

## MASTER

**Developing a co-creation structure for an IT consultancy firm and its client organizations to explore possibilities of new technologies**

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Eindhoven, April 2016

**Developing a co-creation structure  
for an IT consultancy firm and its  
client organizations to explore  
possibilities of new technologies.**

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BSc Industrial Design – TU/e (2012)  
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in partial fulfilment of the requirements for the degree of

**Master of Science  
in Innovation Management**

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## Abstract

This report contains the research into long-term Technological Innovation Partnerships of ICT Corp.'s BM Department<sup>1</sup>. BM Department explores what current day new technologies, such as virtual reality and robotics, can mean for client organizations in the near future. This is done through inspiration workshops and development of concepts and prototypes in close collaboration with the client. The goal of this thesis is to explore how the Technological Innovation Partnerships can be improved so the department will be likely to receive more long-term assignments from its clients. The diagnosis of this thesis revealed that there is a desire to increase the creative atmosphere, client engagement, and structuring of work processes while maintaining flexibility. The design phase focuses on how to improve the current way of working to increase these three aspects. The proposed design is a combination of existing solutions with aspects taken from design thinking, workspace design, and Bohmian dialogue.

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<sup>1</sup> Due to confidentiality reasons the company and department names are changed and the appendices of this thesis are not publicly available.



## **Management summary**

Since there was no specific management problem defined at the start of this thesis by the department, the decision was made to work with a management challenge as the basis for a gap analysis and design. The current and desired state of the business unit was defined with help of company documentation, data, and interviews with nine co-workers (three managers, three software developers, and three business developers). The diagnosis results in a qualitative and quantitative gap and a cause and effect diagram. The design scope is defined based on these results. The design phase started by collecting design tools that could be appropriate to decrease the gap between the current and desired state. The design tools are evaluated with help of design requirements. Next there is evaluated whether the design tools can be used together. Based on this evaluation the researcher made the decision on the form of the final design.

## **Management challenge**

BM Department has an ideal picture in mind with a higher turnover and more long-term Technological Innovation Partnerships (TIPs). The department aims to provide the best ICT and new product development services possible to their customers. BM Department recognizes co-creation as an important approach in achieving this ideal picture. The management challenge is:

*Optimizing the TIPs to create durable client relationships.*

## **Theoretical Background**

The theoretical background describes the theoretical context that this research is guided by. First of all, the methodological background is explained. Three paradigms can be extracted from current day research on the topic of organizational creativity and co-creation (Van der Voort, 2015): the Variable paradigm, the Systems paradigm and the Chaos & Complexity (C&C) paradigm. The Variable paradigm takes on a partial worldview. Management literature fitting this paradigm provides a lot of easy-to-use tools. The C&C paradigm takes on a holistic worldview. The advantage of the C&C worldview is that it provides a more complete understanding of mechanisms that lead to organizational change. Theories fitting this paradigm take into account interactions of entities on more than one level, which is not done by research in the variable paradigm. Outcomes of interventions in this paradigm are less, or not at all predictable. Due to the relative newness of management research in this paradigm, the amount of easy-to-use tools that fit this paradigm is low. The aim of this research is to generate solutions that are strongly grounded in literature and easy to use in practice. For this reason, this thesis takes on an eclectic approach; using theories and tools from both paradigms.

The next section of the theoretical background explains concepts found in literature to generate a better understanding of the topics within the scope of this thesis. This section explains more on service science, service-dominant logic (SDL), co-creation, and creativity.



## Diagnosis

Current situation: The parent company is a traditional consultancy firm that aims at sustainable long-term client relationships. It has a divisional structure. BM Department differs itself from the rest of the company by focusing on new to the world innovation, high client engagement, and by creating a highly creative environment. There is room for smaller projects with higher societal relevance. The department is treated as a start-up within the parent company. At this moment the department is growing and starting to generate profit. The department has an informal culture and structure. Typical clients are clients with whom a personal relationship can be build up. The analysis of the current state revealed several aspects influencing the current situation: performance indicators, innovation culture of the parent company, innovation culture in the market, climate for creativity within BM Department, innovation tactics, team cohesion, level of experience of co-workers, and client engagement.

