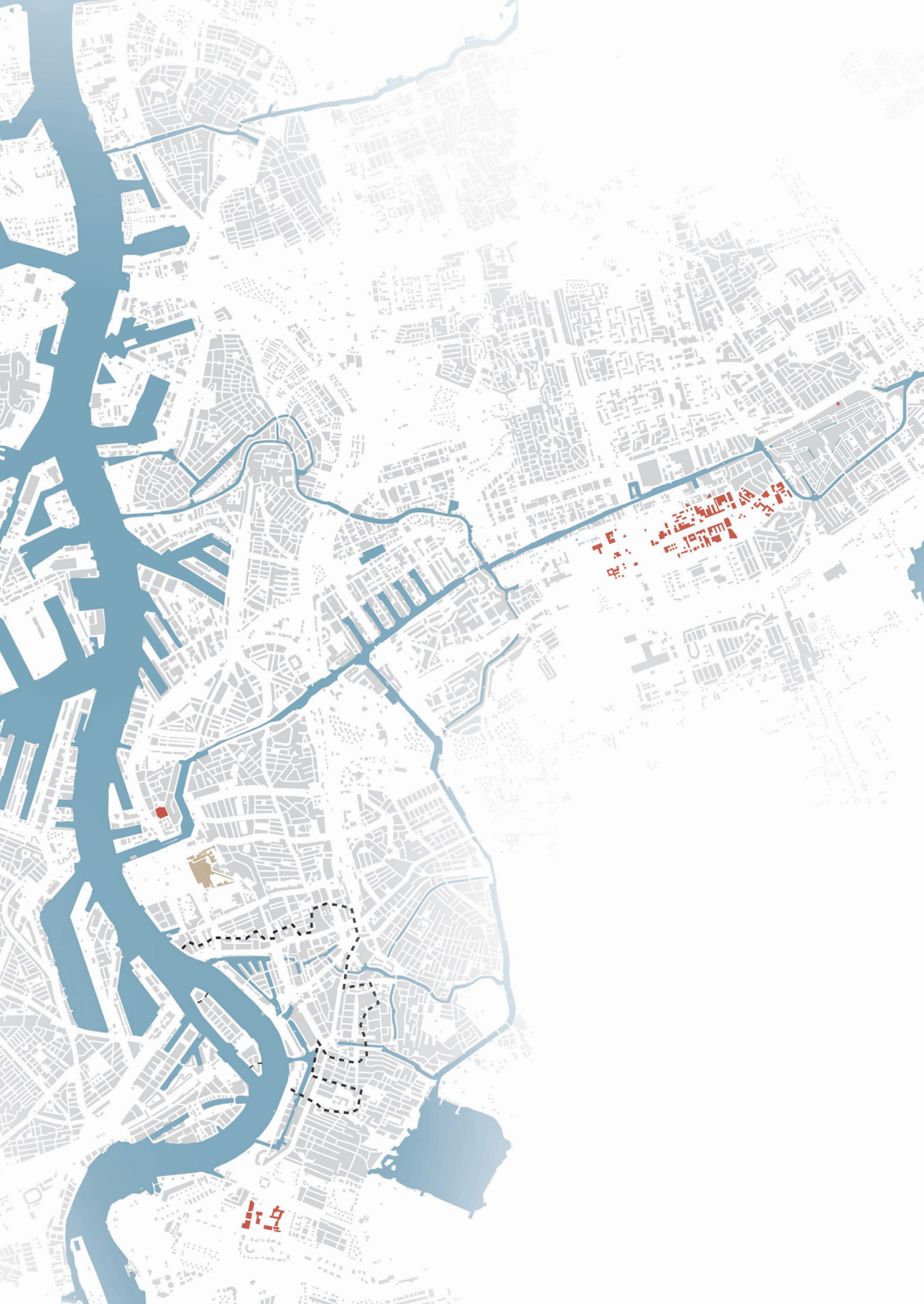
N.L. BOHM

reflection on the integration of research and
design and its application in the urban context

MSC THESIS

urbanism and science communication

TU Delft



MSc Thesis

Idea Generation in University Cities:
Reflection on the Integration of Research and Design and its Application in the Urban Context

N.L. BOHM

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PREFACE

This MSc Thesis is part of a joint graduation project between Science Communication and Urbanism at the University of Technology Delft. During my MSc education at the university, I have been educated in both disciplines and therefore, I have always been focussed on the common attributes between them. As a last step within my formal education in Delft, this document describes a graduation project that aims at integrating both science communication and urbanism within my thesis on idea generation in university cities.

Since starting my double degree programme in 2013, I have met a wide variety of responses to the combination of these disciplines. During my internship at *West 8 Urban Design and Landscape Architecture* landscape designer Adriaan Geuze knew to legitimise my choice in just three words: "Urbanism ís communication." Some of the responses at the faculty of Architecture have been with more wariness as to the thought of urbanism as a 'science'. Altogether, these different opinions have fuelled my own thoughts and position.

It turned out that approaching urbanism as a scientific discipline was not without risk. Not many have gone before me in investigating how urban design impacts human behaviour. I hope that my view on idea generation in the city can be an addition to the existing perspectives from environmental psychology or social geography. I hope that the approach towards research and design I developed will encourage others to start investigating this way too.

The outcomes of this thesis suggest a different type of university for the future. It is no coincidence that my graduation project took this turn towards educational reform. During my time at the Delft

University of Technology, I have been involved in different bodies of student representation. As a board member of Study Association D.B.S.G. Stylos and as a member in the Education Committees (OC) of Bouwkunde and Science Education and Communication, I have been able to witness at short range the way our education programmes are made and the didactical dilemmas that play a role in teaching research and design at university.

As a student representative, I have always meant to take a constructive position, trying to offer a possible solution to accompany every point of criticism. In extent, this thesis gave me the opportunity to go deeper into some of these solutions and investigate what their impact could be for the university in the long run.

In this graduation project, I have aimed at formulating my own response, both as a researcher and a designer, to everything I have seen and learned during my time in Delft. At the basis of that response lies a strong believe that interdisciplinary approaches are essential to dealing with complex tasks and challenges, such as the organisation of cities and the development of innovation.

ACKNOWLEDGEMENTS

I want to thank Egbert Stolk, Caroline Wehrmann, MaartenJan Hoekstra and Maarten van der Sanden for explaining my own thinking, when I was to confused to understand what I was doing. Your trust that I would be able to come to a satisfactory outcome has motivated me to keep on exploring throughout the entire process. Specifically, I want to thank Egbert for giving me the confidence to develop this line of research. I want to thank Caroline for continuously being able to organise my thoughts by asking the right questions. MaartenJan for his infectious enthusiasm in all of our conversations and the occasional fatherly advice. Maarten for letting me make use of his abstract thinking in critical moments in the process. Many parts of this thesis feel not as a product of my own thoughts, but a result of the combined conversations I have had with the four of you.

This graduation project strongly leans on the input of experts and I am very grateful that they could find the time and open mind-set to explore with me different angles of their own field of expertise. Therefore, I want to thank the interviewees Daniel Sligte, Henk Staats, Judith Lekkerkerker, John Habraken and Maurits de Hoog. Within the confinement of the university, I am happy that Els Bet, Arie Romein, Machiel van Dorst and Roberto Rocco have let me borrow some of their extensive knowledge of urbanism. I want to thank Roberto Cavallo, Jeanna de Haan and Tessa Vossen for their didactical insights in research and design education. Eva van Baren, Hilje Papma and Stella Groenewoud I want to thank for sharing their experiences within the Leiden-Delft-Erasmus collaboration with me. The last expert I am obliged to thank is Andy Dong, for putting forward a hypothesis that was rich enough to trigger the first investigations of this thesis.

Throughout the graduation year, I have received support from different people and students around me. In that regard, I want to thank the students at the SEC graduation room in TNW, the students in the theory of urbanism support group and the group of students from Architecture, Urbanism and Civil Engineering that were brought together by Egbert to exchange their ideas. In particular, I owe my thanks to Oukje, Nikki, Roel, Charlotte, Lisa, Judith and Wendel for their constructive feedback and their enduring support up until the last days before graduation. I want to thank Bob for showing me what serendipity actually looks like.

I am grateful for the financial support of the "Vereeniging Familie Salm" throughout my education at the Delft University of Technology.

Lastly, I would like to thank my parents. You brought me to school for the first time when I was four years old and I am so happy that you will be here together to see me graduate from university.

Many of the important things in life I have learned from all of you and I hope to take your lessons with me long after I graduate.

Nina Lotte Bohm
Delft, August 2017

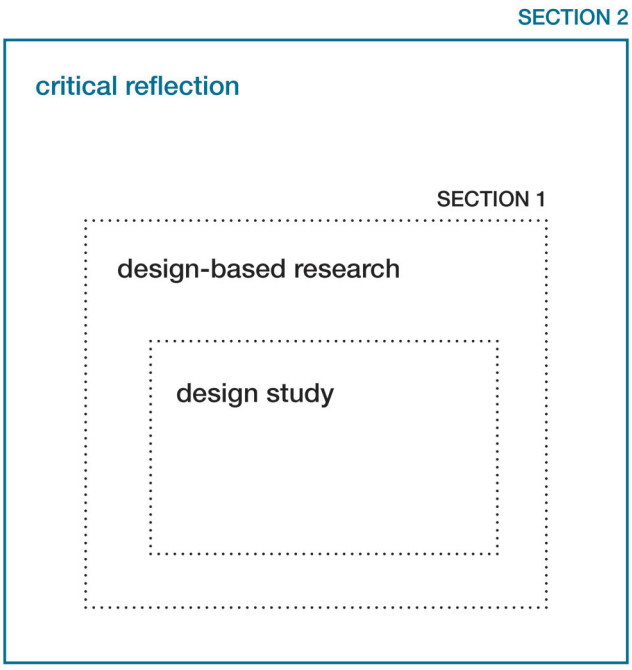
READING GUIDE

This thesis reads like a frame story. It consists of three scientific stories that will unfold within this thesis (**Figure 1**). Section 1 of this thesis contains the first two frames. It describes a design-based research into idea generation in university cities. Within this research a design study is done into the integration of campus development and the university collaboration between the universities of Leiden, Delft and Erasmus (Rotterdam). Section 1 could be read as an individual Urbanism thesis.

Section 2 of this thesis comprises the critical reflection on the integration of design and research in the project described in Section 1. This reflection is aimed at developing recommendations for the development of adaptive expertise through urban design education.

Although this thesis describes the graduation process for two degrees at the Delft University of Technology, the reader should not perceive the frames as separate processes. It has been a continuous endeavour to combine insights of both disciplines in every frame. Without this exchange, neither research, nor design would have developed the way they did.

Figure 1 Thesis structure



SUMMARY

New ideas and innovation are the fuel to the modern knowledge economy. The university has for centuries been part of the innovation system responsible for the development of new ideas. Today, the interdisciplinary character and complexity of societal issues makes that there is a need for new methods to support innovation development at university. This thesis has sought for these methods from two different perspectives: that of the urban design of the university city (Section 1) and that of the learning process of its students (Section 2). Section 1 aims at developing an urban design approach for creating innovation space in the university city by conducting design-based research. Section 2 uses critical reflection as a method to give insight in the integration of design and research of Section 1.

SECTION 1

Since 2014, the universities in Leiden, Delft and Rotterdam have formed a strategic alliance in order to collaborative innovation development within their organisation. As the spatial proximity of the three, cities is one of the main reasons for investing in this collaboration, there is a need for an urban design perspective on idea generation. This thesis develops one possible approach to stimulate innovation by means of urban design.

By conducting interviews with experts in the field of creativity and innovation and a literature research, a spatial understanding of the idea generation process has been built. The results of these investigations have been captured in a conceptual model (**4.1**) with seven spatial conditions for idea generation. The conceptual model is aimed at urban designers working on developing innovation space and an urban design study for the campus in Delft has been used to test the application of the conceptual in a design process.

The urban strategy (**5.4**) puts forward a perspective on the development of the campus in Delft based on four design principles:

Integrate city and campus (**6.1**), enrich campus with urban elements (**6.2**), built project centres for collaboration (**6.3**) and develop routes to influence cognitive maps (**6.4**). These four design principles in combination with the conceptual model, can offer urban designers a decision support tool when developing innovation spaces in the city.

SECTION 2

Higher education increasingly makes use of design-based learning to accommodate the future need for engineers with 21st century skills. MSc students learn these skills through the integration of research and design. However, there is only little know about the way students integrate research and design. There is need for a more detailed understanding of the learning process that leads to 21st century skills in order to innovate didactic methods for higher education.

The design-based research project in Section 1 offers a case-study of a learning process that integrates research and design. In order to entangle the way research and design were integrated in this process, I used critical reflection. The critical reflection was structured in three steps: description, interpretation and comparison.

Critical reflection has put adaptive performance forward as the main characteristic in the development of design-based research (**9.1.3**). Four levels of working have been distinguished: A structural, theoretical, organisational and spatial level. Through continuous movement between these levels, I reflected on the stage of the process I was at and decided how to proceed. Adaptive performance arose by developing a rhythm of reflections that allowed for an integration of design and research (**10**). These outcomes suggest the need for a different model of design and research integration that could serve as communication tool in higher education.

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Figures, tables and graphs are drawn by the author, but may be adapted from literature. If that is the case, a reference in the caption refers to a source in the reference list.

LIST OF DEFINITIONS

idea generation	both the individual, cognitive process to invent or create an idea, as well as the social verification of the created idea
spatial conditions	the spatial factors or circumstances affecting the way in which people live or work, especially with regard to their well-being
urban design approach	methodology for urban designers to come to an urban plan or design
design principle	concept to organise the design process
design guidelines	general rule to steer the design toward a certain outcome
urban pattern	re-accuring element in the urban environment Each pattern describes a problem which occurs over and over again in our environment and then describes a solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice. (Alexander, 1977)
conceptual model	simplified representation of theory
urban plan	coherent plan / design / drawing that describes a course of action over a timespan of several years
urban strategy	a plan of action to achieve a desired city model / urban goal, coordinating public and private
urban intervention	small-scale urban design that intervenes in the urban fabric (examples: (re-)design of a street, square, busstop, entrance to a public building, etc.)
innovation space	a place that stimulates one of the first stage of the innovation process: idea generation
stimulate	encourage / enable
modifications of public space	physical adjustments (such as an urban intervention) made in the urban fabric
campus	sum of locations with predominantly university or university-related functions (Den Heijer, 2011)
route	The origin of the route is the repetition of the route (in via veritas)
deduct	to subtract from a generic rule a certain result
induce	to derive from one specific case a generally applicable principle (probable outcome)
abduction	reasoning to come from an observation to the most probable explanation (hypothesis)

SECTION 1

"The problems challenging us today, the ones really worth working on, are complex, require sophisticated equipment and intellectual tools, and just don't yield to a narrow approach. […] The traditional structure of university departments and colleges is not conducive to cooperative, interdisciplinary work."

(Brown in Ledford, 2015, p. 525)

"Our mind shapes the spaces we inhabit and our spaces return the favour."

(Johnson, 2010)

1 INTRODUCTION

1.1. UNIVERSITY COLLABORATION IN KNOWLEDGE CITIES

The university is a thousand-year-old industry concerned with the production of innovation. Operating from cities such as Oxford, Bologna, Montpellier and Leiden, from the fifteenth century onward, universities grew to become important centres for the creation of new ideas (Van Greenhuizen, Nijkamp, & Mickiewicz, 2012). In the 21st century knowledge city, universities still form the main knowledge base and provide the most valuable product in the modern knowledge economy: innovation.

Universities are constantly under pressure to retain the competitive advantage of being the largest supplier of highly skilled people, technological innovation and academic knowledge in the economy. Against the background of internationalisation, finding ways to stimulate innovation is essential to survive universities' global competition

for students and funding (EY., 2012; PwC, 2015).

Since 2012 the universities of Leiden, Delft and Rotterdam have, therefore, decided to form a strategic alliance 'Leiden-Delft-Erasmus' (LDE). By initiating such an interdisciplinary collaboration, the three universes hope to come to more specialised and interdisciplinary ideas and innovations. In the future, it is expected that these types of interdisciplinary collaborations between universities will become essential to innovation production (EY., 2012).

Within the LDE collaboration not only the complementarity of the knowledge institutions plays a role, but also their physical proximity (Universiteit Leiden, Delft University of Technology, & Erasmus Universiteit Rotterdam, 2012). Face-to-face interaction is deemed essential to knowledge exchange and interdisciplinary collaboration (Storper & Venables, 2003). The three universities are located in less than an hour of travelling from each other and this should stimulate their collaboration.

The LDE presumption that spatial proximity matters to interdisciplinary collaboration, shows that a university is not just an intangible innovation producing institution, but also a physical place, where people come to work, study, educate and interact. To stimulate innovation, apparently, it is not enough to attract the 'right' institutions into a collaboration, but it is also crucial to physically facilitate the interaction that leads to the creation of new ideas.

1.2. PROBLEM STATEMENT

Universities use their campus as a resource to achieve their organisational goals, such as stimulating the development of innovation (Curvelo Magdaniel, 2016, pp. 26-28; Den Heijer, 2008). However, in the light of inter-university collaborations, such as LDE, the campus becomes a complex concept, dispersed over different cities and the traditional approaches are not conducive to campus development anymore.

In order for a successful collaboration to arise between the universities of Leiden, Delft and Rotterdam, new ways have to be found to develop a campus that can stimulate the generation of good ideas that lead to innovation. To facilitate the flow of ideas between the participants in the LDE collaboration a new approach to the urban design of campus environments needs to be developed.

1.3. RESEARCH APPROACH

Not many studies have investigated the relation between the campus and innovation before. Although this relation has been studied in the fields of management, geography, planning and regional studies, these studies have focussed on a regional scale (Curvelo Magdaniel, 2016). The scale level of the urban fabric and specifically, the public space, that is relevant for the urban development on campus, has not yet been subject of study.

The exclusive quality of the city
In his book *Where good ideas come from*, Steven Johnson describes the extraordinary track record of cities in producing new ideas and innovations. As happens on a small scale on campus, in the city, face-to-face interaction promotes the creation of new ideas as well (Storper & Venables, 2003). The economic and social diversity of the city gives spill-overs between different disciplines a bigger chance of leading to a truly innovative idea (Jacobs, 1969). This exclusive quality of the city asks for a more thorough investigation of how university cities can contribute to generation of ideas by the knowledge workers that inhabit these cities (Landry, 2006).

The challenge for urban design
A recent insightful essay by Andy Dong (2016) offers a starting point for the theoretical investigation in this thesis into the exclusive idea generating qualities of the city. From a cognitive perspective on design thinking, Dong provocatively argues that not only have our brains been able to design increasingly sophisticated cities, our cities could contribute to the production of increasingly creative brains.

Dong admirably connects design thinking to structural regularities in the city, such as historic buildings and the complexity of the structure of the city. Although Dong is not an urban designer or specialised in urban studies in general, his essay holds an articulate challenge to further investigate these principles from the perspective of urban design.

These theoretical hypotheses suggest that there is a need to zoom into the structure of the city, the small grain, the public spaces, the homes and the workspaces, where creativity and innovation take place in their day-to-day ordinariness. In order to come to a model for urban designers to deal with the idea generation processes on campus.

1.4. AIM

This research takes the hypothesis from Dong (2016) that the city can be designed in such a way that it supports the idea generation process of its inhabitants, as a starting point for an investigation into idea generation. Projecting this hypothesis onto the challenge for LDE to establish a campus

environment in four different cities, offers a design study in which the theoretical knowledge on idea generation can be integrated in the urban design of modern campuses.

This thesis aims at developing an approach to dealing with spatial conditions for idea generation in an urban design for the university collaboration LDE. The explorative character of the subject makes that in some parts this thesis reads as a thought experiment, taking different theoretical explorations and connecting them to practical problems in the design of modern campus environments.

This project targets researchers, designers and decision makers studying, designing, planning and tinkering with the public space at university campuses or similar urban environments. It is meant to inspire university actors for whom stimulating innovation is an organisational goal to use the urban fabric as a resource for innovation and present them with one potential urban approach to innovate within interdisciplinary collaborations.

1.5. RESEARCH QUESTIONS

Given that there has been little research done on the relation between the urban fabric and innovation, this project has a highly explorative character. The questions posed are therefore often aimed at developing a coherent understanding of the research topic, rather than formulating a conclusive answer.

The following central research question has been formulated:

RQ URBANISM (U)

How can urban designers develop an urban strategy to stimulate idea generation processes within the university collaboration between the universities of Leiden, Delft and Rotterdam?

In order to structurally answer this research question, three subquestions have been formulated (RQ1-3):

1. What are spatial conditions for idea generation? (RQ1)

2. What conceptual model can support the urban designer in making design decisions on the urban fabric in relation to idea generation processes? (RQ2)

3. How to design an urban strategy for the university campus in Delft in order to stimulate idea generation within the university collaboration LDE (Leiden, Delft, Erasmus)? (RQ3)

The relation between the different subquestions (RQ1-3) and the central research question (RQ_U) is portrayed in **Figure 3**. There are four terms that need more clarification at this point, in order to avoid ambiguity on the subjects of study.

Idea generation
There are many ways of characterising and defining creativity and here a distinct decision is made to focus on creativity that leads to the generation of new ideas. In the context of innovation systems, creative capabilities are directly or indirectly aimed at producing innovation and the starting point for innovation is a good idea. By choosing this terminology, both the individual, cognitive process to invent or create an idea, as well as the social verification of the generated idea are considered. The essence here is that ideas do not arise from a single moment, but that it is a generative process.

Spatial conditions
In order to look at the relation between space and the idea generation process, this research starts by investigating what the spatial conditions are for idea generation (RQ1). Following the Oxford Dictionary, conditions are 'the circumstances or factors affecting the way in which people live or work, especially with regard to their well-being'. This research starts by exploring how the internal parts of the city affect the way in which people generate new ideas. The aim of looking for spatial conditions is to be able to determine how and if the urban designer can influence these condition in an urban strategy.

Conceptual model
In order to transfer the theoretical knowledge on spatial conditions to be able to make it applicable within a design process, RQ2 deals with developing a conceptual model. A conceptual model is a simplified representation of theory. In this case the model is specifically developed for the use in a design process.

Urban strategy
Finally, RQ3 deals with a design study to produce an urban strategy for the university collaboration LDE. This strategy is a plan of action to achieve a campus model

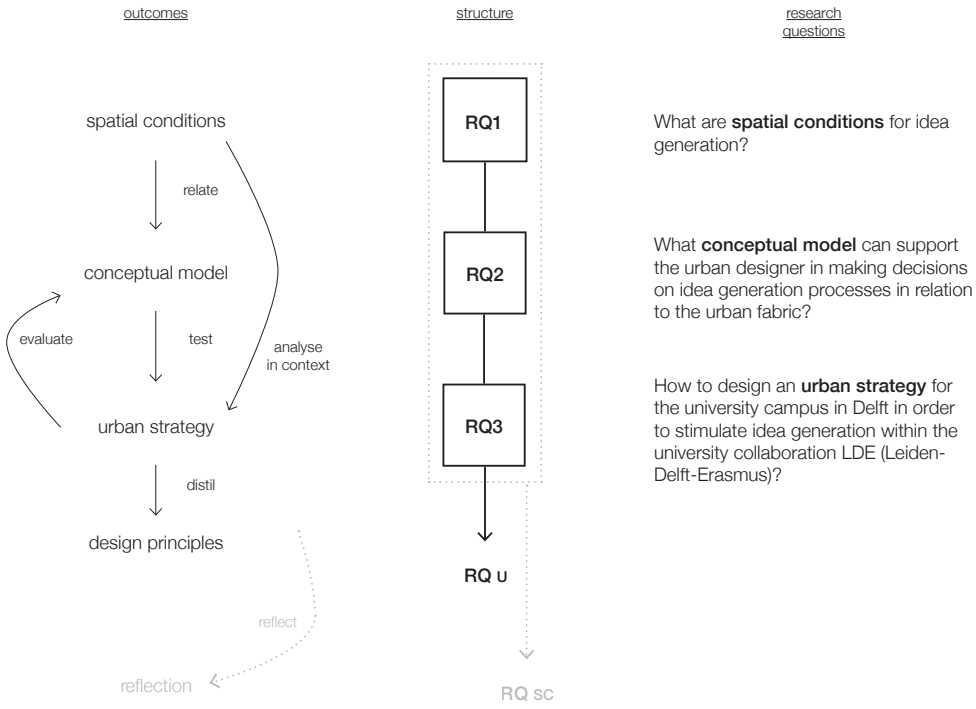


Figure 2 Diagram of subquestions and central research question

that includes the spatial conditions for idea generation, creating an environment that stimulates innovation and coordinating public and private efforts to achieve that goal. More than a spatial strategy, this is an urban strategy, because the city is a crucial component in the study of idea generation.

1.6. RESEARCH METHODOLOGY

The open and explorative character and the size of the initial research subject, creative processes, require a clear, concise and structured research approach. The overarching structure of this study is a design-based research methodology (Wang & Hannafin, 2005). This research method has been gaining importance in studies that try to understand the relationships between theory, designed artefacts and practice ([DBRC],

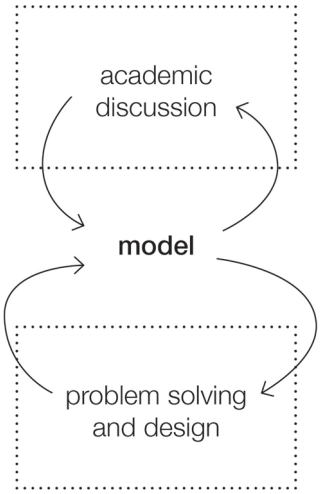


Figure 3 Combining design and experimental research (adapted from: Dorst, 2013)

2003). As this research aims to investigate the theoretical background of idea generation, the urban fabric and the urban design practice, design-based research offers a structured approach to achieving this goal.

Consequently, theory, designed artefacts and practice, the three components of design-based research, are visible in the research questions structure in this thesis. Through a theoretical investigation in RQ1, this research aims to develop a conceptual model in RQ2. That model is developed for the use in the practice of urban design. The application of the model in practice is tested by designing with the model in a design study in RQ3. The conceptual model in this study does not only function as simplified representation of theory, but also as a connection between theory and practice in urban design.

This dual use of a model as hinge between theory and practice is characterised by Dorst

(2013) in his proceedings on academic design (**Figure 3**). The intention within this research and design project to not only make a contribution to the urban design practice, but also to the discussions in the academic field, is clearly illustrated in the model of Dorst. The distillation of the core design principles from the design study leads to a conclusion that shows the generalisable essence of the design study. It is important to keep in mind that design-based research goes beyond the designing and testing of a particular intervention ([DBRC], 2003), but additionally aims at making a contribution to the scientific field.

1.7. RELEVANCE

1.7.1. SCIENTIFIC RELEVANCE

Since the term 'creative city' was first coined by David Yencken in 1988 and later developed by Charles Landry (2000) and Richard Florida (2004), it has ceased an enormous amount of attention, both from the professional practice, as from the scientific community. It was meant as an ambitious term to inspire urban innovation and give rise to new approaches to city planning. The dominating approach toward the creative city has been on the level of network building. However, a multidimensional approach considering individual, group and network interactions has not been as widely researched. This could be considered as the knowledge gap in the field of urbanism that this research tries to address. The aim of this project is therefore not to produce an overarching answer on the research question that fully addresses the complete gap, but rather a more specific formulation of hypotheses and a clearer concept of the subject of study.

This research, as part of a MSc graduation project, can only aim at making a modest contribution to developing scientific knowledge in this field. It will try to understand the urban patterns as part of the city structure that influence idea generation of its inhabitants. The structure of the city is seen as a facilitator to that idea generation process, in which communication is a vital component. Innovative and creative networks, that form the starting point for thinking about creative cities, are intrinsically made up of communication. A better understanding of the urban impact on the creation of innovative ideas can therefore contribute to the research field of science communication.

1.7.2. SOCIETAL RELEVANCE

All over the world people choose to move to the city. More than half of the world's population is living in cities today. Managing the development of cities and metropolitan regions is therefore one of the most important challenges in building sustainable environments. The past decade the notion of the creative city has helped policy makers and city government to give direction and meaning to their spatial plans and urban programmes. It has given them momentum

to build sustainable urban environments and simultaneously stimulating economic vitality and growth. However, the tools they use are aimed at sociological aspects of creativity and often lack consideration of other dimensions of idea generation.

This research aims at developing a model that relates different dimensions of idea generation in order to give an insight to what extent these dimensions can be influenced by urban design intervention. That insight might be valuable for many different stakeholders that are working on the construction of creative environments. The tools derived from this study could be applicable at a city scale as well as on the scale of innovative organisations.

The valorisation of the conceptual model to be developed is done within a design study. In the exercise of developing design principles from the model and on the bases of them designing an urban plan, the applicability on an actual case will be tested. Reflecting on the outcomes and process of the design is therefore an essential step toward translating the results of this study into practice.

"The city in short, shows the good and evil in human nature in excess. It is this fact, perhaps, more than any other, which justifies the view that would make of the city a laboratory or clinic in which human nature and social processes may be conveniently studied."

(Park in Lofland, 2003, p. 937)

2 METHODS

Within the methodological structure of design-based research, this graduation project is structured in three steps: investigating spatial conditions (**2.1**), developing a model in which to consider these spatial conditions (**2.2**) and lastly, testing the model in a design study (**2.3**). The methods used to investigate, develop and test are described in this chapter.

2.1. RQ1 LITERATURE STUDY INTO SPATIAL CONDITIONS FOR IDEA GENERATION

The aim of the research question 'what are the spatial conditions for idea generation?' is to come to a theoretical framework that describes the spatial conditions for idea generation. The theoretical framework is developed through a literature study and expert interviews.

Orientation on creativity studies
Creativity is an extremely broad field of study. For long, both artists and scientists

have tried to describe and explain this intriguing cognitive process. This has lead to such a diverse body of knowledge that there has even been argued that there can never be one scientific theory of creativity (Boden, 2004, p. xi). In order to create a coherent theoretical framework, it is necessary to come to a concise selection of generally acknowledged idea generation models.

Search for spatial conditions for idea generation
In this research, a fair cut through the existing literature is made by using snowball search as a strategy. Snowball search is conducted from two starting points: on one hand the article by Dong (2016) and on the other the references from researchers in the field of creativity. Several researchers from the Erasmus University, Leiden University, the University of Amsterdam and Groningen University, specialised in creativity are asked to refer to literature they find fundamental to understanding the creative process. These researchers have diverse backgrounds in cognitive, environmental and social psychology, sociology and design thinking. The gathered body of literature forms a demarcated section of all the literature available in this field and this section is reviewed on spatial conditions.

The definition of spatial conditions used in this study is the 'spatial circumstances affecting the way in which people live or work' (see List of Definitions). These spatial conditions are interpreted from the outcome of the literature search for models for idea generation.

Evaluation through expert interviews
As evaluation of the literature study, three experts are asked to reflect on the outcomes of the literature study. In these exploratory interviews, the experts are asked to consider their field of expertise in relation to the spatial conditions. This offers a form of verification to the interpretations from literature. Additionally, this help to gain more in-depth knowledge about the relation between idea generation and the context of the city.

2.2. RQ2 DEVELOPMENT OF CONCEPTUAL MODEL OF IDEA GENERATION

The development of the conceptual model is done on the basis of the theoretical framework and answers the research question: 'What conceptual model can support the urban designer in making design decisions on the urban fabric in relation to idea generation processes?'.

The aim of developing a conceptual model is to organise the spatial conditions for idea generation in such a way that they make sense for the urban designer in his/ her design process. By experimenting with different organising models, this research searches for one method of representation that is most clear for the interpretation of the spatial conditions in practice. Additionally, the pos-

sible application of the conceptual model is described in an instruction manual for urban designers.

Dong (2016) presented a perspective on idea generation new to the urban design discipline. His proposition to shape the city in such a way that it can support the idea generation process is in need of a more concrete exploration in urban design. The conceptual model is a stepping stone to designing for innovation space in the city. The conceptual model is consequently tested for this use in urban design in a design study described in 2.3.

2.3. RQ3 DESIGN STUDY FOR URBAN STRATEGY LDE

The design study in this research aims at answering the research question: 'How to design an urban strategy for the university campus in Delft in order to stimulate idea generation within the university collaboration LDE (Leiden, Delft, Erasmus)?'. De Jong and Van der Voordt (2002, p. 19) characterise a study as a 'collective term for generating knowledge by thoroughly thinking through a problem, carrying out experiments and collecting, processing and analysing data'. Within a design study, design is the main method used to think through a problem. What better way of understanding a problem is searching for possible solutions?

A design study means 'making a design in a relatively well-known context of potential users, investors, available techniques, building materials, political, ecological and spatial restrictions' (De Jong & Van der Voordt, 2002). In order to get familiar with the context and problematisation of the collaboration LDE, in this project three analyses are done: a study into the programme requirements of LDE (A), an analysis of the local context through theory (B) and a spatial analysis of the urban context in Delft (C). After establishing a well-known context, the urban strategy is developed by means of the conceptual model that is developed in RQ2.

A. Analysis programme requirements LDE
In order to gain a deeper understanding of the collaboration between Leiden, Delft and Erasmus, an organisational analysis is made. This analysis is based on data gained from institutional documents on the collaboration and explorative conversations with two participants in the collaboration.

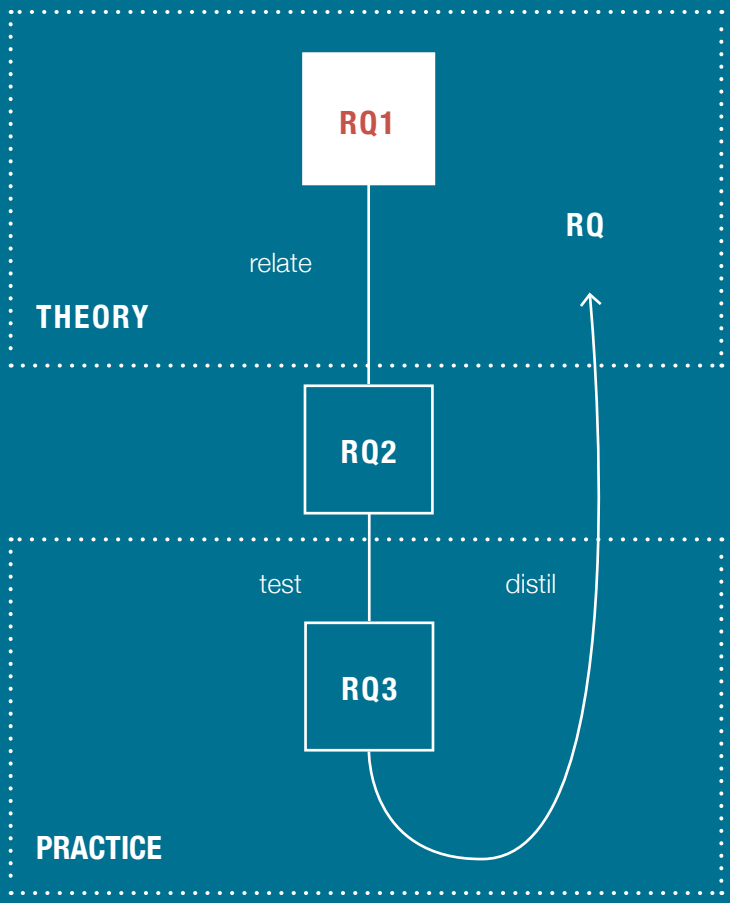
B. Analysis local context through theory
Analysis A deals with the organisational components of the LDE case, analysis B, respectively, deals with the spatial components. From urban design theory, three perspectives are discussed and related to the spatial components of this design study: the campus model by Den Heijer (Den Heijer, 2008), the theory on interaction milieus by De Hoog (De Hoog, 2012), and cognitive mapping as design approach (Haken & Portugali, 2003).

C. Analysis urban developments in Delft

Analyses A and B lead to a better understanding of the design challenge of LDE. In analysis C the urban context in Delft, where the design has to land is investigated. In this urban analysis the urban structure, infrastructure and planned urban developments in Delft are investigated.

Urban strategy design

To come to an urban strategy for LDE in Delft, the analyses in A, B and C are combined with the conceptual model. Knowledge gained from all these investigations is incorporated within the urban strategy. This essence of the result distils four core design principles that are described as a conclusion and answer the research question (RQ_U): 'How can urban designers develop an urban strategy to stimulate idea generation processes within the university collaboration between the universities of Leiden, Delft and Rotterdam?'.


RQ1
RQ
relate
THEORY
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RQ3
PRACTICE

WHAT ARE SPATIAL CONDITIONS FOR IDEA GENERATION?

3 SPATIAL CONDITIONS FOR IDEA GENERATION

The point of departure for the theoretical exploration in this chapter is the suggestion that human creative processes are connected to the places they inhabit (Johnson, 2010). Creativity is the unique cognitive ability of human-beings that lies at the core of generating new ideas. In order to find the spatial conditions for idea generation, in this chapter, the mind where those creative processes ignite, is taken as a starting point.

The goal of this chapter is to develop a theoretical framework that describes the spatial conditions for idea generation and explores theory from different disciplines (**Figure 4**). Taking cognitive science and psychology as a starting point, firstly, four models are selected as the basis of the theoretical framework (**3.1**). From these four main models on creativity, spatial conditions for idea generation are derived. This theoretical framework is discussed within exploratory interviews (**3.2**). This chapter concludes with a summary of the spatial conditions for idea generation and their relation to the theoretical framework on idea generation.

3.1. THEORETICAL FRAMEWORK

Creativity is a fascinating study topic that appears in many studies and is at the same time difficult to define (Runco, 2007). In this study the focus is on the production of ideas and how that process is related to the urban fabric. That relation has been scarcely studied and spatial conditions for idea generation have not yet been established as such in previous studies. Therefore, the theoretical exploration in this chapter is very open.

In order to gain an understanding of creativity and how the creative process leads to the production of good ideas, experts that study creativity in different fields (cognitive, environmental and social psychology, sociology and design thinking) were asked to provide a theoretical starting point. From these

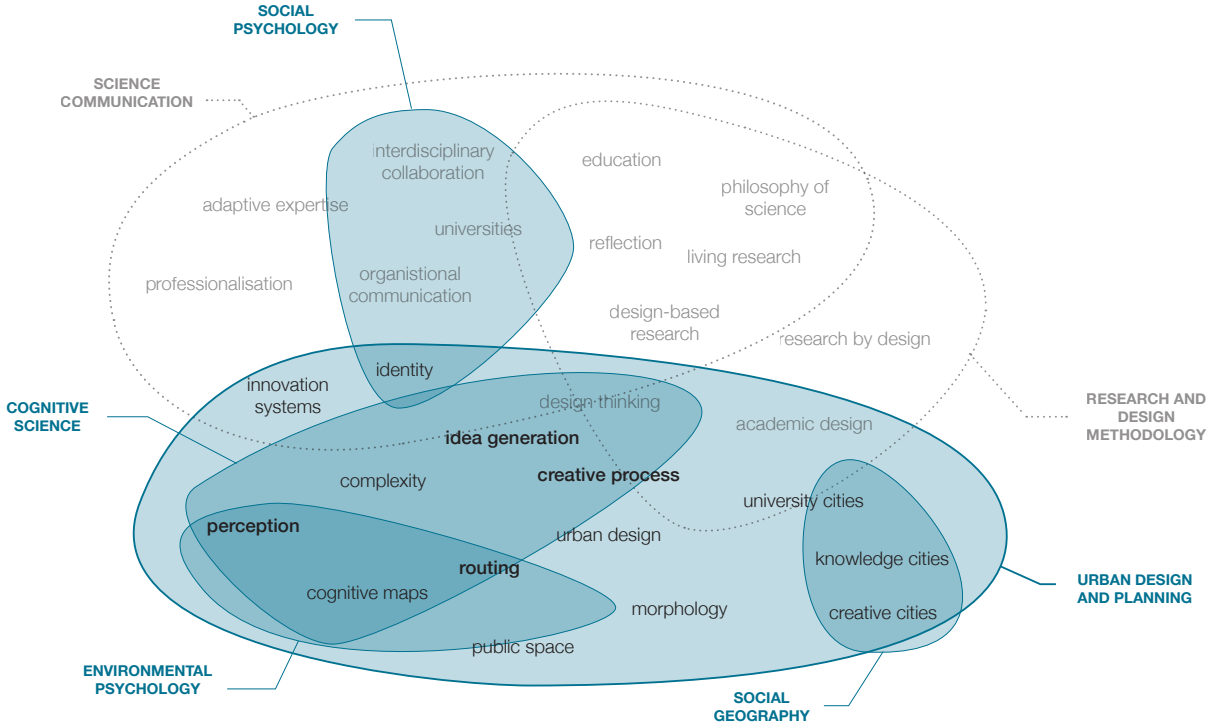


Figure 4 Research field in theoretical framework

literature suggestions and Dong (2016), a snowball search was done to uncover related literature and develop a generic understanding of idea generation.

This search resulted in four generic models that describe idea generation. These four models consider the idea generation process on different scale levels: the unconscious, the mind, the individual and the collective (Ohlsson, 2011) (see Figure 4). The first model explored is focussed on the level of the unconscious and the mind.

3.1.1. TWO PATHWAYS TO CREATIVITY MODEL

To generate an idea an insight has to travel from the unconscious to the mind. Ohlsson (2011) shows in **Figure 5** that this needs selective activation of the brain. The two pathways to creativity model describes two modes of thinking that are used to activate the brain in order to seek for a solution to a given problem or assignment.

Carsten & de Dreu (2016) define two types of brains: the flexible and the persistent brain

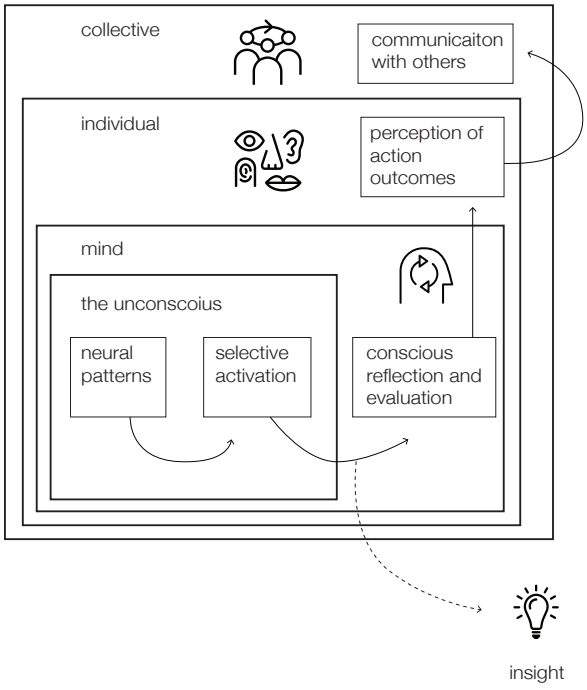


Figure 5 Production of novelty within four envelopes of idea testing and generation (adapted from: Ohlsson, 2011)

(**Figure 6**). The flexible brain is employed with divergent thinking, searching for new connections in all the data available. It is a mode of thinking that is associated with abstract thinking, taking a long term view or global perspective (Baas in De Dreu & Sligte, 2016). This mode of thinking is easily associated with high levels of creativity, because people can make connections between insights and concepts that might not have seemed logical before.

Persistent thinking, employed by the persistent brain, takes place in the prefrontal cortex, which is associated with the conscious management of our behaviour. When working on a creative task through persistency the brain travels to the edges of what is know. There, new pieces of information that did not seem so relevant before, pop-up and new connections can be made by persistently looking for these new pieces of information.

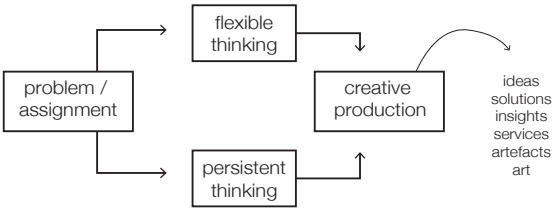


Figure 6 Dual Pathway to Creativity Model (adapted from: De Dreu & Sligte, 2016)

Generally, people have the ability to employ both flexible and persistent thinking, however, we tend to have a preference to use one or the other. That preference is influenced by our personality, social context ánd the environment (De Dreu & Sligte, 2016).