Desired situation: For BM Department the most important objective is to generate more and continuous revenue. There should continuously be sought for a balance between generating value for customers and the parent company and innovation. It is desired that BM Department can keep its free informal atmosphere, while performing well in the traditional consultancy parent company.

## Design scope

Analysis of seven interviews that focused on finding bottlenecks resulted in the cause and effect diagram (Porrás, 1987) in *Figure 1*. The Design Scope is chosen based on the focus of the thesis and the personal interest of the researcher.

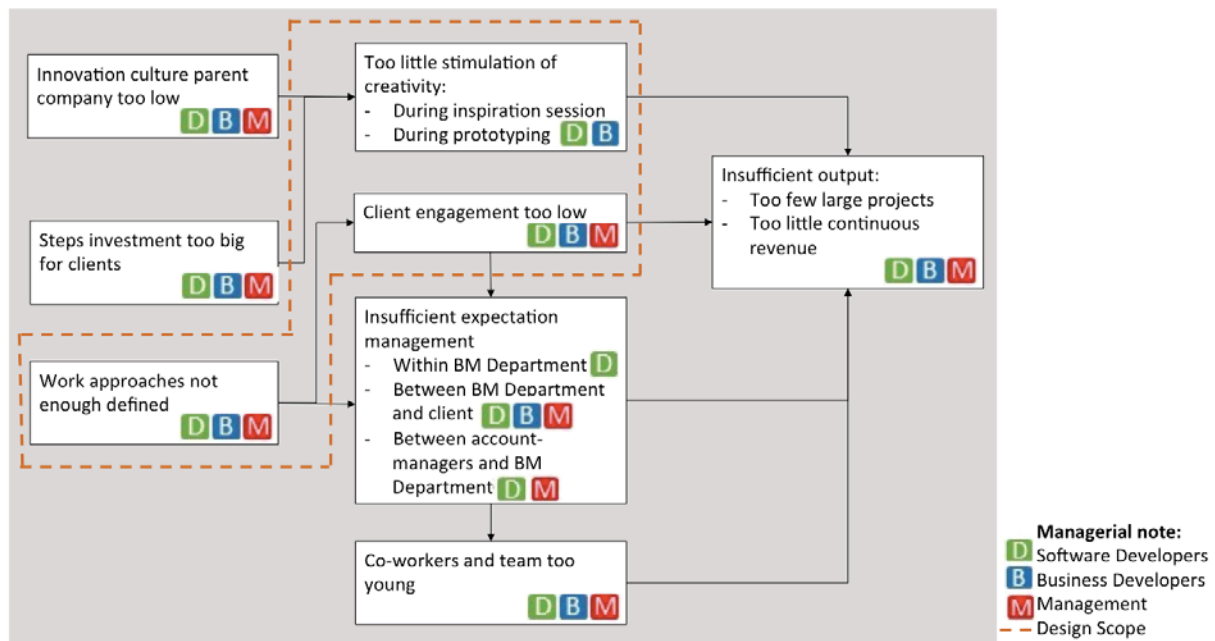


Figure 1. Cause and effect diagram (Porrás, 1987) with design scope.

## **Design**

Based on the result of the diagnosis phase, the researcher developed design requirements. In literature and best practices was sought for fitting solutions fitting these requirements to mitigate the gap and decrease the effect of the bottlenecks. Design tools are found in three categories: Bohmian dialogue variations, physical workspace design for creativity, and Design Thinking. The design tools are evaluated with help of the design requirements. Next, an evaluation is done on the effect the tools are expected to have when used simultaneously. The decision is made that a combination of tools is the optimal solution and this is proposed as the final design for BM Department. The final design provides a menu with simple tools that can be selected and implemented.

## **Recommendations for future research**

Further research can be done by further developing the idea of combining models from the variable and C&C paradigm in depth. Secondly, the actual effect over time of combining several variable-based tools might be evaluated. Implementation and evaluation is outside the scope of this thesis.



## Preface

This master thesis is the result of my graduation project Innovation Management at the faculty Industrial Engineering & Innovation Sciences at Eindhoven University of Technology. About seven years ago I walked in here for the first time together with my dad for one of the open days. Not long after this I decided to move to Eindhoven and start the bachelor Industrial Design. I learned and changed a lot since then and I would like to take this opportunity to thank a few people for being a part of this process.

First of all, I would like to thank dr. Van Eijnatten and dr. ir. Vanderfeesten for their support and guidance. Dr. Van Eijnatten was my first supervisor during the master thesis project and my mentor during the past two years while working towards the graduation project. I often left our meetings inspired with new insights and ideas. Dr. ir. Vanderfeesten was my second supervisor during the graduation project. She provided me with many new insights and I experienced our meetings highly motivating.

Secondly, I would like to thank my colleagues at ICT Corp. for their interest in the research and the welcoming, inspiring, and fun working environment during the thesis project. I would especially like to thank my company supervisor for the opportunity to perform this project at ICT Corp.

Finally, I would like to express my gratitude towards my mum and dad, opa en oma, Tea, Jos, Oscar, Eva, Suus, Alice, Phil, Ineke, Lotte, Michel, Michelle, and my past and present housemates. Thank you for your continuous support and the fun times during the past seven years and the years to come.

Lisa van der Voort  
Eindhoven, April 2016.



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## List of Abbreviations

BM Department

ICT Corp.

SDL

SECI

TIP

Department the research is performed at

Company this thesis is performed at

Service-Dominant Logic

Socialization, externalization, combination, and  
internalization

Technological Innovation Partnership

# 1. Introduction

This chapter introduces the research by explaining the nature of the research, the company description, the research context, goals within the project, the theoretical and practical relevance of the research, and the boundaries of the research.

## 1.1 Nature of the Research

This research is a design-oriented research. According to Van Aken, Berends and Van der Bij (2012) design-oriented research aims to understand the objects of study and to develop alternative solutions for a problem. The research is future-oriented. The counterpart of design-oriented research is exploratory research, of which the only objective is merely to understand the objects of study. Van Aken *et al.* (2012) mention the following characteristics of design science: *“it is driven by field problems (not by pure knowledge problems), it uses an actor’s perspective (not an observer’s perspective), it is solution oriented (not aimed at only understanding the problem), and it justifies research products on the basis of pragmatic validity (whether it works or not)”* (p. 61). The process of the research is based on Van Strien’s (1997) regulative cycle. During this master thesis project the first three steps (challenge definition, diagnosis, and design) will be performed. As shown in Figure 2, the design is not the end goal but merely input for the next phase ‘intervention’.