Spatial Condition 1A+B

The persistent brain has other demands of its surroundings than the flexible. Where flexible thinking is triggered by all kinds of stimulants and feeds of inspiration from social and environmental contexts, working persistently allows for much less distractions in the surroundings. The persistent brain needs a calm, **low-stimuli workspace** to concentrate. Flexible thinking is supported by **collaboration workspaces** that allow for the exchange of ideas.

These two types of environments, the 'low-stimuli workspace for persistent thinking' and the 'collaboration workspaces for flexible thinking', are not contradictory pairs, but should complement each other. Therefore, they should not be considered as contraries. Contraries are ubiquitous, but do not always consider the complexity of reality (Kelso & Engstrøm, 2006, pp. 1-16). Influential architect and theorist Aldo van Eyck describes complementaries, opposed to contraries, in architecture as 'twin phenomena'. Examples of twin phenomena are for instance 'open-closed', 'alone-together' and 'inside-outside'.

Flexible and persistent thinking could also be considered as a twin phenomenon. Collaboration workspaces and low-stimuli workspaces should, therefore, also complement each other in order to create the environment that supports idea generation. In this study, therefore, these two spatial conditions are categorised as numbers 1A and 1B.

Additionally, this recognises the importance of creating the possibility for the knowledge workers to search for the conditions in their environment that support the mode of thinking they are in (De Dreu & Sligte,

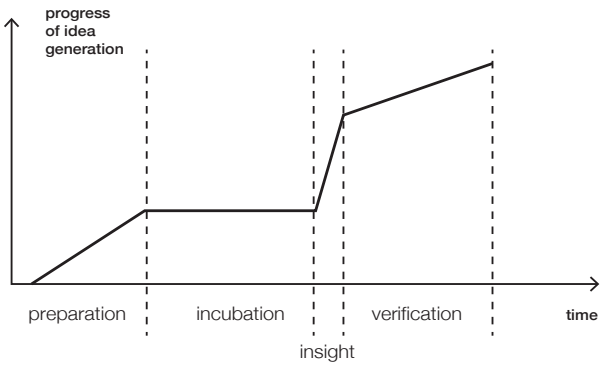


Figure 7 Four Stages of Creativity Model (adapted from: Ohlsson, 2011).

2016; Droog, 2016). Autonomy of workspace is an important organisational condition that should allow for knowledge workers to choose a surrounding that fits their cognitive creative needs.

Both the flexible and the persistent thinking need focus and a certain level of cognitive activation from their surroundings. This insight is further explored within the four stages of creativity model.

3.1.2. FOUR STAGES OF CREATIVITY MODEL

The two pathways to creativity models shows that idea generation is a cognitive process that employs different modes of thinking. The next model discussed explains creativity as a process (**Figure 7**). The four stages of creativity model is one of the most common used models to decompose creativity (Runco, 2007).

Generally, the cognitive process of creativity is divided in four stages: preparation, incubation, illumination and verification (Runco, 2007; Wallas, 1926). Illumination, also known as the aha- or eureka!-moment, is maybe the most recognisable and certainly the most famous stage in the process. But before that flash of enlightenment happens, a lot of (unconscious) thinking has already been done.

During the preparation stage, a person tries to get familiar with the problem at hand (Runco, 2007). While exploring the problem material, one tries to get a good understanding of the goals and one tests possibilities that come to mind right away (Ohlsson, 2011). This is a crucial stage for the quality of the idea, as the solution can only be as good as your understanding of the problem (De Dreu & Sligte, 2016).

Entering the incubation stage, a point of saturation is reached in the information and solution seeking. Ohlsson (2011) calls this stage the 'impasse', as it gives the feeling of being stuck. In this stage, often unconsciously the mind goes on searching for new combinations, exploring thought spaces and trying to transform them, until a moment of illumination.

The new idea that arises from the moment of illumination is consequently tested in a verification stage. This is in line with the definition of creativity given above, in which the functional quality of the idea is represented as well as the original quality. An insight can than turn out to be false or only partly applicable, through which one might enter a new phase of investigation and preparation.

The Four Stages Model predominantly shows that idea generation is not a moment, it is a process. There is not one type of thinking involved in idea generation and the mind is almost continuously (but not always consciously) occupied with solving the problem, especially, within the incubation and illumination stage.

Spatial Condition 2A
Therefore, these stages have additional demands from their environment. During the incubation stage it is important to keep activating the brain, but it does not necessarily need to be occupied with the problem at hand. One could benefit from disrupting the everyday urban context by taking a walk or run through a park. The mind gets activated and processes information from the preparation stage, but it is not forced to work on a problem and does not need to feel stuck. This demands that the city facilitates in **public spaces for physical activation**, for example, in urban sports parks. Physical activation can also be encouraged through subtle landscape features such as height differences on street level or building circulation that stimulates the use of staircases.

Spatial Condition 2B
Another way of achieving mental activation, whilst not actively working on a solution, is by slowing down the thinking process. This is one of the reason for the common conception that we have good ideas under the shower (De Dreu & Sligte, 2016, pp. 82-84). After a good night's rest our mind has had time to incubate all the information gained in the preparation stage. With a clear mind in the morning (under the shower), it is easier to think flexible and gain a new idea. Within the urban environment, **public spaces for contemplation** could create this same effect.

Contemplation space could be associated with religious buildings, such as churches and prayer rooms. A positive relation has been found between creativity and some forms of meditation and mindfulness. These activities could be supported by contemplation spaces. The calming effect that nature

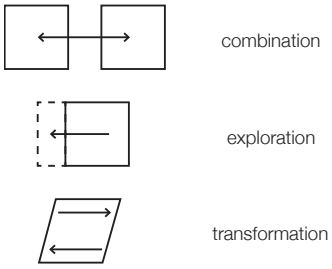


Figure 8 Cognitive strategies

has on the mind, is also reason to associate contemplation space with green spaces as parks and forests (Kaplan, 1995).

The next model takes a closer look at what happens on an unconscious level between incubation and illumination.

3.1.3. COGNITIVE STRATEGIES MODEL

This third model focuses on the most detailed level considered in this thesis. It describes the three cognitive strategies involved in idea generation. Cognitive strategies are different from the modes of thinking described in the Two Pathways to Creativity Model.

The mind's first strategy to think creatively is to make a new combination of existing ideas (Boden, 2004, p. 3). To people with a rich and diverse store of knowledge and the flexibility to move these ideas around, combining them in a new way might not be too difficult. The cognitive strategy of 'combination' delivers creative ideas that are surprising in their unfamiliarity, but the mind is able to be creative on a more abstract level as well.

In the strategies involving *exploration* or *transformation*, 'conceptual spaces', as Boden (2004) describes them, play a vital role:

> "Conceptual spaces are structured styles of thought … They include … any disciplined way of thinking that is familiar to (and valued by) a certain social group. Within a given conceptual space many thoughts are possible, only some of which may actually have been thought." (Boden, 2004, p. 4).

When being creative through the second cognitive strategy, one finds a new idea within a conceptual space. It means the idea 'fits' within a space that was familiar, but one never realised before that the idea was there. Being creative as an artist or scientist often means to come up with an idea within an existing conceptual space.

Probably the deepest and challenging way of being creative is by transforming a conceptual space in order to fit a new idea in (Boden, 2004). The conceptual spaces in our mind can change and one changes them by creative thinking. This happens when one comes up with an idea that, considering the existing conceptual spaces in one's mind, could not have been thought of before. It means that a conceptual space had to be altered to allow a new idea to fit in (**Figure 8**).

Spatial Condition 3

Just as the mind can surprise you by coming up with a new idea, the city can surprise you by presenting you with structures, forms or details you did not expect. The perception of the city is built on expectations that we derive from structures we experiences before (Cullen, 1971; Lynch, 1959). We built mental models to categorise and understand the enormous number of buildings and information that the city offers us (Haken & Portugali, 2003). These unique urban stimuli are on themselves input for analogical reasoning, used when combining or exploring conceptual spaces, but they can also stimulate the creation of frames when transforming a conceptual space (Dong, 2016). The **complexity of the urban fabric fosters an element of surprise**. Different from the spatial conditions 1A, 1B, 2A and 2B this spatial condition is difficult to design, but can be integrated within the planning efforts of the urban designer.

3.1.4. LOCAL BUZZ AND GLOBAL PIPELINES MODEL

The last model discussed within this theoretical framework is the model by Bathelt, Malmberg and Maskell (2004). Their model explains the social mechanisms behind idea generation in economic clusters and originates from the field of social geography (**Figure 9**). It therefore also involves the individual-collective scale into the consideration of spatial conditions for idea generation.

Bathelt et al. argues that spatial proximity is important for organisations in order to exchange knowledge and create new ideas. Although we live in a globalised society, successful economic clusters are characterised by a 'local buzz': an innovative or inspiring atmosphere that is location bound. At the same time, the 'global pipelines' in this model represent the networked connections to other specialised clusters in the world. Both interactions, local and international, are essential for idea generation (Collis, Felton, & Graham, 2010).

Spatial Condition 4

In the light of the Four Stages of Creativity Model, the local and international exchange of knowledge is important to the preparation and verification stage. In the preparation stage the **social diversity in the local interaction** of the city could offer new input. The diverse cultural context and distraction of the city can be experienced in a local exhibition, but also by developing mixed-use areas (Dong, 2016). The quality of diversity of the

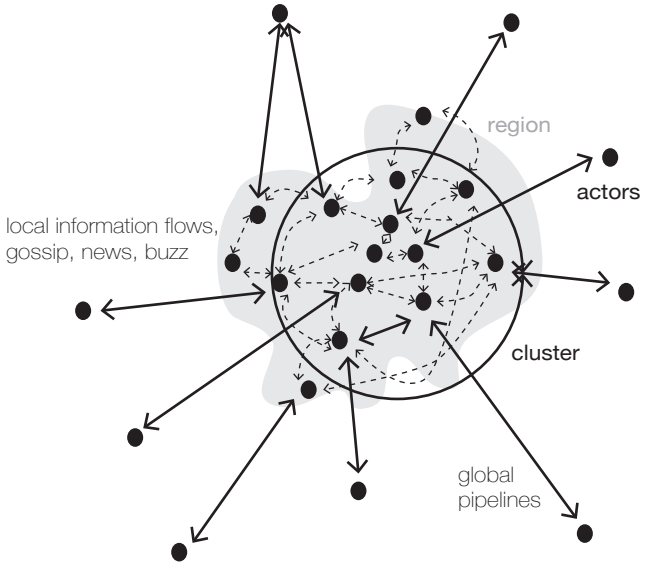


Figure 9 Local Buzz and Global Pipelines Model (adapted from: Bathelt et al., 2004)

face-to-face interactions within a knowledge cluster are essential to idea generation (Storper & Venables, 2003).

Spatial Condition 5

Within the verification stage, a new idea is evaluated with other experts from the field in which the new knowledge or technology is developed. In the globalising knowledge economy experts from both inside or outside the knowledge cluster could be involved in the idea generation process. **Connectivity** to global pipelines is important and also digital communication is indispensable to establishing these pipelines. At the same time, face-to-face interaction should not be underestimated and it is crucial to facilitate the exchange of ideas (Storper & Venables, 2003). A recent study found a correlation between citations and geographical location (Glaeser, 2011). Apparently, papers are cited more within the same geographical location. It suggests a connection between local interaction between knowledge workers and

the type of knowledge they use to develop new ideas. Facilitating face-to-face interaction with other knowledge workers in **spatial proximity** of each other is key within the idea generation process.

3.2. EXPERT INTERVIEWS

In the previous paragraph four models for idea generation were used to establish a general understanding of the idea generation process. From these four models spatial conditions were derived by interpreting them from the perspective of the urban designer. In order to contextualise these interpretations, the spatial conditions were discussed within three exploratory interviews. In a short summary, the most important leads from the interviews are explained.

DR. DANIEL SLIGTE

PhD Work and organisational psychology, University of Amsterdam

- In relation to personality, Sligte states that the differences between individuals are very small. Psychology is a formula, like 'person x situation', where the situation always has a greater impact. This is one of the things the Milgram experiment proves as well. When put in the same situation, every individual tends to act the same way. In relation to designing for creativity it is better to look for generic models, than focus on personal differences between individuals, such as avoidance and approach traits.

- Sligte finds environmental conditions for creativity in terms of 'autonomy', the ability to take risks and 'psychological distance'. Autonomy can manifest itself, when you can adjust your work space to your personal needs. Certain environments are perceived as more playful, more permissive of mistakes and might therefore increase the ability of risk taking. Psychological distance has to do with the ability to think abstractly.

DR. HENK STAATS

PhD Social and environmental psychology, Leiden University

- Staats supports that there is not much known about the perception of cities in psychology. Until recently, the city was predominantly perceived as an 'overload'. The urban environment always over stimulated and therefore caused stress.

- Staats finds that environmental conditions for creativity are found in residing values, such as sunlight and shelter. It is more useful to stop viewing the city as an opposite of nature, but to decompose it into districts, such as 'downtown', 'center environment' or 'public space', characterising places by their attractively for people to reside there.

- It is a good idea to proceed with Wallas, agrees Staats. It is important to consider cognitive activation. This can be achieved through both physical and cognitive activity. Taking a run or looking for a place to contemplate can both contribute to the incubation and illumination stages.

JUDITH LEKKERKERKER

Researcher Urban and Economic Development at Ruimtevolk

- Starting point for this research was the need of national government to think about spatial planning on national level (NOVI).

- As part of the research Ruimtevolk organised several regional round-table meetings in innovation districts. There they found three recurring elements that were essential to organising interaction: connectivity, face-to-face encounters and proximity. Lekkerker also states that the existing infrastructure is decisive for innovation opportunities. It is the existing infrastructure that determines the dynamics of a certain district.

- Some networks and infrastructures work increasingly in niches. These niches are highly specialised networks inside the city. Because these networks are so specialised they complicate the interaction or spill-over with other networks. Therefore, we should look for the places where mixing is encouraged and creativity can arise again.

- Lekkerker suggests to look at the 'matchmakers' in the city. With matchmakers one could think of frontrunners in urban innovation or innovative entrepreneurs, but also institutions as local government could take such a position. One could also think about facilities that take a matchmaker position, such as co-working spaces (B Amsterdam/ WeWork/ Student Hotel), arts centers or a soccer stadium.

These images show the locations the interviews have been conducted:

Image 1 The Coffee Company in Amsterdam

Image 2 Pieter de la Court building in Leiden

Image 3 The Office of Urhahn Urbanism in Amsterdam

3.3. CONCLUSION RQ1

Idea generation is both a cognitive and a social process. By discussing four models on idea generation that range from the smallest scale level of the mind to the level of collective social networks, five spatial conditions for idea generation were derived (**Table 1**) and they form the answer to the subquestion 'What are spatial conditions for idea generation?'.

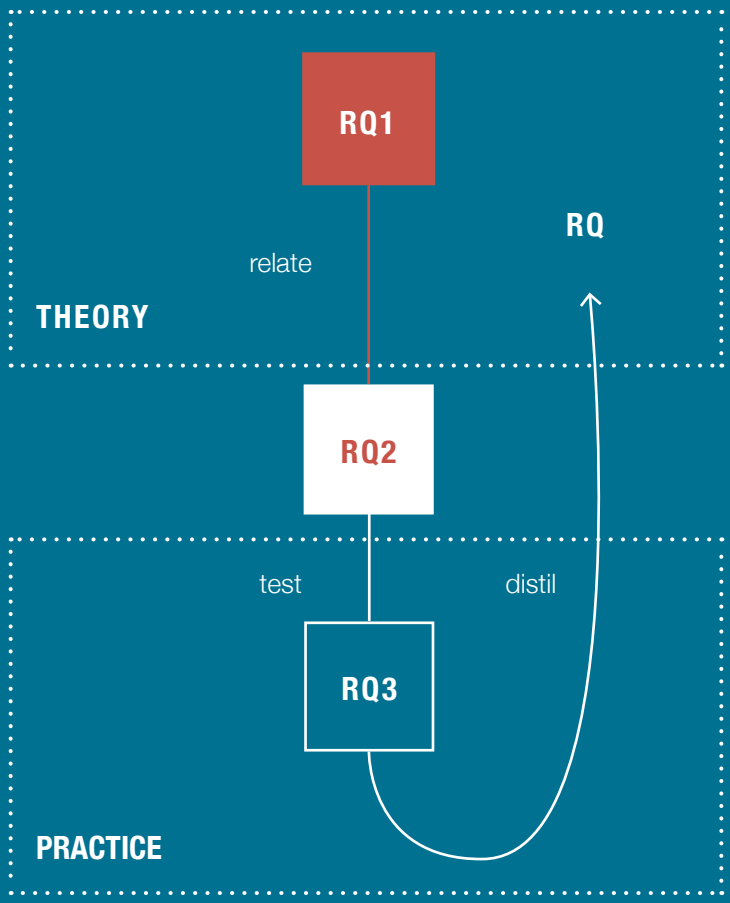
Spatial conditions 1A, 1B, 2A and 2B have a concrete spatial character and anticipate on the possibility that an individual agent can autonomously choose an environment that fits its mode of thinking. Spatial condition 3 is derived from a model on deep learning that explains on a cognitive level how ideas are generated. An exclusive quality within the urban fabric, the element of surprise, is found as instigator of the cognitive process of illumination. Spatial conditions 4 and 5 should be considered in the context of social geography and describe conditions that function on the level of a city or knowledge cluster.

The models discussed in the review were put in perspective by exploratory interviews with experts from the fields of environmental and social psychology and urban design. The spatial conditions are contextualised this way. For instance, by Lekkerker who describes matchmakers in the city as key figures who can connect different networks. This aligns with the potential of social diversity in local interactions that could spike new ideas by yielding diverse perspectives on the problem.

The idea generation process happens more and more in the context of the city, as that is where most people live and work. The spatial conditions for idea generation as they are found in this literature review, are a first suggestion of how we should understand idea generation in the city and potentially how we could design for these conditions as well. In the next chapter, the spatial conditions will be the starting point for developing a model for urban designers.

Model	Cognitive scale	Spatial condition	Spatial characteristics
Two Pathways to Creativity Model (De Dreu & Sligte, 2016)	unconscious - mind - individual	Collaboration workspaces for flexible thinking (1A)	The flexible brain can take a helicopter view to look at the problem at hand. Within this view almost anything can serve as a valuable trigger to ignight an idea.
		Low-stimuli workspaces for persistent thinking (1B)	When working through persistent thinking to solve a problem, the mind needs the least distraction from it surroundings. The persistent brain needs a calm, low-stimulus environment to concentrate.
Four Stages of Creativity Model (Wallas, 1926; Ohlsson 2011)	mind - individual	Public spaces for physical activation (2A)	Within the incubation and illumination stage it is important to keep the mind active, although one might not be consciously working on the solution. One way of achieving that mental activation, is by physical activation.
		Public spaces for contemplation (2B)	Contemplation spaces are spaces that rest the mind. They could be associated with religious buildings, such as churches, meditation and prayer rooms, as well as natural surroundings and green spaces, such as parks and forests.
Cognitive Strategies (Boden, 2004)	unconscious - mind	Complexity of urban form fostering elements of surprise (3)	Just as the mind can surprise you by coming up with a new idea, the city can surprise you by presenting you with structures, forms or details you did not expect.
Local Buzz and Global Pipelines (Bathelt, Malmberg & Maskell, 2012)	individual - collective	Social diversity in local interaction (4)	The social diversity in the local interactions within the city could offer new input in the preparation stage. The diverse cultural context and distraction of the city can be experienced in a local exhibition, but also by developing mixed-use areas.
		Connectivity and spatial proximity (5)	Face-to-face interaction, established by connectivity and spatial proximity of knowledge workers, is crucial to facilitate the exchange of ideas

Table 1 Summary models and spatial conditions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WHAT CONCEPTUAL MODEL CAN SUPPORT THE URBAN DESIGNER IN MAKING DECISIONS ON IDEA GENERATION PROCESSES IN RELATION TO THE URBAN FABRIC?

4 CONCEPTUAL MODEL FOR URBAN DESIGN

The previous chapter[1] concluded with five spatial conditions for idea generation. In this chapter, these results are positioned within a conceptual model that shows the relation between the spatial conditions for idea generation and the urban environment (**4.1**). The aim of developing such a model is to create a tool that supports decision making by urban designers that are developing urban projects for innovation. The possible use of such a model within the urban design process is described in an instruction manual (**4.2**).

The conceptual model functions as a transitional tool between the academic discussion on theory of urbanism and the problem solving in urban design practice. Motivated by the challenge of universities to stimulate innovation in their campus surroundings (practice) and the issue that within urban design there is only little known about the spatial conditions within the city that stimulate innovation (theory), a new frame needs to be developed to integrate the academic discussion from the 'world of thought' and the 'design discussion in the real world' (Dorst, 2013, pp. 14-19). The conceptual model is derived from academic thoughts and translated into experimental action, in the design study in Chapter 5.

4.1. DEVELOPMENT CONCEPTUAL MODEL

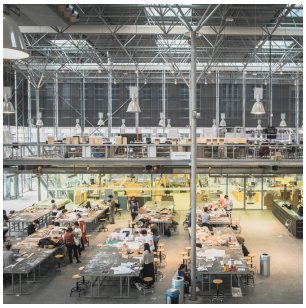
The development of the conceptual model is done in three steps. Firstly, the spatial conditions are each illustrated in a generic urban example to show the context in which to interpret the condition. Secondly, these conditions are organised on an urban scale level. Finally, they are redistributed on a cognitive scale and this paragraph concludes with a conceptual model for idea generation in the city. Additionally, the possible applica-

1 Up until this part of the thesis I have predominantly based my argument on the findings of others. This resulted in a theoretical framework for this study. From here on, I will gradually develop a conceptual model that is based on my own interpretation of the theory presented before.

tions of the model within the design process is explained in paragraph 4.2.

4.1.1. URBAN ELEMENTS

In the theoretical framework each model has shown a different relation to the urban environment. In some cases that relation is more obvious than in others. This results in spatial conditions that have a different level of abstraction.



Collaboration workspaces for flexible thinking (1A)

On campus the faculty buildings facilitate in the collaboration among students and researchers. Increasingly didactic approaches are based on group work and in research co-working in interdisciplinary teams becomes more important too. On the Delft campus the modelling hall at the Faculty of Architecture is an example of how study facilities and co-working are combined in one workspace. The open and transparent structure suits a the open and transparent flexible mode of thinking associated with collaborative work. The route to the cafeteria that lies through this hall additionally makes this an ideal place for coincidental encounters between faculty members.

Image 4 Faculty of Architecture modelling hall

Image 5 Office designed by Anonym Studio in Bangkok

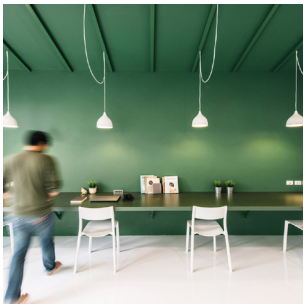
Image 6 Bridge in New York

Image 7 Governors Island in New York

Image 8 Dirklangendwarsstraat in Delft

Image 9 Doelenplein in Delft

Image 10 River Manzaneras in Madrid



Low-stimuli workspaces for persistent thinking (1B)

The collaboration workspaces as exemplified above need to be complemented by low-stimuli workspaces for a persistent mode of thinking. Here, as an example the design by Anonym Studio for a TV production office in Bangkok is used to illustrate how a low-stimuli workspace could look. From studies in environmental psychology not just a walk through nature had calming affects on a person's well-being, the colour green in workspaces can serve the same purpose (Bell, Greene, Fisher, & Baum, 2001). Additionally, the workspaces visible here are directly connected to an inner courtyard offering another spatial condition: a public space for contemplation.

Public spaces for physical activation (2A)

The public space facilitates physical activation in numerous ways, offering safe bicycle routes between home and work and encouraging to take the stairs instead of the escalator, when leaving the metro station. Here, a running route in New York is used to illustrate this. On the Delft campus that physical activation is facilitated within the Mekelpark, designed by the architecture firm Mecanoo. The height differences in the park form an unnoticed contribution to physical activation in this public space.

Public spaces for contemplation (2B)
At a small distance from Manhattan, Governors Island offers contemplation space to New Yorkers. Designed by West 8 Urban Design and Landscape the island offers a diverse set of landscape features. The island is an unique way to get away from the rushed city life and enjoy the distance in a hammock.

Complexity of urban form fostering elements of surprise (3)
Historic inner cities in Europe have had the opportunity to develop gradually over many centuries. Different from recently planned and built modern expansion areas in the city, such as the Voorhof in Delft, the urban fabric within the historic inner cities seem to foster an element of surprise. Here, a piece of street art in the Dirklangendwarsstraat in the city of Delft is used to illustrate that element of surprise. While wondering through the small streets in the inner city, the image of the cow can surprise you when turning a corner.

Social diversity in local interaction (4)
Social diversity of local interactions is one of the exclusive qualities of the city that is difficult to find in other places of habitation, simply because social diversity appears in places where many people live. Local interaction can take place in the city in many ways, facilitated by urban functions for retail, leisure and culture. The example used here is an image of a street theatre activity for the Delft Fringe Festival.

Connectivity and spatial proximity (5)
Urban infrastructure is often the key to connectivity within and between cities, but can at the same time present the city with major barriers. An artery can be a wall at the same time. This was the case for the motorway along the river Manzaneras in Madrid. A major urban transformation that opened the city and set fertile ground for other spatial conditions to grow. Today, the park offers contemplation spaces and an opportunity for social diversity to occur in its local interaction.

Figure 10 Spatial conditions organised on three urban scale levels

4.1.2. THE URBAN SCALE

As designer, scale is an important way to come from strategic measures (abstract) to design propositions (concrete). Although interventions always impact across all scales, for designers the urban scale level can help organise the complexity of intervening in the urban fabric. In **Figure 11** and **Figure 12** two experiments with scale levels are shown on the Y axis. Figure 11 shows almost all relevant layers for urban design, from region to home. In Figure 12 these categories have been reduced to the three main urban layers (region, city and public space) and an architectural layer (building).

The problem with these graphs is that they do not help in creating an overview of design possibilities for the urban designer. It is difficult to let them function as transitional tool between theory and practice if the practitioner cannot quickly grasp the organising principle within the model. Only Figure 11 is successful in creating to some extent a

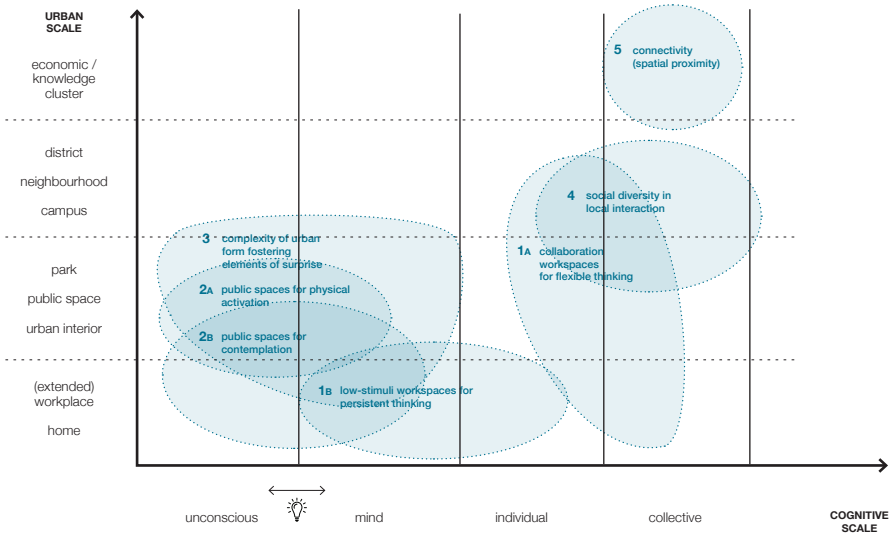


Figure 11 Organisation spatial conditions along a cognitive scale

hierarchy, however, much of the information on the idea generation process in the graph disappears.

In order to consider the different scale levels of the spatial conditions, without oversimplifying, instead of organising them along a scale, here a decision is made to categorise the spatial conditions. Three scale levels that are relevant from the combined perspective of knowledge institutions and the urban designer: Campus, morphology and city (**Figure 10**). Of course urban design interventions have effect along the axis from small to large scale. The three scale categories used, are meant to offer a more concrete starting point for developing the spatial conditions for idea generation within the urban fabric.

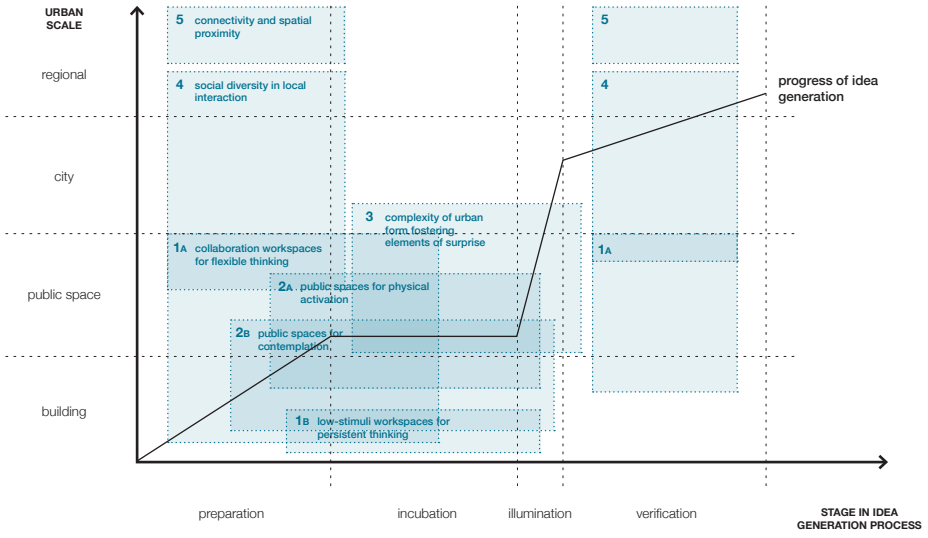


Figure 12 Organisation spatial conditions along the stages of idea generation

4.1.3. THE IDEA GENERATION PROCESS

In the pervious paragraph the experiment on the Y axis was described, in the same way, an exploration for the X axis was done. In this case, using the X axis as a cognitive scale (**Figure 11**). The cognitive scale was derived from three different models used as an example. The first is based on Ohlsson's model for the production of novelty in four envelopes (2011) (**Figure 12**). By organising the principles in four envelopes (unconscious, mind, individual and collective) it becomes clear that there are two groups: those spatial conditions that are closely related to the mind (1B, 2A, 2B and 3) and those that are closely related to the collective (1A, 4 and 5). This is undesirable, as the model objectifies to show the integration of principles instead of dividing them into two groups.

The second proposition for the X axis shows the idea generation process in accordance to the Four Stages of Creativity Model (Ohlsson, 2011). Some spatial conditions can play

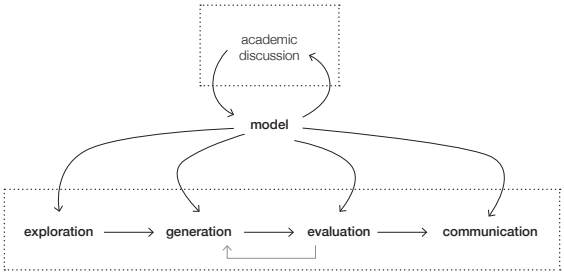


Figure 13 Application of conceptual model within four stage design process (adapted from: Cross, 2000' Dorst, 2013)

a role in two or more stages at the same time. The combination with the urban scale in this way is unfortunate, because it means that spatial conditions reappear, again failing to create overview.

Conceptual model of idea generation for urban design

The proposal for a conceptual model of idea generation is a result of the previous two experiments. The most important conclusions from these experiments is most clear to categorise the spatial conditions in three scale groups: Campus, morphology and city. At the same time, one of the most important conclusions from Chapter 3 was that idea generation should not be seen as a moment, but as a process. Therefore, the conceptual model organises the spatial conditions, on one hand, per urban scale category and, on the other hand, per stage in the idea generation process (**Figure 14**).

4.2. THE CONCEPTUAL MODEL AS URBAN DESIGN TOOL

The conceptual model is designed to be used as a tool in urban design projects that aim at developing an environment that can contribute to stimulating innovation. In general, a conceptual model can have different uses within the design process. At different stages the designer can ideate between theory and design. Cross (2008) developed a simple descriptive model of the design process, summarising the basic activities that the designer performs: Exploration, generation, evaluation and communication (**Figure 13**). Here, the prospected use of the conceptual model is discussed in each of these stages.

Exploration

In the exploration stage the conceptual model can be used as analytical tool. The model now shows generic urban elements that illustrate the spatial conditions. The urban designer could look for more elements within his project location. In the course

of this analysis, the designer gains a deeper understanding of the meaning of the spatial conditions and at the same time gets familiar with the project location. Additionally it can aid the designer in defining the problem space by asking questions on the status of the spatial conditions. Which spatial conditions are under developed or absent? Which spatial conditions seem to naturally be present within the project location?

Generation

There is a beautiful ambiguity about using a model explaining how idea generation works for the generation of concepts and ideas in a design process. The conceptual model can serve as a starting point for generating design ideas. The spatial conditions are not presented as concrete design solutions and, therefore, their level of abstractness leaves room for explorations and interpretations of the designer.

An interesting side effect of the ambiguity in using the model at this stage is that the designer at the same gains insight in what type of environments might be stimulating for his/her own design process. This might stimulate reflection on the idea generation process and trigger more conscious behavior by the designer. He/ she might by means of experiment search for a different type of environment to enhance his/her own process of generating ideas for a design project.

Evaluation

Just as the model can serve as an analytical tool, it can also serve as an evaluation tool. The spatial conditions could be interpreted as criteria to which the location is measured. Some spatial conditions might be naturally integrated within the urban fabric that is studied and some might be absent or underdeveloped. Evaluation can be done by comparing the criteria and the proposed intervention and considering if the design proposal indeed addresses the problems and goals from the analysis in the exploration stage.

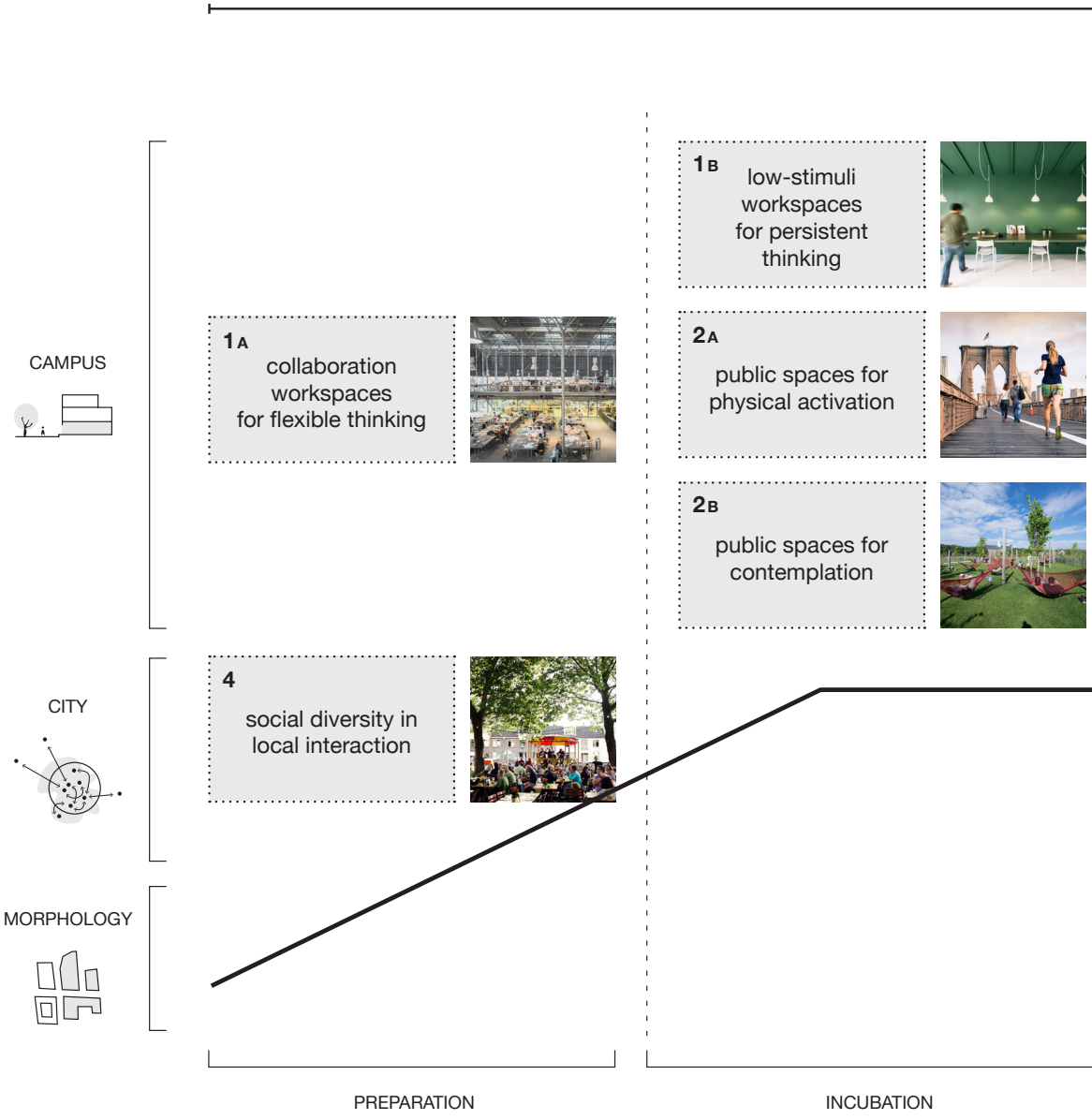
Communication

The communication of a design proposition is especially important in urban design. The urban designer has a different relation to the designed artefact than designers from other design disciplines have (George, 2007). Not only does the urban designer in most cases work on an extremely large scale, often he/ she does not have a direct relationship to the designed object. As George (George, 2007, p. 143) describes it:

> "Urban designers describe the decision environment within which others make decisions to design and alter the built environment."

In the transition from the decision environment to the design of the built environment the conceptual model could serve as a transmission tool. The conceptual model could offer insight in some of the large scale and

Figure 14 Conceptual model



progress of idea generation

1A
collaboration
workspaces
for flexible thinking

5
connectivity and
spatial proximity

4
social diversity in
local interaction

3
complexity of urban
form fostering
elements of surprise

ILLUMINATION

VERIFICATION

more abstract considerations of the urban designer to designers that might work in his/her decision environment.

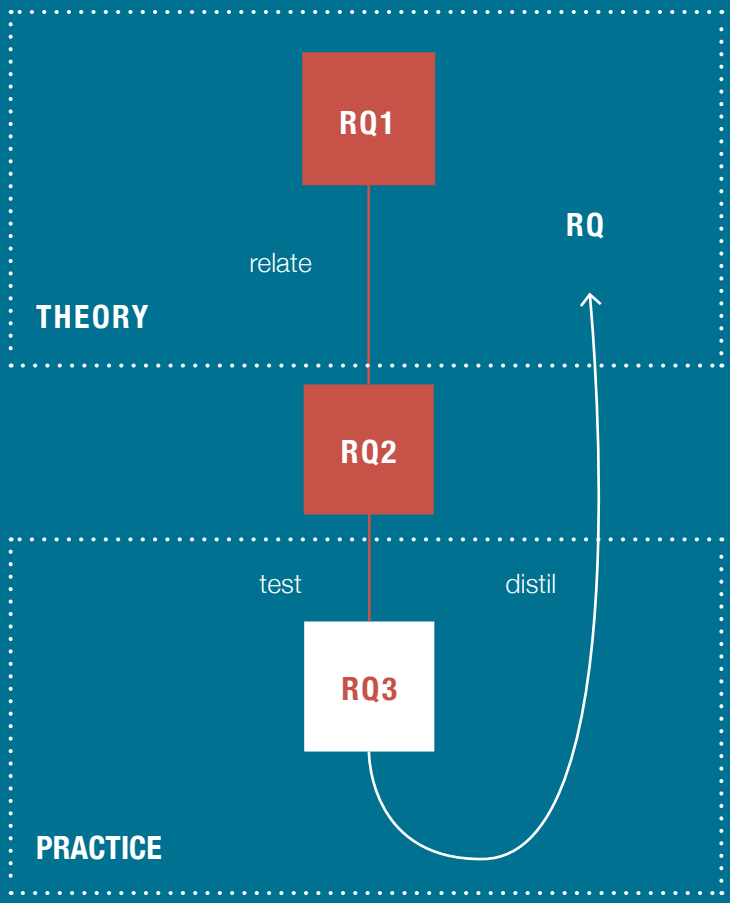
4.3. CONCLUSION RQ2

In this chapter, the spatial conditions for idea generation that were the result of the literature review in the previous chapter, were organised into a conceptual model for idea generation (4.1). Each spatial condition was related to an urban element to illustrate its meaning in the urban environment. For example, the spatial condition 'spaces for physical activation' was illustrated by the Singelpark development in Leiden, where specific facilities for running are planned.

As a way of organising the spatial conditions in a model two strategies were used. Firstly, all conditions were organised into the categories 'campus', 'city' and 'morphology', allowing for a quick interpretation of the urban designer. Secondly, all conditions were organised within the four stages of creativity model, giving insight in idea generation as a process. Combining these organising strategies resulted in the conceptual model for idea generation.

The use of the conceptual model was explained for exploration, generation, evaluation and communication in the design process (4.2). This provides an answer to the question 'What conceptual model can support the urban designer in making decisions on idea generation processes within the urban fabric?'.

The conceptual model for idea generation is developed with an eye on campus development by universities. The generic explorations within the theoretical framework from which the conceptual model originates, allow for the model to be relevant in the context of urban design for all kinds of innovation districts. However, to understand the conceptual model as urban design tool, the model is tested within a design study in the next chapter.


RQ1
RQ
relate
THEORY
RQ2
test
distil
RQ3
PRACTICE

HOW TO DESIGN AN URBAN STRATEGY FOR THE UNIVERSITY CAMPUS IN DELFT IN ORDER TO STIMULATE IDEA GENERATION WITHIN THE UNIVERSITY COLLABORATION LEIDEN-DELFT-ERASMUS?

5 DESIGN STUDY LDE

How can a conceptual model be used as a tool for urban design? In this chapter explorative design is used as a method to get familiar with the use of such a model. The aim of developing a conceptual model, as is done in the previous chapter, is to smoothen the transfer of theoretical knowledge into practical design solutions. The conceptual model for idea generation does not dictate concrete design solutions. These solutions should be found by exploring the model in a design study.

The aim of this chapter is to develop an urban strategy within a design study for the university collaboration Leiden-Delft-Erasmus (LDE), using the conceptual model for idea generation, the outcome of RQ2. The case of the university collaboration and the argumentation for using this specific location is explained in paragraph **5.1**. By explorative interviews a better understanding of the organisational structure and urban challenges for LDE is gained. The urban challenges of the 21st century campus are further explored in an analysis from three theoretical perspectives. Consequently, these perspectives are places in the context of the campus environments within the cities of Leiden, The Hague, Delft and Rotterdam (**5.2**). Delft is chosen as starting point to design an urban strategy and paragraph **5.4** zooms in on the urban context of Delft. In paragraph **5.3** the design of the urban strategy is described and elaborated in three urban design interventions.