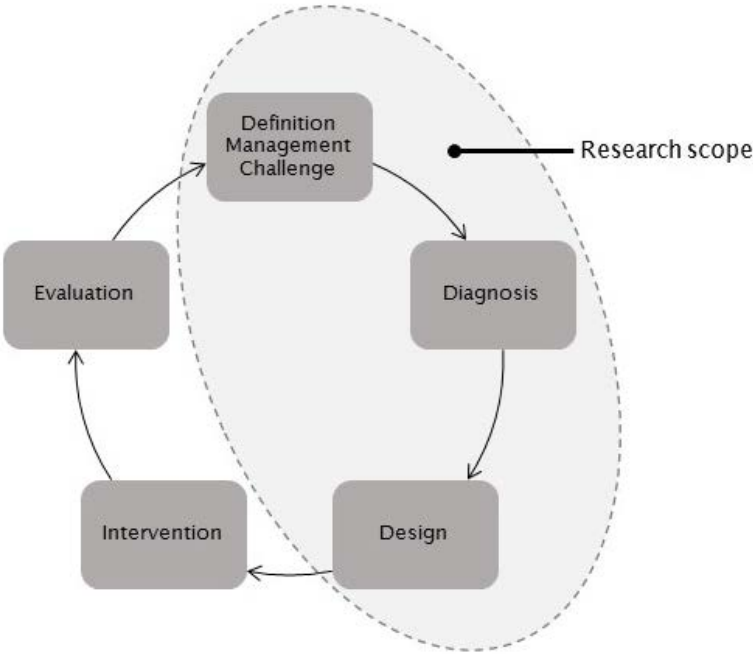


Figure 2. Regulative Cycle (Van Strien, 1997). This thesis will execute the following steps: Definition Management Challenge, Diagnosis, and Design.

## 1.2 Company Description

ICT Corp. is a public limited liability company that provides consultancy in ICT and business solutions for the public sector, several industry sectors, health care sector and financial services sector. Of these sectors the public sector accounts for the largest part of the revenue in 2014. ICT Corp. takes care of development, implementation and management of the provided ICT solutions. The company employs about 3000 people. The head office is located in The Netherlands and serves mainly Dutch customers (ICT Corp., 2014).

The business unit of ICT Corp. that will be analyzed during this master thesis is BM Department. BM Department is at the start of this project only two-and-a-half years old. The department is still growing in amount of co-workers and revenue and treated as a start-up within ICT Corp. BM Department provides its clients with services related to the application of the newest technological innovations in the specific context of the client. Examples of types of innovations the business unit works with are: sensing, wearables, robotics, augmented and virtual reality, and the Internet of Things (ICT Corp., 2014).

## 1.3 Research Context

ICT is playing a progressively more important role for companies each day due to exponential growth in availability of new technologies. This is an opportunity for ICT Corp. and BM Department to grow and build rewarding long-term relationships with clients. Since ICT solutions are mostly not 'quick fixes' but long-term projects that develop and change with the dynamics of the client company. Therefore durable relationships are considered advantageous for both ICT Corp. and its clients (ICT Corp., 2014).

### Technological Innovation Partnerships (TIPs)

The main goals of the TIPs for BM Department's clients is to decrease costs and increase revenue, increase the innovative status, and realize higher employee engagement. For BM Department this results in: increased revenues, building blocks of software that can be used for other projects, and a more innovative corporate image for ICT Corp. The content of a TIP contract is based on the wishes of the client but can for instance indicate how many activities are performed over a fixed period of time. These activities can include, among other things, inspiration workshops, prototyping projects, and pilot tests.

## 1.4 Goals within the Master Thesis Project

This chapter aims to describe the management challenge and the goals of the diagnosis and design phase of this research.

### 1.4.1 Definition of the Management Challenge

The performance of the TIPs is not examined yet and everything seems to be going well. However, BM Department has an ideal picture in mind with a higher turnover and more TIPs. The business unit aims to provide the best ICT and new product development services possible to their customers. BM Department recognizes co-creation as an important approach in achieving this ideal picture.

The management challenge is:

*Optimizing the TIPs to create durable client relationships.*

### 1.4.2 Diagnosis Goals

The first goal of the diagnosis phase of the master thesis is to list organizational characteristics of the current and desired state of the TIPs. Secondly the aim is to highlight the gap that exists. The diagnosis phase will result in a deeper understanding of the current state, desired state, and performance towards the desired state of BM Department's TIPs.

Questions that will be answered are:

#### 1. What is the current state of the TIPs?

- 1.1 *What is the current performance of the TIPs in terms of amount, dimensions, outcomes, and profitability?*
- 1.2 *What do the working processes look like?*
- 1.3 *Which bottlenecks influencing the performance can be discovered in the current TIPs?*

#### 2. What is the desired state of the TIPs?

- 2.1 *What is the performance according to BM Department and company documents in terms amount, dimensions, outcomes and profitability?*
- 2.2 *What does the desired working process look like?*
- 2.3 *Which characteristics can be discovered influencing the desired state?*

#### 3. What is the gap between the current and desired state?

- 3.1 *What does the qualitative gap look like in terms of dimensions, outcomes, and profitability?*
- 3.2 *Which factors should be improved upon to mitigate the gap?*

### 1.4.3 Design Goals

The objective of the design phase is to redesign parts of the organization (e.g. structure, processes, and protocols) to mitigate the gap between the current and the desired state of the TIPs. This will result in a conceptual design; a practical description of how the design of the new structure, process, and protocols can be used to increase organizational performance.