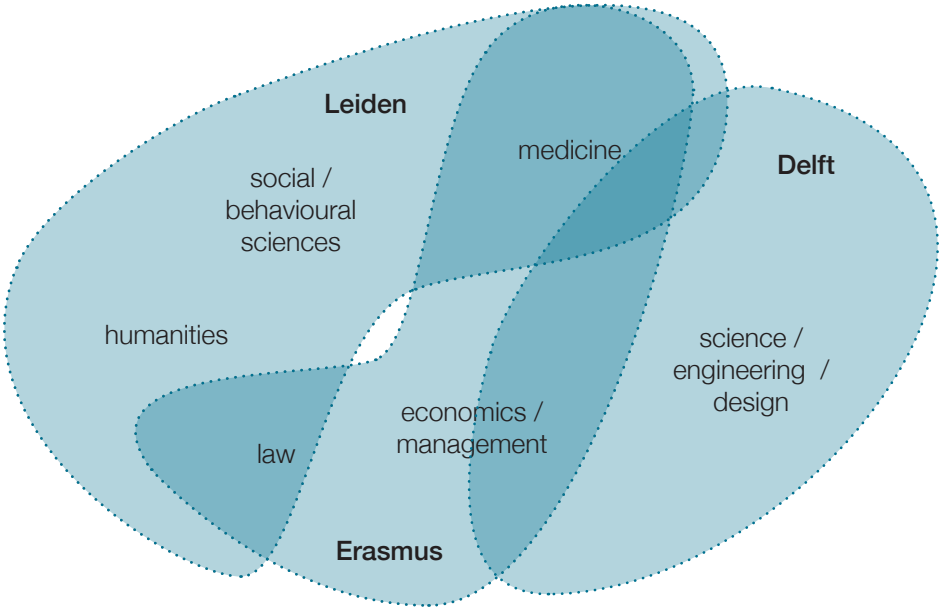


Figure 20 Complementarity of research fields in LDE collaboration (adapted from: Universiteit Leiden; Delft University of Technology; Erasmus Universiteit Rotterdam, 2012)

5.1. STRATEGIC ALLIANCE LEIDEN-DELFT-ERASMUS (LDE)

Since 2014 the universities in Leiden, Delft and Rotterdam formed a strategic alliance in which they formalised their collaboration (Universiteit Leiden et al., 2012). For over a decade, these universities have sought collaborations between different parts of their organisations. Motivated by geographical proximity and the complementarity of the fields of expertise within the three institutes, the success of these existing collaborations in the past has given incentive to work together more explicitly in the future. The strategic alliance is an ambitious plan to intensify their collaboration between the three universities in both their education and research activities.

5.1.1. DESIGN STUDY SELECTION

University collaborations arise all over the world. The decision to focus on the LDE collaboration was based on a few criteria. In

order to study the spatial conditions in the field, the focus had to be on locations in the Netherlands. Within the Netherlands, three university collaborations were considered:

- 4TU.Federation (Delft/ Eindhoven/ Wageningen/ Enschede)
- Applied Metropolitan Solutions Institute (AMS) (Amsterdam/ Delft/ Wageningen/ Cambridge, MA)
- Strategic Alliance Leiden-Delft-Erasmus (LDE) (Leiden/ Delft/ Rotterdam/ Den Haag)

The 4TU.Federation is a collaboration between the four Universities of Technology in the Netherlands. Spread over the Netherlands the collaboration between these engineering institutes aims at improving knowledge sharing and creativity in the technological sector. The disadvantage of looking at this collaboration is that it is less interdisciplinary than the other two cases. Additionally, the collaboration does not have a strong geographical cause.

The AMS Institute is a beautiful example of a collaboration that has a close relation to its geographical location. Amsterdam is used as a living lab and the researchers are embedded in the city by a building located in the heart of Amsterdam. However, as a small institute in the dutch capital it does not have much say in the urban developments. It would make more sense to look at a university cities, where local government is more concerned with integrating its urban developments with the campus developments of the university.

Between these three collaborations, LDE has two characteristics that make it more relevant as design study. Firstly, the collaboration is characterised by its interdisciplinarity. Within LDE six academic disciplines are involved to create opportunity for innovation (**Figure 20**). Additionally, LDE capitalises the geographic location of the three cities as one of their main reasons to formalise their collaboration. The LDE Board shows interest in the physical opportunities and sees 'shared space' as a tool for facilitating their collaboration. Therefore, LDE is chosen as a case to investigate further in this research.

5.1.2. STRATEGIC ALLIANCE LDE

LDE is not an organisation in itself. It is a collaboration that has a recognisable identity, but exists of activities within the three university campuses and people that are employed by one of the three universities. The added value that is created by collaborating does take new organisational forms, such as Medical Delta or the Centre for Sustainability (**Figure 21**).

Organisational and strategic decisions about LDE are made by the LDE steering committee that consists of the three executive boards of the TU, Leiden and Erasmus. In its day to day communication, the LDE collaboration is managed by three employees from

Delft: A project leader, strategic & science communication advisor and a communication officer. LDE also runs a management trainee programme with a group of trainees that shifts between different functions within the three universities.

To enable the intensification of the collaboration the steering committee has made funds available for a period of five years, until 2019. Since 2014, eight interdisciplinary centres have arisen from these funds. The centres feature a combination of research and education and most of them are currently investigating how to work more interdependently from the LDE funds. In education, the LDE funds are used to run three fully joint bachelor programmes and one master programme, closely collaborating programmes and joint tracks. Additionally, there are some cross-disciplinary research groups that work together on research, innovation and valorisation activities together.

One of the most successful examples of collaboration within LDE is the Medical Delta network. This collaborative network of life, science, health and technology partners already preceded the strategic LDE Alliance and has its own organisational structure and funding.

5.1.3. CONVERSATIONS WITH LDE

In conversations with researchers and employees within LDE, a better understanding of the organisational structure of LDE was gained. Here, two of the exploratory interviews done, are summarised to show some insights gained from talking with different stakeholders within LDE.

EVA VAN BAREN

Centre for Sustainability

- Eva van Baren is Community Manager at the Centre for Sustainability. The Centre for Sustainability is one of eight interdisciplinary centres for research and education within LDE. Van Baren has studied and worked in Rotterdam. She lives in The Hague.

- Van Baren explains the difficulties of working for a collaboration between institutions instead of for an actual organisation. LDE is not an entity in itself and that comes with specific problems. As an example she describes that for a long time she was only able to use printers in Rotterdam, although most of the week she would work at different locations on the campuses of Leiden, Delft and Rotterdam.

- The LDE centres have to find their own location for working and organising their activities. Some are bound to specific labs or facilities, but many participants within these centres move flexibly around on or between campuses, combining different positions. Now that these centres become more and more organised, Van Baren notices that they need a fixed location to work and meet at least once a week.

- The Centre for Sustainability works with people from Leiden, Delft and Rotterdam. It is notable that the CfS chooses to work in the Wijnhaven Building in The Hague. Motivated not only by the fact that it is a central location between Leiden and Rotterdam, but also because it avoids making a decision to settle in one of the three collaborating campuses and therefore avoiding a certain emphasis. The Hague is ‘neutral territory’.

- CfS also organises an innovation hub around the theme ‘Happy City’ in which Honours students from the three universities work together with practitioners in the field of urbanism and city making in Rotterdam. The Groothandelsgebouw is their current working space.

HILJE PAPMA

Strategic Communication LDE

- Hilje Papma is Strategic & Science Communication Advisor for LDE. Her office is situated in the Civil Engineering Faculty in Delft. Previously, she worked and studied at Leiden University.

- Papma sees for LDE both a challenge on the development of virtual communication as in the facilitation of face-to-face contact. Trends such as online media, blended learning and the virtual classroom are important for the collaboration. At the same time, Papma strives to make LDE more visible within the three universities. LDE should develop as a recognisable brand and she would be interested to learn how that could have a physical impact on the campus.

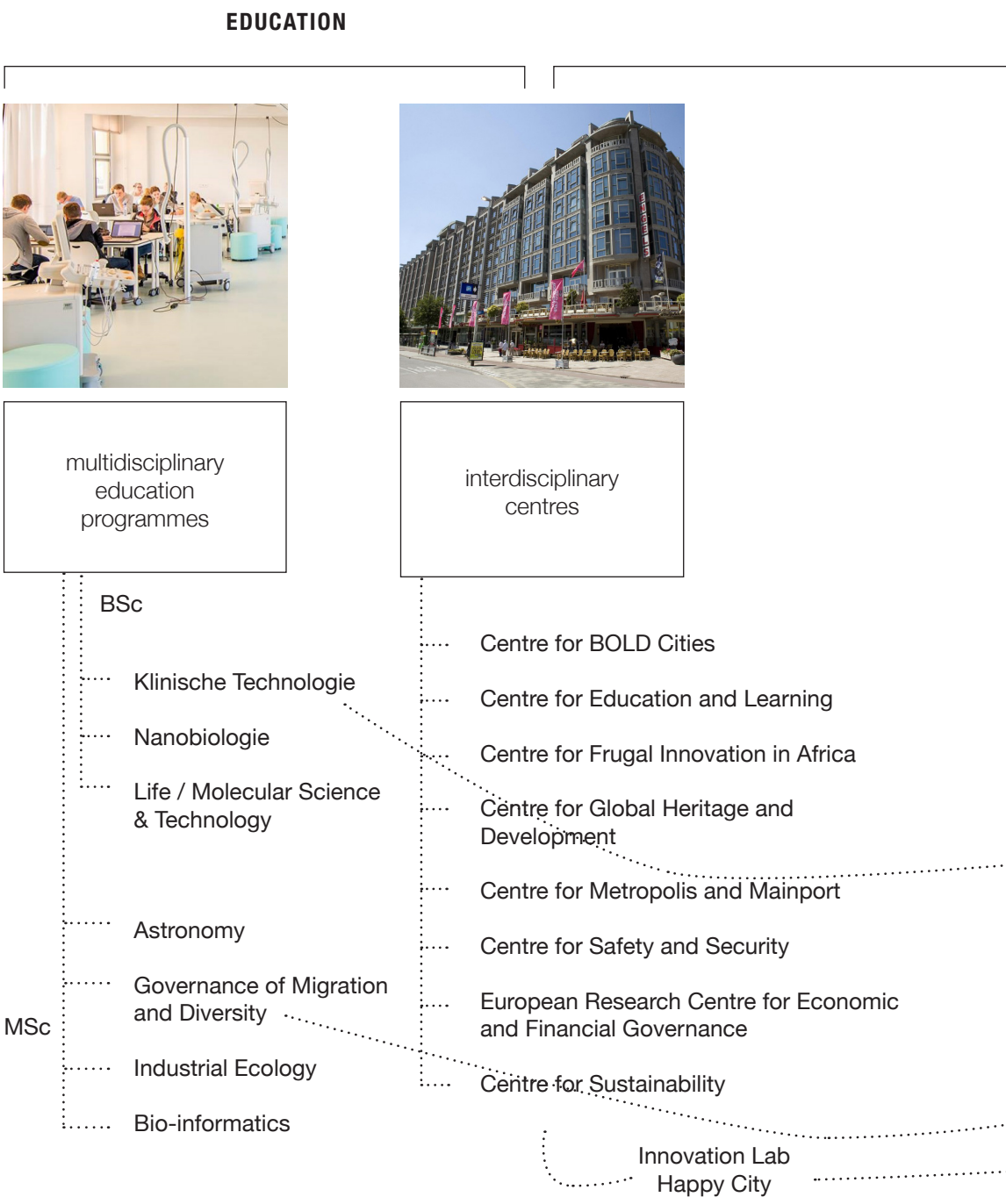
- The management trainees in LDE are an important link between the three universities. They are actually at work within the capillaries of the three universities but exchange their experiences by changing their positions every half year.

- Papma explains that she often travels from Delft to Rotterdam or Leiden. In her perception Leiden felt closer, because you do not need to transition to another mode of transport in the city. Where as in Rotterdam she had to change to the tram, metro or bus to reach the Woudestein campus. Interestingly, Papma mentions that she recently decided to use the OV-bicycles from Rotterdam Blaak to reach the campus and that her perception of the distance changed. She felt she had more ‘freedom’ and that she experienced Rotterdam as her ‘own city’.

Image 11 Hilje Papma

Image 12 Eva van Baren

Figure 21 Organisational analysis LDE collaboration



RESEARCH **VALORISATION**

technological research

medical delta

innovation development for society

Nanofront

HollandPTC

QuTech

Erasmus MC / Leiden UMC

Rotterdam

The Hague

Delft

Leiden

Organisational Goal	Spatial Opportunity
Stimulate interdisciplinary collaboration	Diverse university-city relations in Delft, Leiden, The Hague and Rotterdam offering opportune dynamics for collaboration (opposites attract)
Encourage travelling between the four cities to stimulate face-to-face meetings	Design for smooth public transport routes from one campus to another
Facilitate face-to-face meetings by offering places for working and collaborating in LDE context	Built collaboration and work spaces
Improve recognisability of LDE by students and employees in the three different universities	Make clear appearance of corporate brand on campus

Table 2 Summary of urban challenges for LDE

5.1.4. URBAN CHALLENGES FOR THE LDE COLLABORATION

Interdisciplinary collaboration arises all over the world. The core business of knowledge institutions, to produce innovation, has become increasingly focussed on bringing together people with different academic backgrounds. The collaboration between the universities in Leiden, Delft and Rotterdam stands out not only because of the diversity of disciplines it tries to combine, but also because of the diverse urban settings that forms the context for this collaboration.

Innovation arises from creative minds that are capable of sharing ideas. The direct urban environment facilitates shared minds. Both the sharing of ideas, as well as the creative capacity of the mind at work. Delft, Leiden and Rotterdam all three have a different university-city relation and therefore offer a different dynamic that is important in the innovation creation within the LDE collaboration. Additionally, The Hague has recently opened a Leiden university building. The metropolitan character that Rotterdam and The Hague is complementary to the university city culture that characterises Leiden and Delft.

Although some labs and collaborations, such as Medical Delta, have existed before, LDE is a relatively new phenomenon. It is therefore still searching for a clear position within the existing university structures. One consequence of that search is that it is difficult to come to make a clear appearance on the university campus.

5.2. ANALYSIS LDE CAMPUS FROM THREE THEORETICAL PERSPECTIVES

In this paragraph three theoretical perspectives on the design study are investigated. Firstly, LDE is discussed as an 'interaction milieu' (De Hoog, 2012). Secondly, an analysis of the campuses in Leiden, Delft, The Hague and Rotterdam is provided by using the campus model of Den Heijer (Heijer, 2011). Lastly, a minor exploration on the design study exercise is done from the perspective of cognitive mapping. These three theoretical insights give ways of understanding the complexity of designing for a university collaboration.

5.2.1. LDE AS INTERACTION MILIEU

When moving knowledge between people, the urban environment purveys a diverse and fruitful context for interaction of that knowledge. When moving knowledge in the brain, the urban environment can shape the right conditions for different stages in the creative processes by being a triggering source of inspiration or by providing neutralising, secluded work environments for persistent thinking. The city functions as an intermediary space between the social and cognitive interactions of knowledge. It is the negotiated context in which exchange of ideas happens and new frames or even new conceptual spaces can be constructed.

Some parts of the public realm naturally foster more interaction than others. In his research on metropolitan regions in the Netherlands, Maurits de Hoog characterises these environments as interaction milieus: "An urban environment with services to facilitate encounter and the exchange of information, knowledge, capital and/ or goods" (De Hoog, 2012, p. 32). As such interaction milieus are extremely suitable for the creation of new ideas and therefore essential to the economic performance of an urban region or metropolitan area.

Interaction milieus diver strongly from living or production environments in that they attract a very diverse group of users and house specialised facilities (De Hoog in Meyer, Westrik, & Hoekstra, 2014, pp. 76-81). Associated with centre environments, interaction milieus form the heart of a culture or knowledge cluster.

The use of the term interaction milieu is interesting in this study for two reasons. Firstly, it is possible to develop typologies of these interaction milieus and search for design solutions that improve the quality of interaction milieus (De Hoog, 2012, p. 33). Therefore, it provides a way to analyse the interactions that happen in the public realm and to relate them to the physical form of the city. This is relevant for studying the campus from the perspective of idea generation processes. The mapping method of De Hoog could be used to point out local ingredients for idea generation in the urban context and integrate these pre-existing conditions in the urban strategy.

EXPEDITION INNOVATION MILIEUS

High-Tech Campus Eindhoven

- In 2016, the research institute for living environments PBL (Planbureau voor de Leefomgeving) and the knowledge organisation for urban and regional development Ruimtevolk worked together on a research investigating innovation milieus in the Netherlands. They presented their findings on an ‘expedition’ day at the High-Tech Campus in Eindhoven. Exploring the problem field of this research in practice, I intended this knowledge day.

- At the Conference Centre of the High-Tech Campus, the five key elements for building an innovation climate (local buzz and global pipelines, urbanity, entrepreneurial dynamism, branding and governance of innovation) were further explored with experts in urbanism and economics from local, provincial and national governments. (Lekkerkerker, Judith; Raspe, Otto 2016).

- Speakers were, among others, Erik Stam, Evert Meijers, Marcel Boogers and Edgar van Leest. One of the main conclusions of that day was the importance of pre-existing local dynamics. It is almost impossible to create an innovation milieu from a complete ‘tabula rasa’.

Image 13 Picknickplaces at High-Tech Campus Eindhoven

5.2.2. THE CAMPUS MODEL

The word 'campus' originates from Latin meaning 'field' (Curvelo Magdaniel, 2016). A university campus is then, the 'field', where the buildings of the university are collected. However, since this term was first coined at the end of the 18th century, the associations with the word have increasingly moved away from something relating to a field. More and more, the campus hosts not only a diverse range not only academic, but also a range of retail and leisure functions (Den Heijer, 2008). It has come to the point where the campus is seen to function as a city within a city (Heijer, 2011).

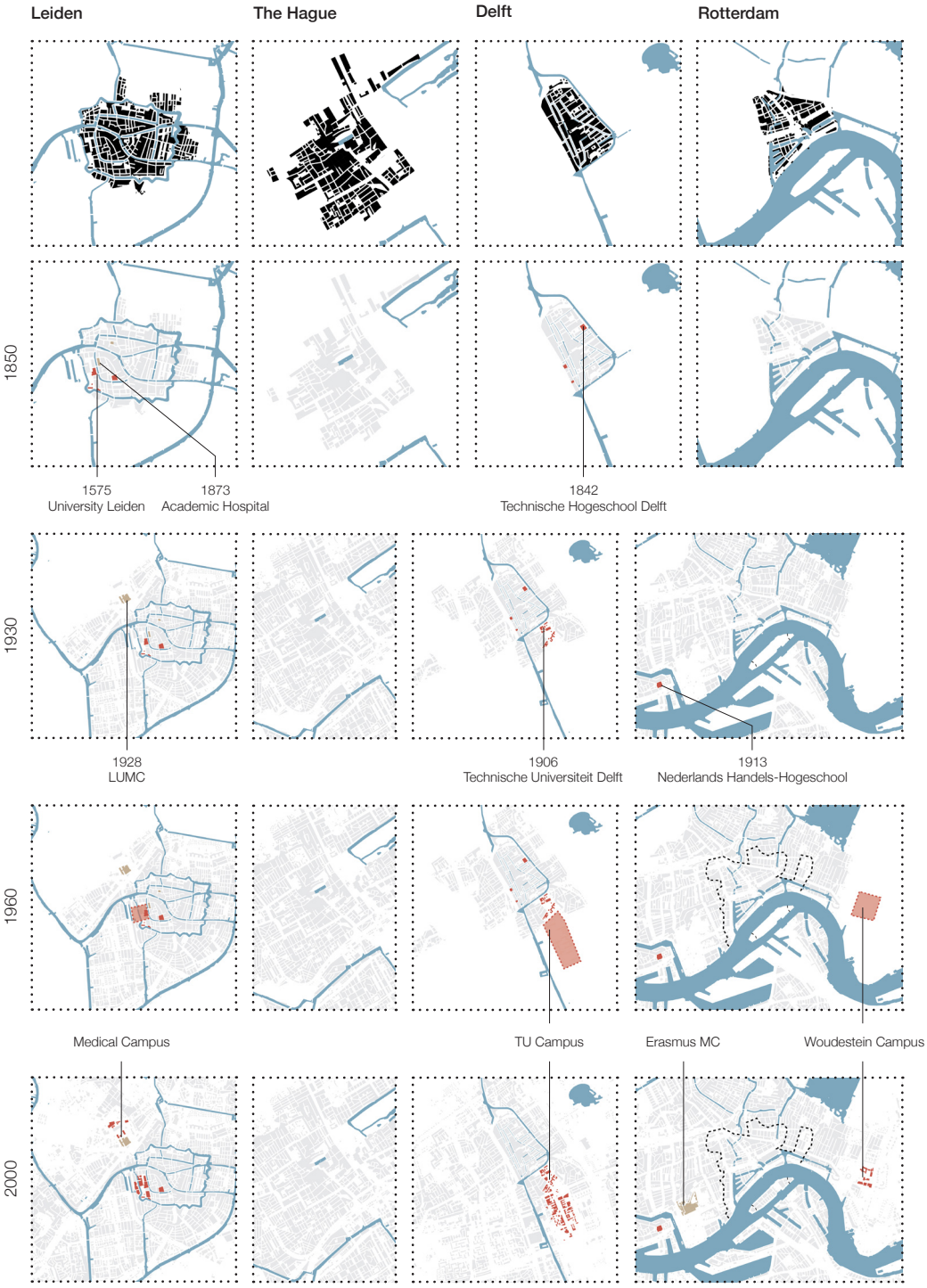
The university campus is a specific urban phenomenon that has been subject of study in fields of planning, urban and regional studies and businesses (Curvelo Magdaniel, 2016, p. 27). Consequently, there are many ways to consider the relation between the city and the campus. Here, three theoretical perspectives are used to consider the differences between the spatial relation that the cities of Leiden, Delft, The Hague and Rotterdam have with their university campus.

The importance of the university campus as part of the knowledge city is increasingly recognised (Den Heijer, 2008, p. 4). Local government in university cities try to align their planning processes with those of campus planners. In the light of stimulating idea generation processes, strengthening the relation between urban activities and activities on campus is also important. This could, for instance, contribute to spatial condition 4 (social diversity in local interactions). How to deal with the spatial relation between city and campus is mainly determined by the spatial configuration they have with respect to each other. Den Heijer (2011) presents three campus models to categorise the types of relation between the campus and the city that have developed in the Netherlands (**Figure 23**).

Three different spatial configurations of the campus

Historically, the first model to develop is that of the campus integrated within the city (Heijer, 2011). This model in fact predates the campus, from when the university could still be facilitated in one or several buildings within the city. This model still mainly determines the relation between campus and city in Leiden, the oldest university of the Netherlands (see **Figure 22** for a comparative study of the campuses in Leiden, Delft, The Hague and Rotterdam). It is also the model for the first developments of university buildings in Delft. However, because the universities are rapidly growing from the 1900s onwards, the faculty buildings fit less smoothly into the existing urban fabric of the university cities. After World War II, the first campus environments are planned outside the city.

This leads to the second campus model of the campus as greenfield outside of the city.


Leiden
The Hague
Delft
Rotterdam
1850
1575
University Leiden
1873
Academic Hospital
1842
Technische Hogeschool Delft
1930
1928
LUMC
1906
Technische Universiteit Delft
1913
Nederlands Handels-Hogeschool
1960
Medical Campus
TU Campus
Erasmus MC
Woudestein Campus
2000

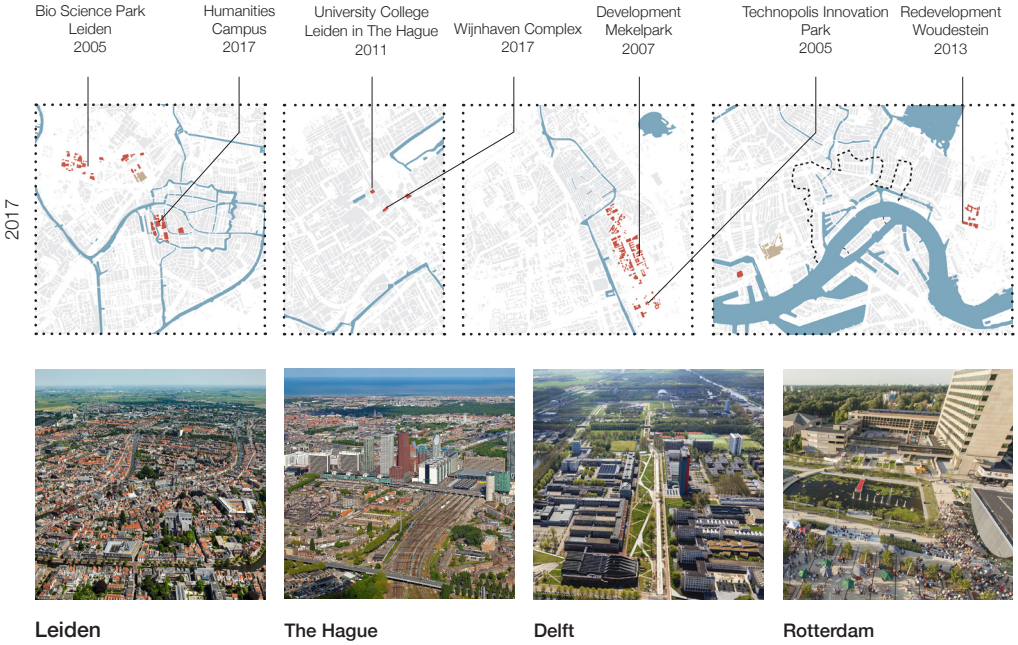


Figure 22 Historical analysis of the development of campus and city in Leiden, The Hague, Delft and Rotterdam

In Delft, the TU Campus was planned this way, as well as the Woudestein campus in Rotterdam. Initially, these campuses were isolated areas with a car-cantered infrastructure. Both in Rotterdam and Delft the public space has in recent years been renovated to make these areas pedestrian friendly and to encourage the bicycle as main transport means to reach the campus. In Leiden a similar development is visible at the medical campus around the LUMC.

Nowadays, the mono-functional campus model as greenfield outside of the city is reconsidered. Most university cities expanded in the past decades, embracing the campus. However, this seldom led to morphological or functional integration between city and campus. Often the campus stays more or less an enclave within the urban fabric, gated within the city. This a clear challenge for the future development of the campus (Curvelo Magdaniel, 2013; Den Heijer, 2008).

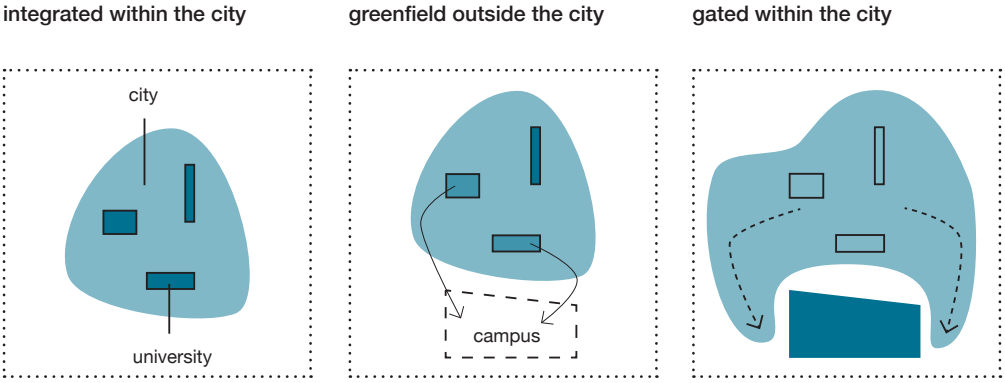


Figure 23 Three different spatial configurations of the campus (adapted from: Den Heijer, 2011)

A recent trend that leads to a new development of the campus integrated within the city, is visible in The Hague. Leiden University has located their University College, that has a strong focus on international governance, in The Hague in order to be close to the government activities there. With the opening of the Wijnhaven Complex this year, that will facilitate even more academic functions of Leiden University in the heart of The Hague, a new type of integration of campus and city is sought by relocating faculties in the urban fabric of the city.

Although the idea of a mono-functional campus seems to be outdated, some faculty functions are so specific that they still ask for an isolated position away from the city. In Leiden the development of the Bio Science Park is an example of this need.

This study follows the proposition by Den Heijer to define the campus as the 'sum of

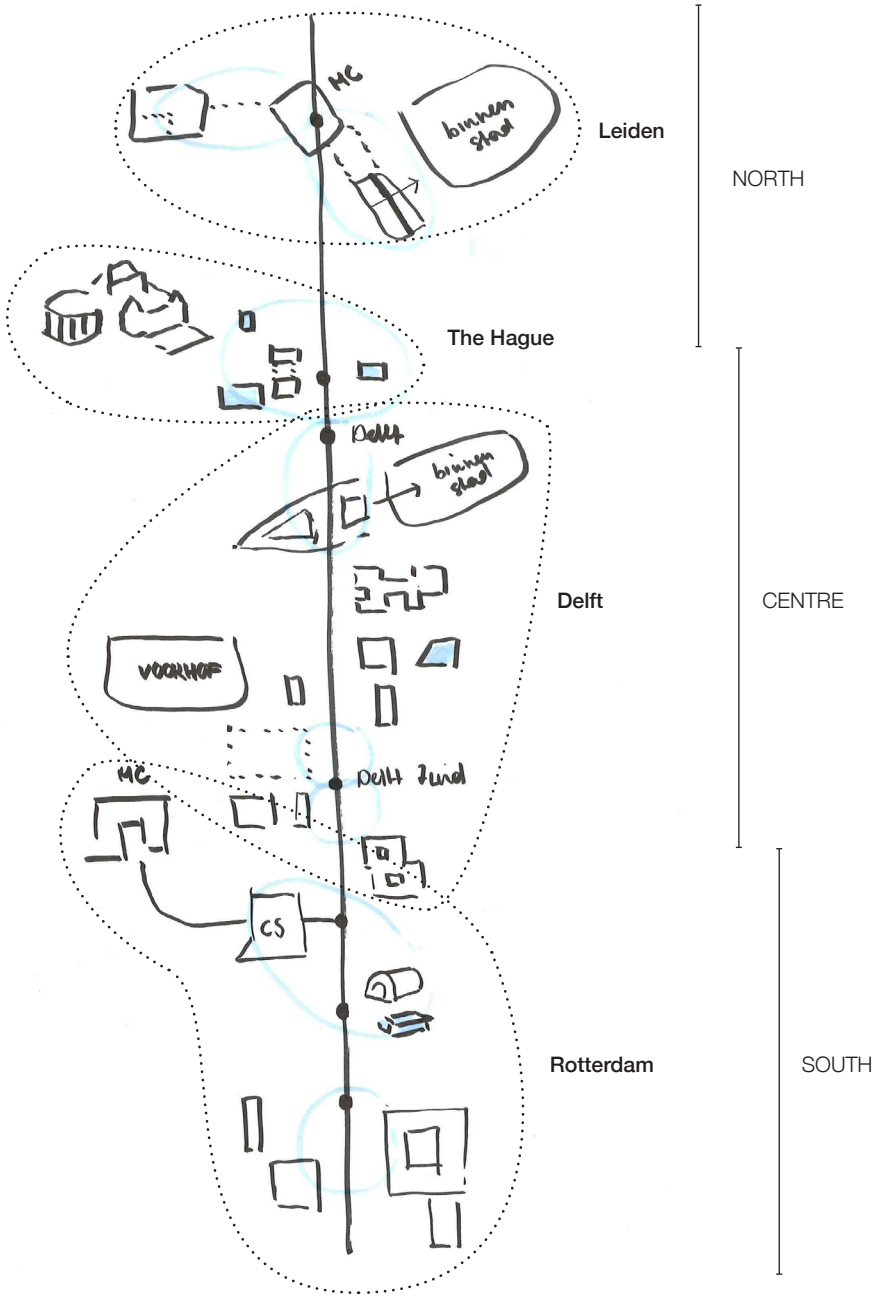


Figure 24 Cognitive map of LDE campus

locations with predominantly university or university-related functions' (2011, pp. 52-53). This allows for a new perspective on the LDE design study, where it is possible to interpret the collaboration to take place on a campus in four different cities.

5.2.3. THE LDE CAMPUS AS COGNITIVE MAP

In essence, this project suggests a design for a LDE campus. But how to develop a campus that is not located in one, but in four cities at the same time? It stretches the concept of campus beyond the common definition. The LDE campus is not a map in the classical sense of a meticulous cartographic map, but as a cognitive map that is constructed between participants within the collaboration.

"Cognitive mapping is a process composed of a series of psychological transformations by which an individual acquires, codes, stores, recalls and decodes information about the relative locations and attributes of phenomena in his everyday spatial environment." (Downs & Stea, 2011, p. 312)

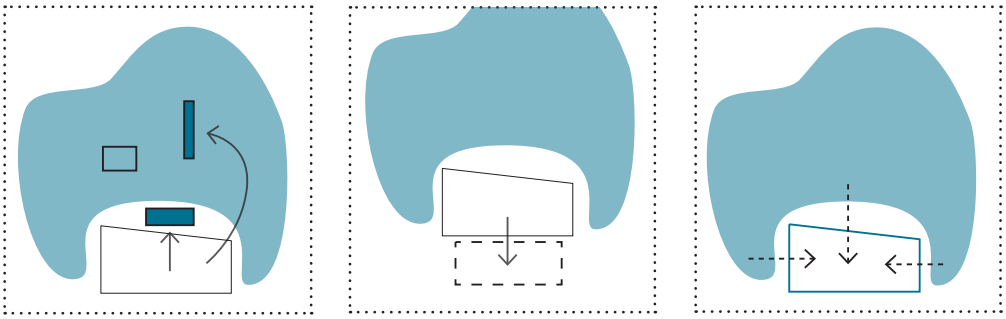
Individuals use cognitive maps to formulate the basis for a strategy of environmental behaviour (Downs & Stea, 2011). Urban planners try to alter cognitive maps. In order to influence the behaviour that leads to idea generation, in this design study a proposition is made to alter the cognitive map of participants in the LDE collaboration (**Figure 24**).

5.2.4. URBAN CHALLENGES FOR THE LDE CAMPUS

In this paragraph an analysis of the campus environment and design study for LDE is done from three theoretical perspectives. From the comparison between the three campus models of Den Heijer (2011) and the campuses in Leiden, Delft, The Hague and Rotterdam, it was found that each model is still present in some form in the university cities. This poses three urban challenges that need to be considered in the development of an urban strategy for LDE (**Figure 25**). The theoretical perspectives on interaction milieus and cognitive mapping rather provide an approach toward the LDE design study, than a concrete urban challenge for the collaboration. As such, the idea of interaction milieus could offer a starting point for intervention in the urban fabric. The conceptual model can be used as an analysis tool to find the urban ingredients for idea generation, the same way De Hoog (2012) looks for specific functions in the city to determine an interaction milieu.

In 5.2.3, the idea of the LDE campus as cognitive map was discussed. The aim of the design study can now be understand as to define an urban strategy that makes alterations to the cognitive map of LDE as a whole.

Because it is difficult to design in four cities at the same time, the focus of the urban strategy is Delft. In the next paragraph, a context analysis is done, in order to get familiar with the current urban developments of Delft.



integrating city and campus by moving faculties to buildings spread over the city

developing science parks with specialised functions outside of the city

dissolving morphological edges along the campus and integrating city and campus functions, making the campus less mono-functional

Figure 25 Urban challenges for the development of a LDE campus

5.3. URBAN ANALYSIS DELFT

The shared ambition of universities and cities to stimulate innovation ask for a shared approach toward the development of the university campus in the city. Although making decisions on the university campus has to happen in consideration of the context, all too often universes and cities keep developing their strategies separately (Curvelo Magdaniel, 2013, p. 2). In an attempt to align the urban strategy for LDE in Delft with the contextual urban development currently being employed by the city as a whole, here a spatial investigation is done into the urban structure and current projects that are important in developing an integrated urban strategy.

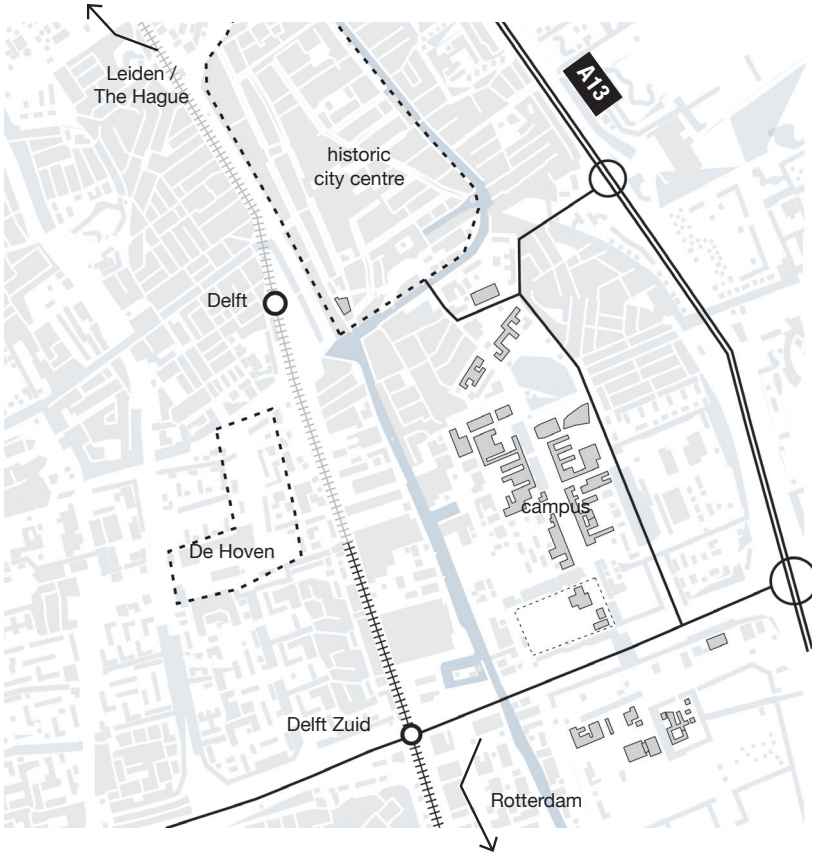


Figure 15 Two centres

Delft is a city with two centres. One is the historical city centre, the other is located around shopping mall 'De Hoven', which is part of the modern expansion of Delft. Both have different urban qualities. The historic city centre clearly shows an element of surprise, being an ideal place for strolling through narrow streets and along the canals. The Voorhof is a neighbourhood with a diverse social structure.

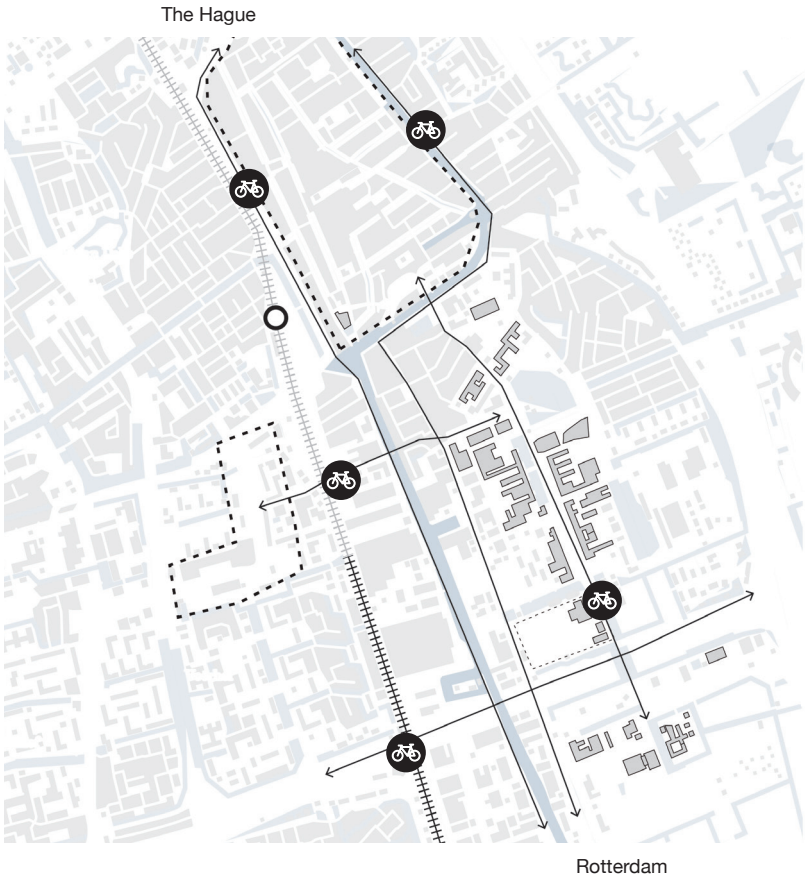


Figure 16 Bicycle infrastructure

The majority of students and employees come to the campus by bicycle. Characterising for the infrastructure along the campus is its linearity from north to south, from The Hague to Rotterdam. The horizontal bicycle routes, connecting the train station Delft Zuid and the Voorhof with the campus, are less integrated in the urban fabric.

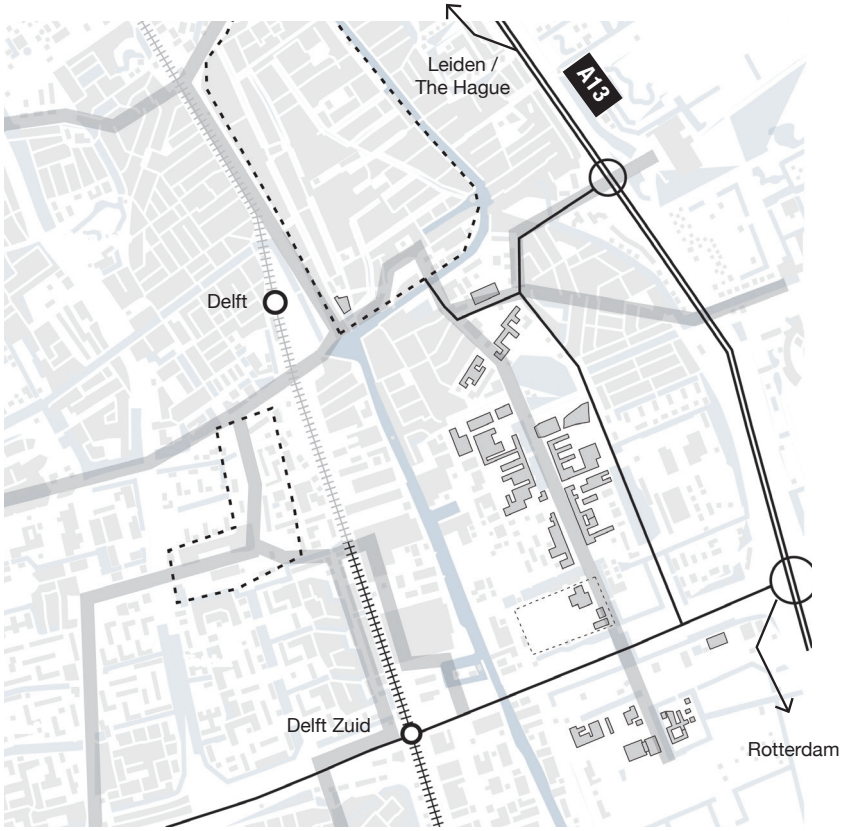


Figure 17 Boulevards

The local government of Delft has determined a set of streets that should be developed as 'boulevards'. Here they show what the main infrastructural arteries are and how they relate to the two centres and the campus. It is striking that also in this infrastructural level the east-west links are seldom marked as boulevard.

Figure 18 Projects Delft

The Delft municipality has been working on a major infrastructural reorganisation at the 'Spoorzone'. In the past years the train track has been moved underground and in the recovered space is being redeveloped, partly as urban park and partly as residential area. Additionally, the municipality has the ambition to develop the area around the river Schie as a 'makers industry'. Flexibility of rules and regulations in this district encourage local entrepreneurs to start a making company here.

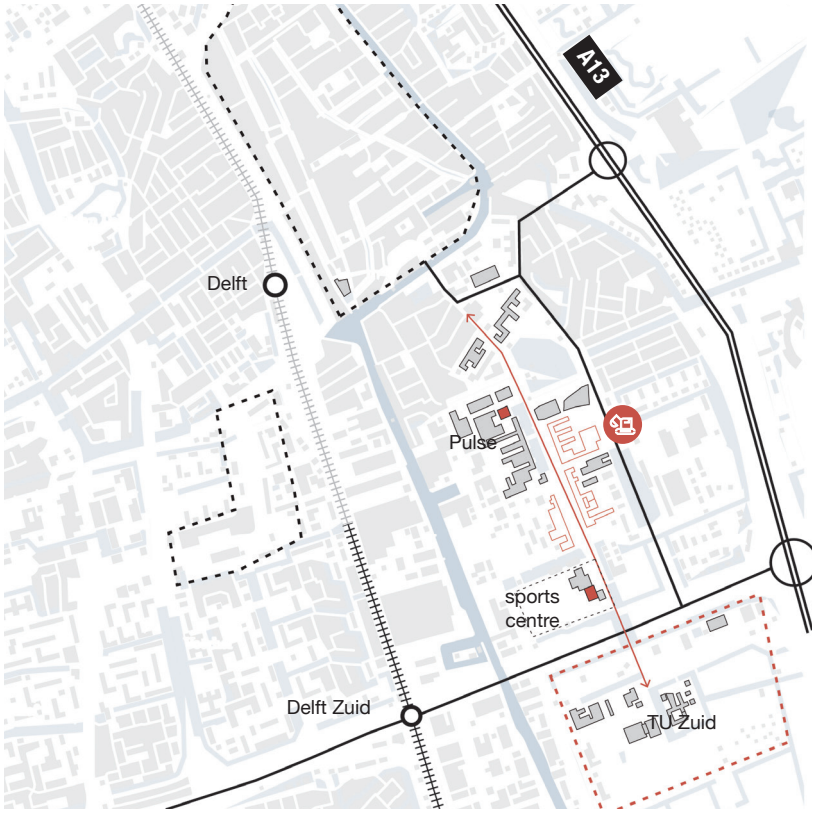
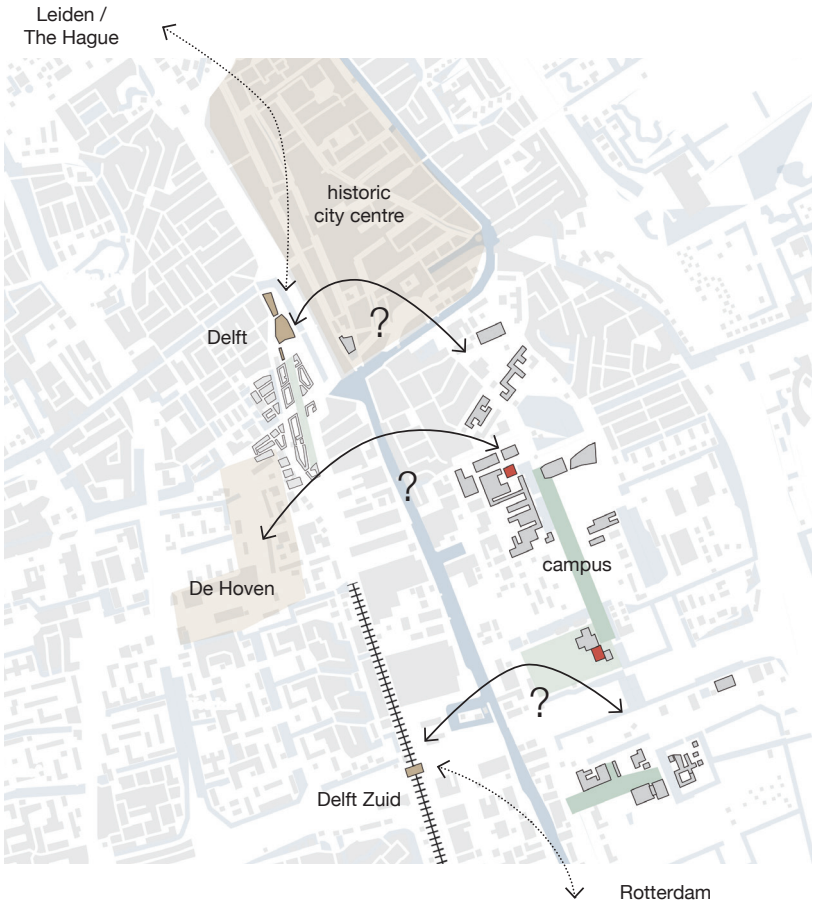


Figure 19 Campus development

The TU Delft Campus is in transition. In the coming five to ten years three of it major faculties will be demolished and it is yet to be determined how these buildings will be replaced or what will be developed at those newly gained open spaces on campus.

At the south side of the campus the Innovation Park of Delft is being further developed as a new centrality on the campus. Currently, a new study centre (Pulse) is built and the sports centre is extended.

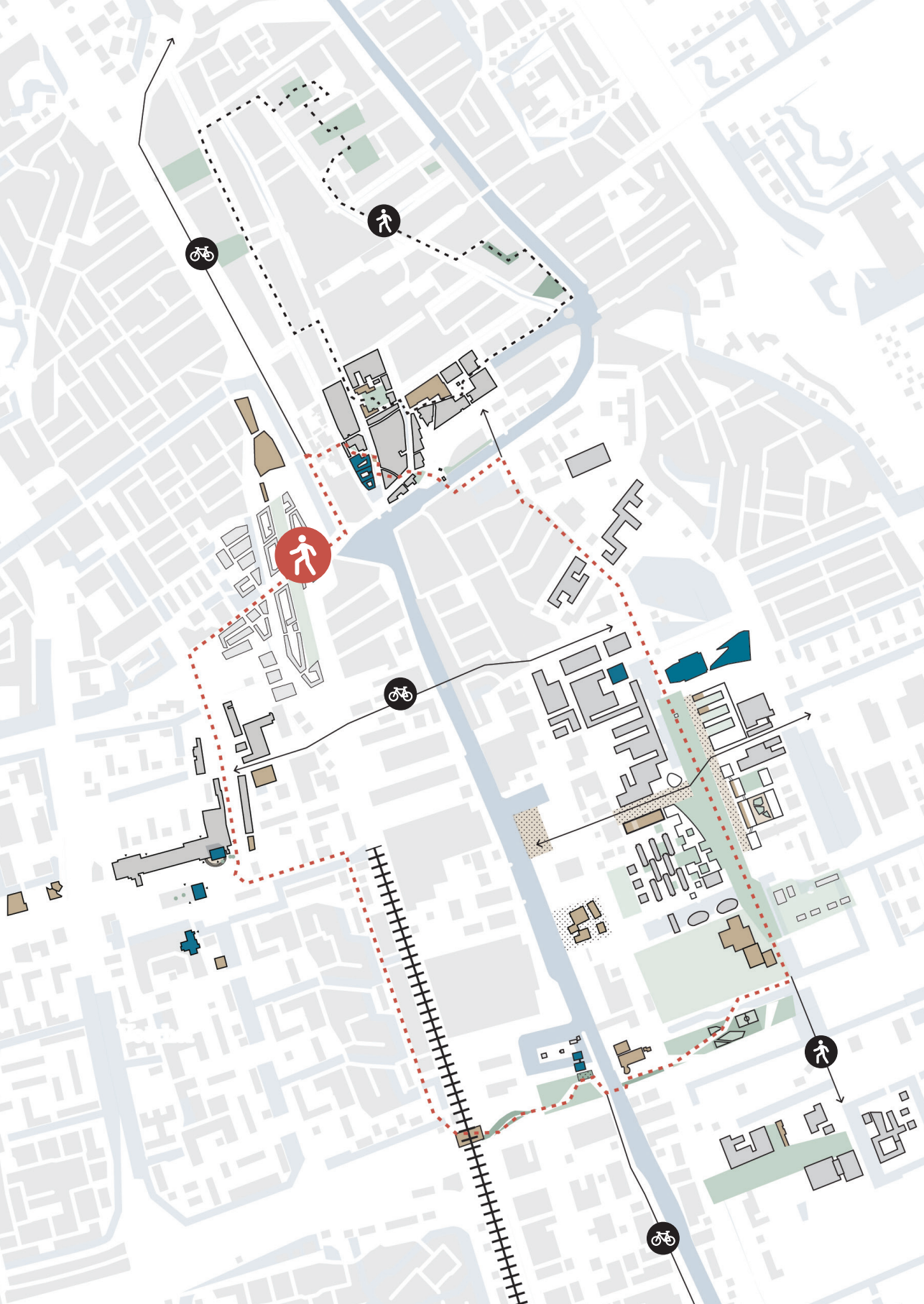


5.4. URBAN STRATEGY LDE

This design study suggests an urban strategy for the campus development of Delft in the context of the university collaboration Leiden-Delft-Erasmus. Such a university collaboration has the organisational goal of stimulating the generation of innovative ideas and it is the strong believe in this thesis that this can be done with the city's urban fabric as a resource. Summarising, three main elements have recurred in the development of this strategy: creating conditions for idea generation, facilitating the LDE collaboration in line with other urban developments in Delft and dealing with the 21st century challenges of the campus.

LDE takes physical form by the collaboration participants moving between different cities and collaborating in different buildings. In order to make use of the exclusive quali-

Figure 26 Map urban challenges LDE



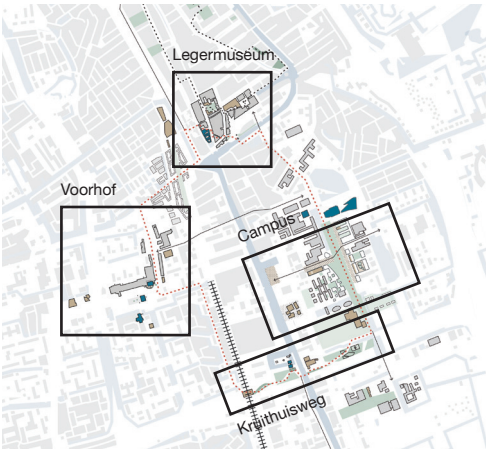


Figure 27 Urban strategy LDE Delft

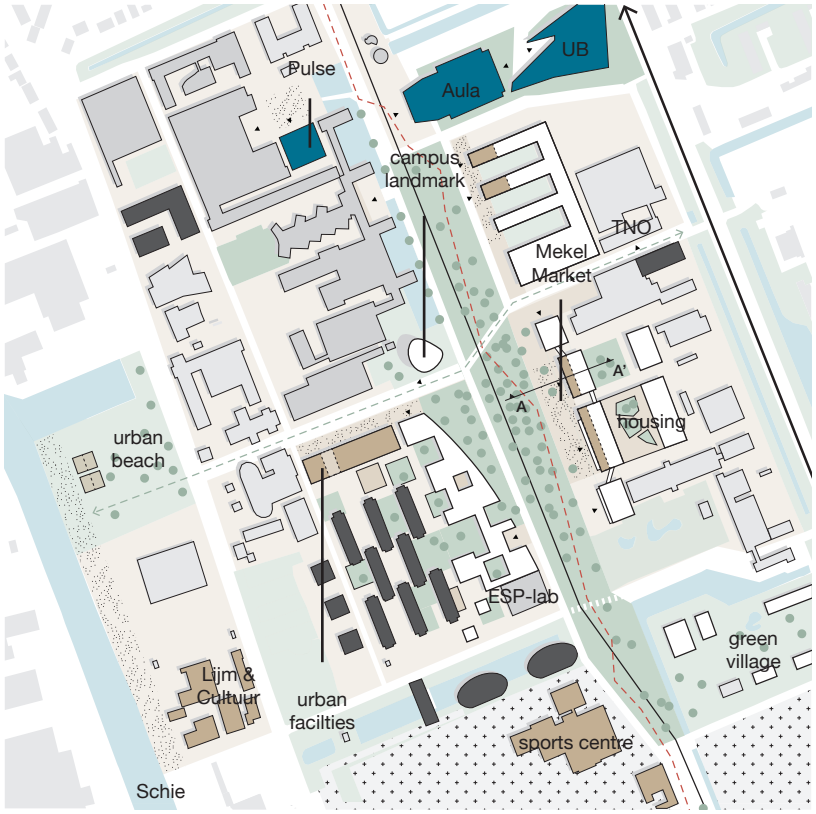
Figure 28 Interventions in urban strategy

- academic functions
- urban ingredients for idea generation
- courtyards and parks
- bicycle routes
- hofjesroute
- LDE route

ties of the city, these collaborative workspaces should not lie isolated on the campus, but should be integrated again in the city, as the model by Den Heijer suggests. How this could be done is explored in three design interventions at the Legermuseum, Voorhof and the Kruithuisweg. At the same time, the campus should be able to adapt to the changes innovations in science and education demand. The urban design inventions on campus, therefore, suggest an urban typology that fits interdisciplinary learning.

5.4.1. CAMPUS

Because of the planned demolition of three main faculty buildings, for the campus the urban challenge lies within the redevelopment of its urban and morphological relation to the city. This urban strategy suggests to develop a mixed academic, working and residential area, creating a transition zone rather than an edge between the campus and its surrounding urban fabric.



The Mekelpark in this proposition is still a continuous line over the campus from north to south. However, that line is expanded around the middle and along that expansion a new mix of urban and academic facilities could be located. Urban functions such as a high-quality restaurant, beach, cinema or yoga studio are developed along a line that intersects the Mekelpark, giving the linearity of the park a different rhythm. With these additional functions on campus not only students, but also other city dwellers might find a reason to come to the campus.

That three of the main faculty buildings will disappear from campus also offers an opportunity to rethink the typology of the faculty buildings. The campus should be able to foster the exchange of ideas, also across disciplines, these mono-functional, mono-disciplinary and mono-formal buildings do not give shape to that interaction. Here, four typological suggestions are done for interdisciplinary buildings.

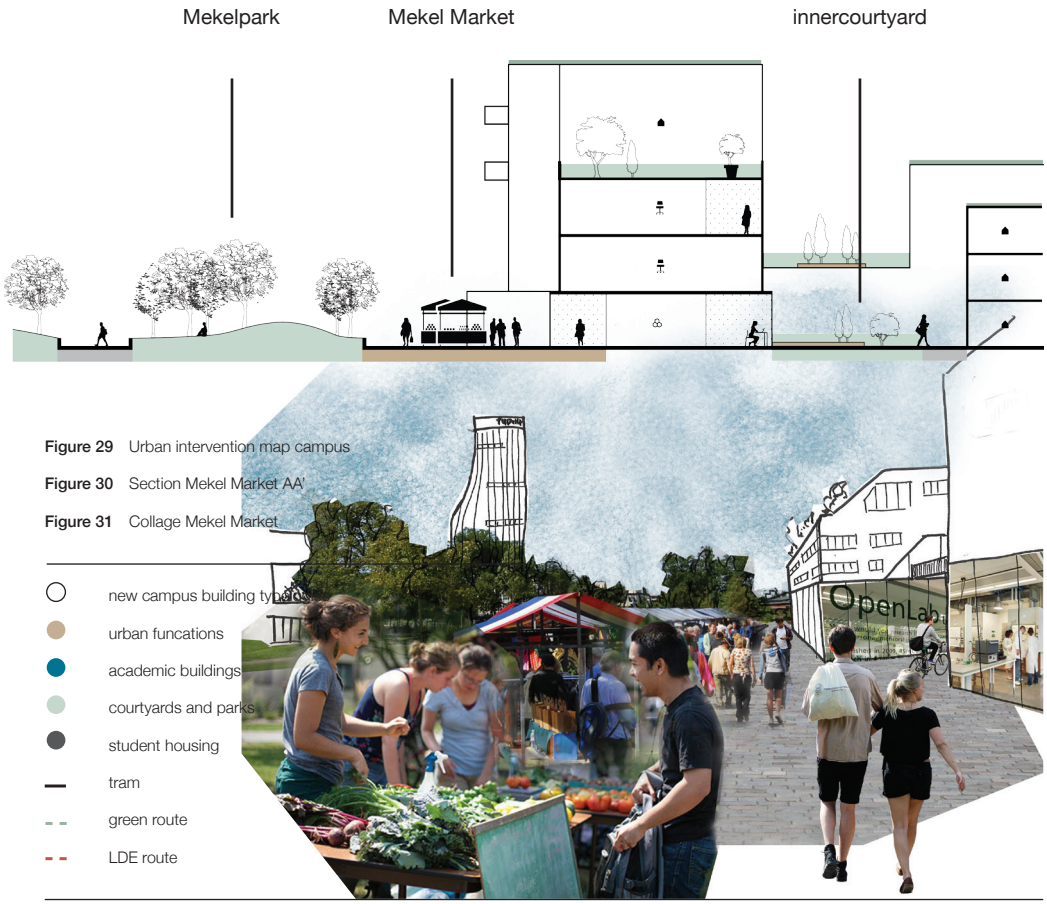
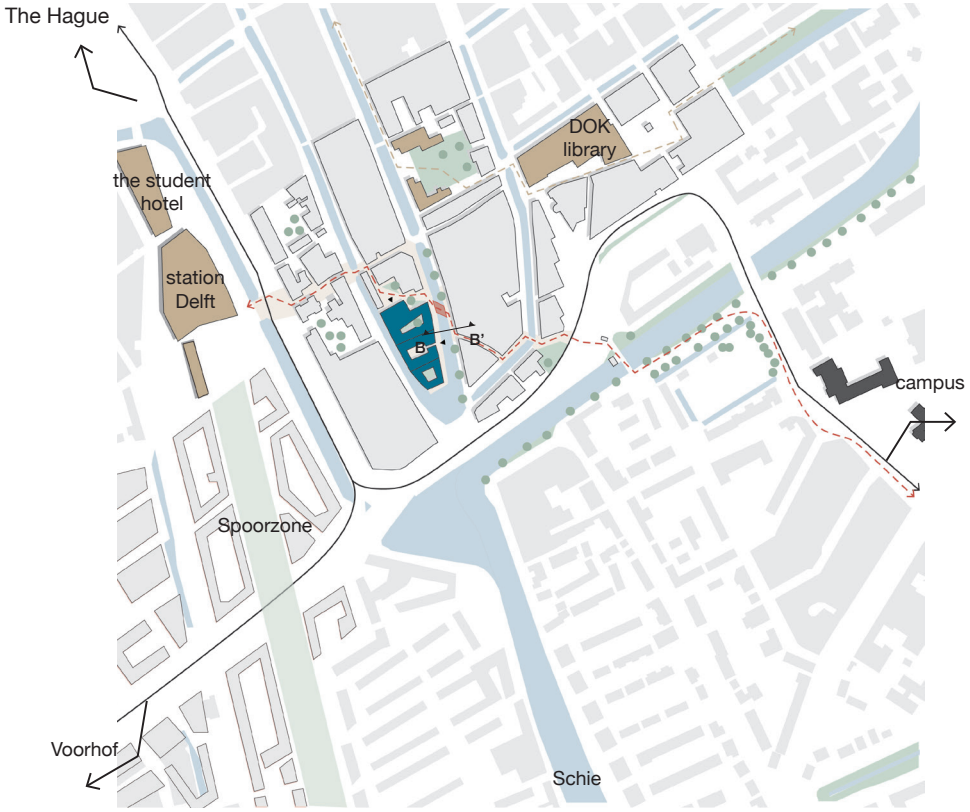


Figure 29 Urban intervention map campus

Figure 30 Section Mekel Market AA'

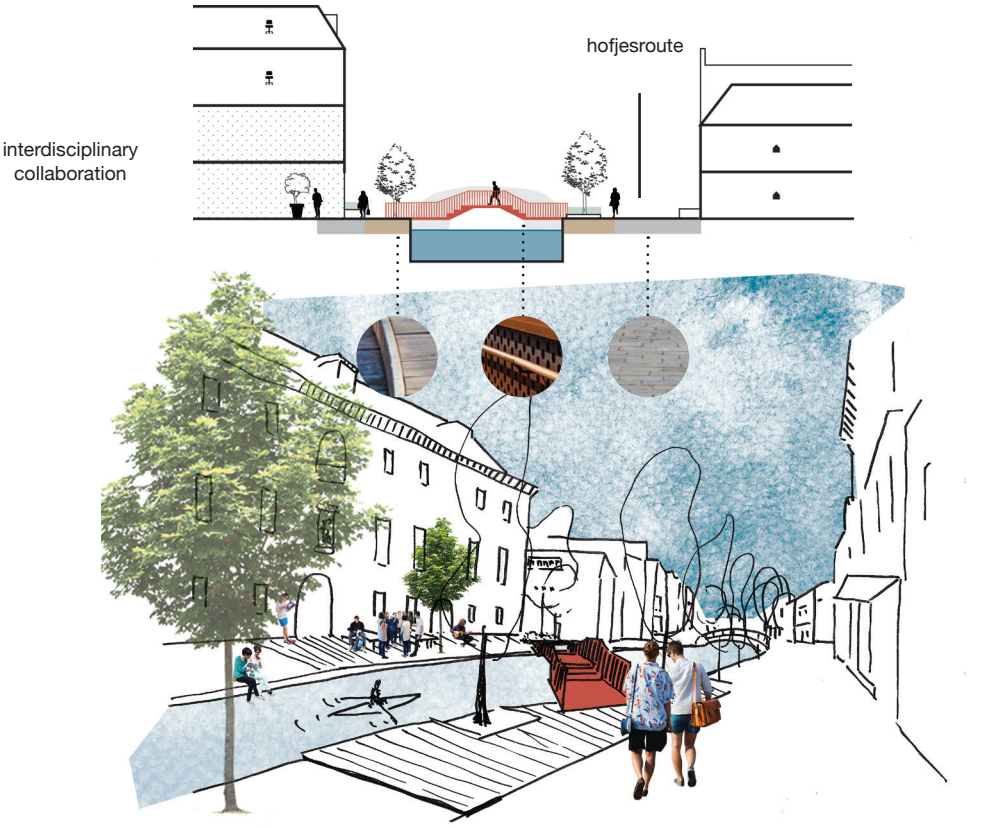
Figure 31 Collage Mekel Market

Firstly, at the place of the current TNW building, a forked typology is suggested. The arms of this building stretched out into the park, creating smaller contemplative spaces in between them and urban functions in their fingertips. The Delft campus will also have to search for a new landmark building that can replace the EWI building. This landmark is the second typological suggestion, a hybrid residential and academic high-rise. At the current place of the EWI building, a staggered typology integrates small courtyards. Spread from the Corvezee housing into the Mekelpark, this type shapes a functional transition from public academic buildings, to private housing for international students. Lastly, instead of the long-stretched CiTG building smaller hybrid buildings, connected by footbridges, could offer a smaller scale to the Mekelpark. In front of these buildings, there is place for a 'Mekelmarket', a farmers market next to the scientific laboratories of the Delft University of Technology. Bringing some of the urban atmosphere to the city.



5.4.2. LEGERMUSEUM

A few years ago the University of Technology in Delft temporarily moved some of their education facilities to the Legermuseum in the historic centre of Delft. Due to an unexpected influx of students, the university quickly had to find new places for lectures and group work. Although in time it is expected that the university will move out again, this design intervention suggests to do the opposite. The Legermuseum should be acquired by the university and developed as a place specifically used for interdisciplinary collaboration, such as the interactions between LDE participants. This way the university would make optimal use of the exclusive qualities the city offers. Especially in the city centre of Delft, so many different facilities come together that inspire opportune interactions for the idea generation process. The Hofjesroute, for instance, that meanders along the Legermuseum is a concatenation of small public spaces for contemplation. At the same time, the development of an



interdisciplinary collaboration workspace would enhance the station to campus route and create a new urban event along the way to the campus.

Figure 32 Urban intervention map Legermuseum

Figure 33 Section Legermuseum BB'

Figure 34 Collage bridge Legermuseum

- interdisciplinary collaboration workspaces
- bridge
- local ingredients for idea generation process
- courtyards and parks
- student housing
- tram
- hofjesroute
- LDE route

5.4.3. VOORHOF

Voorhof is a neighbourhood characterised by diversity. This district has the lowest income average in Delft. The modernistic centre around shopping mall 'De Hoven' facilitates many municipal social functions, such as a sheltered employment facility (De Werkplaats) and a language centre (Taalhuis). At the same time, a lot of student housing is located in the Voorhof. This diversity could be enhanced by facilitating more local interaction, creating one of the conditions for enhancing the idea generation process. The exchange between students and other inhabitants could broaden the view on both sides. A study centre could mediate that interaction. In this area, three possible locations are suggested for the development of such a study centre: in the partly vacant De Hoven tower, in the former nursing homes near the Marcus church or attached to the new development of the super market opposite to the EduP student housing flat.

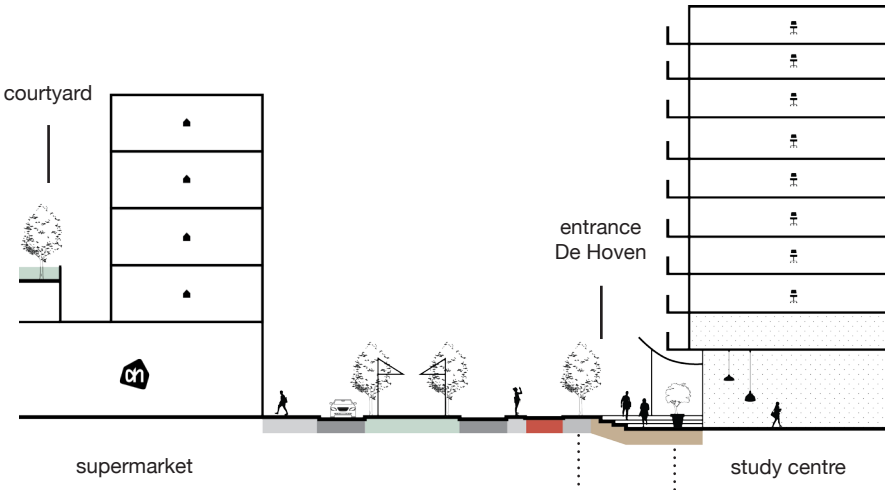
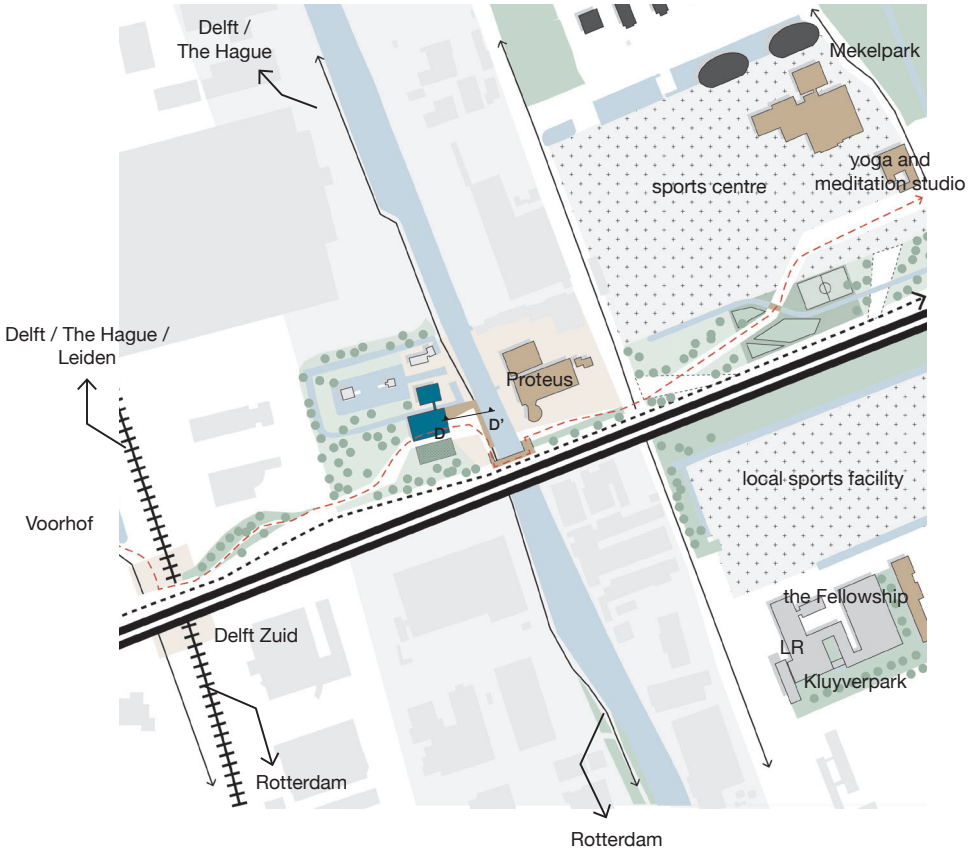


Figure 35 Urban intervention map Voorhof

Figure 36 Section Voorhof CC'

Figure 37 Collage study centre in Voorhof

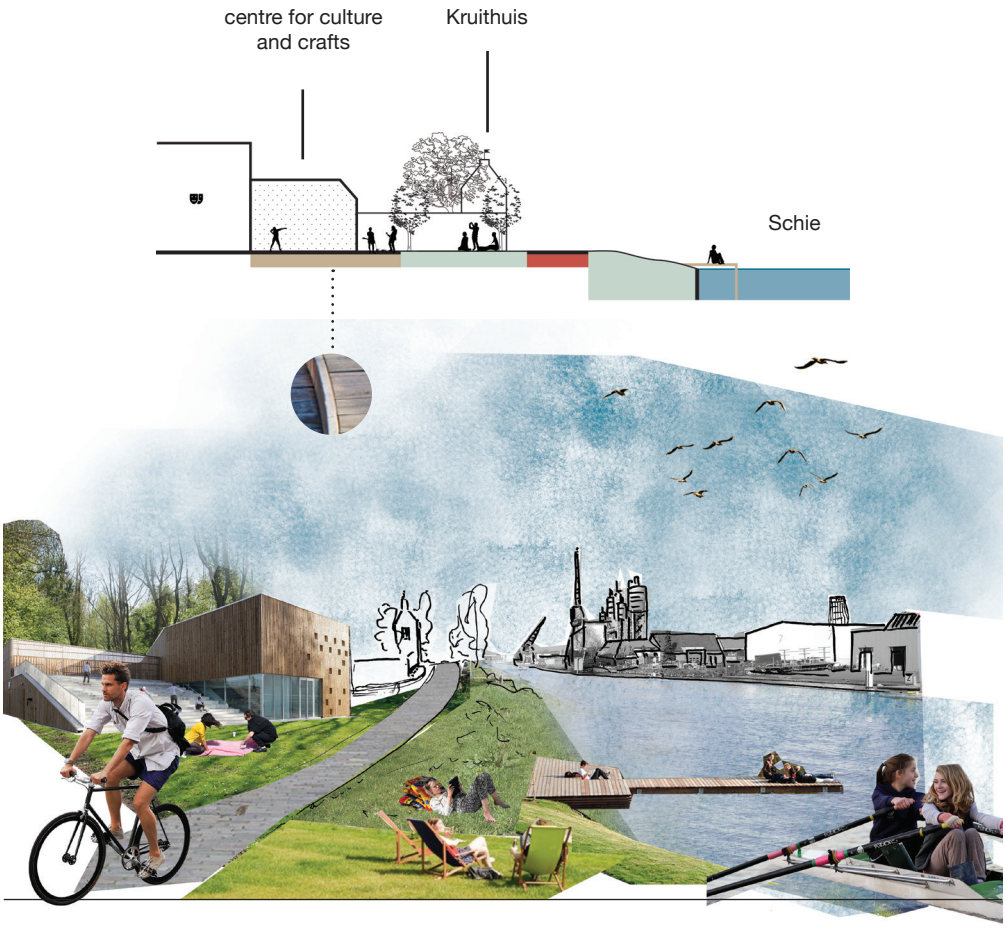
- possible location study centre
- local ingredients for idea generation process
- commercial functions
- courtyards and parks
- student housing
- tram
- LDE route



5.4.4. KRUITHUISWEG

Currently, the Kruithuisweg is the main route from the Delft Zuid Station to the campus. However, that connection is mainly designed a cyclist highway and does not facilitate a slower type of traffic. In this urban intervention it is suggested to develop this route to make it more suitable to the pace of pedestrians. In order to create this new pace, the Kruithuisweg is in need of some new 'urban events' that happen along the way from station to campus.

The first opportunity for creating such an event, is the development of the makers industry along the Schie. As planned by the municipality, attracting making companies offers an opportunity to relocate the culture and crafts facilities from the campus and combining them with the makers industry development. An opportune place for this relocation would be inside the Kruithuis, an almost forgotten historic building in Delft meant as a storage place for gunpowder. A second event along the Kruithuisweg route



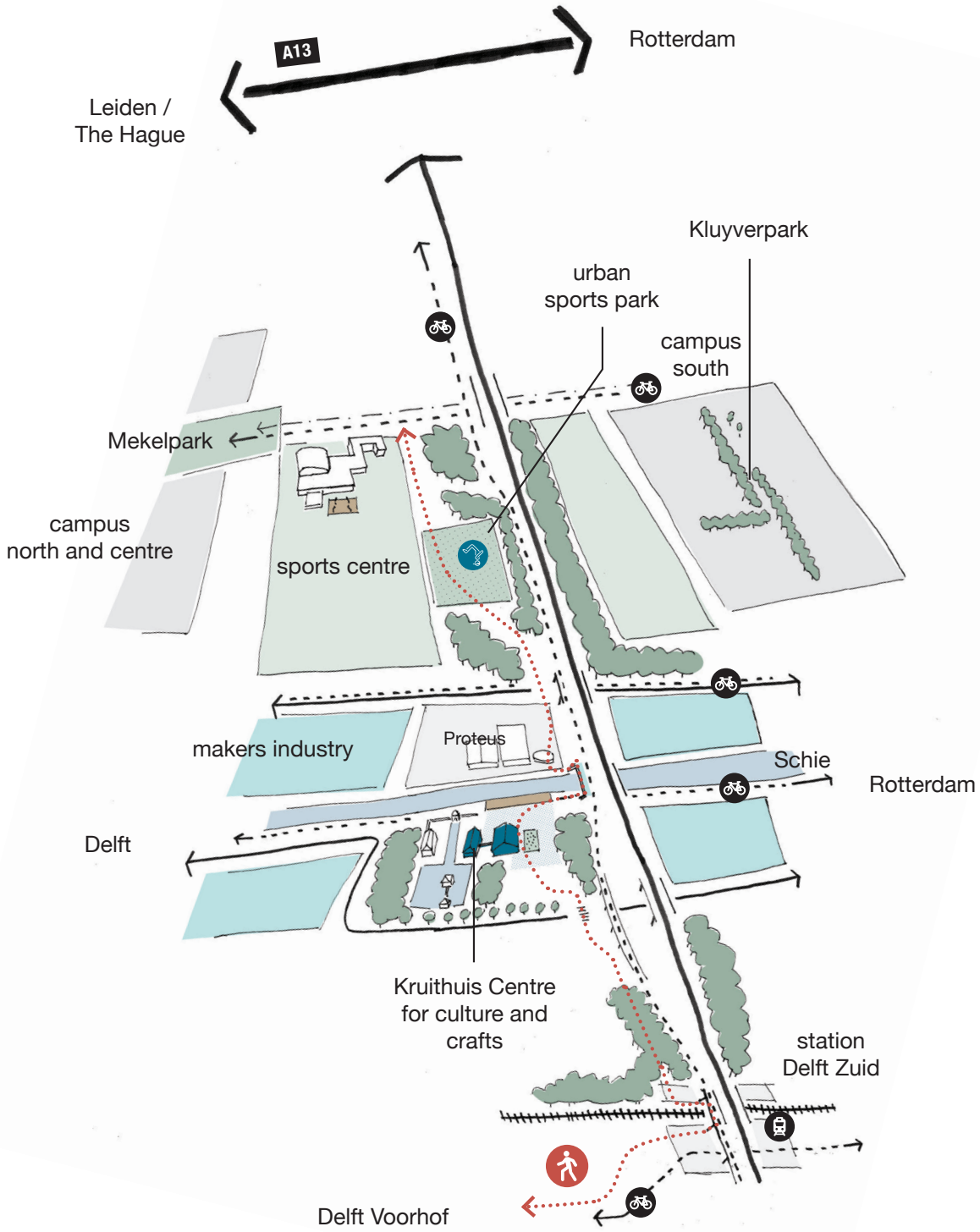
could be designed next to the sports centre, by the development of an urban sports park.

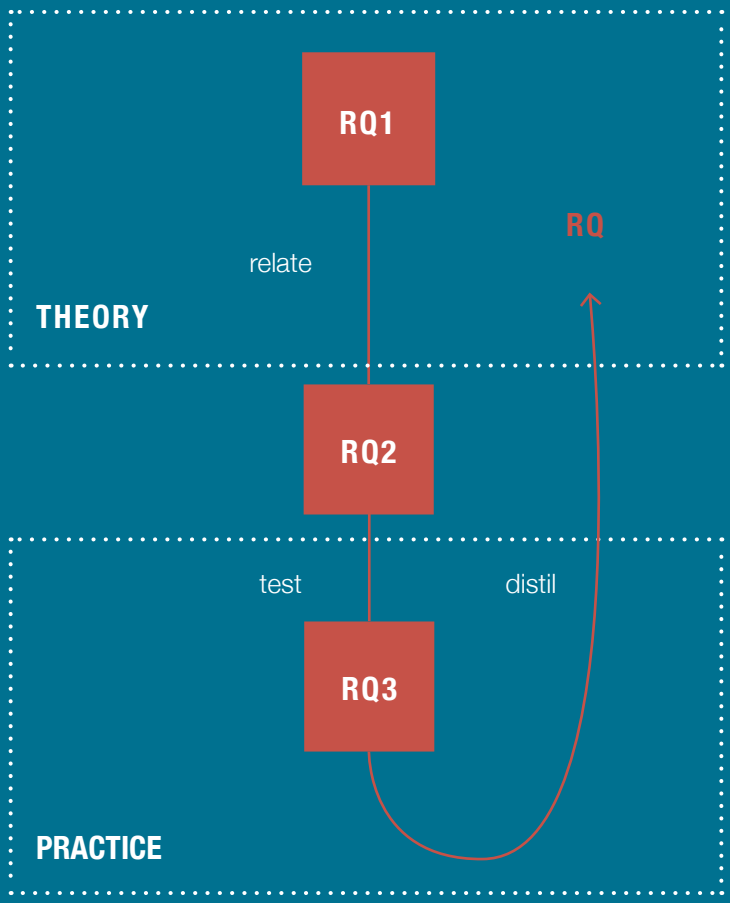
Figure 38 Urban intervention map Kruithuisweg

Figure 39 Section Kruithuisweg DD'

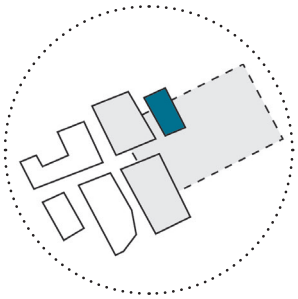
Figure 40 Collage Kruithuisweg

- interdisciplinary collaboration workspaces
- bridge
- local ingredients for idea generation process
- courtyards and parks
- student housing
- tram
- hofjesroute
- LDE route


A13
Rotterdam
Leiden /
The Hague
Kluyverpark
urban
sports park
campus
south
Mekelpark
campus
north and centre
sports centre
makers industry
Proteus
Schie
Rotterdam
Delft
Kruithuis Centre
for culture and
crafts
station
Delft Zuid
Delft Voorhof


RQ1
RQ
relate
THEORY
RQ2
test
distil
RQ3
PRACTICE

HOW CAN URBAN DESIGNERS DEVELOP AN URBAN STRATEGY TO STIMULATE IDEA GENERATION PROCESSES WITHIN THE UNIVERSITY COLLABORATION BETWEEN THE UNIVERSITIES IN LEIDEN, DELFT AND ROTTERDAM?



6 CONCLUSION

In the previous chapters, a theoretical framework, conceptual model, design method and urban strategy in Delft have been developed in order to investigate how urban designers can use an urban strategy to stimulate idea generation processes within the university collaboration between the universities Leiden, Delft and Rotterdam. The design study focussed on Delft, but from this specific urban strategy it is possible to induce design principles for LDE.

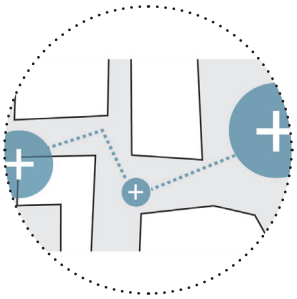
6.1. INTEGRATE CITY AND CAMPUS

The position of the campus in the university city has seen some important transformations over time. Den Heijer (2008) categorises these transformations in three types of campus-city relation: the campus as separate area outside the city, the campus as distinct area within the city and the campus integrated within the city. All the three types play a role in the development of the campus from the perspective of the LDE collaboration.

The theoretical investigations in idea generation confirmed the potential of the urban environment for the idea generation process. In the light of the Den Heijer model, the typology of campus integrated within the city makes the best use of the exclusive idea generation qualities present in the city. By strategically relocating academic functions in the city, as is done in the design study at the Legermuseum and de Voorhof, campus and city can be integrated and profit from mutual exchange of knowledge and inspiration.

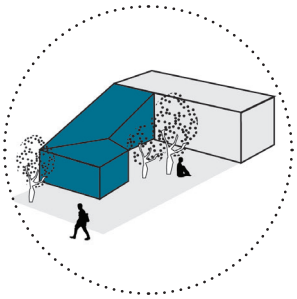
The isolated development of technology campuses as has been done in Delft and Rotterdam, and in recent years, also in Leiden, does not make optimal use of the advantages the city offers. In order to tap from the spatial conditions for idea generation naturally present in the urban fabric, the hard morphological edges between the campus and city need to be integrated. In Delft an opportunity for tinkering with the morphological edges of the campus arises, when in the coming years three faculty buildings will be demolished. Replacing them with a mix of residential, academic and cultural functions, allowing for the mono-functionality to decrease, could support a change of urban dynamics.

The natural sciences and engineering faculties will retain a need for extremely specialised faculty buildings. The development of the Applied Sciences Faculty on the Delft campus, as an almost vibration-free building, is a good example. This makes isolated campus typologies separate from the city still relevant in the future. When the idea generation process cannot draw from urban context, the urban designer needs to bring some of these spatial conditions to the scene. This principle is explained in paragraph 6.2.



6.2. ENRICH CAMPUS WITH URBAN ELEMENTS

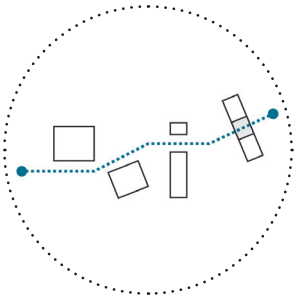
Originally, campuses are developed as separate, isolated structures outside of the city, completely dedicated to university functions. Because of what is currently known about the advantages of the city for idea generation, that isolation and mono-functionality is unfortunate. Although the complexity of the city cannot be completely mimicked in a campus environment, it is possible to enrich the campus with urban elements that contribute to creating spatial conditions, such as allowing food trucks onto the campus or a yoga studio to create contemplation space (spatial condition 2B). Although the social diversity in local interaction (spatial condition 4) will be limited on a mono-functional campus environment, by implementing some of these advantageous urban elements, the urban designer can contribute to facilitating local interactions and connectivity (spatial condition 5). Ultimately, enhancing the urban fabric in such a way that it can start to grow its own urban complexity and an element of surprise (spatial condition 3).



6.3. BUILT PROJECT CENTRES FOR COLLABORATION

From the conversations about LDE, it became clear that there is enough cause to start thinking about developing a project centre for collaboration. Not only would a project centre contribute to the brand development for LDE, it would also facilitate in organisational needs, such as a designated meeting place and facilities for valorisation activities. Maybe, the LDE collaboration in itself does not show enough incentive or does not have the means to make the investment in developing a project centre. However, there are many more interdisciplinary collaborations that the universities are involved in that could benefit from such a place.

One of the learning points in the design study is the strategic positioning of project centres as part of developing a LDE campus. The idea generation model suggests the combination of low-stimuli environments and collaborative workspace (spatial conditions 1A+B). The actual development of these type of spaces on an architectural level will need more investigation. However, the design study does show some typological examples of interdisciplinary can take physical form. The character of these buildings is shaped by courtyards, opened-up facades and sequenced small-scale buildings that encourage to move between them.



6.4. DEVELOP ROUTES TO INFLUENCE COGNITIVE MAPS

At first sight, the LDE collaboration seems not to be a physical phenomenon. The collaboration between three universities is supported by digital connections. However, from theory looking into idea generation, it is clear that stimulating idea generation in this collaboration does have spatial conditions. Shared minds need shared spaces.