The questions to be answered are:

**1. How can the gap between the current and desired state be mitigated?**

- 1.1 *Which requirements should the design meet taking into account the company context?*
- 1.2 *Which design directions can be extracted from literature, best practices, and expert recommendations?*
- 1.3 *Is there a solution or combination of solutions available that fits the company context of BM Department or should a new solution be developed?*
- 1.4 *Which improvements in terms of organizational structure, processes and protocols (etc.) can be made to decrease the gap between the current and desired state of the Technological Innovation Partnerships?*

## 1.5 Relevance of the Research

### 1.5.1 Theoretical Relevance

Present-day academic literature provides a large amount of information on co-creation, creativity and organizational learning. Management literature provides numerous tools that can be used to optimize these three factors. Knowledge on how to apply both academic and management literature to a specifically defined company context is limited. Academic literature is often perceived as being too abstract to put into practice by companies. Management literature elaborates upon tools that worked well in one specific company context, making the described interventions often not applicable in a slightly different context. There exists a need to define how management literature and academic literature can be used to ground, improve, and design company processes. This research does just that.

### 1.5.2 Practical Relevance

The impact of the research for BM Department is mainly in the value of the design deliverable. The design will provide a conceptual design for the TIPs to increase effectiveness and efficiency of the process. It is a first step towards optimization of the TIPs. The implementation of the design will provide BM Department with the possibility for a certain degree of improvement on several aspects.

For BM Department the following impact could be expected:

1. A higher amount of TIPs,
2. More productive TIPs:
  - Increased innovation
  - Increased revenue

## 1.6 Boundaries of the Research

The thesis project will be approached from multiple perspectives: people, processes and (ICT) systems. The final deliverable of the design phase will be a conceptual design in the form of a structure for collaboration focused on building more successful TIPs. The master thesis project should be limited to this specialization, e.g. intellectual property rights and security are outside the scope of this thesis.

The thesis has a time restriction. For this reason, the final deliverable will not be an implemented and evaluated solution.

## 1.7 Report Structure

This chapter introduced the management challenge and goals this research is guided by. Chapter 2 explains the methodological lens of this research and concepts fitting the research scope. Chapter 3 elaborates upon the research methods used for the diagnosis and the design phase of this thesis. The results of the research can be found in Chapter 4.1 and 4.2. Chapter 5.1 explains whether or not and to what extend the research questions of Chapter 1.4.3 are answered. Chapter 5.2 contains a reflection on the research method used and a theoretical reflection. In Chapter 5.3 the researcher elaborates upon her personal experience of the realization of this project. The structure of this report is summarized in *Table 1*.

*Table 1. Report structure.*

Report Structure			
Research Background	Diagnosis	Design	Discussion of results
Chapter 1 Introduction	Chapter 4.1 Results Diagnosis	Chapter 4.2 Results Design	Conclusion
Chapter 2 Theoretical Background			Reflection on Research Method
Chapter 3 Research Method			Theoretical Reflection
			Personal Reflection

## 2. Theoretical Background

This chapter describes the theoretical context that this research is guided by. First of all, the methodological background is explained. Three paradigms can be extracted from current day research on the topic of organizational creativity and co-creation (Van der Voort, 2015): the Variable paradigm, the Systems paradigm and the Chaos & Complexity (C&C) paradigm. The Variable paradigm takes on a partial worldview. Management literature fitting this paradigm provides a lot of easy-to-use tools. The C&C paradigm takes on a holistic worldview. The advantage of the C&C worldview is that it provides a more complete understanding of mechanisms that lead to organizational change. Theories fitting this paradigm take into account interactions of entities on more than one level, which is not done by research in the variable paradigm. Outcomes of interventions in this paradigm are less, or not at all predictable. Due to the relative newness of management research in this paradigm, the amount of easy-to-use tools that fit this paradigm is low. The aim of this research is to generate solutions that are strongly grounded in literature and easy to use in practice. For this reason, this thesis takes on an eclectic approach; using theories and tools from both paradigms.