The LDE collaboration takes place in shared spaces at all three universities. Those shared spaces are located in four different cities. The people working in the collaboration construct in their minds a personal map that they associate with LDE. That map contains four cities and the routes that connect them. By urban design it becomes possible to influence those cognitive maps of LDE.

Taking cognitive maps as a starting point for design, the urban designer should invest in the LDE routes. Routes through the city are crucial to the perception and cognitive mapping of the city's inhabitants. If the designer wants to contribute to a strong cognitive map of LDE, these routes should be a focal point in the urban strategy. After all, a LDE campus only exists as a cognitive map, but that cognitive map contains urban elements present in actual space. If the main aim of this collaboration is to stimulate the development of innovation than the urban elements collected in the cognitive map of LDE should contribute to creating the right spatial conditions for idea generation.

In addition to the central objective of stimulating innovation development, LDE has developed the organisational ambition to become more visible in the three universities. The collaboration is allowed to become more recognisable as a brand. The existing cognitive maps are also part of the construction of a brand. By creating distinct physical LDE patterns that occur in the campus environments of all three universities, a stronger LDE brand could be built.

7 DISCUSSION AND REFLECTION

This chapter deals with the generalisability of the results and evaluation of the process that lead to this graduation thesis. In the discussion paragraph the practical and theoretical implications of the research are discussed (**7.1**). Some recommendations for de LDE collaboration are made in paragraph **7.2**. In the reflection paragraph research and design in this process are further explored (**7.3**) and this chapter ends with recommendations for future research (**7.4**).

7.1. DISCUSSION

The main objective in this graduation project has been to develop a method for urban design. This means that not the urban plan, but the model used to come to that plan is the central outcome of the project. Developing an urban design method in this case means to create a decision support tool. The tool is shaped as a conceptual model that offers an insight in the theoretical framework on which urban designers can built their ideas. The theoretical subject the model means to transfer knowledge about is idea generation. Here the practical implication of designing with this conceptual model in the context of university collaborations is discussed and the theoretical implication of developing knowledge on the relation between idea generation and the city.

7.1.1. PRACTICAL IMPLICATIONS AND GENERALISABILITY

Interdisciplinary collaboration is of increasing importance to facing societal challenges as they are described in European research agenda Horizon 2020 and Dutch research policy, such as 'topsectoren'. Not just these three universities that are part of the design study investigated in this graduation project, use collaboration to stay on the forefront of innovative knowledge development, these types of collaborations arise all over the world. The investigation of the impact of the spatial, urban surroundings in which these collaborations are settled, is applicable in

the wider context of knowledge cities (Van Greenhuizen et al., 2012).

Even if the specific alliance LDE would seize to exist in the future, the urban development that this strategy suggests would remain relevant on the premise that interdisciplinarity will be. The collaboration between these universities has existed long before the alliance arose and as interdisciplinary research is still growing world-wide, it is not to be expected that collaboration will become less important in the future. This means that the urban connectivity that this strategy aims to develop between four cities within one of the most prominent Dutch knowledge clusters, is relevant in a broader context than the contracted alliance.

Both the conceptual model, as well as the four design principles described in the conclusion, could provide other urban designers with a decision support tool when working in a similar context, using urban design for innovation. The design principles are expected to be generic enough to not only function between inter-university collaborations, but could also apply to collaborations on other scale levels, such as between faculties.

On the basis of the design study in which the conceptual model is tested, it difficult to conclude what the generalisability of the conceptual model as a decision support tool actually is. To be able to develop such a conclusion, the model does not only need to be tested by the developer, but also by other urban designers that do not have the foreknowledge form research into idea generation.

7.1.2. THEORETICAL IMPLICATIONS

On the basis of a first hypothesis by Dong (2016), this thesis theorised further on the idea that the urban fabric of the city is connected to the generation of new ideas by its inhabitants. The developed theoretical framework does a more extensive proposition of what spatial conditions are for the generation of new ideas.

The spatial conditions are derived from models constructed for the explanation of creative processes in general and do not specifically address the relation to the city. More specific research, dedicated to finding the relation to the city, is needed.

7.2. RECOMMENDATIONS FOR THE COLLABORATION LEIDEN-DELFT-ERASMUS

This thesis is built on the presumption that interdisciplinary collaborations will be a dominant part of scientific development in the future. Today, already more than one-third of scientific references point to papers from other disciplines and this number is still rising (Ledford, 2015). The LDE collaboration is an organisational structure meant to stimulate interdisciplinary research projects within the three universities. It organisationally supports collaboration both

by making financial resources available and developing cross-university education and research programmes. The urban strategy described in this thesis could be viewed as a spatial structure to stimulate those interdisciplinary collaborations.

Interdisciplinary collaboration does not arise effortlessly. Many researchers who have worked in an interdisciplinary context encounter misunderstanding or scepticism. It is a common misconception that "interdisciplinary research is for people who aren't good enough to make it in their own field" (Ledford, 2015). We should be aware that working on this type of research needs these kinds of organisational, financial and spatial support structures in order to offer guidance to making interdisciplinary collaboration successful.

In the conversations with people working within LDE, it became evident to me how important the personal ties in these collaborations are. The synergy in the collaborations is crucial to overcoming the barriers that a cross-university collaboration inevitably struggles with. The resources LDE makes available should help collaborators to establish sustainable relationships. The design principles that this thesis concludes with in Chapter 6 are developed from the perspective of urban design, however, they can be extended to be implemented on an organisational level as well.

The most important prerogative of this study is that shared minds need shared spaces. Urban strategies, as the one this project suggests have a long-term implementation process, if one would want to start tomorrow with implementing some of the ideas implicated with this study, this prerogative should be leading. I would suggest to make existing meeting places available to LDE-related meetings on the three campuses. These spaces should offer facilities such as flexible laptop places, presentation facilities.

At the beginning of 2017, Leiden University opened a new faculty building, the Wijnhaven Complex, in The Hague. This is a good example of how city and campus can be integrated (**6.1**). When complemented with places for LDE meetings at the campuses, this could be the start of a physical LDE network (**6.2**). When this is done in consideration of the route it might create, these meeting places could become a string of beads that later on might be expended to collaborative project centres, as the urban strategy suggests (**6.3** and **6.4**).

Can these shared spaces also be digital spaces? In this time, it is inevitable that a lot of the communication in collaboration is digital and LDE has to be on the forefront of developing technologies to support efficient data and information exchange. However, it is hard to imagine that sustainable, personal relationships can be developed digitally. For this, face-to-face contact will keep playing a

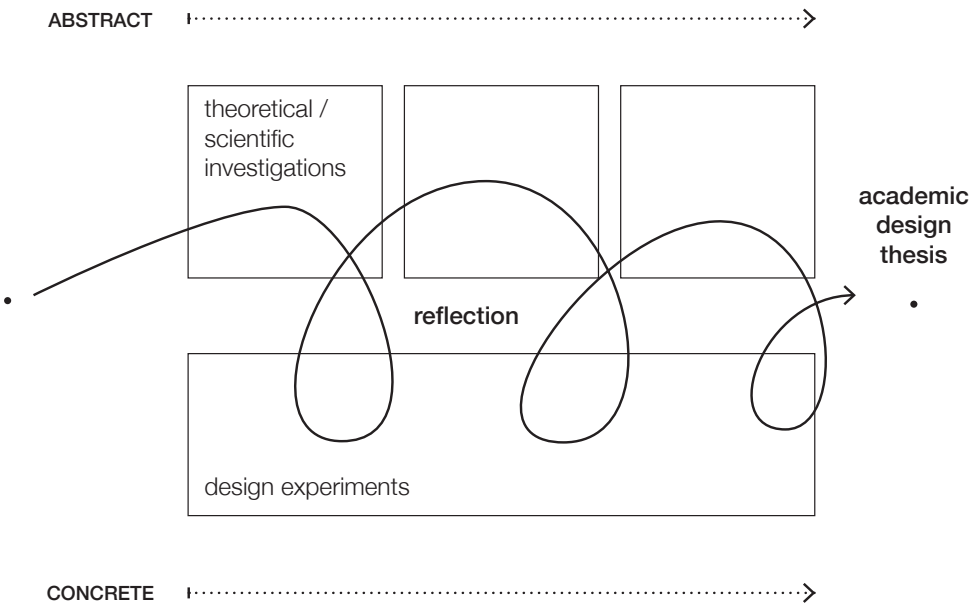


Figure 41 Diagram of graduation process and the role of research and design activities

crucial role and especially when it comes to creating new ideas, facilitating encounters in physical places on and off campus has to be as much on the LDE agenda as well as developing digital communication facilities.

7.3. REFLECTION ON RESEARCH AND DESIGN

Who has paid close attention, might have seen the 'Droste effect' within this thesis. Thoroughly diving into how good ideas are created, not only provided a basis for a design study into campus environments, but also gave me tools to understand my own idea generation processes, during the development of my thesis. That reflectivity on the process of research and design has been one of the most characterising aspects of this thesis development and it is taking as a starting point for the reflection in this chapter.

Graduating at the Faculty of Architecture happens along extremely diverse routes. Although all projects have in common that they use both research and design methods, each individual student colours with a personally compiled set of markers and pencils that they have decided to pick up along their study path. The methodology in my graduation project is determined by the methods I have adopted during my education at Urbanism, as well as my education within Science Communication. The conscious exchange between these two fields of study is present in all the research and design decisions I have made and characterises this graduation project.

Figure 41 diagrammatically illustrates the perception of the exchange between theoretical research investigations and practical design studies. This has not been a linear process, but an almost constant exchange between different activities. The design-based research perspective I used, aiming at developing a design study to test the outcomes of theoretical research, has been an important structuring element. Therefore, it is possible to distinguish between a more research-oriented and design-oriented stage in my graduation process.

During my P2 presentation, I showed the first version of the conceptual model. Up until that point the project was more research-oriented. In the second half of the graduation my approach shifted using much more design-oriented methods. By means of a design study I researched if the conceptual model could function as a decision support tool in my own design process.

The difference between the first and second part of my graduation is characterised by the contrast between research and design methods. In the first half of my graduation process I felt I made conscious decisions on which steps to take. I was continuously reflecting back and forth to see check my own rationality and considerations.

In comparison, the second half I experienced as being much more an intuitive process. It was very difficult to know in advance what logical decisions were and what the result of a certain investigation would be. I had the tendency to choose my methods based on experiences from previous design processes. Only after a few weeks, when I was making decisions on the urban plan and when I was trying to describe and argue the decisions I had made, the methods seemed to have a logical sequence.

The conceptual model was a structuring element in this second stage of the project. Following a design-based research process I tried to design an urban plan in a specific design study, using the model as starting-point. In the beginning the model functioned as an analysis tool, because it dictated certain spatial conditions I could look for in the urban context. In a later stage, I used the model to

distil the four design principles that I could use to strengthen or complement the urban issues I had found within my analysis.

7.4. RECOMMENDATIONS FOR FUTURE RESEARCH

From the previous discussion and reflection paragraphs, three main recommendations for future research are made.

1. Test the use of conceptual model with other urban designers

In order to find out if the conceptual model can be used by other urban designers, there is a need to test the model in a social design experiment. Asking a sample group of designers to use the conceptual model as means to deal with a specific design exercise could provide new insights on how urban designers deal with their process and use theory to do so.

2. Explore the relation between creativity and the urban fabric

Although this research has done some suggestions on how the relation between creativity and the urban fabric could be understood by urban designers, there are probably be found countless other ways to investigate that relation. Doing social research in the urban context, for instance, trying to find the cognitive maps of knowledge workers and linking them to their own idea generation process, would be an interesting line of exploration. This might be away to falsify some of the spatial conditions from the conceptual model. A next exploration, however, would still be far away from producing a conclusive theory on the relation between creativity and the city. As the way Boden (2004) argues for creativity, might also be true for the city: The body of knowledge on the topic is so diverse and complex that there can never be one scientific theory.

3. Investigate integrative skills in combined research and design projects

Using a conceptual model to function as hinge between research and design, as suggested by Dorst and experimented with in this research, poses new questions for research. One of these questions is if we need other skills next to the skills for research and design to integrate them within the context of academia. Both research and design have found a place in academia as separate entities, however, the combination of the two is relevant in schools for engineering and design. Further investigation is necessary to understand what the integrative skills are that students learn from the exchange between research and design. A first stepping stone for that type of research is done in the second section of this thesis.[1]

1 Section 2 of this thesis contains the critical reflection on research and design within this graduation process.

SECTION 2

"The paradox of education is precisely this - that as one begins to become conscious, one begins to examine the society in which he is being educated."

(Baldwin, 1963)

"Although most [of my designs] I come to intuitively, I don't just 'do something'. I start with my feeling, but then I introduce a theory. It is very hard to say how this works, but the reasoning emerges on the way. And then, when you look back, you think:
'Oh is that so?'"

(Beyer in Lawson & Dorst, 2009, p. 35)

8 INTRODUCTION

8.1. RESEARCH AND DESIGN

Learning is one of the most intriguing human abilities. Where at the start of all learning processes, we tend to decompose the new material into smaller bits, as it is easier to learn a new skill in isolation (Lawson & Dorst, 2009). Later on, with more experience of problem solving in a certain area students develop routines, combine procedures and the need for compartmentalising decreases.

This strategy of compartmentalising problems in order to learn has strongly been embedded in teaching systems at all levels of education, from preschool to university. Many curricula are dominated by separate disciplines (Van Breukelen, 2017) and universities are traditionally structured in disciplinary departments (Ledford, 2015).

The educational structure is increasingly being criticised, because it does not comply to a rising need for professionals that can deal

Current MSc Graduate Profile	Shifting needs
Mono-disciplinary thinking	Multi- and interdisciplinary thinking
Reductionism	Integration
Convergent thinking	Creativity (divergent - convergent)
Independence	Collaboration
Tecno-scientific base	Socio-economic context
Understanding certainty	Handling ambiguity and failure
Rounded expert	Employability, lifelong learning
Rational problem solving	Complex problem solving

Table 3 Shifting needs for MSc graduates (adapted from: Kamp in Kamp & Klaassen, 2016)

with complex interdisciplinary tasks. The critique from scientist and science philosopher Theodore Brown (in Ledford, 2015), that has been the starting point of the first section of this thesis, is just as relevant here:

"The problems challenging us today, the ones really worth working on, are complex, require sophisticated equipment and intellectual tools, and just don't yield to a narrow approach. […] The traditional structure of university departments and colleges is not conducive to cooperative, interdisciplinary work."

In response to this critique, in recent years, many integrative approaches in education have arisen (Van Breukelen, 2017). In order to educate interdisciplinary thinking, the MSc graduate profile at university shifts to integrate 21st century skills that are characterised by creativity, entrepreneurial behaviour and rigorous engineering (**Table 3**) (Kamp & Klaassen, 2016). New didactic methods are developed in order to educate for these type of skills. In these approaches, it is often design that is used to learn to inte-

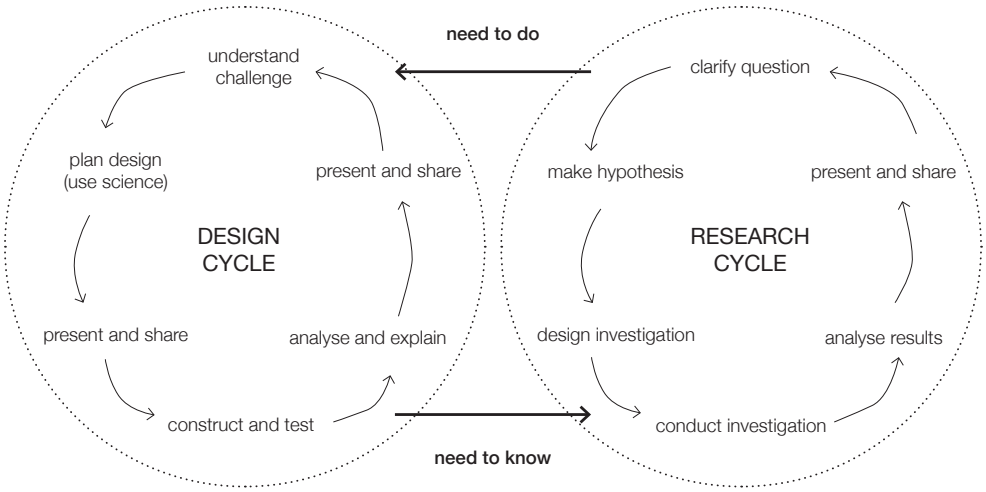


Figure 42 Learning by design cycle (adapted from: Kolodner et al., 2003)

grate knowledge, skills and practices on a scientific level.

In secondary education in the Netherlands, integrative research and design courses (Ontwerpen & Onderzoeken) are becoming more and more a natural part of the curriculum. At the start of these courses, design and research are introduced as to separate learning cycles. Later on, students learn about the exchange between the two.

The exchange between design and research is characterised in the 'Learning by design cycle' from Kolodner (2003) (**Figure 42**). Weather the focus is on developing a design project or a research project at any stage the student can take a step into another cycle. When in the research cycle a problem arises, for instance, there is not a suitable instrument to gather data, the student develops a 'need to do', in other words, a need to develop such an instrument. Within the design cycle, a similar

exchange might occur when a student develops a need to know.

This simplified representation of the design process as suggested by Kolodner is a useful support tool in the didactic approach towards research and design currently employed in secondary education. However, it is unclear if the Kolodner model is still applicable in higher education, where the problems students work on are more complex.

8.2. PROBLEM STATEMENT

Just as secondary schools have done, universities are looking for ways to construct design-based learning experiences that will enable students to make the exchange between research and design (Cuthbert, 2010). In order to do so, a cohesive understanding of the process to be taught is necessary.

In the first years of higher education, as part of the BSc degree, it makes sense to decompose the research and design process, in such a way as the Kolodner model suggests. However, when confronted with more complex problems and when getting familiar with scientific research in the education for the MSc degree, students are expected to integrate research and design even further. It is unclear if the model of Kolodner represents the way MSc students in higher education deal with research and design. The problems these students deal with might ask more integration of research and design than the Kolodner model suggests and we might need to understand the integrative process of students in a different way.

8.3. AIM

In order to develop didactic approaches to research and design at university, there is a need to entangle the process by which students learn. Learning processes are difficult to study, but detailed knowledge about the way students integrate with research and design while dealing with complex problems, can help universities in their search for relevant educational strategies. This section of the thesis aims at developing a reflection on the way research and design were integrated in the graduation project described in Section 1, in order to find a representation of how students integrate research and design methods to deal with complex problems.

8.4. REFLECTIVE QUESTION

The investigation in this section is focussed on the project developed in the first section of this thesis (**Figure 43**). By a critical reflection on the integration of research and design in the design-based research process, I will try to formulate an answer on the question:

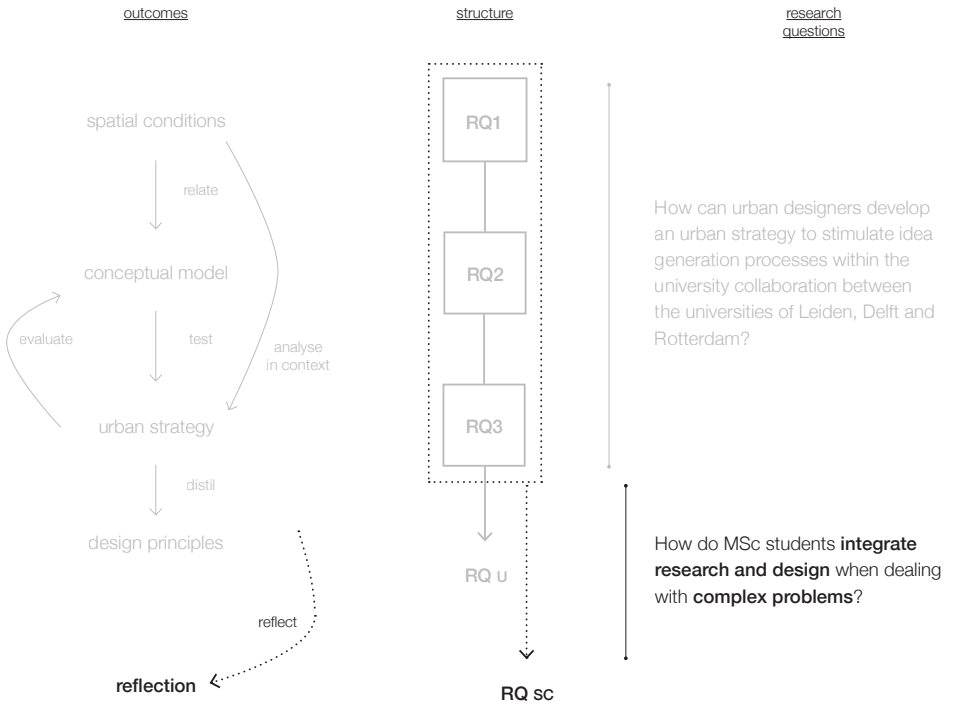


Figure 43 Research structure and position reflection

RQ SCIENCE COMMUNICATION (SC)

How do MSc students integrate research and design when dealing with complex problems?

Complex problems

The research topic of the graduation project in the first section (stimulating idea generation processes in university collaboration by means of urban design), can be defined as a complex problem (**Table 2**) (Glouberman & Zimmerman, 2002). Raising a child is in many ways comparable to designing a city. Every city is unique and experience in previous designs might be helpful, they can never guarantee success. Even though in the end, the outcome is an urban strategy for

Simple problems	Complicated problems	Complex problems
Following a recipe	**Sending a rocket to the moon**	**Raising a child**
The recipe is essential	Formulae are critical and necessary	Formulae have a limited application
Recipes are tested to assure easy replication	Sending one rocket increases assurance that the next will be OK	Raising one child provides experience but no assurance of success with the next
No particular expertise is required. But cooking expertise increases success rate	High levels of expertise in a variety of fields are necessary for success	Expertise can contribute but is neither necessary nor sufficient to assure success
Recipes produce standardized products	Rockets are similar in critical ways	Every child is unique and must be understood as an individual
The best recipes give good results every time	There is a high degree of certainty of outcome	Uncertainty of outcome remains

Table 4 Difference between simple, complicated and complex problems (Glouberman & Zimmerman, 2002)

stimulating idea generation, there is still a high degree of uncertainty. The answers on the questions in these type of problems are never 'true' or 'false', rather they are 'good' or 'bad' (Rittel & Webber, 1973).

The graduation project in the first section offers an interesting example of the type of complex problems that university students deal with, but that do not yet occur in secondary education. By analysing and reflecting on the process, a comparison can be made between the model of Kolodner and the research and design cycles as they are progressed through by a graduation student.

Integrate research and design

There exist different approaches to integrate research and design. As this graduation project is part of a double degree programme in which I combined the MSc track Urbanism at the Faculty of Architecture, Urbanism and Building Sciences and the MSc track Science Communication at the Faculty of

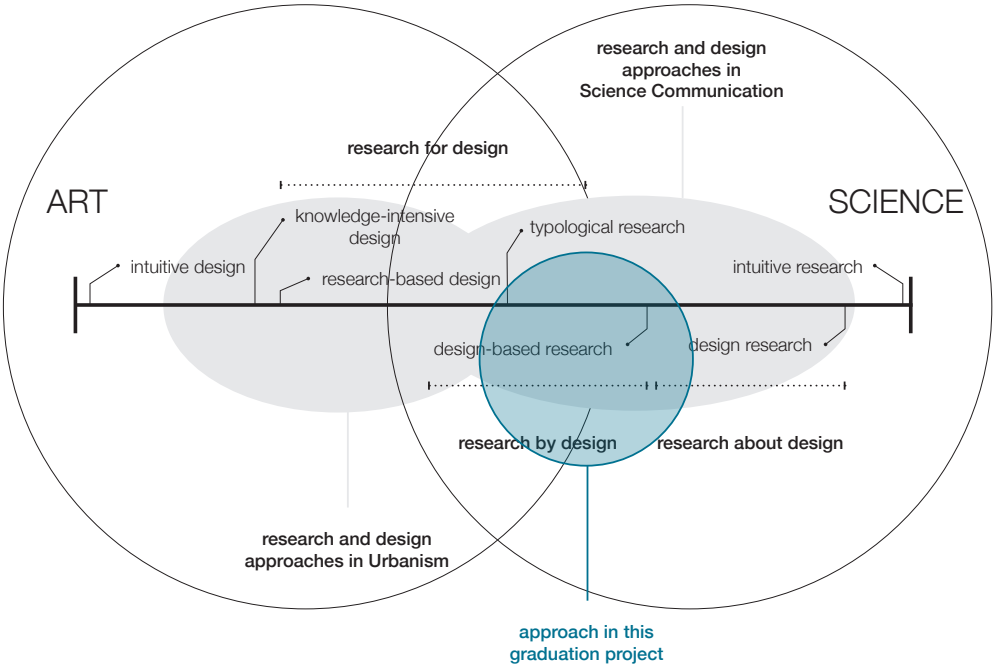


Figure 44 Design and research typologies (adapted from: De Jong & Van der Voordt, 2002) and the position of the methodology I used in this graduation project

Applied Sciences, it is important to position the methodology I used between the other approaches that might exist in the context of these two faculties.

These approaches are not mutually exclusive and an integrated project can employ several of these approaches. The model developed by De Jong & Van der Voordt (2002) shows the approaches towards research and design on a scale, with on one end science and on the other art (**Figure 44**). The ambition to integrate design as research method in this project, moved the methodological approach towards the science side in the model. Section 1 describes the design-based research I conducted. Within the methodological framework of design-based research, I used different methods to do theoretical investigations and design experiments. Some of these methods, I borrowed from other places along the axis, sometimes partly doing research for design and sometimes reaching my own design process.

Description	Interpretation	Outcome
What happened? How did I conduct research and design?	What is most important/ relevant/ interesting/ useful about the way research and design have been integrated in the graduation process? How can it be explained by theory? How is it similar or different from the research and design integration as presented in the model of Kolodner?	What have I learned from this? What does it mean for the future in research and design education?

Table 5 Reflection structure (adapted from Hamption, 2010)

8.5. REFLECTION METHODOLOGY

Using critical reflection as research method, it becomes possible to recognise the fundamental steps within my graduation process (Fook, 2011). The goal is here to make my own learning explicit. In order to do so, the learning process is documented by logging activities and products, such as sketches, schemes and intermediary reports. This body of process material is used to reconstruct the development of the project and used as a starting point for the critical reflection.

What is interesting about using critical reflection as a method is that my personal experiences are the subject of study. In recent years, this type of research has increasingly seized attention as 'living research'. Within living research, practice experience is being studied in order to gain a better understanding of complex human behaviour, such as learning. Within social research, living

research offers a range of relatively new methods that aim at describing experiences that are initially difficult to express (Fook, 2011). Reflection is one of these methods.

The critical reflection is structured in three parts (**Table 5**), following Hampton (2010): Description (**9.1**), interpretation (**9.2** and **9.3**) and outcome (**10**). In the description part, I tell the story of my graduation process and in what stages research and design were present in different forms. In the interpretation paragraphs, that story is interpreted and the most important learning object is derived to examine in theory. At the end of Chapter 9, I compare the process to the model of Kolodner. The outcomes of the critical reflection are discussed in Chapter 10.

8.6. RELEVANCE

8.6.1. SOCIETAL AND SCIENTIFIC RELEVANCE OF INTEGRATING RESEARCH AND DESIGN

The type of societal challenges that need to be addressed in academic research and education are increasingly complex and ill-defined (Sanders & Stappers, 2008). Typical forms of reasoning in science, such as analysing or problem solving are not conducive to working on complex problems.

The realisation that grand societal challenges ask different forms of problem solving, has brought an educational reform aimed at educating students that can deal with that complexity. That reform changes the way design is perceived, as well as the way research is conducted. Their integration offers new insights for both.

In design, abduction is used as a type of reasoning to create new approaches to a problem (Dorst, 2013). Expert designers develop sophisticated multi-layer methods to entangle complex issues in daily practice. It is a crucial part of addressing the type of problems we find important for society today. Through the development of new research methods, such as design-based research, abductive reasoning has found its way into scientific research.

From the perspective of design practice, the integration with research is inherent to its own process, which consists of combining and integrating rather than breaking down and dividing (Lawson & Dorst, 2009, p. 86). For the designer there is not a direct route from problem to solution. In order to arrive at a solution, the designer needs to incorporate all the demands and issues into one design that offers a solution in an integrated matter (Lawson & Dorst, 2009, p. 42). Theoretical knowledge production is indispensable to the process of developing relevant design solutions.

8.6.2. SOCIETAL AND SCIENTIFIC RELEVANCE OF RESEARCHING LEARNING PROCESSES

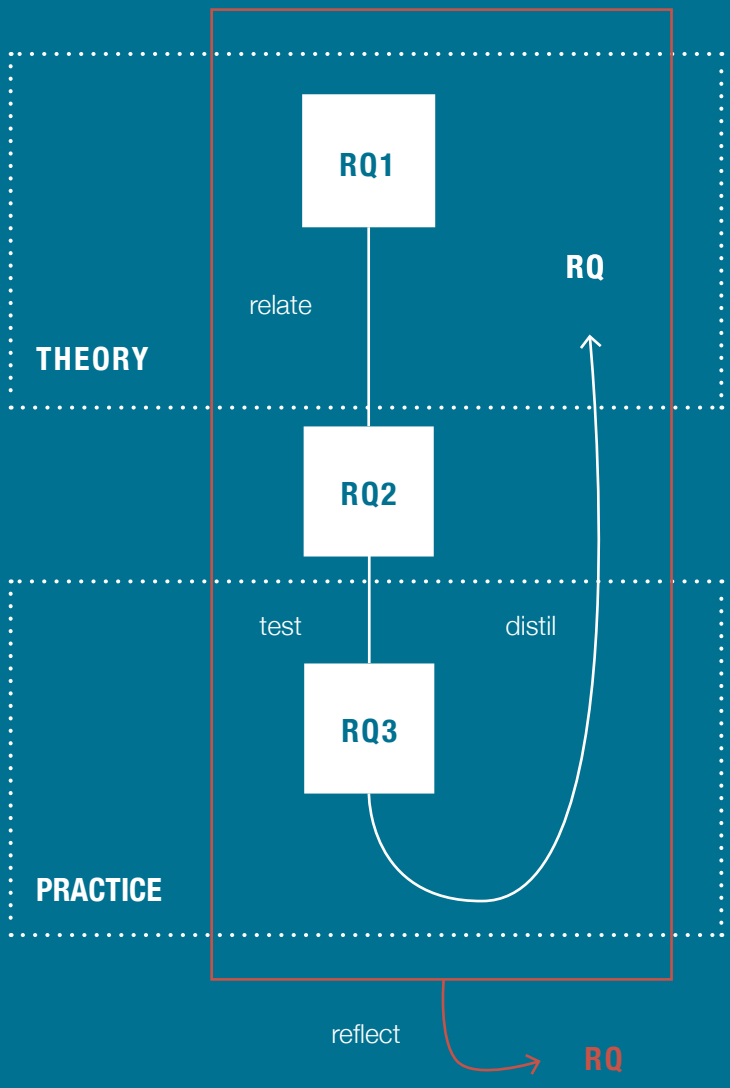
The department of Science Education and Communication (SEC) at the Delft Uni-

versity of Technology is concerned with the development of innovation in science communication processes in order to bring science and society closer together. Developing innovation for education programmes contributes to that process. Knowledge about the way students deal with the methods they are handed in class is crucial for development of educational innovation.

Some of the research from the SEC department is often developed within education. Strongly invested in design-based research methods, SEC develops its education programme with a clear focus on the integration of research and design activities and puts complex problems at the core of their curriculum. As a result, courses with an innovative didactic structure arise, such as C-lab.

In C-lab, research and practice (valorisation) are integrated in a studio-like setting. Within the studio students work on the design of a decision support tool for the development of a communication strategy in a real-life case. The aim of developing these new didactic methods, such as C-lab, is to find a way to teach students 21st century skills.

Research on learning processes and knowledge on the development of expertise is necessary to evaluate the success of the new approaches that are being developed to scientific research and education. This study aims at being an example of the way this research could be conducted by means of critical reflection. The insights this critical reflection offers in the integration of research and design aim to contribute to the further development of relevant scientific learning products and processes.


RQ1
RQ
relate
THEORY
RQ2
test
distil
RQ3
PRACTICE
reflect
RQ

HOW DO MSC STUDENTS INTEGRATE RESEARCH AND DESIGN WHEN DEALING WITH COMPLEX PROBLEMS?

9 CRITICAL REFLECTION

This chapter deals with the reflection on the graduation project that was described in Section 1 of this thesis. In this graduation project a strong focus lay on the exchange between research and design. Because this graduation project was part of a double degree between Science Communication and Urbanism, the different approaches from either discipline towards research and design made that in a way I needed a way to develop my own method to deal with the differences in emphasis.

The impact of a constant exchange between two disciplines is described and reflected on in paragraph 9.1. The graduation process is interpreted through literature on expertise development in research and design education (9.2) and the development methodology is compared to the methodological learning objectives from both the education programme for Science Communication, as well as Urbanism (9.3).

9.1. DESCRIPTION

This paragraph aims at describing 'what happened?'. In order to do so, I have carefully tried to document the project development by logging the amount of hours spend on a certain activity, the people I talked with and the drawings and writing I produced. I developed my graduation project in 44 weeks, starting from September 5th 2016 until the final meeting with my supervisors on July 5th 2017.

As an archaeologist, I will look at the pieces of information in order to reconstruct the thinking path over the course of this year. While doing so, determining what have been the critical moments in the idea generation process and how research and design activities have contributed to construing these moments. These moments will be examined in more detail in order to find the competencies used to integrate research and design in these places.

9.1.1. MAPPING THE GRADUATION PROCESS

Over the course of almost a year, I tracked the amount of time spend on a certain activity. The size of the time segments was about half an hour to a few hours. I categorised the activities with labels, such as 'literature review', 'adapting conceptual model' or 'email and organising'. In **Graph 1** all these activities are stacked together and this shows a plot of the amount of hours spend per week. A few things catch attention by this first general description of the process.

The three weeks I took a break from the project, the amount of hours drops to zero and in the final weeks before the thesis deadline the amount of hours raises to a maximum. Weeks 10, 21, 34 and 44 are the weeks in which I presented my project to my complete Urbanism committee.

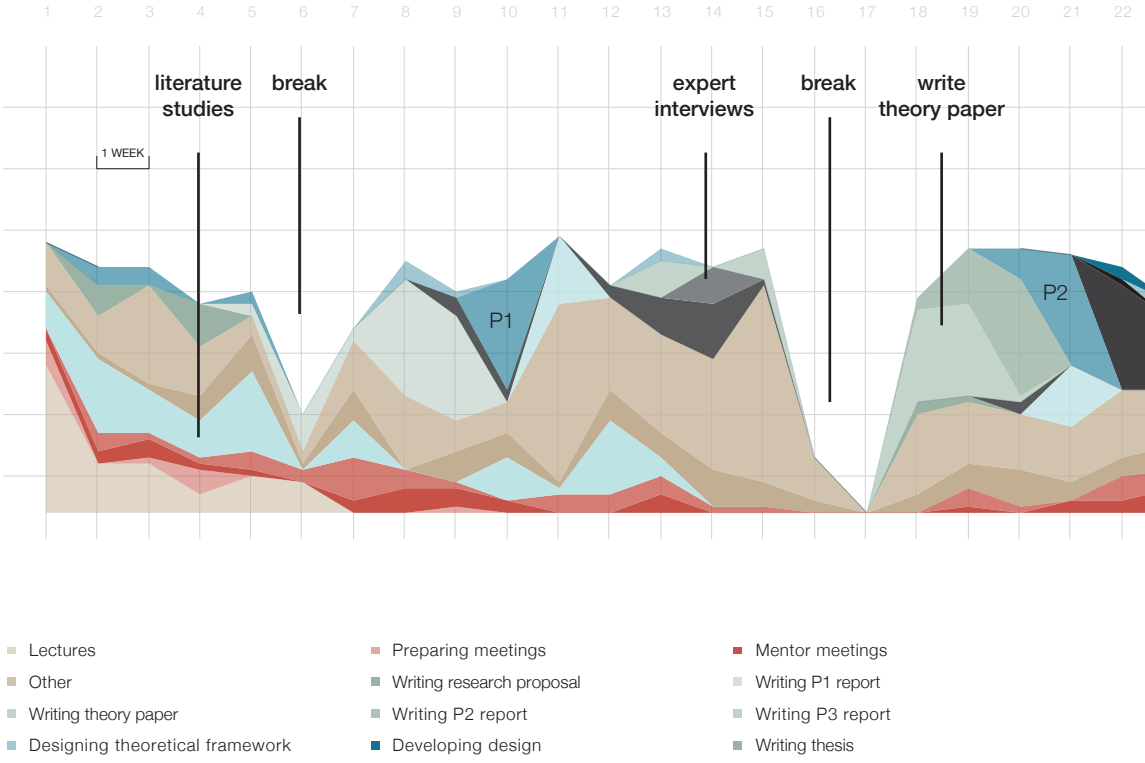
These presentations have formed significant intermediary deadlines and the feedback gathered from these presentations is an important verification step. Before these presentations, I tend to work persistently on preparing the presentation material in words and images. This isolation is reflected in the decline of conversations I have in the two weeks before each presentation.

On average, I worked 37 hours per week on the project. In the period between week 27-32 something curious happens, as the amount of hours declines. This period I experienced as being confused and stuck. The lack of control on the material demotivated me.

Some activities are constantly present throughout the process. I met with my tutors almost every week or had some informal meetings to discuss the project with fellow students or other faculty members. An activity I labelled as 'organising' is continuously present. The four P-presentations also are clearly recognisable in the graph.

Apart from these weekly reoccurring working patterns, some other patterns can be distinguished as well. The working process until week 21, looks different from the process after week 21. Although literature review often returns, it is one of the most prominent activities in the first half of the project and in the second half it seems to have gotten a different, more supporting role. In week 26 a lot of information is gathered through spatial analysis and site visits, but in the weeks that follow the process staggers.

This analysis points toward three periods in the process that need to be examined in more detail: the working patterns of the first half of the project (week 1-21), week 26 and the period that can be characterised as the impasse (week 27-32). I further generalised the activities in order to see if this would deliver more insides in working patterns. I recognised five categories:



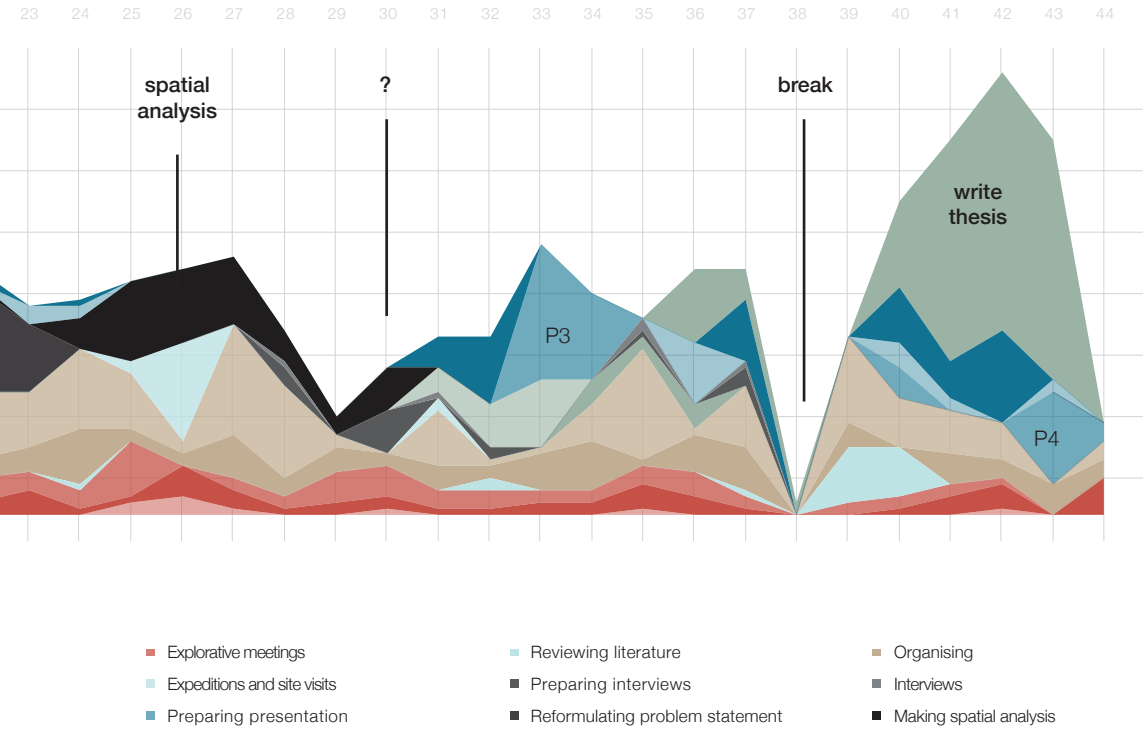
Graph 1 All activities logged during graduation process

Organising

This is the most continuous activity in the research and design process. Organising does not only mean dealing with organisational matters, but also preparing for interviews and tutor meetings. Generally, this meant also drawing or writing down thoughts.

Gathering information (reading, looking and listening)

To gather information, I used different methods in different parts of the process. 'Reading' meant studying literature. I tagged all the activities that were related to field work as 'looking'. 'Listening' are the activities realted to interviews.

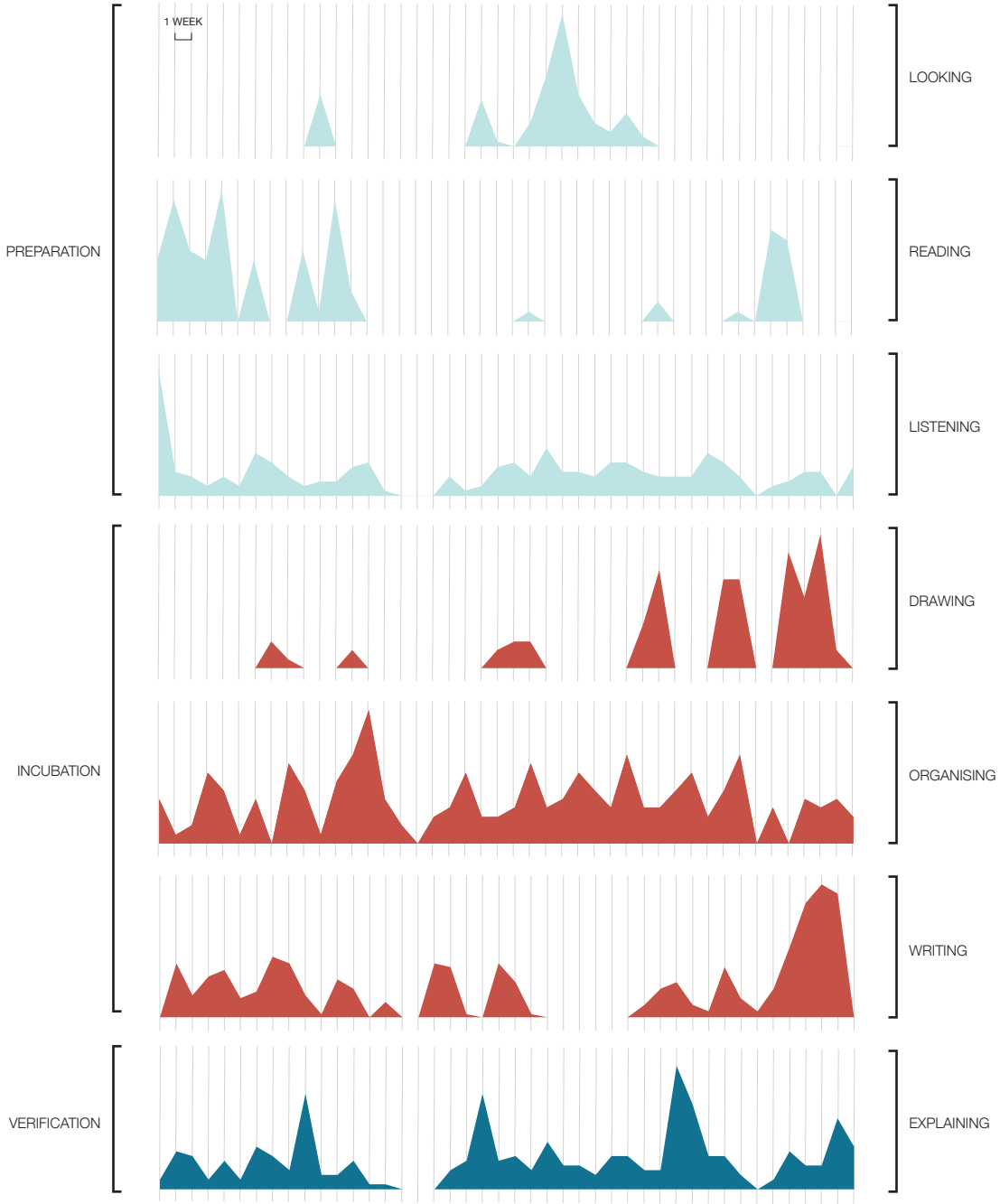


Explaining

This activity coincides with 'organising' as these are the meetings, interviews and brainstorms that I did during the process. These I often used to verify my ideas and to put all my ducks in a row.

Designing

This is a difficult activity to log. In this group of activities, it refers to time that I labelled specifically as 'development design' or 'development theoretical framework'.



Graph 2 Activities categorised as 'looking, reading, listening, drawing, organising, writing and explaining' and as 'preparation, incubation and verification' activities

Writing
These are all the activities necessary to produce the research proposal, intermediary reports and the development of the academic design thesis.

In **Graph 2** these five activity categories are pulled apart and show the process in a different way. Some activities, such as organising, are almost continuously present in the process. Where as others only occasionally appear, such as looking and reading.

Another level of abstraction is added to the seven competencies by categorising the activities as is suggested by the Four Stages of Creativity Model (Ohlsson, 2011): Preparation (gathering information), incubation (designing, writing and organising) and verification (explaining). This categorisation shows a rhythmic exchange of preparation and verification activities in which incubation is constantly present.

In **Graph 3** the activities are again plotted together, but the threefold now clearly shows a rhythm over the complete process as well. In the beginning the research and design cycles I made are still quite small, later on these loops of preparation, incubation and verification become bigger.

In the next paragraph I describe how I experienced the loops within my process at different critical moments in the graduation project.

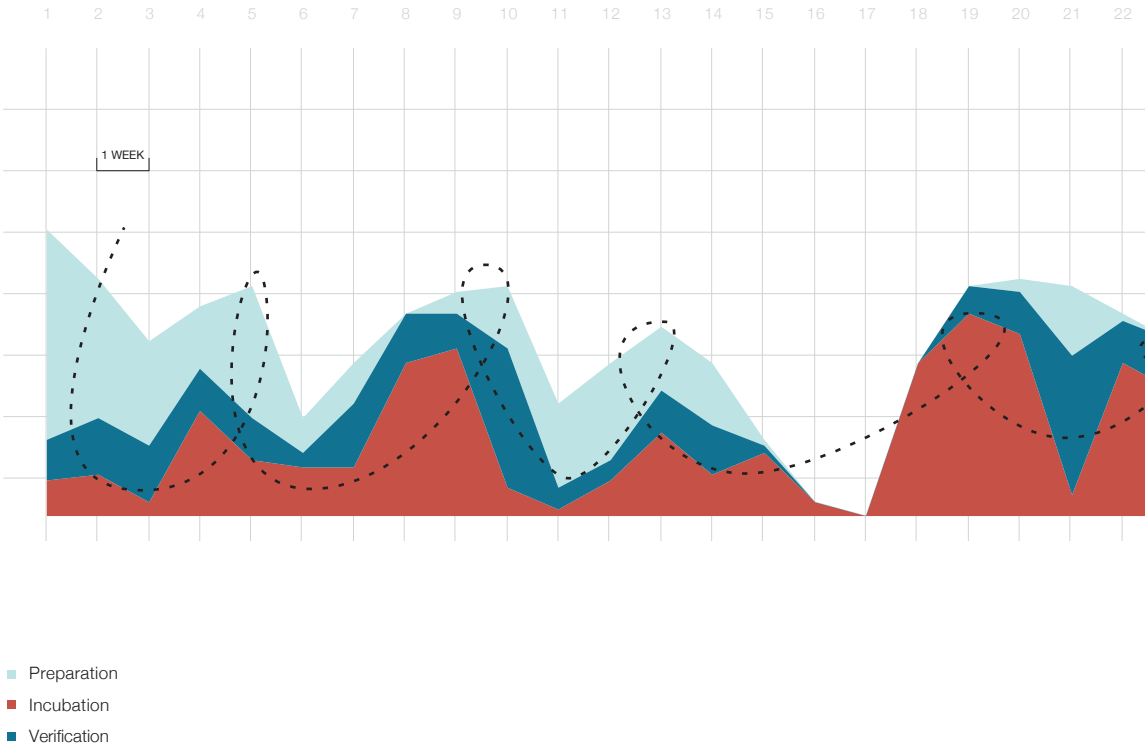
9.1.2. DESCRIBING THE GRADUATION PROCESS

Weeks 1-14
In these first weeks of project development, I made several short iterations on the project proposal. Meeting every week with one of my main mentors to discuss the project proposals. Firstly, discussing four proposals, going back to two and finally choosing one that I wrote a thesis plan for, which I presented to my committee in a kick-off presentation in week 10 (**Graph 4**-1).

The rhythm of these iterations is reflected in **Graph 3**, where the incubation and verification activities meander in contrast with preparation activities. In the weeks that I met with my mentors I wrote down my thoughts, which I mapped as an incubation activity. Consequently, I verified my thoughts with my mentors in the same week. Often this resulted in a renewed, more specific search on information on the problem, hence the preparation activity spikes in the week after verification.

An example of the level of abstraction that was the starting point for the theoretical investigation, I wrote in one of the first research proposals that:

> Many of the tactics described above have been based on the notion of a creative city. It presumes **a link between creative thinking and the structure of the city**. Dong (2016) does a proposition in his essay on design thinking and the city's structure that suggests that this link

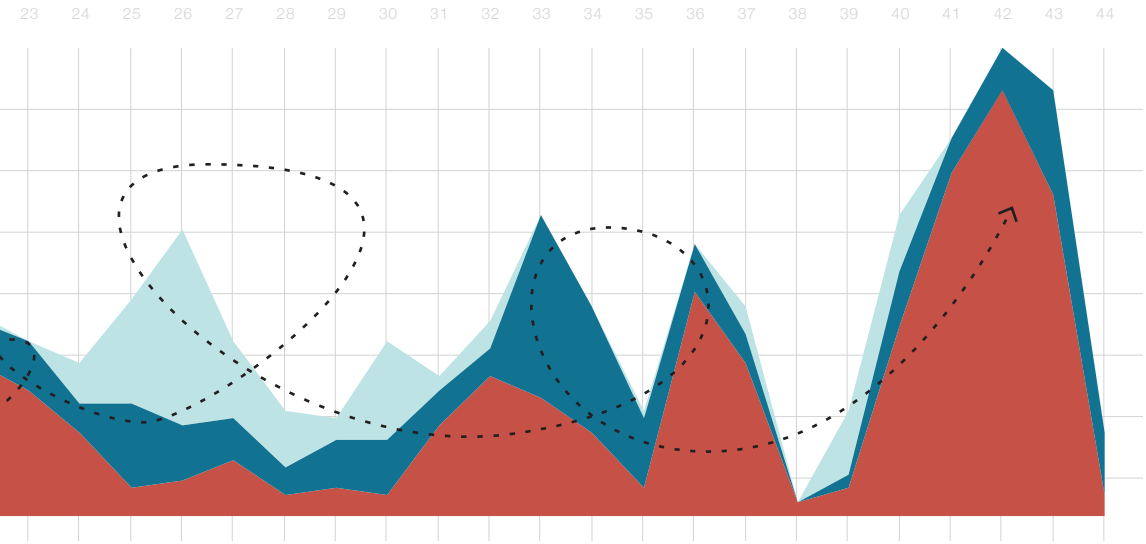


Graph 3 Activities categorised as preparation, incubation and verification activities

can be strengthened by using new **urban design principles**.

I started to explore 'the link between creative thinking and the structure of the city' in a literature study (**Chapter 3**). During the literature research (**Graph 4**-2), I found that in the extremely broad field of creativity studies, the connection to the urban environment was relatively unexplored. The theoretical investigation concluded with seven spatial conditions (**Graph 4**-3), interpreted from four generic models on creativity. These spatial conditions were organised in a conceptual model (**Graph 4**-4).

Although this was the outcome I was aiming for by doing this literature study, the result was problematic. The conceptual model did not offer specific design solutions or dictate a certain method. I do think I had a grasp of how I had to work with the conceptual model, but it was not possible to prepare this explicitly beforehand, I felt I just had to start



by drawing some spatial solutions for the design study LDE.

Week 21

The iterative circles changed their pace after week 21. Maybe this had to do with the abstraction level on which I approached the problems. In weeks 1-21, I was predominantly working on the level of the research structure and theory. After being confronted with the issue that the spatial conditions had to be concretised by testing them in an urban design study, this added new, more concrete levels in which to explore the problem (**Graph 4**-5).

Week 21 was the week in which I presented my intermediary report (P2) and afterwards I worked on the reformulation of the problem statement in my graduation, as this had been one of the main suggestions by the graduation committee.

Week 22-25
I remember this period as being quite unsettling. I wanted to bring all the thoughts and ideas I had together in one sketch about the project, but I could not find a way to express all this condensed information on paper.
As I described before, I was aware that the methods used in the weeks before were not sufficient to solving the problem. I had to try something new, with which I was unfamiliar. Within this part of the process I had to work intuitively, because it was not possible to know which methods would result in a solution.

One of the first drawings I made in this period was an analytical sketch on the regional scale of the cities Leiden, The Hague, Delft and Rotterdam (**Graph 4**-5). This drawing is best comparable to the final drawing I made in the spatial design development (**Graph 4**-6). This suggests that intuitively I knew on what scale level I could find one piece of the solution. However, this was not the only scale level involved in the solution. Distinctive for complex problems is that they often manifest on several scales at the same time. At this point, I decided that it was too difficult for me to deal with the regional scale and I abandoned this drawing to work on a completely different scale.

One of the techniques I learned from previous urban design projects when dealing with abstract concepts, was to ask myself 'what does it look like?'. In order to answer this question, I made collages for all seven spatial conditions found in theoretical investigations from the previous weeks (**Graph 4**-7). From these collages I gained a richer understanding of the spatial conditions in the conceptual model. Consequently, I started to map the existing spatial conditions on maps of the campuses (**Graph 4**-3). For instance, spatial condition 2B 'public spaces for contemplation', I found in small prayer rooms that were spread over each campus.

Week 26
Graph 4 shows a peek in week 26. This is the week in which I conducted site visits to Rotterdam, Leiden and The Hague. A few days I explored the different routes on the Leiden-Delft-Erasmus collaboration and I drew and mapped all kinds of details that I could relate to literature from idea generation processes.

At that point, I was not really sure what I was looking for anymore. I photographed the places that I recognised as a spatial condition and after the site visits I mapped them, updating the earlier maps I made of the campus. I felt I was wasting my time.

Week 27-32
After this extensive search done in week 26, it seems I created a complete impasse for myself in the weeks that followed. Although I might have had the intention of designing new ideas for the LDE study, my design activities seized, as well as my writing and

reading activities. In comparison to all other moments in the project, the diversity of type of activities is limited. In contrast to the small iterations at the start of the project (weeks 1-14), these weeks seem to have been part of a problem solving process that made a much larger circle from preparation (week 26), incubation (weeks 28-31) to verification (week 34).

One of the things I was able to keep working on in this period was the organisational analysis of the LDE collaboration (**Graph 4**-9). I analysed the case through conversations with different actors within the collaboration. In conversation, exchanging some of my knowledge on urban design and some of their knowledge on how a collaboration between different universities, did encourage me to keep working and not yet give up on the project all together.

The problem at this point was that I had quite concrete examples of the spatial conditions for idea generation in Leiden, Delft, The Hague and Rotterdam and an organisational analysis of the collaboration, combined they would not yet lead to a cohesive design approach.

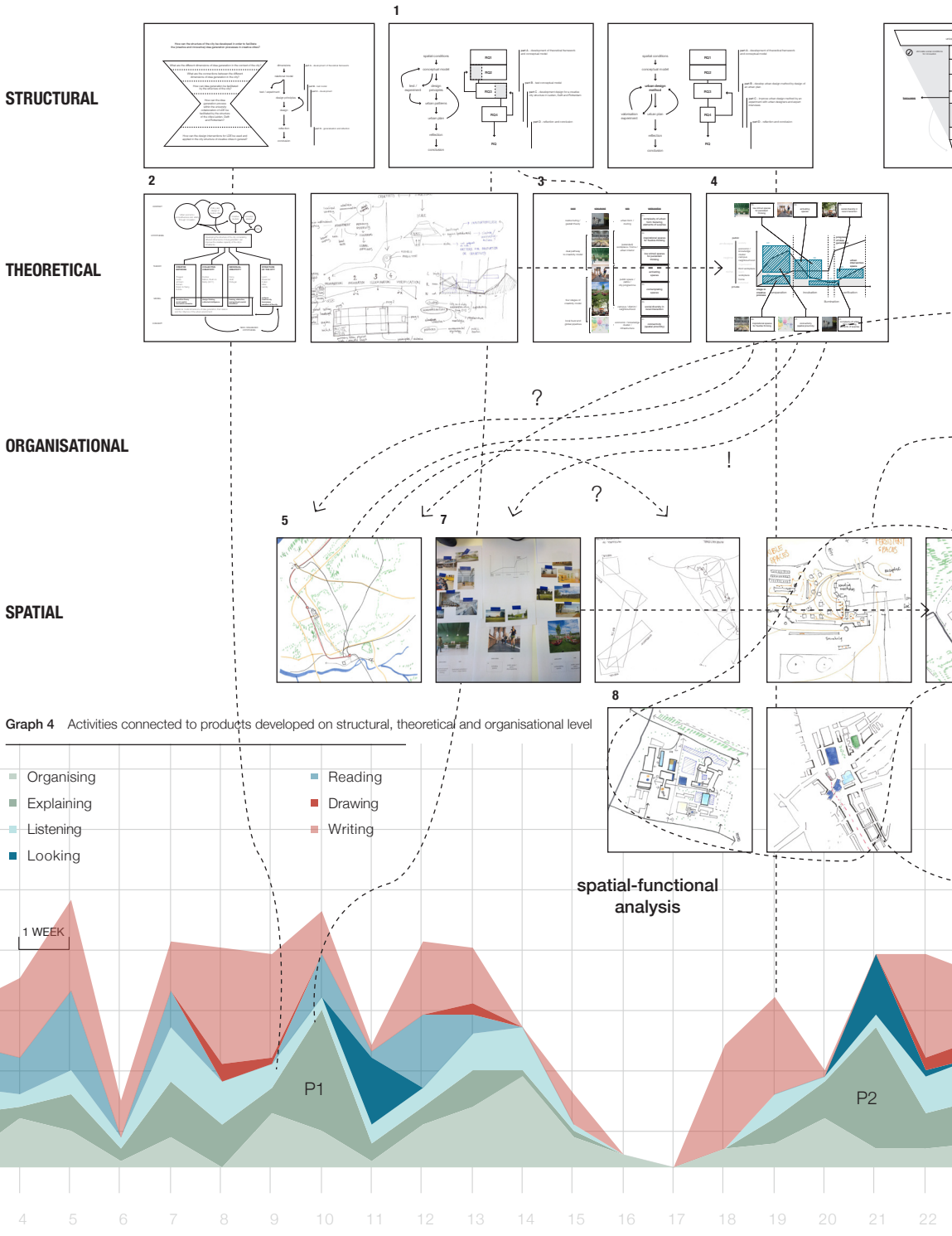
Week 30

Finally, I introduced a theory. This step is very much comparable to the comment of graphic designer Eliane Beyer on her design process:

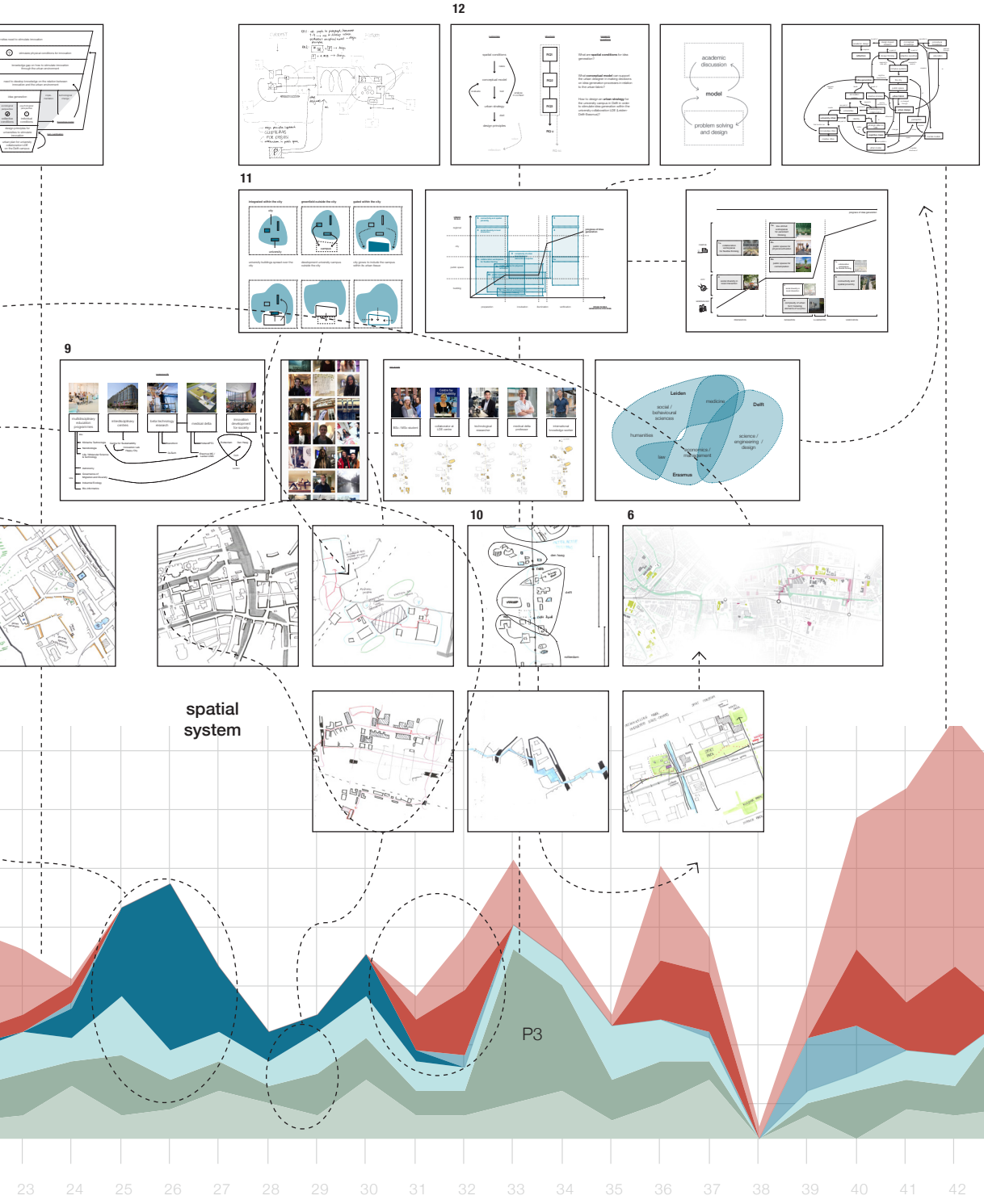
> "Although most [of my designs] I come to intuitively, I don't just 'do something'. I start with my feeling, but then I introduce a theory. It is very hard to say how this works, but the reasoning emerges on the way. And then, when you look back, you think: 'Oh is that so?'" (Beyer in Lawson & Dorst, 2009, p. 35)

The theory I used in this instance was the theory on cognitive mapping. To illustrate the LDE collaboration on a cognitive map, gave me the freedom to show spatial elements important for idea generation on one hand and the perception of LDE by its participants on the other (**Graph 4**-10). Combining this in one map, made that the problem could be framed as a 'campus design'. The campus is a concrete urban design task that provided a clear approach for the design. Now, I started to write and design again.

I found that I could introduce a theory and position the design in relation to that theory, it was not difficult to reuse that method for other issues in the design. The next loop of theorising, analysing and designing followed as a logical sequential procedure. Firstly, theory on the campus was explored. Den Heijer (2011) was chosen as a starting point and her papers on campus development from the perspective of campus management were very helpful to understanding trends and tasks for designing modern campuses (**Graph 4**-11).



Graph 4 Activities connected to products developed on structural, theoretical and organisational level


12
academic discussion
model
problem solving and design
11
9
Leiden
medicine
social / behavioural sciences
Delft
humanities
science / engineering / design
economics / management
law
Erasmus
10
6
spatial system
P3
P4
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43

Week 33
Week 33 shows a peek in verification. After all the exploration and incubation time necessary to find a way to deal with the complexity in the design task, I felt the need to verify the new ideas on the project. In the progress review with my committee (P3), I presented my project.

During this presentation I still felt very confused. Although the solutions and ideas were there, the reasoning I developed to come to these solutions had not yet emerged. In the weeks that followed I needed my tutors to be able to reconstruct the reasoning that had brought me to these solutions.

Week 34-35
In order to find the reasoning behind the solutions I designed, I needed to take a 'helicopter view' (De Dreu & Sligte, 2016) and look from a distance at the urban strategy to recognise a generic line (**Graph 4**-12). This way, I induced four design principles. In the conclusion (**Chapter 6**), these design principles were explained and their application in LDE was discussed. In **Chapter 7**, the discussion and reflection of Section 1, I discussed the generalisability of the four principles in the context of other types of collaboration and campus environments.

Week 36-44
These are the final weeks before the deadline of the final draft of my thesis (P4 report for Urbanism and Green Light report for Science Communication). Preparation and verification activities seized almost completely and I worked on writing, designing and (re-)reading to combine everything in my final thesis.

What is typical for my way of working and recognisable in the periods of preparing for other deadlines, is the isolation in the final two weeks. I rigorously avoid talking and are not receptive to new feedback, afraid that this might interrupt my train of thought in such a way that I will not be able to deliver a finished product.

9.1.3. ADAPTIVE PERFORMANCE

What has been the most characterising element in the description of the process above is the constant transitioning between scale levels. When reflecting on that process, I can distinguish four levels. Firstly, a level of structure, where the research and methods are organised and reflected upon. Secondly, a level of theory, in which I worked a lot at the beginning of the project and later returned to when it was necessary to introduce a theory. A third level is organisational, in this project that level consists of the case of the collaboration Leiden-Delft-Erasmus, which I needed to get a better understanding of the theoretical explorations. Finally, the fourth level is spatial in which I developed the urban strategy.

If I felt stuck in the design on a spatial level, I could switch to an organisational

level, where I could discover a new piece of information by doing a study of organisational structure. Or when I could not figure out how to structure the design-based research worked on a structural level, I would intuitively choose a method to design a new part of an urban intervention on a spatial level. Switching between these levels has helped me to develop a working rhythm that allowed me to deal with the uncertainty of the complex problem.

To better understand the critical moments in the process, in **Graph 4** the activities are aligned with the products that were developed from these activities. Creating visual representations has been a key ingredient in the process and I used this method on all levels of abstraction in the project: the structure, the theory, the case study analysis and the spatial analysis and design.

By connecting the products to the activities, it becomes clear that throughout the graduation process there has been a constant loop from describing the research structure and explorations in theory or the design study. One of the main characteristics of the way of working I developed, was a constant need to explicate what I was doing and how I was doing it. This required switching from concrete to abstract thinking at critical moments in the process.

Graph 4 shows that the process 'flows' best when almost all four layers are present in the process and several competencies are used next to each other. In almost all uncomfortable parts in the process I was able to keep moving and looking at the problem from different angles. This rhythm of movement between the structural, theoretical, organisational and spatial levels, I would like to characterise as adaptive performance.

In order to travel from one level to another, I again and again employed different methods, from collaging to interviewing, from mapping spatial conditions to doing a literature review. These methods in themselves or the competencies necessary to employ them are not the most characterising feature of the process. The core of the process, in my opinion, lies in the adaptive performance of recognising where one is at within the project and adapt the methods at hand to be able to deploy a next step.

The development of methods does not necessarily have to be something that happens explicitly. Some reasoning might emerge within exploration and methods might be chosen intuitively, when it is difficult to anticipate the outcomes. However, there has always been a moment of reflection on the structural level, to evaluate the explorations on one of the other levels and to position them in the broader scheme of the project. By doing this, research and design are integrated.

9.2. INTERPRETATION

What I have characterised as adaptive performance in the previous paragraph, needs to be evaluated in the context of existing theory on learning. In this paragraph, the adaptive performance is interpreted as reflective practice, expertise development and adaptive expertise. From this point there are two levels of reflection. On one hand, the critical reflection I have used in this chapter as research method and on the other hand, the reflectivity I employed as part of adaptive performance.

9.2.1. REFLECTIVE PRACTICE

Following Schön (2009), the designer continuously reflects on the understanding of the problem by creating frames 'to see the problem'. From the frame the designer can move towards a solution and evaluate that solution, by which a new move might arise or a need for the creation of a new frame becomes evident (**Figure 45**) (Lawson & Dorst, 2009).

Through the graduation process I used often abstract, theoretical frames to come to a concrete understanding of the design. To be able to do this, I can describe three methods I have used in the course of my graduation project.

Diagrammatic modelling (drawing)
Both Schön (2009) and Lawson and Dorst (2009) emphasise the importance of making representations of the idea or solution one works on. Whether these representations are made through describing in words or making drawings through sketches, does not matter, as long as they can be used to reflect. In the case of this graduation project, I did a lot of model development. Generally, these were diagrams representing my graduation process and the methods I used.

A conceptual model is a simplified representation of theory. Developing such a conceptual model was an important aim in the project proposal, not only to find a new representation of theory, but also to be able to test the application of the theory in design practice. The conceptual model worked as a hinge between theory and design.

However, I used the development of models throughout the process. There are many more models than this one conceptual model (**Figure 14**) that have an important function in the process. It is through a reflective conversation with these diagrams and models it became possible to decide upon a next step or move towards a certain solution. These models are an important method to produce a 'frame', as Schön (2009) suggests, from which it is possible to move and evaluate.

One of the most clarifying models, I have developed was the semantic map of concepts within this combined graduation project (**Appendix D**). This is an interesting example, because this map does not offer overview

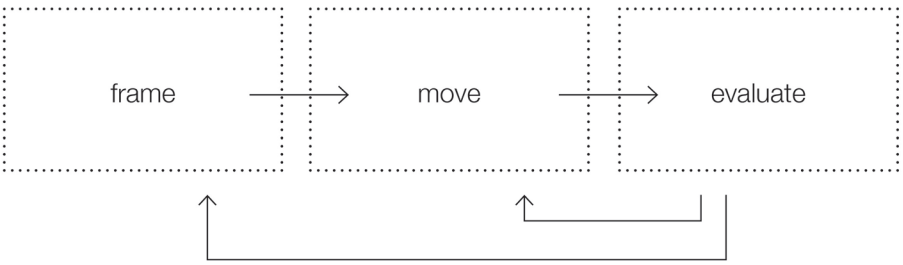


Figure 45 Reflective practice model Schön (adapted from: Schön in Lawson & Dorst, 2009)

to anyone else. However, in the process the map helped me to understand how the different bodies of theory in Science Communication and Urbanism connected with each other.

Explaining

These representations were not only facilitating conversation with myself, but also with tutors and other contributors in the project. There have been several moments in which explaining turned out to be a way to come from abstract to concrete. This happened in the conversations with tutors, during the interviews and in the presentations.

An important learning point for me was the use of examples. I used to think that examples made a generic term devaluate, because it could no longer hold a holistic explanation. However, I noticed that in my attempts to explain what I was doing or wanted to do, it was crucial to use concrete examples of places and projects to make myself and the project understandable to others.

Being explained

There have been countless moments in the process, in which it has been difficult to explain what I was doing. Even concrete examples fell short. Bringing the external representations of the project, in word or in drawing, to the table with tutors and fellow students has often helped me to entangle some of my own confusion. The way this process works is eloquently described by Lawson and Dorst (2009, p. 97):

> One of the nicest things in design education is to see students take a jump forward in their expertise. You can often recognise that this is about to happen when the student starts producing work that is a lot better or deeper than the student realises. The tutor perhaps needs to spend time explaining what is so good about the student's own idea. **These are strange conversations; the tutor is enthusiastic, and the student probably confused and may not really understand what the tutor is talking about.** But sometimes it just clicks, and these are defining moments of expertise shifts. Engineering these moments is what design education should strive for.

This description is not only recognisable to me, but to the tutors of my graduation project as well. While learning, it can be difficult to see what is being learned. Only through reflection it becomes clear what has happened.

Reflective practice seems to be one of the things that I have learned, in order to integrate research and design activities in this graduation process. Learning from reflection is a crucial tool in education and is often used as a means of formative assessment. Letting students reflect on acquired skills often gives insight in development of their expertise level, that would otherwise stay hidden in tests that only consider explicit knowledge.

9.2.2. EXPERTISE DEVELOPMENT

Students arriving at university have vastly differing backgrounds and by the time they arrive at the point of graduation they, to a certain level, have acquired a similar set of skills, knowledge and abilities through education (Lawson & Dorst, 2009, p. 96). In all levels of education this is characterised as the development of 'expertise'.

Models on expertise generally imply that expertise is developed in a sequential manner, stepping from one level to the next, while building on new knowledge and skills. For example, Dreyfus (2004) describes expertise development in five stages: Novice, advanced beginner, competent, proficient and expert. Each stage can be distinguished with certain characteristics. Where a novice acts very much rule-based, an expert acts intuitively and from situational knowledge.

Lawson and Dorst (2009) consider the development in design education not as a linear process. Instead of leaving a certain expertise level behind when gaining experience, one adds another level of expertise to the existing level. The levels of expertise are never exclusive.

As there are so many ways of categorising expertise development, depending on the focus on skill, knowledge or personal characteristic. I found that my experience of expertise development can best be described by Kuhn (1996). In his theory of scientific revolutions, students can experience paradigm shifts in their expertise development (Lawson & Dorst, 2009). They do not throw away one approach to adopt a new type of expertise, rather they adapt a new mode of thinking that offers them more opportunities for dealing with novel problems.

In paragraph 9.1, I described the way in which I continuously have been switching between abstract theories and concrete design experiments as adaptive performance. Adaptive performance has to me been a new mode of thinking me that I adopted in the process of graduation in order to combine research and design. It suggests the development of a new level of expertise that is comparable to adaptive expertise.

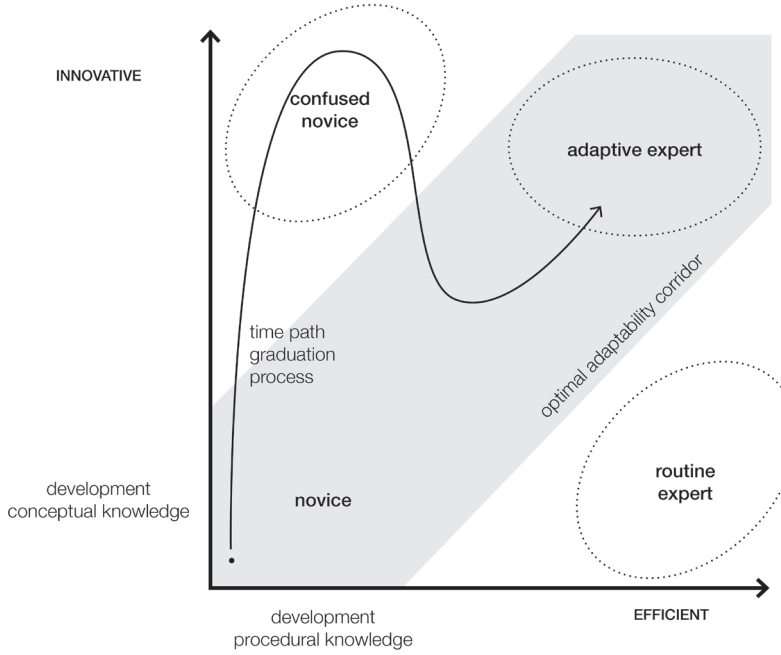


Figure 46 Adaptive expertise model and development during graduation process (adapted from: Schwartz, Bransford, & Sears, 2005)

9.2.3. ADAPTIVE EXPERTISE

Adaptive expertise is a learning science framework describing a particular way of thinking and problem solving (Goldman & Kabayadondo, 2017). In the 1980s Japanese researchers Hatano and Inagaki (1986) studied the development of mathematical cognition with children. They found that some children dealt different with mathematical problem solving than others and categorised two types of expertise: routine and adaptive expertise (Hatano, 1988).

The routine experts have learned to apply their problem-solving skills efficiently within a domain they have practiced experience in. These experts are quick and accurate in solving routine problems. However, when novel types of problems arise they have only limited flexibility to deal with these problems and it is difficult for them to develop innovatively (VanLehn & Chi, 2012).

Routine expertise is not sufficient to deal with wicked problems (Rittel & Webber,

1973). These complex challenges that do not have definitive or objective answers cannot be solved by routine procedures. The type of expertise that makes some experts capable of applying their skills in a different context in order to solve a novel type of problem is characterised as adaptive expertise.

"Whereas routine experts are able to solve familiar types of problems quickly and accurately, they have only modest capabilities in dealing with novel types of problems. Adaptive experts […] may be able to invent new procedures derived from their expert knowledge." (Hatano & Inagaki, 1986)

In addition to procedures to make judgement and executing actions (procedural knowledge), adaptive experts develop a rich amount of conceptual knowledge. Conceptual knowledge is 'an implicit or explicit understanding of principles within a domain' (Rittle-Johnson, Siegler, & Alibali, 2001, pp. 346-347). This knowledge is flexible and not tight to specific problem types and, therefore, an adaptive expert is capable of applying this knowledge to new and unfamiliar challenges. The two types of knowledge are not to be seen as separate entities, but rather lie on a continuum (**Figure 46**).

Especially in the context of urban design conceptual knowledge plays an important role, because urban problems are always context dependent. Every urban problem has new characteristics that ask for different methods. The same problem never occurs twice. Adapting known design methods to new problems is, therefore, a crucial skill in urban design.

Rules and procedures

A graduation student is expected to have developed a certain level of expertise in the past education programme. In essence, all the previous education should contribute to the development of a student towards acting and managing the process of an individual graduation project. As such, students do not start their graduation project as complete novices anymore. Where novices use provided rules and procedures to determine action, graduation students have gained experience in real research and design situations and have learned to explicate their own rules and procedures to solve problems.

Starting out in a field in which there was little research done (the relation between idea generation and the urban fabric) and using a design exercise with a complex organisational background (a campus for the collaboration Leiden-Delft-Erasmus), I created a situation in which there were almost no existing rules or procedures that I could act upon. Where a beginner might still be able to detach from a project and take a rule-based approach, this did not seem to be a valid tactic for dealing with these issues in the research and design process.

In order to adopt a suitable approach, I looked for rules and procedures from other fields, often theoretical, and applied them

in this new problem field that I had created for myself. For example, by using personas or semantic mapping. Thus creating new procedures or routines in the course of the graduation project. These procedures or rules were not always explicit, while working. This matches the idea that as expertise development progresses, it becomes more difficult for the learner to know what the rules were applied in the process (Dreyfus in Lawson & Dorst, 2009).

Through reflection in the final stages of the project, I derived the rules from my urban strategy and uncovered the rules I made during the process. These might be the type of rules that novices or advanced beginners can use when they start out in a similar context. They are explicit and offer a starting point for design.

Creativity and innovation

Innovation often requires a move away from what is most efficient (Schwartz et al., 2005). In order to develop the procedural knowledge necessary to create relevant solutions, an important step in my process was to use 'designing' as a method by taking a theoretical exploration and putting it into a specific design experiment, switching from abstract to concrete.

Experiencing design this way, I have learned that both design and research are processes in which to trust, although the outcomes and the methods might be vague and unclear at the start. Often this made me feel confused and stuck. At the same time, I learned from studies into creativity that this stage, in which one feel stuck, 'the impasse', as Ohlsson (2011) calls it, is an inherent part of a creative process. A stage of incubation is necessary to cope with all the information acquired and find a suitable solution to the problem at hand.

This is comparable to what is characterised as the 'frustrated novice' in the adaptive expertise model (Hatano & Inagaki, 1986; Schwartz et al., 2005; Wehrmann). I would typify this as the 'confused novice', to make it more applicable to the situation I recognise myself in. In line with what I described from reflective practice literature, expertise development happens unconsciously and it is often through explanation by the tutor or reflection that it becomes clear that a solution is already at hand.

9.3. COMPARISON

At the beginning of learning a new skill, procedure or piece of knowledge, it is natural behaviour to try to separate and study the object in isolation. When expertise develops, not only does that behaviour change, it becomes more difficult to tell how the processes are separated. By means of reflection, I have tried to make explicit how research and design activities were used in this graduation process and what I have learned from integrating them.

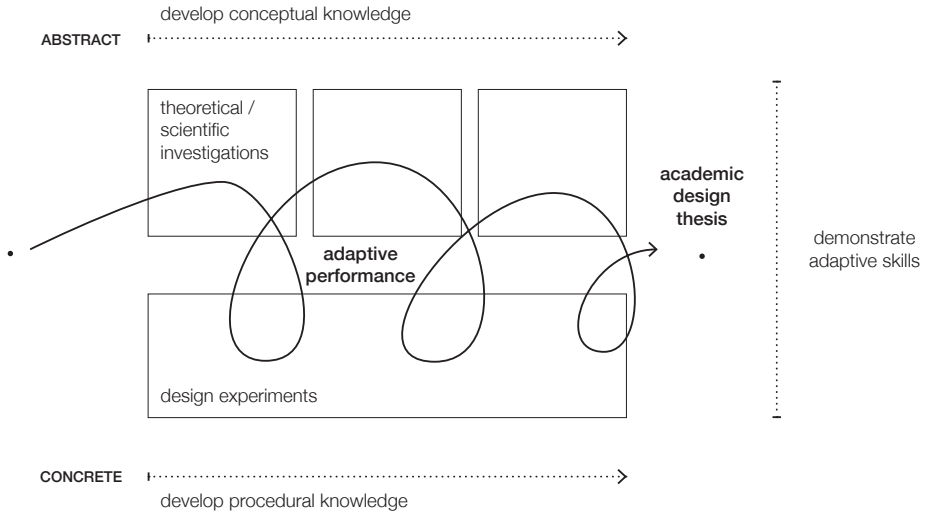


Figure 47 Process structure graduation

In the course of the 44 weeks that the process analysis covers, I have gone through many learning by design cycles, as Kolodner et al. (2003) describes them. These cycles were present in scientific investigations, in design experiments and on the transition from theoretical investigation and design experiment (**Figure 47**). When developing conceptual knowledge, for instance when trying to gain understanding of the concept campus, the research cycle is bigger than the design cycle. The design cycle is more prominent in developing procedural knowledge, when for instance analysing urban structures by drawing maps. The process as a whole is described in an academic design thesis, in which reflection is an explicit, but at the same time integral part of the design and research process.

The critical reflection in this chapters shows that the most important learning experiences were created on the transition from a research cycle to a design cycle. These

moments have contributed to developing new adaptive skills, such as using explorative interviews to find out how theoretical investigations could be implemented in urban design or drawing theoretical frameworks. What I found to be adaptive performance is difficult to understand in the Kolodner model.

The Kolodner model describes the transition between the research and the design cycle as the 'need to do' or the 'need to know'. This study suggests that learning by design in higher education happens mostly on the fringes between research and design cycles. The task for students and tutors in university is not to understand the research or design cycle in themselves, but rather in the understanding of the movement between the two. The way students deal with switching between research and design cycles purports more than those two arrows in the Kolodner model portray.

Students and tutors need theoretical support and understanding in more detail about the process of transitioning between research and design. The skills the university requires students to develop in higher education by confronting them with complex problems in graduation cannot be understood by the Kolodner model. The learning by design cycle MSc students experience and the way tutors adjust their guidance to that learning cycle, divers from the learning by design cycle Kolodner describes for secondary education.

"Throughout design, judgement must be made more or less continuously about the way the process is going.
This reflective process becomes increasingly unconscious as designers develop more expertise. In the early years, however, students need guidance not just on appropriate content for their designs but on how to manage the process itself."

(Lawson & Dorst, 2009)

10 CONCLUSION

Through a critical reflection on the integration of research and design in this graduation process, I tried to produce an answer to the question: 'How do MSc students integrate research and design when dealing with complex problems?'. I used the design-based research project described in Section 1 as study object for a critical reflection in order to entangle the way research and design have been integrated during my graduation process. The critical reflection shows adaptive performance as the main characteristic in the process of integrating research and design (**Figure 48**).

Adaptive performance means the ability to recognise the position one is at in the problem solving process by means of reflection and if it is necessary to transfer from a design to a research cycle, to find the right tools or methods to make that transition possible. The research and design cycles can be positioned on different levels in the process.

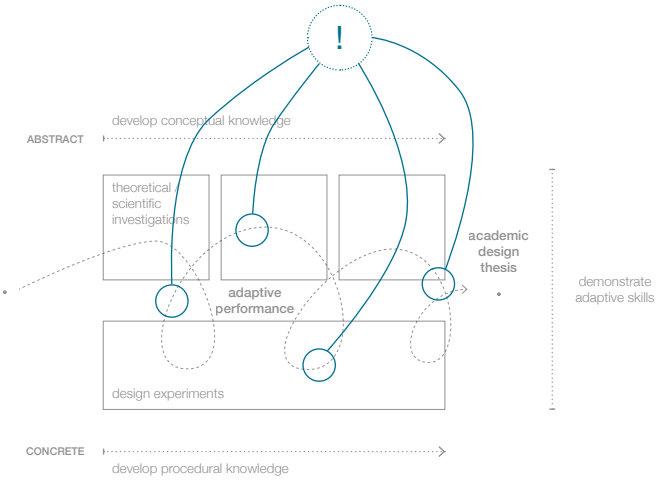


Figure 48 The critical reflection in Chapter 9 shows in more detail what happens in adaptive performance

I have been able to distinguish four different levels that I used to develop design and research investigations on: a structural, theoretical, organisational and spatial level. During the graduation year, I developed a rhythm of continuously moving from one level to another.

If I was not able to solve the problem on one level, I looked at it from another level. If I was not able to understand the overall structure of the research project (structural level), I would intuitively choose a method to work on the urban design (spatial level). If I could not find design solutions for the urban strategy, I would look in to literature (theoretical level) or do work on the analysis of the organisation I was designing for (organisational level). Keeping up the pace of the movement between levels has made that in the end I was able to formulate one possible answer (abduction) to the complex problem of stimulating innovation.