The Systems paradigm can be seen as a transition between the variable and C&C paradigm, taking elements of both paradigms. In the remainder of this research it will not be used further, but it is provided in this section to show the complete spectrum of found paradigms in current day management literature on creativity and co-creation.

Section 2.2 explains concepts found in literature to generate a better understanding of the topics within the scope of this thesis. It explains more on service science, service-dominant logic (SDL), co-creation, and creativity.

### 2.1 Paradigms

This section describes the paradigms found in current day literature (Van der Voort, 2015). There is no single definition of the Variable, Systems and C&C paradigm. The paradigms can be placed on a continuum from simplicity to complexity (Van der Voort, 2015).

#### 2.1.1 Variable Paradigm

In the Variable paradigm (Van der Voort, 2015), researchers usually see *“the whole as a sum of its parts”* (e.g. Montuori, 2011, p. 418). The system is broken down into its simplest components. In the Variable paradigm, the researcher separates between A & B (Montuori, 2011). It is clear where the boundary is between A (inside) and B (outside) and *“inside is where the action is”* (Montuori, p. 417). *“The underlying assumption is that atoms exist in isolation from their environment, and that knowledge on the behavior of the atoms could be used to predict the future of the system as a whole”* (Monuori, 2011, p.419). The general thought is  $A+B=C$ , so when A is increased with value X, B stays the same and C is increased with



value X'. Typically research in the Variable paradigm is purely analytic, done in a laboratory setting and all independent and dependent variables are measurable (research is quantitative).

Montuori (2011) links the reductionist view to the 'Newtonian world': *"a deterministic world wherein everything had to happen by necessity. Once set in motion, the universe unfolds following precise laws [...] there is an unquestionable order to the universe, and anything we consider disorder or complexity is simply a function of our limited knowledge"* (Montuori, 2011, p. 419). Before Newton (17<sup>th</sup> century) the view was that the *"laws of nature were the laws of God and these laws are perfect, therefore no change occurs, is necessary or even possible [...] Being a real science is defined largely by the capacity for prediction and control"* (Muntuori, 2011, p. 420). The Newtonian view still holds the idea that the world is static and time does not play a role. *Figure 3* shows an example of a variable based approach.