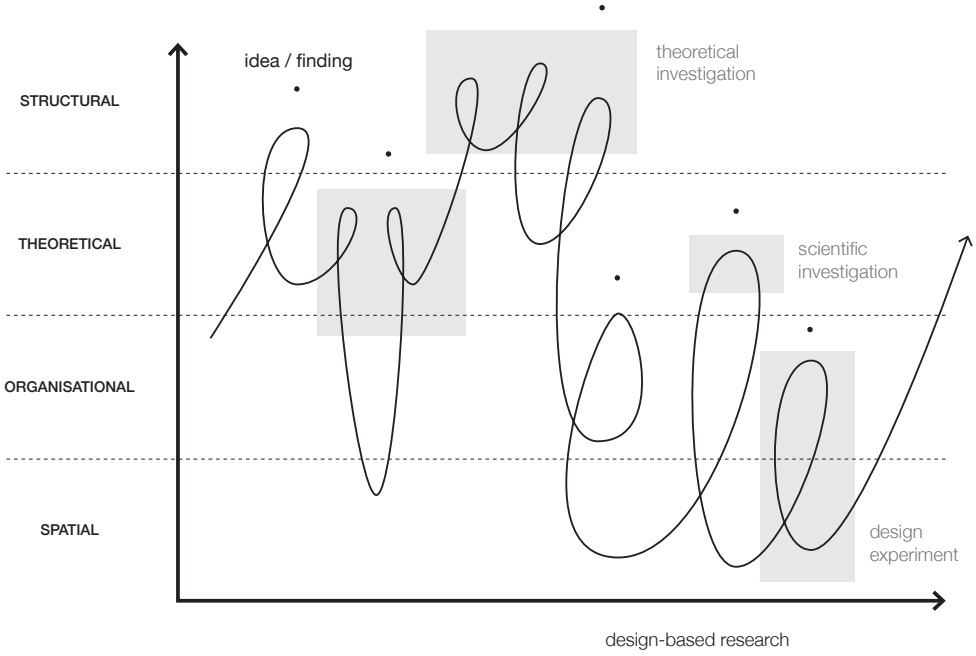


Figure 49 Illustration of adaptive performance in design-based research

Adaptive performance, as I have recognised it in my process, can be explained by different theoretical concepts on expertise development. As part of the adaptive performance I made use of reflective practice. Through reflection in the action of conducting research and design, I was able to frequently shift between abstract and concrete thinking. Using the abstract thinking to create theoretical frames, which I applied in a continuous design experiment. In this adaptive procedure, I developed conceptual knowledge on the process of innovation development. While doing this, I unconsciously was moving away from the experience of a confused novice, towards adaptive expertise.

Figure 50 illustrates adaptive performance as a looped process between the structural, theoretical, organisational and spatial layer. Theoretical, scientific or design investigation are done in order to generate a loop or transition and as a result a new finding or idea arises.

The focus on transition in this graduation process is different from the way students in secondary education integrate research and design. The Learning by Design Cycle as presented in the model of Kolodner explains the process as two separate cycles that can be interrupted if a 'need to know' or 'need to do' arises. MSc students in higher education might feel less the need to separate the activities. To them the learning process is in transitioning from one to another and that transition might be more complicated than the two arrows in the Kolodner model suggests.

When dealing with complex problems a lot of the problem solving is done by moving from one cycle to another. Continuously looping around the problem, understanding parts of it and looking from different disciplinary perspectives, is a key approach to dealing with complexity. I have entangled that looped process in more detail by means of critical reflection. In order to derive a general, transferable pattern that could serve in education, more investigation and comparison with other integrated design and research processes is necessary.

This study does not refute the relevance of the Kolodner model, it merely shows the need for a better understanding of part of that model in order to make it applicable for and within higher education. In order to educate students that are capable of dealing with complex problems in their future careers, a better understanding of adaptive performance is crucial. There is a need to develop a model that can better explain the looped process of transitioning between research and design to both students and tutors. In the discussion, the implications for educational practise are further developed in recommendations both on the level of the academic curriculum, as well as on the level of student and tutor interaction.

"Embrace ambiguity and hang out with it on your couch."
(Senova, 2017)

11 DISCUSSION AND RECOMMENDATIONS

This thesis has investigated the functioning of the university from mainly two very different levels: that of the learning process of its students and that of the physical structure of the university.

The first section of this thesis started at a small scale with how humans create ideas in their brains and get to innovation, to the scale of the urban landscape where city and university are integrated at the level of the campus. In this, second, section, I have looked into the way students in higher education deal with research and design in order to come to innovative solutions that will help to deal with the complex problems challenging society today.

In this discussion chapter, I will reflect on the findings from the process analysis in this section (**11.1**). In paragraph **1.2**, the implications of the findings for our knowledge on expertise development is discussed and recommendations for future research are made. Finally, I would like to make an attempt to combine the insights from Section 1 and 2 to suggest ways to innovate the educational processes in the university (**11.3**).

11.1. REFLECTIONS AND LIMITATIONS

In order to find out how I integrated research and design in Section 1, I needed to find a way to document the process, as well as a method to analyse the data gathered. In order to document the development of the project, I logged what type of activities I did in the hours I was working on the project. For the tracking of hours, I used the online time tracker 'Toggl'[1]. Toggl is an extremely simple online timer that makes reports by means of labels that are attached to the logged time entries. Because I was interested in the way I would use reflection to label the

1 https://www.toggl.com

activities, I did not make use of predefined labels. However, if one would be interested in testing the use of specific methods and connect that to time spend and products produced, this could be done by means of the same time tracking method.

The limitation of solely looking at logged hours is that only the time the participant views as productively spend on the project is being tracked. From Section 1, we know that often ideas can arise from coincidental connections that can happen outside the work environment. In this research, I have tried to overcome some of that limitation by mapping some other activities that had nothing to do with the work on the project, such as sports. However, it was difficult to find a correlation with the working patterns I distinguished in the description of the process.

In addition to keeping track of time, I kept a digital logbook of intermediary research outputs in writing, modelling and drawing. The results from both time tracking and logbook filing, were described and reflected on in (Chapter 9). In order to reflect on the data, I adapted the reflection structure by Hampton (2010) to fit to the reflective question 'How do students in higher education integrate research and design when dealing with complex problems?'. In the reflection, I asked myself the question 'How did I integrate research and design during the graduation project?'.

The answer I formulated to this question is a crucial step. What I perceived as the most important learning experience was the development of adaptiveness and the way I used adaptive performance to switch between the different structural, theoretical, organisational and spatial layers in the project.

One of the unexpected findings in Section 2 is the reflection method itself. The power of using reflection as a method is that it can structurally integrate the interpretation of a learning process as a research finding. It offers a way of studying learning processes, that are otherwise very difficult to entangle. This type of 'living research' is a relatively new research method and still needs to be discovered and critically reviewed in the academic debate. However, studying learning, designing and research processes on their own terms and within their own culture could deliver valuable insights for education (Cross, 2001).

11.2. IMPLICATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This study puts forward a new hypothesis on the way students deal with design and research when dealing with complex problems. Different from the models that explain the integration of design and research in secondary education, a model on design-based learning in higher education should not as much focus on explaining research and design cycles in themselves, but rather illustrate the way students switch between cycles. In order to come to such a model further research is necessary to develop theory on design-based learning in higher education.

Not only this study points to a need for further investigation into teaching and learning at the university. In a recent evaluation of study success by the Delft University of Technology (Onderwijssucces: Van structuur naar Cultuur, 2017), an explicit recommendation was done to make resources available for applied educational research. At the same time, with the strategic alliance Leiden-Delft-Erasmus an interdisciplinary centre has been established in order to investigate how learning and teaching in higher education work. The Centre for Education and Learning offers the ideal environment to start developing a line of research into design-based learning as well.

Within this line of research into design-based learning, we should look at further developing reflection as a scientific tool within this type of research. Although there is a general understanding of reflection as an important tool to give insight in learning processes, we often struggle to find out how we should reflect, what should be the focus of reflection in education and when the right moments are to get the reflective quality we are looking for.

The interdisciplinary position of the Centre for Education and Learning offers the opportunity to investigate how interdisciplinary learning works. This thesis is a result of a double degree programme within the Delft University of Technology. One of the prerogatives of developing Science Communication as a double degree is that it contributes to the development of T-shaped students. T-shaped students possess a thorough understanding of one discipline, but also have the competency to exchange their knowledge and skills cross-disciplinary. Although in scientific research interdisciplinary work is more and more common, we have limited knowledge on how students deal with interdisciplinary encounters in education and what the right moments are for students to start learning adaptiveness through interdisciplinary work.

11.3. RECOMMENDATIONS FOR RESEARCH AND DESIGN INTEGRATION IN HIGHER EDUCATION

One of the fundamental ideas behind design-based learning, is that within design activities complex problems can be solved that would be difficult to tackle in another more structured approach. Employing academic research to tackle those complex problems means that we need to find ways to integrate design thinking within scientific research. These new methodological viewpoints should consequently impact the way students are taught about research and design in higher education. The challenge for knowledge institutions is to design a learning environment in which students can develop adaptive expertise that puts them in the position to make the exchange between research and design, both in their academic as well as their professional work.

On the basis of the findings in this thesis and against the background of my personal experience with the education programmes of Urbanism and Science Communication from several student representational bodies, I present three recommendations for university education programmes that want to raise attention for the integration of research and design in their curriculum. In order to grow the right conditions for adaptive expertise to develop, these three ingredients could contribute:

1. **Discussing methodologies**
2. **Combining the 'lab' or 'studio' environment with structural reflection exercises**
3. **Creating valuable exchanges between student and tutor**

The three ingredients and the recommendations connected to them are explained in more detail in this recommendation paragraph. The common condition in these ingredients is that they all require students to take control over their own learning process. With these ingredients, an educational framework can be built in which students should be able to experiment and explore freely. They should be able to decide which methods, tools and competences they might need in order to become the type of professional they would like to become.

11.3.1. TEACHING ABOUT INTEGRATED DESIGN AND RESEARCH METHODOLOGIES

The debate on the relationship between design and science has always been part of the development of higher education in the design disciplines (Cross, 2001). Strongly rooted in practice, the development of future designers at universities has never been without the struggle to position design within a scientific environment. The key of that positioning is in the research methodology educated within a faculty or programme.

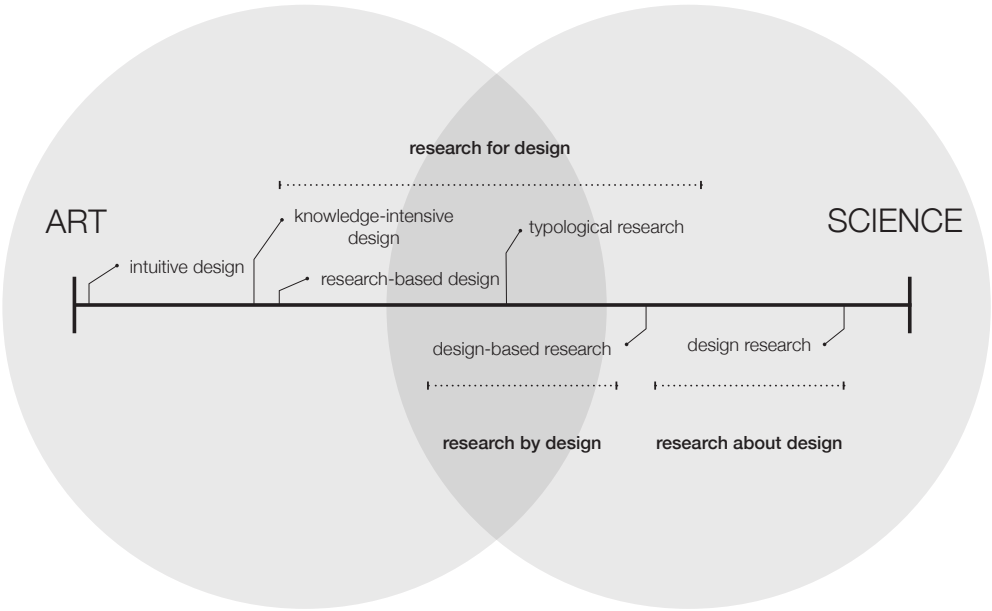


Figure 50 Design and research typologies (adapted from: De Jong & Van der Voordt, 2002)

In design faculties, the abilities necessary to become a designer are often considered fundamentally different from those abilities we need to conduct research (Lawson & Dorst, 2009). Where research activities are often associated by structural methods and a clear anticipation of outcomes, the same cannot be said for design activities. The explorative and intuitive character of design activities makes that it is difficult to have a clear anticipation of outcomes and often the reasoning emerges on the way.

Students and researchers that want to integrate research and design need to deliver a constant battle to bring together two activities that at their core seem to be so different. The duality of research and design within one education programme is difficult to understand for the novices that students are to the processes of research and design. In order to deal with ambiguity often the need to separate research and design as two isolated activities arises.

As a consequence, the added value of switching between design and research and the methodology that is connected to this process, stays implicit to both students and researchers. This way, the integrative quality of design in the scientific environment of the university is lost in its translation to educational practice (Colman, 1988; Higgs, Titchen, Horsfall, & Bridges, 2011).

Both students and teachers need a methodological framework to understand the many ways research and design can be integrated. That frame is already present as the main research methodology of an education programme. However, often that methodology stays implicit throughout the education programme.

In the case of the Urbanism education programme at the Delft University of Technology, the educated methodology is most explicit in the final achievement levels and the didactic concept of the MSc programme as a whole:

> **An urbanism graduate has a systematic approach to planning and design, recognizes the value of academic research and uses appropriate theories, methods and techniques to critically investigate and analyse existing, newly proposed and self-formulated urban projects and theories.** The graduate is prepared to be a **'life-long learner'** in order to continue to acquire, interpret and reflect upon, and employ new knowledge and skills independently. The graduate is able to document adequately the results of research and design, hereby contributing to the development of knowledge in the field of urbanism.
> ("Student Charter: Master of Science Architecture, Urbanism & Building Sciences Academic Year 2016-2017," 2016, p. 32)

> **Didactic Concept MSc AUBS**
> Designing means integrating knowledge and specific skills and making choices, underpinned in a coherent entity in an individual design (**'knowledge-intensive design'**)
> ("Student Charter: Master of Science Architecture, Urbanism & Building Sciences Academic Year 2016-2017," 2016, p. 15)

Within my graduation project, I had the explicit ambition to approach the design aspects as part of the research. Design had to be a means, not an end in the research project. This aligns with the design-based research methodology that is an important approach toward research and design in the Science Communication education programme at the University of Technology in Delft. This approach suggests that the design is used to reflect back to theory developed in the field one is researching in.

Design-based research and knowledge-intensive design are not contradicting approaches, rather they are positioned differently on a scale between research and design activities. The model developed by De Jong & Van der Voordt (2002) shows that scale, with on one end science and on the other

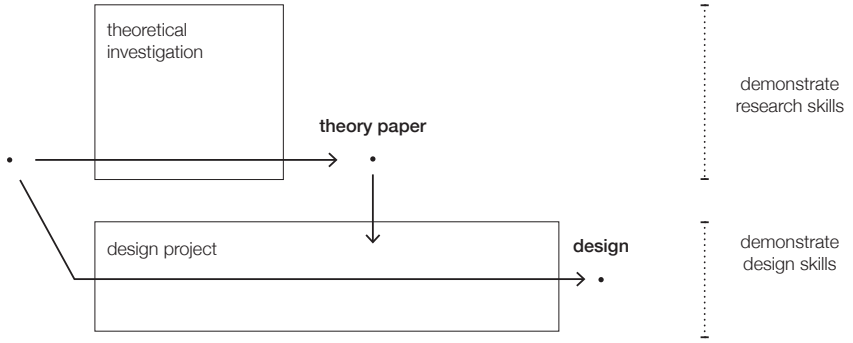


Figure 51 Structure graduation programme in Urbanism track at the Delft University of Technology

art (**Figure 50**). The scale gives insight in the methodological choice students have to approach research and design in their projects. Each methodology has a different way of integrating research and design. Students might feel more comfortable on one or the other side of the scale.

All education programmes at the MSc level feature methodology courses. The methodological scale could be used in these courses as a tool to debate the position of design within research or the other way around. The position of the methodology course within the curriculum in Urbanism should be reconsidered. In the Urbanism education programme students with different (international) backgrounds come together. These students bring different approaches and skills to the urban design studio in the first quarter. A methodology course next to the first design studio could be used as a vehicle to discuss and employ these approaches.

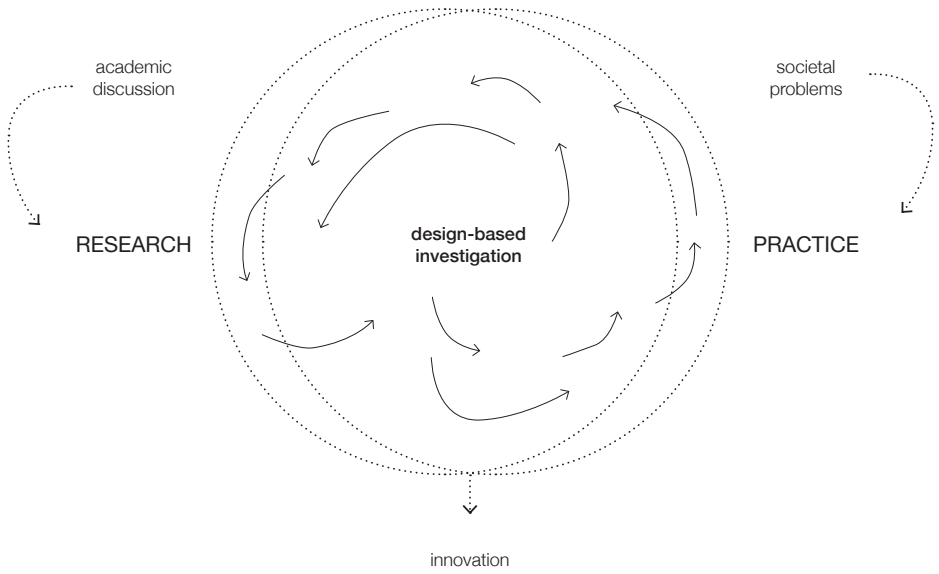


Figure 52 Structure C-lab course in Science Communication track at the Delft University of Technology

11.3.2. POSITIONING REFLECTION IN THE LAB OR THE STUDIO

Research methodology courses provide students with rules to help them perform a new set of skills in the scientific arena, whereas design is taught in the experimental practice of the studio. This way, research and design are introduced as two separate activities in the BSc curriculum and it is only later in their education programme that students can start to integrate the different methods. That integration can only be fully achieved if it can land in didactic methods such as the 'lab' or 'studio'. Students need to learn adaptive performance in exploration and the investigative and open culture in a lab or studio environment is designed for fostering intuitive explorations.

In the way the graduation studio in the Urbanism track is currently structured, the moment of integration of research outcomes in the design is expected to take place after

DR.IR. ROBERTO CAVALLO

Education Director Faculty of Architecture

- "We need to deliver a constant fight to bring together design and science in our faculty." Cavallo sees a university wide trend to use design as a method within scientific research.

- Education at the faculty increasingly aims at avoiding a clear distinction between research in design. More than before, graduated students are employed in a diverse work field. The multifaceted design discourse asks for practitioners that are able to apply their design skills much broader than a generic architectural or urban design exercise.

- Reflection and ethics are reintroduced and there is now sought for ways to reintegrate these more explicitly within the curriculum of both master and bachelor education programmes.

- The way methodology is thought is under evaluation. All master tracks have their own strategy and teach methodologies in a different way. This is not necessarily an issue to Cavallo, although he would like to find a way to give students a clear methodological framework at the beginning of their master education. Preferably, by offering a methodology course in the first quarter of the master education. In the academic year of 2017-2018 a first experiment will be done with this in the Architecture track. One key objective from Cavallo is to bring the methodology courses in line with what students learn in the studio about design.

- The studio will stay the main didactic method in design education at the faculty. However, Cavallo would like the studios to function more interdisciplinary and bottom-up. Some studios suffer from introversion and undermine the open and sharing attitude that the studio is meant to reflect. Cavallo would also like students to take more ownership of their education in the studio. Studios should be much more structured by the students and mentors should have a facilitating role.

Image 14 Faculty of Architecture, Orange Hall, designed by MVRDV

writing a theory paper, in which a theoretical framework is produced (**Figure 51**). Both in the structure of the Urbanism graduation programme and the evaluation criteria, research and design are put forward as two separate entities. The connection between the two is expected to be made by students through applying something from the research into the design, making the design knowledge-intensive.

A consequence of this structure in the Urbanism graduation process is that research is reduced to a secondary role after the theory paper is handed in halfway in the graduation process. The integrated approach suggested needs both design and research to re-occur continuously in the process in an iterative manner.

C-lab, an innovative didactic method developed within the Science Communication curriculum, offers an approach towards integrating research strategies that is more explicit about the method within the studio (**Figure 52**). While working on a complex case, students are asked to employ research to find relevant solutions. The ill-defined and wicked problems addressed ask for design approaches to develop and test those solutions.

Students in C-lab have to learn to be able to investigate their own process in order to be able to make the design cycles work for them in the research cycle. While stepping in and out of the studio, students gain the ability to move and adapt to find new approaches to the problem. Students bring knowledge and methods from their own field and combine that with the stories from practice and theory on science communication. Through critical reflection on the process students try to harvest the ideas and solutions from these explorations.

A crucial method for integrating research and design is critical reflection, because it can uncover the implicit learning within the creative process. In their most recent evaluation of the AUBS Bachelor and Master education programmes Delft University of Technology, the accreditation committee concludes that scientific reflection on the design process needs improvement (QANU, 2012).

Lab and studio environments are essential for design-based learning. In order to let this didactic environment rise to its full potential, in higher education reflection needs to be integrated in the studio approach, also within the Faculty of Architecture and the Built Environment. The way critical reflection is done in this study, by means of description, interpretation by theory and comparison, could offer a structure for reflection in the studio.

The role of the tutor by the development of that reflection is crucial, as reflecting on the own working process can be quite complicat-

ed. It is often difficult to know which parts of the creative process are special, because some of the approaches and methods have developed intuitively and the reasoning behind them might not have crystallised in the student's mind yet.

11.3.3. RECOMMENDATIONS FOR STUDENTS AND TEACHERS

Although the university as an organisation is responsible for facilitating an academic learning environment, ultimately, the student and teacher shape the studio or lab atmosphere that is decisive for the way teaching and learning actually takes place. When it comes to learning processes that at their core are about fostering creativity and innovation, as is the case in design-based learning, the culture of the studio or lab is decisive for study success. Instead of a culture of competition in which there is a fear of failing, both students and teachers are responsible for creating a permissive atmosphere, in which there is enough space to experiment and be uncomfortable within that process.

Design education is about vulnerability. This might ask a different approach towards education from both students and teachers, then they might be used to in traditional domain-specific education forms. If students have to show vulnerability by being open about the uncertainty and uncomfortable feelings they experience and reflect on the process of integrating design and research, tutors need to show the vulnerabilities they struggle with in return. The development of adaptive performance does not happen in a linear fashion and the only way to grow is by receiving and incorporating constructive feedback.

By the time students are asked to work on complex problems, higher education has passed the point where learning can be measured in numbers. Giving and receiving constructive and honest feedback, therefore, becomes increasingly important. Complex problems have no true or false solutions (Rittel & Webber, 1973). At most, an approach or strategy can be good or bad. The student cannot look for the tutor to give the right answers, because there simply do not exist right or wrong answers in these kind of exercises. It asks much more involvement and conscious guidance of the tutor to help students to become able to manage the creative process themselves (Lawson & Dorst, 2009).

"Don't be mistaken about this, honest conversations about vulnerability and shame are difficult. The reason these conversations are often avoided is that they are unsettling." (Brown, 2012, p. 182)

Vulnerability researcher, Brené Brown, looks into the way organisations, schools and families deal with giving feedback and she describes how that uncomfortable feeling does not only exist on the side of the student, but just as much on the side of the teacher. The only way of dealing with that uncom-

fortable feeling in the learning process is to normalize it. Therefore, Brown suggests that student and teacher should come to sit on 'the same side of the table' (Brown, 2012, pp. 200-201).

To sit on the same side of the table is a beautiful metaphor for the way feedback should be positioned in the lab or studio. It means that the tutor does not give feedback from a static position behind an iron desk, but comes to sit in a chair next to the student. This way the tutor not only positions him or herself on the same level as the student, showing vulnerability by doing this, but the tutor also shows involvement with the learning experience of the student. Neither of them have true or false answers in this conversations, however, both are just as much involved in finding solutions. To me that is what the integration of research and design in higher education should be like, open and honest investigations towards developing valuable solutions for the complex issues of society in the 21st century.

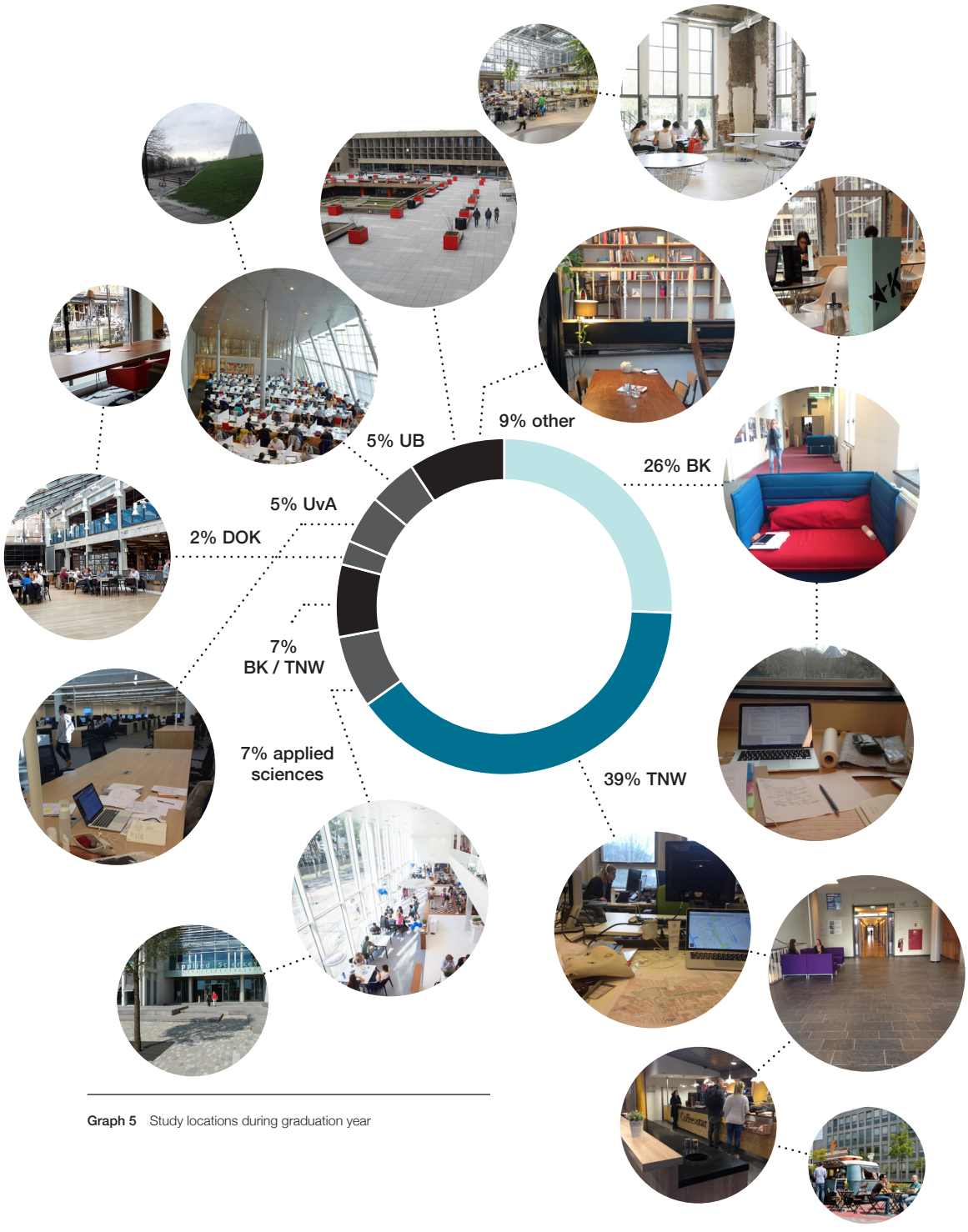
"Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand."

(Einstein in Senova, 2017)

EPILOGUE

The university is a fundamental link in the innovation system our knowledge economy leans on. Knowledge and innovation are increasingly international products. On campus the diversity of nationalities raises at the start of every semester. At the same time, the Dutch language is gradually disappearing from academic writing and learning. Universities are becoming global institutions and one could wonder what the geographical meaning of the university is in this international academic world.

My study has focussed on the meaning of space for innovation development. Communication can never take place without context and disciplines. Environmental psychology have already shown that the spatial environment is an implicit presence in all human interaction. This thesis gives meaning to urban design for the generation of ideas within the academic world. The development of my own ideas, naturally, happened in a spatial context as well.



Graph 5 Study locations during graduation year

During the graduation process, I have continuously been aware of the impact that my study environment has had on my work flow. I developed a preference for certain places when I was writing and chose a different environment for when I was drawing. Graph 5 shows my distribution of time over different study locations. The hypothesis that these study locations impact the way ideas are generated, puts forward another question: Would my idea generation process be different when I had the urban environment to my disposal as I designed it in the urban design study for Delft?

On my way home from the TNW building at campus, through the inner-city and along the Legermuseum, I often imagined the way my route would be different when some of the urban design ideas of the study would be implemented in Delft. Leaving a new type of faculty building, I might have had to find my way through a farmer's market in the Mekelpark. On my bike route home, my mind probably would drift off, the same way it does now. Only, when cycling through the Giststraat, I would encounter a new part of the campus within the city. Maybe I would get off my bike to meet some fellow students there. Or later in the evening take a stroll to visit a courtyard.

Living in this 'reflective city' might not have fundamentally changed the outcomes of the investigation in this thesis. However, it does suggest a way in which my explorations could have been better supported by the richness of the city. A new hypothesis that we can take into the living laboratory of the city, to investigate further.

REFERENCES

[DBRC], D.-B. R. C. (2003). Design-Based Research: An Emerging Paradigm for Educational Inquiry. *American Educational Research Association, 32*(1), 5-8.

Baldwin, J. (1963). *A Talk to Teachers*.

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and Knowledge: Local Buzz, Global Pipeliness and the Process of Knowledge Creation.

Bell, P. A., Greene, T. C., Fisher, J. D., & Baum, A. (2001). *Environmental Psychology*. New York: Taylor & Francis Group.

Boden, M. A. (2004). *The Creative Mind: Myths and Mechanisms* (2 ed.). London: Routledge.

Brown, B. (2012). *De Kracht van Kwestbaarheid: Heb de moed om niet perfect te willen zijn*. Amsterdam: Bruna Uitgevers.

Collis, C., Felton, E., & Graham, P. (2010). Beyond the Inner City: Real and Imagined Places in Creative Place Policy and Practice. *The Information Society, 26*(2), 104-112.

Colman, J. (1988). Urban design: A field in need of broad educational innovation. *Ekistics, 55*(328/329/330), 106-109.

Cross, N. (2001). Designerly Ways of Knowing: Desing Discipline Versus Design Science. *Massachusetts Institute of Technology Design Issues, 17*(3), 49-55.

Cross, N. (2008). *Engineering design methods: strategies for product design* (4th ed. ed.). Chichester: Wiley

Cullen, G. (1971). *The Concise Townscape*. London: Architectural Press.

Curvelo Magdaniel, F. (2013). *The university campus and its urban development in the context of the knowledge economy*. Delft University of Technology.

Curvelo Magdaniel, F. (2016). *Technology Campuses and Cities: A study on the relation between innovation and the built environment at the urban area level.* (PhD), Delft University of Technology, Delft.

Cuthbert, A. (2010). Going Global: Reflexivity and Contextualism in Urban Design Education. *Journal of Urban Design, 6*(3), 297-316. doi:10.1080/13574800120105805

De Dreu, C., & Sligte, D. (2016). *Creativiteit krijg je niet voor niks*. Assen: Koninklijke van Gorcum.

De Hoog, M. (2012). *De Hollandse Metropool: Ontwerpen aan de Kwaliteit van Interactiemilieus*. Bussum: Thoth.

De Jong, T. M., & Van der Voordt, D. J. M. (2002). *Ways to Study and Research: Urban, Architectural and Technical Design*. Delft: DUP Science.

Den Heijer, A. (2008). *Managing the University Campus in an Urban Perspective: Theory, Challenges and Lessons from Dutch Practice*. Paper presented at the Corporations and Cities: Envisioning Corporate Real Estate in the Urban Future, Brussels.

Den Heijer, A. (2011). *Managing the university campus : information to support real estate decisions.* Eburon Academic Publishers, Delft :. WorldCat.org database.

Dong, A. (2016). Design Thinking as Principles for the Structure of Creative Cities. In J. Portugali & E. Stolk (Eds.), *Complexity, Cognition, Urban Planning and Design: Post-Proceedings of the 2nd Delft Internatioal Conference* (pp. 14). Switzerland: Springer.

Dorst, K. (2013, 23 October 2013). *Academic Design.* Paper presented at the Inaugural Lecture, Eindhoven University of Technology.

Downs, R. M., & Stea, D. (2011). Cognitive Maps and Spatial Behaviour: Process and Products. In M. Dodge, R. Kitchin, & C. Perkins (Eds.), *The Map Reader: Theories of apping Practice and Cartographic Representation*. Hoboken: John Wiley & Sons.

Dreyfus, S. E. (2004). The Five-Stage Model of Adult Skill Acquisition. *Bulletin of Science, Technology and Society, 24*(3), 177-181. doi:10.1177/0270467604264992

Droog, M. (2016). *Can Nature Bloom your Creative Performance?* , Leiden, Leiden.

EY. (2012). *University of the Future*.

Florida, R. (2004). *The Rise of the Creative Class*. Boston: The Perseus Books Group.

Fook, J. (2011). Developing Critical Reflection as a Research Method. In J. Higgs, D. Bridges, A. Titchen, & D. Horsfall (Eds.), *Creative Spaces for Qualitative Researching: Living Research*. Rotterdam: Sense Publishers.

George, R. V. (2007). A procedural explanation for contemporary urban design. *Journal of Urban Design, 2*(2), 143-161. doi:10.1080/13574809708724401

Glaeser, E. L. (2011). *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier* New York: Penguin Press.

Glouberman, S., & Zimmerman, B. (2002). *Complicated and Complex Systems: What Would Successful Reform of Medicare Look Like?* .

Goldman, S., & Kabayadondo, Z. (2017). *Taking Design Thinking to School*. New York: Routledge.

Haken, H., & Portugali, J. (2003). The Face of the City is its Information. *Journal of Environmental Psychology, 23*(2003), 385-408.

Hampton, M. (2010). *Reflective Writing: A Basic*

Introduction. University of Portsmouth.

Hatano, G. (1988). Social and Motivational Bases for Mathematical Understanding. In G. B. Saxe & M. Gearhart (Eds.), *Children's Mathematics* (pp. 55-70). San Francisco: Jossey-Bass.

Hatano, G., & Inagaki, K. (1986). Two Courses of Expertise. In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), *Child Development and Education in Japan*. New York: W. H. Freeman.

Heijer, A. C. d. (2011). *Managing the university campus : information to support real estate decisions.* Eburon Academic Publishers, Delft :. WorldCat.org database.

Higgs, J., Titchen, A., Horsfall, D., & Bridges, D. (2011). *Creative Spaces for Qualitative Researching: Living Research*. Rotterdam: Sense Publishers.

Jacobs, J. (1969). *The Economy of Cities*. New York: Penguin Press.

Johnson, S. B. (2010). *Where Good Ideas Come From: The Natural History of Innovation*. New York: Riverhead Books.

Kamp, A., & Klaassen, R. (2016). *Impact of Global Forces and Empowering Siutations on Engineering Education in 2030.* Paper presented at the 12th International CDIO Conference, Turku, Finland.

Kaplan, S. (1995). The Restorative Benefits of Nature: Toward an Integrative Framework. *Journal of Environmental Psychology, 1995*(15), 169-182.

Kelso, J. A. S., & Engstrøm, D. A. (2006). *The Complementary Nature*. Cambrige, MA: MIT Press.

Kolodner, J. L., Camp, P. J., Crismond, D., Fasse, B., Gray, J., Holbrook, J., . . . Ryan, M. (2003). Problem-Based Learning Meets Case-Based Reasoning in the Middle-School Science Classroom: Putting Learning by Design(tm) Into Practice. *Journal of the Learning Sciences, 12*(4), 495-547. doi:10.1207/s15327809jls1204_2

Kuhn, T. S. (1996). *The structure of scientific revolutions* (3rd ed. ed.). Chicago :: University of Chicago Press.

Landry, C. (2000). *The Creative City: A Toolkit for Urban Innovators*. London: Earthscan.

Landry, C. (2006). *The Art of City Making*. London: Earthscan.

Lawson, B., & Dorst, K. (2009). *Design expertise*. Oxford :: Architectural Press.

Ledford, H. (2015). Team Science. *Nature, 525*, 308-311.

Lofland, L. H. (2003). Community and Urban Life. In L. T. Reynolds & N. J. Herman-Kinney (Eds.), *Handbook of Symbolic Interactionism*. Walnut Creek: Altamira Press.

Lynch, K. (1959). *The Image of the City*. Cambridge: The MIT Press.

Meyer, H., Westrik, J., & Hoekstra, M. J. (2014). *Het Programma en Ruimtegebruik van de Stad*. Nijmegen: SUN.

Ohlsson, S. (2011). *Deep Learning*. New York: Cambridge University Press.

Onderwijssucces: Van structuur naar Cultuur. (2017). Delft

PwC. (2015). *The 2018 Digital University: Staying relevant in the digital age*.

QANU, Q. A. N. U. (2012). *Rapport over de bach-*

erlopleiding Bouwkunde en de master-opleiding Architecture, Urbanism and Building Sciences van de Technische Universiteit Delft. Utrecht

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*(2), 155-169. doi:10.1007/bf01405730

Rittle-Johnson, B., Siegler, R. S., & Alibali, M. W. (2001). Developing conceptual understanding and procedural skill in mathematics: An iterative process. *Journal of Educational Psychology, 93*(2), 346-362. doi:10.1037//0022-0663.93.2.346

Runco, M. A. (2007). *Creativity Theories and Themes: Research, Development and Practice*. Oxford: Elsevier.

Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign, 4*(1), 5-18. doi:10.1080/15710880701875068

Schön, D. A. (2009). *The reflective practitioner : how professionals think in action*. Farnham :: Ashgate.

Schwartz, D. L., Bransford, J. D., & Sears, D. (2005). Efficiency and Innovation in Transfer. In J. Mestre (Ed.), *Transfer of learning from a modern multidisciplinary perspective* (pp. 1-51). Greenwich, CT: Information Age Publishing.

Senova, M. (2017). *This Human: How to be the person designing for other people.* Amsterdam: Bis Publishers.

Storper, M., & Venables, A. J. (2003). *Buzz: Face-To-Face Contact and the Urban Economy*. London: Centre for Economic Performance.

Student Charter: Master of Science Architecture, Urbanism & Building Sciences Academic Year 2016-2017, Delft University of Technology (2016).

Universiteit Leiden, Delft University of Technology, & Erasmus Universiteit Rotterdam. (2012). *Meer Waarde: Gezamenlijke profilingersnotitie strategische alliantie Leiden - Delft - Erasmus*.

Van Breukelen, D. H. J. (2017). *Teachning and Learning Science Through Design Activities: A revision of design-based learning.* (Master of Education), University of Technology Delft, Ede.

Van Greenhuizen, M., Nijkamp, P., & Mickiewicz, A. (2012). *Creative Knowledge Cities: Myths, Visions and Realities*. Cheltenham: Edward Elgar Publishers.

VanLehn, K., & Chi, M. (2012). Adaptive Expertise as Acceleration of Future Learning: A Case Study. In P. J. Durlach & A. M. Lesgold (Eds.), *Adaptive Technologies for Training and Education*. Camebridge: Cambridge University Press.

Wallas, G. (1926). *The Art of Thought*. Tunbridge Wells, Kent: Solis Press.

Wang, F., & Hannafin, M. J. (2005). Design-Based Research and Technology-Enhanced Learning Environments. *ETR&D, 53*(4), 5-23.

Wehrmann, C. CommTalks.

APPENDICES

CONTENT

A INTERVIEW PROTOCOLS

DANIEL SLIGTE

December 5, 2016

NOTITIES VOORAF

Interviewee: Daniel Sligte
Locatie: Coffee Company Waterlooplein
Achtergrond, functie en bedrijf: PhD Universiteit van Amsterdam / Gemeente Amsterdam
Documenten meenemen: Boek 'Creativitieit krijg je niet voor niks' / Illustraties: Dong, Wallas, Guilford / Matrix creativiteit / Toestemmingsformulier

DOEL VAN HET ONDERZOEK

In mijn onderzoek kijk ik naar 'idea generation in creative cities'. Het genereren van nieuwe ideeën en het produceren van innovaties wordt van grote waarde geacht voor de (kennis)economie. Het idee van de creatieve stad is dat die productie gestimuleerd wordt door sociale netwerken en interactie, die aanwezig is in steden. Mijn onderzoek probeert die relatie tussen stedelijke structuur en creativiteit beter te begrijpen en manieren te vinden om die relatie te versterken. De hoofdvraag is daarbij: How can the structure of the city be developed in order to facilitate the (creative and innovative) idea generation processes in creative cities?

Als startpunt neem ik het individuele creatieve proces en bestudeer ik bijna op cognitief niveau wat het individu nodig heeft om creatief te kunnen zijn. Daarbij spelen zowel stimulerende prikkels als belemmeringen uit de stad een rol en die probeer ik vervolgens in kaart te brengen.

DOEL VAN HET INTERVIEW

Aangezien mijn basiskennis van psychologie beperkt is, probeer ik in een serie interviews een beter beeld te krijgen van het vakgebied in relatie tot creativiteit. Het is daarom een exploratief interview, waarbij ik geïnteresseerd ben in uw vindingen op het gebied van creativiteit, maar u ook vooral wil vragen om mee te denken over de invloeden van de stad.

Ik bevind met in een exploratieve fase van mijn afstudeeronderzoek en ik ben inmiddels wel redelijk ingelezen op het gebied van creativiteit in de psychologie. Enerzijds wil ik het daarom graag hebben over het theoretisch kader zoals ik dat nu gebruik. Wellicht kun jij de literatuur wat meer in perspectief plaatsen of mij wijzen op iets wat ik nog over het hoofd zie?

Anderzijds wil ik je ook vragen om mee te denken over wat de invloed van de stad is op creativiteit. Maakt het leven in steden ons inderdaad creatiever in jouw ogen? En zouden we steden zo kunnen bouwen dat hun inwoners beter instaat zijn tot creatief denken?

DEEL 1 – THEORIE

Definities en theorie over creativiteit

- Wat is jouw achtergrond en interesse

of fascinatie met psychologie en creativiteit?
- Wat is creativiteit in de psychologie?
- Guilford maakt voor het eerst onderscheid tussen creativiteit en intelligentie. Waarom was dat belangrijk? Is dat nog steeds belangrijk?
- Wallas is een van de eerste denkers over creativiteit. Hij omschrijft vier stappen in het creatieve proces: Preparation, incubation, illumination and verification.
- Daarnaast bestaat ook het four C-model van Kaufman. Daarin wordt het onderscheid gemaakt tussen small-c en big-c creativity, waarbij het een iets is wat je dagelijks gebruikt en het ander voor grotere ideeën. Zou je dat misschien nog iets meer kunnen uitleggen? Als we het hebben over creativiteit als motor van de stad, welke vorm van creativiteit hoort daar dan volgens Kaufman bij?
- Dong geeft in zijn diagram strategieën en skills aan. Zijn deze elementen voor jou herkenbaar? Hoe zou jij hun relatie met creativiteit uitleggen?

Boek
- In het boek worden twee manieren van denken omschreven flexibel en persistent. Betekent dat dat er twee groepen mensen zijn: Mensen die geneigd zijn om flexibel te denken en mensen die geneigd zijn om persistent te denken? Betekent dat dus ook in de aanpak van de creatieve stad dat die stimuli moet hebben die bij beide denkwijzen passen?
- Hoe persoonlijk is het creatieve proces? In omgevingspsychologie komt vaak wel terug het verschil tussen introverte en extraverte mensen en dat zij om goed te kunnen werken andere dingen van hum omgevingen nodig hebben. Denkt u dat dat verschil ook geld voor creativiteit? Zou de stad daarom ook verschillende milieus voor zowel introverte als extraverte mensen moeten bieden?