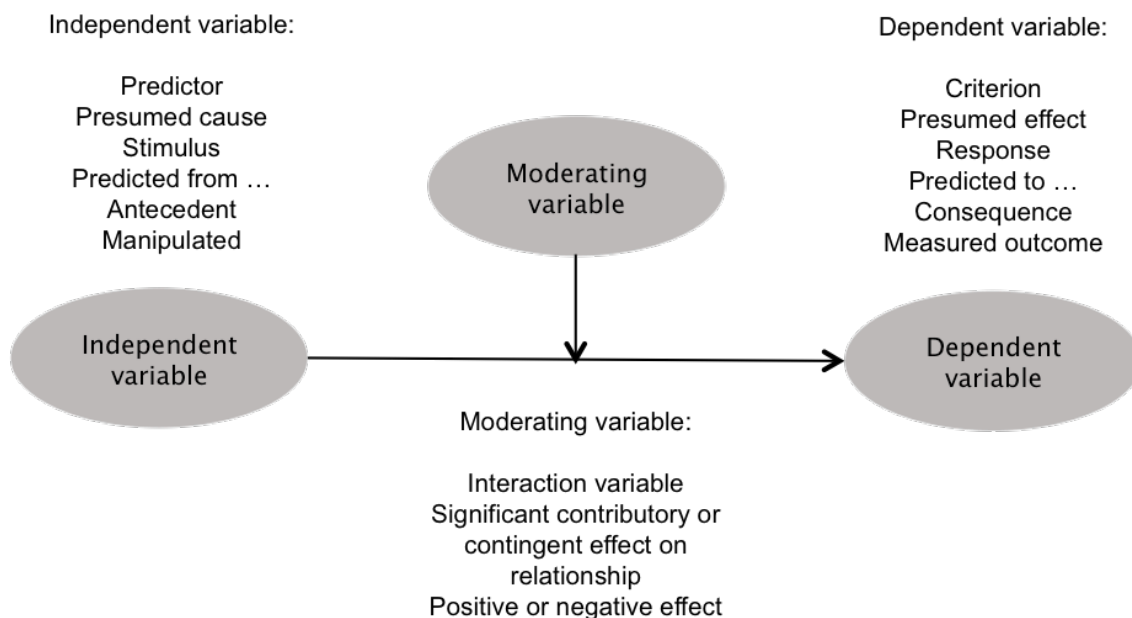


Figure 3. Example of variable based approach (Cooper & Schindler, 2008).

### 2.1.2 Systems Paradigm

Vranken (2012a) provides an appropriate definition of the meaning of a system in the systems paradigm: *"A system consists of elements, which have a set of attributes, that have process-like internal relationships to one other. The system's boundaries define its place within its environment. A system always has a goal it strive to achieve, i.e. its steady state. When studying systems, the system as a whole is the unit of study, not the object, attributes, and relations operating within the system"* (Vranken, 2012a, p. 42). Organizational systems are often open systems, which means interaction with the organizational environment takes place.

Montuori (2011) links the systems paradigm with the development of Darwin’s evolutionary theories. These theories caused a change in the view of the world from the static variable perspective to a more complex world wherein “time played an active, creative role, because things changed as they reproduced, and as they come into contact with each other” (Montuori, 2011, p. 421). Figure 4 shows an example of a system-based approach.

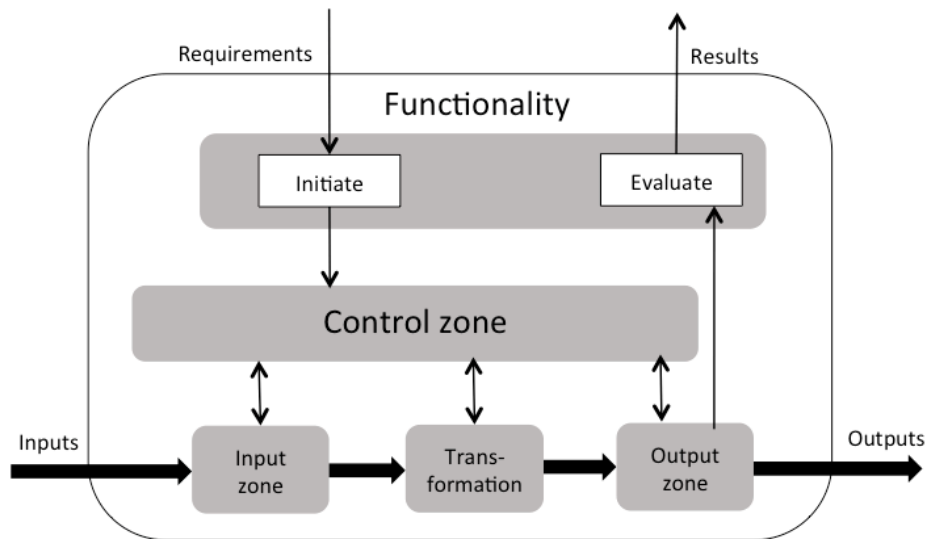


Figure 4. Example of system based-approach, reproduced from Veeke (2003, p.4).