DEEL 2 – STAD

Prikkels en belemmeringen van creativiteit
- Wat zijn belangrijke invloeden op creativiteit van het individu? Wat vind u daar in belangrijk?
- Wat is de rol die de omgeving speelt daarbij?
- Welke factoren uit de stad spelen daarbij een rol?
- Sommige grote (.com) bedrijven maken gebruik van de omgeving om creativiteit voor innovatie te stimuleren. Dat beperkt zich tot het gebouw, het interieur en soms de campus, maar ook de stad speelt een rol. Zijn de ideeën die bedrijven gebruiken voor het stimuleren van creativiteit op te schalen naar het ontwerp van de stad?

Invloed van de stad
- Wat is volgens u de rol van de stad daarin? Wat is belangrijk als je de stad zou willen aanpassen aan het creatieve

proces?
- Denk u dat de stad zich kan aanpassen op een manier dat het creatieve proces gestimuleerd wordt?
- Hoe zou de stad zich daarop kunnen aanpassen?

Afsluitende vragen
- Wie zouden er nog meer interessant zijn om mee te gaan praten?
- Zou u graag op de hoogte blijven? Of wellicht in een later stadium mee willen denken in een focus groep?

NOTITIES ACHTERAF

Opmerkingen na het interview:
- Basisvoorwaarde van creativiteit is dat iets nieuw is, maar creativiteit blijft altijd moeilijk te meten. In de discussie over intelligentie geldt dat na een IQ van 110/120 geen voorspelling meer doet over hoe creatief iemand kan presteren.
- Lees: Simonton (Psychology of Creativity)
  Literatuur over brainstormen / evaluation apprehension / production blocking / psychological distance
- Over persoonlijkheid in relatie tot creativiteit. Psychologie is een formule als situatie x persoon, waarbij de situatie altijd van grotere invloed is. Uiteindelijk handelt iedere persoon op dezelfde manier, zoals ook het Milgram experiment aantoont. Het heeft dus geen zin om in de omgeving heel specifiek rekening te houden met introversie/ extraversie of vermijdings / toenaderingsorientatie?
- Welke omgevingsfactoren zouden kunnen meespelen in creativiteit?
  Risico durven nemen, autonomie en vrijheid, opleidingsniveau, diversiteit in achtergrondkennis, psychological distance.
  Flexwerkplekken zijn een slecht idee. Dat heeft ook te maken met social veiligheid en die is belangrijk voor creativiteit.
- Case oude marineterrein als interactiemilieu / innovatiemilieu. Ook noemt hij het topsectoren beleid.
- Goed idee om af te bakenen wat het doel is van de creativiteit waar ik me op richt. Gaat het over Tech / IT / innovatie?

HENK STAATS

December 7, 2016

NOTITIES VOORAF

Interviewee: Henk Staats
Locatie: Faculteit Sociale Wetenschappen Leiden
Achtergrond, functie en bedrijf: Assistant Professor Universiteit Leiden
Documenten meenemen: Boek 'Omgevingspsychologie en ontwerpen' / Illustraties: Dong, Wallas, Guilford / Matrix creativiteit / Toestemmingsformulier

DOEL VAN HET ONDERZOEK

In mijn onderzoek kijk ik naar 'idea generation in creative cities'. Het genereren van nieuwe ideeën en het produceren van innovaties wordt van grote waarde geacht voor de (kennis)economie. Het idee van de creatieve stad is dat die productie gestimuleerd wordt door sociale netwerken en interactie, die aanwezig is in steden. Mijn onderzoek probeert die relatie tussen stedelijke structuur en creativiteit beter te begrijpen en manieren te vinden om die relatie te versterken. De hoofdvraag is daarbij: How can the structure of the city be developed in order to facilitate the (creative and innovative) idea generation processes in creative cities?

Als startpunt neem ik het individuele creatieve proces en bestudeer ik bijna op cognitief niveau wat het individu nodig heeft om creatief te kunnen zijn. Daarbij spelen zowel stimulerende prikkels als belemmeringen uit de stad een rol en die probeer ik vervolgens in kaart te brengen.

DOEL VAN HET INTERVIEW

Aangezien mijn basiskennis van psychologie beperkt is, probeer ik in een serie interviews een beter beeld te krijgen van het vakgebied in relatie tot creativiteit. Het is daarom een exploratief interview, waarbij ik geïnteresseerd ben in uw vindingen op het gebied van creativiteit, maar u ook vooral wil vragen om mee te denken over de invloeden van de stad.

Ik bevind met in een exploratieve fase van mijn afstudeeronderzoek en ik ben inmiddels wel redelijk ingelezen op het gebied van creativiteit in de psychologie. Enerzijds wil ik het daarom graag hebben over het theoretisch kader zoals ik dat nu gebruik. Wellicht kun jij de literatuur wat meer in perspectief plaatsen of mij wijzen op iets wat ik nog over het hoofd zie?

Anderzijds wil ik je ook vragen om mee te denken over wat de invloed van de stad is op creativiteit. Maakt het leven in steden ons inderdaad creatiever in jouw ogen? En zouden we steden zo kunnen bouwen dat hun inwoners beter instaat zijn tot creatief denken?

DEEL 1 – THEORIE

Definities en theorie over creativiteit

- Wat is jouw achtergrond en interesse of

fascinatie met omgevingspsychologie?
- Wat is creativiteit in de psychologie?
- Hoe persoonlijk is het creatieve proces? In omgevingspsychologie komt vaak wel terug het verschil tussen introverte en extraverte mensen en dat zij om goed te kunnen werken andere dingen van hum omgevingen nodig hebben. Denkt u dat dat verschil ook geld voor creativiteit? Zou de stad daarom ook verschillende milieus voor zowel introverte als extraverte mensen moeten bieden?
- Four C-model van Kaufman. Daarin wordt het onderscheid gemaakt tussen small-c en big-c creativity, waarbij het een iets is wat je dagelijks gebruikt en het ander voor grotere ideeën. Zou je dat misschien nog iets meer kunnen uitleggen? Als we het hebben over creativiteit als motor van de stad, welke vorm van creativiteit hoort daar dan volgens Kaufman bij?
- Dong geeft in zijn diagram strategieën en skills aan. Zijn deze elementen voor jou herkenbaar? Hoe zou jij hun relatie met creativiteit uitleggen?
- Welke omgevingsfactoren beïnvloeden volgens u het creatieve proces?
- Wallas is een van de eerste denkers over creativiteit. Hij omschrijft vier stappen in het creatieve proces: Preparation, incubation, illumination and verification. Hoe ziet u bijvoorbeeld omgevingsinvloeden in die vier fases?

Onderzoek Droog 'Can nature bloom your creative process?'
- Natuur en stad zijn allebei te begrijpen als complexe systemen. Wat Droog schrijft over natuur geldt ook voor de stad: Het is het niet mogelijk om de omgeving direct te overzien en daardoor triggert het nieuwsgierigheid en flexibel denken.
- In het boekje van Carsten de Dreu over creativiteit, staat eigenlijk weinig over de maakbaarheid van de omgeving en hoe dat bijdraagt aan creativiteit. Wat hij er over zegt is dat autonomie heel belangrijk is. Het kunnen aanpassen van de omgeving naar je eigen behoefte. Hoe ziet u dat? Is autonomie inderdaad zo belangrijk? Droog argumenteert juist dat mensen dan vaak de verkeerde keuze maken.
- In het onderzoek staat 'vision' centraal als meest belangrijke waarneming (Ulrich, 1979). Kunt u dit voor mij in perspectief plaatsen, hoeveel belangrijker is het dan andere zintuigen?
- Implicaties? Moeilijk, vanuit stedenbouwkundig perspectief wil je mensen dus verschillende uitvalsomgevingen bieden, zodat ze kunnen kiezen wat bij hen past?

DEEL 2 – STAD

Prikkels en belemmeringen van creativiteit
- Wat zijn belangrijke invloeden op creativiteit van het individu? Wat vind u daar in belangrijk?
- Wat is de rol die de omgeving speelt

daarbij?
- Welke factoren uit de stad spelen daarbij een rol?
- Sommige grote (.com) bedrijven maken gebruik van de omgeving om creativiteit voor innovatie te stimuleren. Dat beperkt zich tot het gebouw, het interieur en soms de campus, maar ook de stad speelt een rol. Zijn de ideeën die bedrijven gebruiken voor het stimuleren van creativiteit op te schalen naar het ontwerp van de stad?

Invloed van de stad
- Hoe zou u, als omgevingspsycholoog, de stad definiëren?
- Wat is volgens u de rol van de stad daarin? Wat is belangrijk als je de stad zou willen aanpassen aan het creatieve proces?
- Denk u dat de stad zich kan aanpassen op een manier dat het creatieve proces gestimuleerd wordt?
- Hoe zou de stad zich daarop kunnen aanpassen?
- Hoe staat u als wetenschapper tegenover maakbaarheid?

Afsluitende vragen
- Wie zouden er nog meer interessant zijn om mee te gaan praten?
- Zou u graag op de hoogte blijven? Of wellicht in een later stadium mee willen denken in een focus groep?

NOTITIES ACHTERAF

Opmerkingen na het interview:
- Belangrijkste begrip om rekening mee te houden in relatie tot de omgeving is arousal. In de psychologie is er nog weinig bekend over de beleving van de stad, zeker niet als daarbij andere sensoren dan zicht worden gebruikt (geluiden, temperatuur). Vroeger werd de stad in de psychologie vooral gezien als 'overload', een omgeving die altijd te veel prikkels geeft. Stad als tegenovergestelde van natuur.
- Mijn benadering ligt misschien dichterbij die van Lofland, die de stad voor het eerst ook als stimulerende ging zien. Vanuit die gedachte kan de stad ook als stimulans voor creativiteit worden gezien. Vaak wordt de stad door psychologen begrepen als de 'stad' tegenover de natuur. Maar je kan de stad natuurlijk opdelen in omgevingen, zoals de publieke ruimte, binnenstad, ruimten die zich laten kenmerken doordat mensen er geneigd zijn te verblijven of samen te komen.
- Autonomie is belangrijk, maar mensen maken vanuit zichzelf de verkeerde keuze. Denken bij creativiteit bijvoorbeeld aan ontspannen, terwijl een bepaalde mate van arousal heel belangrijk is.
- Als je naar ruimtelijke condities wil kijken, kijk dan naar verblijfswaarden (beschutting, zon, etc.).
- Mentale en fysieke activiteit zijn

wellicht beiden belangrijk voor creativiteit. Die cognitieve activatie kan dus via verschillende wegen bereikt worden. Hardlopen / contemplatie.

- Welke omgevingsfactoren zouden kunnen meespelen in creativiteit? Musea's subsidiëren, vestigingsklimaat verhogen, hoogopgeleiden trekken (klinkt als Florida?), verhoogt de kans op triviale ontmoetingen.
- Lees: Lofland
  William White (youtube 1960),
  Michelle Droog, constructing creativity
  Civil attention matters (Wesselmann) / zelfvertrouwen
- Goed idee om met de fasen van Wallas aan de gang te gaan. Preparation / Verification heeft dan veel met de sociale context te maken. Incubation / Illumination gaat dan meer over contemplatie.
- Case Singelpark Leiden besproken
- Goed idee om af te bakenen wat het doel is van de creativiteit waar ik me op richt. Is het economisch of gaat het om de creatieve productie in de creatieve sector of gaat het om ideeën van grote individuen?

JUDITH LEKKERKERKER

December 9, 2016

NOTITIES VOORAF

Interviewee: Judith Lekkerkerker
Locatie: Urhahn Urban Design, Laagte Kadijk 153
Achtergrond, functie en bedrijf: Ruimtevolk
Documenten meenemen: Illustraties: Wallas, Guilford, Geels / Matrix creativiteit / Toestemmingsformulier

DOEL VAN HET ONDERZOEK

In mijn onderzoek kijk ik naar 'idea generation in creative cities'. Het genereren van nieuwe ideeën en het produceren van innovaties wordt van grote waarde geacht voor de (kennis)economie. Het idee van de creatieve stad is dat die productie gestimuleerd wordt door sociale netwerken en interactie, die aanwezig is in steden. Mijn onderzoek probeert die relatie tussen stedelijke structuur en creativiteit beter te begrijpen en manieren te vinden om die relatie te versterken. De hoofdvraag is daarbij: How can the structure of the city be developed in order to facilitate the (creative and innovative) idea generation processes in creative cities?

DOEL VAN HET INTERVIEW

Aangezien mijn onderzoek een heel exploratief karakter heeft, probeer ik in een serie interviews een breder beeld te krijgen van de ideeën die er over creativiteit en de stad (urban creativity) bestaan in verschillende vakgebieden. Hoewel ik voor het stedelijk perspectief ook in mijn eigen faculteit terecht zou kunnen, spreek ik toch graag een keer met iemand die bezig is in de praktijk en die van dichtbij onderzoekt. Enerzijds zou ik graag meer horen van jou over het onderzoek met het PBL en wat jij daarin de belangrijkste vindingen vindt in relatie tot de stad en de publieke ruimte.

Anderzijds wil ik je ook vragen om mee te denken over wat de invloed van de stad is op creativiteit. Maakt het leven in steden ons inderdaad creatiever in jouw ogen? En zouden we steden zo kunnen bouwen dat hun inwoners beter instaat zijn tot creatief denken?

DEEL 1 - INNOVATIEMILIEUS

- Hoe is dit onderzoek tot stand gekomen?
- Kan je iets meer vertellen over jouw interesse voor innovatie in de stad? Wat is in uw ogen innovatie? Wat is de rol van creativiteit daar in? Expressie van creativiteit?
- De WRR en ook in de longreads hebben we het vaak over een innovatiesysteem, waar bestaat een innovatiesysteem precies uit? Wat zijn daarbij belangrijke (ruimtelijke) elementen?
- Wat is de potentie van co-werkplekken? Jullie schrijven ook over het belang van verbinding tussen kleine bedrijvigheid en grote bedrijven. Hoe zou je die verbinding nog meer kunnen maken? Heeft misschien ook met urbanity te

maken?
- Opzoek naar maakbaarheid noemen jullie vijf kernelementen, maar benadrukken ook de grenzen van de maakbaarheid. Waar liggen die grenzen precies?
- In de introductie hebben jullie het over 'kenniscirculatie', dat past erg bij de case in mijn onderzoek van de samenwerkingen tussen Leiden, Delft en Erasmus. Wat denk jij dat belangrijk zou zijn in het ontwikkelen van die campussen om de kenniscirculatie te bevorderen?
- Maurits de Hoog introduceerde in Nederland de term interactiemilieu. Wat is het verschil tussen een interactiemilieu en een innovatiemilieu?
- Sommige grote (.com) bedrijven maken gebruik van de omgeving om creativiteit voor innovatie te stimuleren. Dat beperkt zich tot het gebouw, het interieur en soms de campus, maar ook de stad speelt een rol. Zijn de ideeën die bedrijven gebruiken voor het stimuleren van creativiteit op te schalen naar het ontwerp van de stad?
- Werkt het wel als die bedrijven al de voorzieningen uit de stad naar zich toe trekken, zoals er veel op de campussen gebeurd? Loop je dan niet juist de verbondenheid met de stad mis? Het brengt de mensen uit van de campus bij elkaar, maar moet het niet juist ook mensen van daar buiten trekken?
- Als je nu nog verder zou kunnen kijken en in meer detail, wat zouden dan jouw aanbevelingen voor verder onderzoek zijn?

DEEL 2 - CREATIVITEIT VAN DE STAD

- Hoe maakt de stad ons creatiever / innovatiever? Welke factoren uit de stad spelen daarbij een rol volgens u?
- Denk u dat de stad zich kan aanpassen op een manier dat het creatieve proces gestimuleerd wordt? Daarbij zijn denk ik twee modellen van creativiteit bruikbaar: het convergerende / divergerend denken en het model van Wallas. Zie jij ook ruimtelijke aanknopingspunten binnen de modellen?
- Wat is volgens jou de rol van de stad daarin? Wat is belangrijk als je de stad zou willen aanpassen aan het creatieve proces?
- Wat is uw mening over omgevingspsychologie en pogingen die worden gedaan om dat beter te integreren in de ontwerp discipline?
- De focus op innovatiemillieus en de creatieve stedeling heeft een tendens zicht te richten op de hoogopgeleide gemeenschap. Is dat een gevaar of een mankement van op die manier denken? Hoe inclusief is het stadmaken nog als we ons op de kenniseconomie richten?

Afsluitende vragen
- Wie zouden er nog meer interessant zijn om mee te gaan praten?
- Zou u graag op de hoogte blijven? Of

wellicht in een later stadium mee willen denken in een focus groep?

NOTITIES ACHTERAF

Opmerkingen na het interview:

- Aanleiding voor ruimtevolk om onderzoek te gaan doen naar innovatiemilieus lag vooral bij de behoefte om weer op nationaal niveau te gaan nadenken over ruimtelijke ordening (NOVI). Op dat niveau spelen economische drijvers een belangrijke rol. Op die manier kwamen zij op het pad van de ondernemers / innovatie / lerende omgeving.
- Door middel van interviews en multidisciplinaire gebiedstafels, kwam naar voren dat het succes van de 5 gebieden samen hing met verbondenheid, face-to-face ontmoetingen en nabijheid. Daarnaast speelden ook bedrijvigheid en kennis een belangrijke rol.
- Hoe organiseer je interactie? (interactiemilieus?)
- Bij interactie is bestaande infrastructuur heel belangrijk. Hoe is die gespecialiseerd? Wat is de cultuur binnen die infrastructuur? Het gaat dan ook om het instandhouden van de dynamiek. Wat zijn de kenmerken van die dynamiek op een specifieke plek? in Amsterdam: Tolerantie, financiële dienstverlening, fintech.
- Wat doet de grote stad voor lager opgeleiden? Vooral voor de middengroep dreigen veel banen te verdwijnen, wat er over blijft is cognitief werk en persoonlijke dienstverlening, maar is dat wel genoeg?
- Beta mensen hebben meer regie nodig in de interactie.
- Lees: Moretti / trickle down effect
- Sommige netwerken of sommige infrastructuur functioneert steeds meer in niches. Die niches zijn zeer gespecialiseerde netwerken binnen de stad, die juist de interactie of overlap met andere netwerken bemoeilijkt, omdat ze zo specialistisch zijn. Daarom moeten we opzoek naar de plekken waar creativiteit samenkomt en menging weer makkelijker wordt.
- Wie zijn de koppelaars in de stad? Zouden we koppelaars ook wel als knowledge brokers kunnen zien?
- Co-werkplekken met een internationale connectie (B Amsterdam/ WeWork/ Student Hotel, eventueel interessant voor observaties/ experiment)
- Programmering
- Kunst en cultuur / podiumkunsten / andere culturele instellingen lokken interactie uit bij mensen met een gedeelde interesse, maar ook het voetbal stadion kan daar een voorbeeld van zijn. Misschien worden daar in de skyboxen wel de beste ideeën uitgewisseld?
- Koppelaars op verschillende schalen: Roergangers, ondernemers, gemeente, intermediairs, instituten.
- Interssant om verder te onderzoeken

volgens Judith zijn levenscycli van creatieve plekken in de stad. Waarom werkt het op een gegeven moment minder? Is het erg dat die verplaatsen / verdwijnen? De mensen / interacties die er achter steken zijn net zo een organisch onderdeel van de stad en duiken daarom toch steeds weer op waar ze de kans krijgen.

EVA VAN BAREN

March 16, 2017

DOEL VAN HET INTERVIEW

Beeld krijgen van beleving LDE vanuit een van de innovation centres / Beeld krijgen van ruimtelijk gebruik van de samenwerking

VRAGEN

- Wat is het CfS precies? Hoe lang bestaat het al? Hoeveel mensen zijn er bij betrokken?
- Watvoor activiteiten vinden er plaats binnen CfS? Onderzoek, onderwijs, congressen, workshops?

- Waar vinden die activiteiten plaats?
- Kiest het CfS bewust voor Den Haag? Wat zijn daar de voordelen van?
- Waar ben je zelf veel aan het werk?
- Ben je veel aan het reizen tussen de drie steden? Hoe ervaar je dat? Maak je altijd gebruik van de trein of is de auto eigenlijk ook wel makkelijk?

- Wat zijn de ambities van CfS?
- Hoe gaat zich dat verder ontwikkelen en hoort daar ook ruimtelijke ontwikkeling bij?
- Is het zinvol om een centrale plek te hebben voor LDE of voor CfS? Of moet zich dit juist spreiden over de verschillende steden?

- Op watvoor manier is het CfS een samenwerking tussen Leiden, Delft en Erasmus? Waar merk je dat aan?
- Komt CfS voort uit LDE of bestond CfS al toen de alliantie officieel werd gemaakt een paar jaar geleden?
- Wat levert de interdisciplinaire samenwerking CfS op?
- Zijn er ook dingen die de samenwerking ingewikkeld maken?
- Wat zijn de verschillen tussen de drie universiteiten? In type mensen / manier van werken? Waar merk je dat aan?
- Wat is uw beeld bij LDE? Is het belangrijk dat die alliantie geformaliseerd is?

HILJE PAPMA

April 3, 2017

DOEL VAN INTERVIEW - DEEL 1

Gebruikersonderzoek LDE

Deze introductievragen zijn bedoeld als input voor het ontwerpproces en als opening van het gesprek. Papma is onderdeel van een van de doelgroepen in het campus ontwerp voor LDE. Haar ervaringen met de samenwerking op de drie verschillende campussen zijn daarom waardevol om te inventariseren.

VRAGEN

- Wat is uw beeld bij LDE? Is het belangrijk dat die alliantie geformaliseerd is?
- Welke activiteiten vallen onder LDE?
- Wat is op de lange termijn de toekomst van de alliantie? Hoe verwacht je dat die verder zal ontwikkelen?
-
- Waar vinden de activiteiten plaats?
- Welke faciliteiten heeft LDE nu ter beschikking? Hoe worden die gedeeld tussen medewerkers en studenten van de drie universiteiten?
- Kiest LDE bewust ook voor werkplekken in Den Haag? Wat zijn daar de voordelen van?
- Moet LDE een duidelijk herkenbare uitstraling / branding hebben? Zou die dan ook zichtbaar zijn in het interieur / gebouw / de stad?
- Waar ben je zelf veel aan het werk?
- Ben je veel aan het reizen tussen de drie steden? Hoe ervaar je dat? Maak je altijd gebruik van de trein of is de auto eigenlijk ook wel makkelijk?

DOEL VAN INTERVIEW - DEEL 2

Toepassing in de context van een campus ontwerp.

Het doel van de expert interviews is om het model te verrijken met de reflectie van een aantal experts. Dit moet het conceptuele model beter bruikbaar maken als vertaling tussen theorie en praktijk. Het zou dan ook gebruikt kunnen worden als decision support tool in het stedelijk ontwerp van innovatieve omgevingen, zoals de universitaire campus.

Uitleg model

Het model is ingedeeld volgens de vier stadia van creativiteit van Wallas, die staan op de x-as weergegeven. Daar boven staat het verloop van het idea generation process weergegeven. Op de y-as staat nu een stedelijke schaal, die loopt van publiek naar privé. Met het grijze veld wordt aangeduid op welk schaalniveau de stedelijk ontwerper het meeste impact heeft in het creatieve proces. Daar overheen liggen nu 6 van 7 ontwerp principes, die zijn dus gerelateerd aan de hand van schaal en status in het creatieve proces.

Het gaat mij er in het interview vooral om over de relatie tussen die ontwerp principes en de rest van het model te bespreken. Door

het model moeten de ontwerp principes minder op zichzelf staan en inzicht geven in hun theoretisch kader.

- In LDE staat het stimuleren van innovatie door interdisciplinaire samenwerking centraal. Welke elementen uit het model zijn voor jouw herkenbaar binnen LDE?
- Denk je dat dat proces versterkt kan worden door aanpassingen van de stedelijke omgeving? Bijvoorbeeld door een study centre toe te voegen in de binnenstad van Delft of door de route van Delft Zuid naar de Zuid campus te verbeteren?
- Wat zijn voor jou belangrijke overwegingen in het ruimtegebruik van LDE?

Uitleg ontwerp principes
Ik heb 7 ontwerpprincipes geformuleerd, die iets zeggen over het verband tussen gebruik van de publieke ruimte en het creatieve proces dat tot innovatie leidt. Nummer 7 geeft aan dat het ook in het digitale tijdperk belangrijk is om ruimtelijk dichtbij elkaar te zijn. Nummer 6 gaat over face-to-face contact en spontane ontmoeting. Nummer 5 en 3 gaan over contemplatie ruimte. Nummer 2 en 4 gaan juist over activatie van hersenen in binnen en buitenruimte. Nummer 1 zegt iets over het belang van de route tussen huis en werk.

- Zijn de gepresenteerde ontwerp principes voor jou herkenbaar in LDE?
- Zijn dit soort overwegingen voor jou toepasbaar binnen LDE?
- Zo niet, waar ligt dat dan aan? Is het de formulering (kan er met meer uitleg een duidelijk beeld van het achterliggende idee gecreëerd worden)? Of ligt het eerder aan de aansluiting met onderwerpen waar jij mee bezig bent binnen LDE?
- Zou er ook een functionele indeling in het model moeten worden geïntegreerd? Bijvoorbeeld door gebruik te maken van het campusmodel van Den Heijer (academic, residential, retail & leisure, related business ands infrastructure)
- Is sommige informatie overvloedig? Of zou je geïnteresseerd zijn iets te kunnen terugvinden dat nu niet zichtbaar is in het model?

MAURITS DE HOOG

May 17, 2017

NOTITIES VOORAF

Interviewee: Maurits de Hoog
Locatie: Weesperplein 8, 3de etage, ruimte: 3 Hoogvoor B
Achtergrond, functie en bedrijf: Dienst Ruimtelijke Ordening Amsterdam, projectleider IJ oeververbindingen / Voormalig TU Delft hoogleraar stedenbouwkundig ontwerpen
Documenten meenemen: P1 / P2 / P3 boekjes / Presentatie P3 / Conceptueel model

Inleidende vragen

- Bent u ook nog actief binnen de TU Delft? Via AMS misschien ook?
- Hoe verbindt u theorie en praktijk?
- Denkt u dat er een verschil is tussen onderzoekers die Rotterdam bestuderen en die Amsterdam bestuderen?
- Kunt u mij iets meer vertellen over de IJ oververbinding. Waar staat u nu in dat project?
- Een brug is altijd een ingreep met een enorme stedelijke impact. Die impact is niet alleen infrastructureel, maar ook sociaal-economisch. Hoe verhoud u zich daartoe in een project dat zo een lange adem heeft?

Interactiemilieus en de creatieve stad

- Wat is een interactiemilieu?
- Hoe staat u tegenover het concept van de creatieve stad zoals Landry en Florida dat voorstellen? Sluit dat aan bij uw theorie over interactiemilieus?
- Hoe maakt de stad ons creatiever / innovatiever? Welke factoren uit de stad spelen daarbij een rol volgens u?
- Denkt u dat de stad zich kan aanpassen op een manier dat het creatieve proces gestimuleerd wordt? Denkt u dat we kunnen ontwerpen aan de stad om interactiemilieus te stimuleren dan wel om creativiteit in de hand te werken?
- De metropoolontwikkeling of het inbreiden van de stad, de enorme aandacht voor de binnensteden, brengt ook problemen met zich mee, vinden sommigen. Hoe kunnen we met de downside van deze ontwikkeling omgaan?
- Zo ja, hoe denkt u dat stedenbouwkundig ontwerpers met die kennis om zouden moeten gaan? Is het zinvol om dit soort cognitieve processen in de stedenbouwkunde meer centraal te stellen?

LDE

- Denkt u dat de universitaire samenwerking tussen Leiden, Delft en Rotterdam inderdaad een stedelijke implicatie heeft?
- LDE gaat misschien ook wel om het implementeren van strategisch politiek-economisch beleid dat een relatief abstract organisatorisch doel stelt, namelijk het stimuleren van innovatie.

U schrijft ook over dat soort beleid in de Hollandse Metropool, zoals de topsectoren. Waarom denkt u dat het belangrijk is om over dit soort beleid op een ruimtelijke manier na te denken? Denkt u dat het belangrijk is om ons bewust te zijn van de ruimtelijke implicaties, maar ook hoe we ruimtelijk ontwerp kunnen inzetten?

- Als u voor de LDE samenwerking zou moeten gaan ontwerpen, waar zou u dan beginnen? Welke concepten zijn dan belangrijk denkt u?
- Wat is de functie van een samenwerking als LDE voor de metropool? Hoe kijkt u daar tegenaan?

ROBERTO CAVALLO

July 18, 2017

NOTITIES VOORAF

Interviewee: Roberto Cavallo
Achtergrond, functie en bedrijf: Associate Professor/ Director of Education

Faculty of Architecture, Urbanism and the Built Environment

Research and design in education

- Wat is uw mening over de positie van ontwerpen en onderzoeken in het huidige master curriculum?
- Wat is de toegevoegde waarde van ontwerp voor het onderzoek in deze faculteit?
- Wat is de toegevoegde waarde van wetenschappelijk onderzoek voor de ontwerpende disciplines, die in deze faculteit worden onderwezen?

Pedagogy and didactics in the Faculty

- Hoe zou het onderwijs op de faculteit er idealiter uit zien? Wat is de atmosfeer of de didactische methode die daar volgens jou bij hoort?
- Wat is onderscheidend aan de manier waarop wij onze studenten onderwijzen?
- Wat voor professionals levert dat op? En zijn dat de professionals die we in de toekomst nodig hebben of zouden studenten nog andere dingen moeten leren om ze klaar te stomen voor werken in de praktijk van de 21e eeuw?
- Wat zijn de cruciale leermoment voor studenten in het curriculum?
- Zouden we studenten nog beter kunnen begeleiden in de ontwikkeling van expertise die ze nodig hebben in het werkveld?

The studio

- Wat is uw mening over de studio als didactische methode en
- Zijn we kritisch genoeg over de manier waarop de studio wordt gegeven? Is er een didactisch concept of een bepaalde studio cultuur die de universiteit wil uitdragen?
- Wat zou uw advies zijn voor andere opleidingen als zij de studio zouden willen gebruiken voor hun onderwijs?

Critical reflection

- De capaciteit om goed te kunnen reflecteren door studenten in onze faculteit wordt wel eens bekritiseerd. Het is de afgelopen jaren ook een focuspunt geweest binnen de opleiding om dit te verbeteren. Wat is volgens jou het belang of de toegevoegde waarde van reflectie in ontwerponderwijs in een academische context?
- Hoe zou volgens u de reflectie idealiter in het curriculum worden verweven?
- Methodologie speelt een andere rol in ontwerp dan in onderzoek doen. Dat maakt het misschien wel extra moeilijk om dit te onderwijzen op een manier die duidelijk is voor de student. Wat vind je

van de manier waarop we methodologie op dit moment onderwijzen in de master tracks? Zouden we dat nog beter of anders kunnen aanpakken?
- Hoe doen we het op het gebied van interdisciplinariteit?
- Hebben we wel genoeg binding met de TU Delft als geheel? Is er aanleiding om die banden te versterken?

Afsluitende vragen
- Op welk gebied in het onderwijs dat zich richt op ontwerp en onderzoek zou jij bij aanbevelingen in geïnteresseerd zijn?

NOTITIES ACHTERAF
- "We need to deliver a constant fight to bring together design and science in our faculty." Cavallo sees a university wide trend to use design as a method within scientific research. Also within the Faculty of Architecture it has become increasingly important to integrate design within research to come to new scientific insights. A clear marker for this methodological shift is the Research by Design Conference organised in the Faculty in 2000 and from this conference onward design has gained more recognition as a scientific method. However, Cavallo still encounters hesitation with natural sciences to adopt design methods.
- Education at the faculty increasingly aims at avoiding a clear distinction between research in design. More than before, graduated students are employed in a diverse work field. The multifaceted design discourse asks for practitioners that are able to apply their design skills much broader than a generic architectural or urban design exercise.
- Cavallo points out that there are a few focus points for the improvement of education in the Faculty at the moment.
- There is general need to improve the documentation of the design process. Not only on the side of the student, but also the feedback of tutors should be better documented.
- Reflection and ethics are reintroduced and there is now sought for ways to reintegrate these more explicitly within the curriculum of both master and bachelor education programmes.
- The way methodology is thought is under evaluation. All master tracks have their own strategy and teach methodologies in a different way. This is not necessarily an issue to Cavallo, although he would like to find a way to give students a clear methodological framework at the beginning of their master education. Preferably, by offering a methodology course in the first quarter

of the master education. In the academic year of 2017-2018 a first experiment will be done with this in the Architecture track. One key objective from Cavallo is to bring the methodology courses in line with what students learn in the studio about design.

- The studio will stay the main didactical method in design education at the faculty. However, Cavallo would like the studios to function more interdisciplinary and bottom-up. Some studios suffer from introversion and undermine the open and sharing attitude that the studio is meant to reflect. Cavallo would also like students to take more ownership of their education in the studio. Studios should be much more structured by the students and mentors should have a facilitating role.

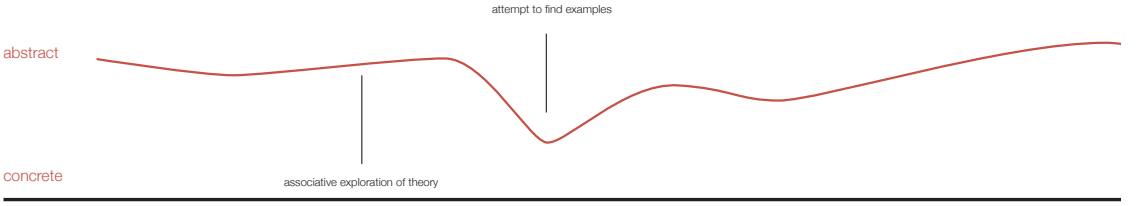
- "How can we best facilitate our student's search?" Which moments in the graduation process are crucial? Which tools do we need to offer as a faculty? What is the reasoning, the choices students make in their graduation and what flexibility should they be offered?

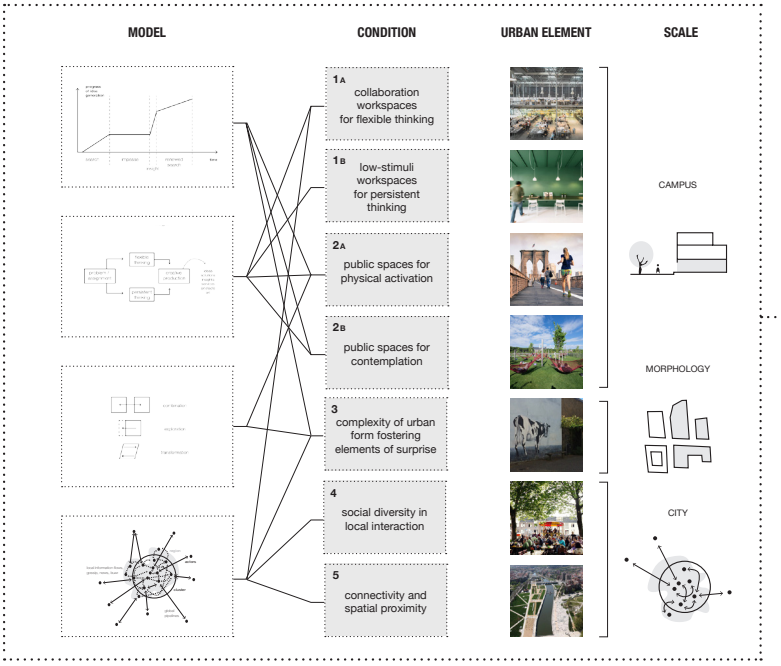
B MATRIX LITERATURE REVIEW

	Boden (2004)	Runco (2007)
Definition creativity	Creativity is the ability to come up with ideas or artefacts that are *new, surprising and valuable*.	*Syndrome* or *complex,* expressed in diverse ways (e.g., art vs. science), and involving different processes (e.g., cognitive or social)
Definition innovation		
Modes of thinking	Creative thinking	• Insightful thinking • Divergent thinking • Associative thinking • Analogical thinking
Cognitive strategies	• Combination • Exploration • Transformation	• Restructuring (Gestalt theory) • Sources of inspiration (abduction)
Contributors / Influences		• Intelligence (threshold theory) • Motivation • Knowledge / information • The individual's ability to use creative tactics or strategies (metacognition)
Stimulating factors		• Associative theory • Analogical thinking • Restructuring (Gestalt theory) • Sources of inspiration (abduction) • Permissive atmosphere
Discouraging factors		• Logic (in some cases) • *Einstellung* (mental block to one's thinking, due to a great deal of experience in the problem domain)
Urban (environmental) implication		

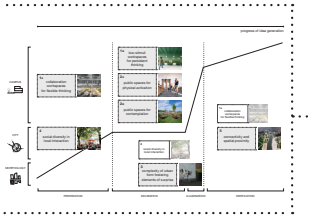
Ohlsson (2011)	Dong (2015)	De Dreu & Sligte (2016)
Cognitive process to create, discover or invent novelty		The creation of a new idea, product or solution with a possible application • Originality • Fluency • Insights
-		Implementation of new insight/ idea (creativity does not necessarily lead to innovation)
Creative thinking as part of analytical thinking (Raisins in the Dough Principle)	Design thinking: • Meta representation • Secondary representation • Primary representation • Recursion • Curiosity	Dual pathway to creativity model: • The flexible brain (divergent thinking) (system 1?) • The persistent brain (system 2?)
• Combination • Accumulation • Restructuring	• Framing • Abduction • Analogizing • Mental simulation	
		• Intelligence • Clear and open working memory • Personality: Toenaderingsoriëntatie (extravert and open), in contrast to people with a vermijdingsoriëntatie (introvert) • Environment • Social context
		• Activating moods Cognitive activation stimulates both persistent and flexible brains • Collaborative circles and informal networks • Psychological safety • Social diversity • Confrontation with unexpected information
		• Deactivating moods • Fear
	• Facilitate opportunities for opportunistic encounters to encourage out-of-domain analogical transfer of ideas. • Cultivate complexity in form to induce the generation of frames of increasing number and novelty about the meaning of city forms. • Embody cumulative cultural knowledge to inform and enhance future design iterations.	• Irrespectively of an individual's intelligence or personality creativity can be encourages by adjusting the environment. • To encourage creativity one must continuously monitor the combination of personality and environment. • Autonomy to adjust the interior to the needs of the individual whose creativity is to be encouraged.

C PROCESS MAP

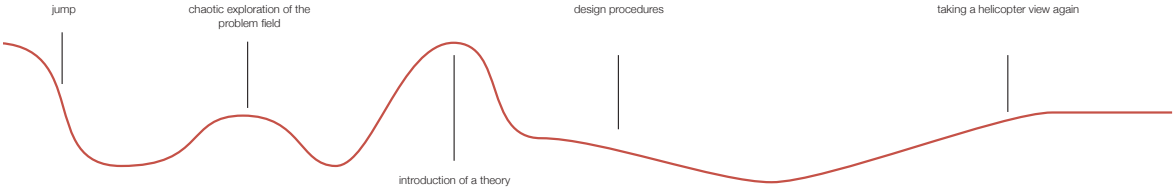




THEORY

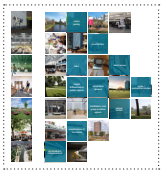


MODEL

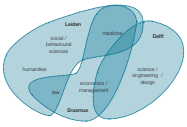


LDE

INTERVIEWS

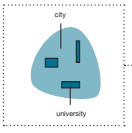


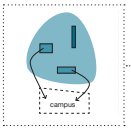
FIELDWORK



ORGANISATIONAL ANALYSIS

CAMPUS

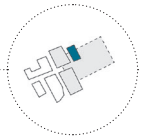


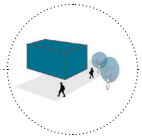


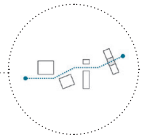
DELFT

URBAN STRATEGY

DESIGN PRINCIPLES



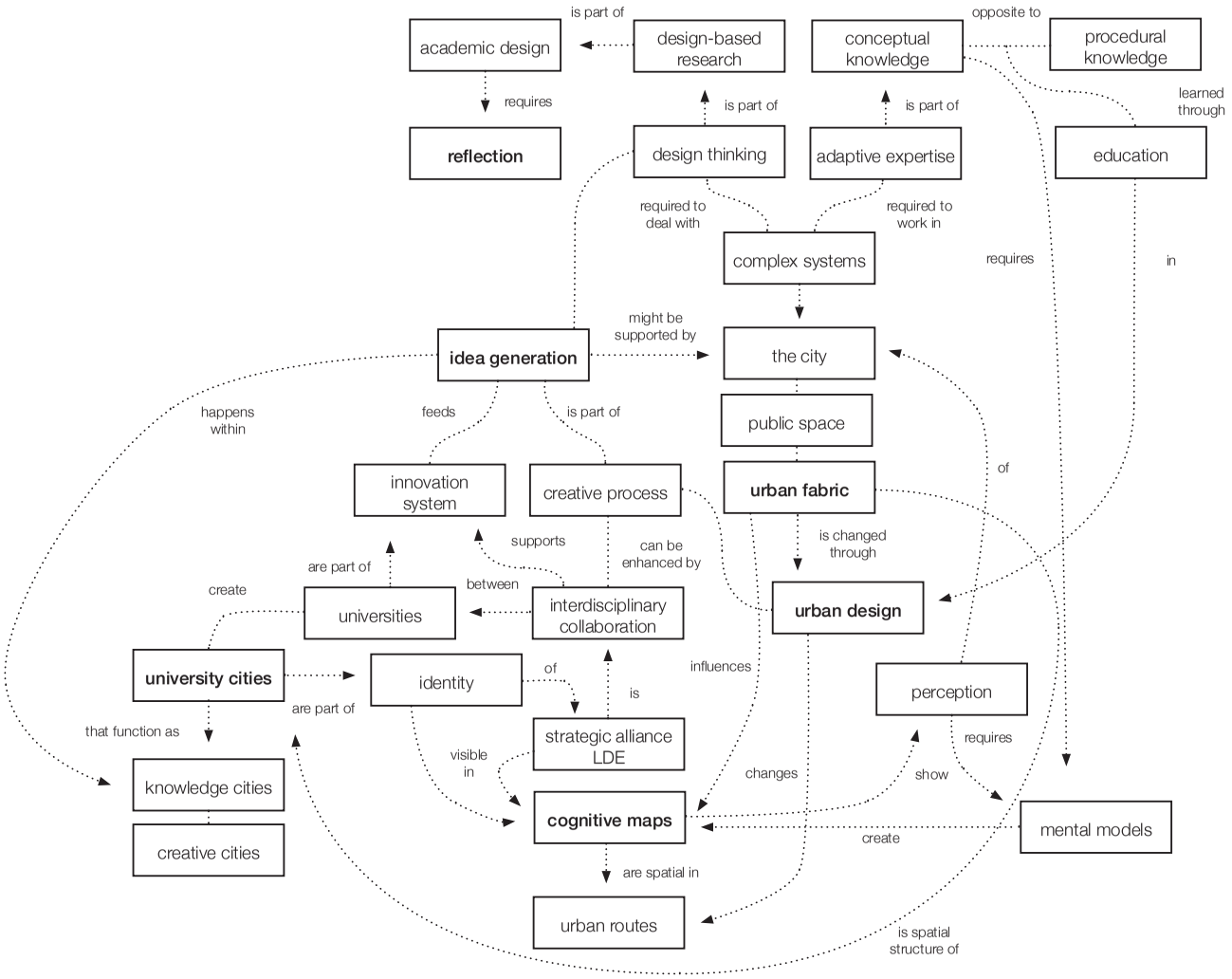




PRACTICE

THEORY

D SEMANTIC MAP


academic design
is part of
design-based research
conceptual knowledge
opposite to
procedural knowledge
requires
reflection
is part of
design thinking
is part of
adaptive expertise
learned through
education
required to deal with
required to work in
complex systems
requires
in
might be supported by
idea generation
the city
happens within
feeds
is part of
public space
innovation system
creative process
urban fabric
of
supports
can be enhanced by
is changed through
are part of
between
create
universities
interdisciplinary collaboration
urban design
university cities
identity
of
is
influences
perception
are part of
that function as
strategic alliance LDE
requires
visible in
changes
show
knowledge cities
cognitive maps
mental models
create
creative cities
are spatial in
urban routes
is spatial structure of