### 2.1.3 C&C Paradigm

Management science started to accept the C&C paradigm in the 1980s, which made it one of the last sciences to embrace the paradigm (Van Eijnatten, 2004). The C&C paradigm is an extended systems approach, which recognizes intensive interaction between the elements. It includes systems that are far from equilibrium. In the C&C paradigm researches focus on an even larger whole than in the system paradigm and the assumption is made that the complex system moves according to a Sigmoid curve (see Figure 5). Researchers do not look for input and output but for patterns in behavior. In the C&C paradigm it is recognized that many elements interact with each other in many ways and sudden events can change everything. Every entity (e.g., an individual) is both an autonomous whole and part of a larger autonomous entity (e.g., a team). These entities are also referred to as ‘holons’ (Edwards, 2008). Developments inside one holon influence developments within higher and lower level holons. Time and the current state of the system play an important role because these factors decide which mechanisms in the complex system are active. Research in this paradigm is qualitative. The aim is not to measure exact variables but to find the boundaries within which the system moves. At these boundaries the system enters the ‘zone of complexity’ and can transform or move into another direction. The behavior of the C&C system is non-linear.

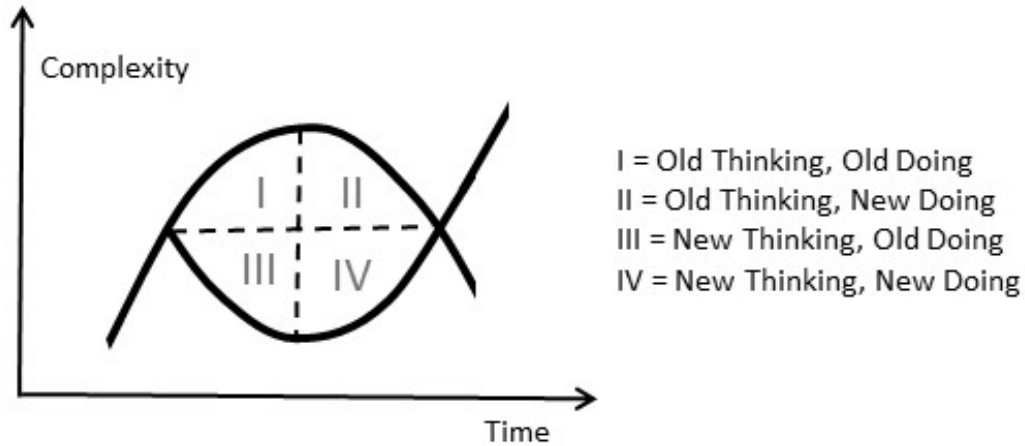


Figure 5. Example of C&C based approach, reproduced from Van Eijnatten (2004, p. 436).

## 2.2 Concepts

This chapter describes theories on creation of new knowledge and learning in organizations.

### 2.2.1 Service Science & Service-Dominant Logic

Service science is a relatively new academic discipline that explores how theories and methods from existing disciplines can be applied to the globally growing service sector (Spohrer & Maglio, 2008). Spohrer & Maglio (2008) define a service as *“clients and providers working together to transform some client-controlled state”* (p. 240) and imply that the client is a key stakeholder in the co-creation of solutions. Service science is a relevant field for IT, because *“Nowadays clients rarely buy an IT system simply because of its technical capabilities (faster, more capacity, etc.) but instead require a business model (return on investment) and an organizational change model (reengineered processes and job roles) that will make the technology an effective solution to their business problems”* (Spohrer & Maglio, 2008, p. 239).

The philosophical foundation of service science lies in service-dominant logic. Vargo & Lusch (2004) explain the evolution in the marketing discipline from a goods-dominant logic (GDL) to a service-dominant logic (SDL). In the GDL outputs are tangible and the customer pays for the output. The meaning of a service in the GDL is a type of output that a consumer can pay for, e.g. health care and education (Vargo & Lusch, 2004). Within the SDL service is defined as: *“the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself”* (Vargo & Lusch, 2004, p. 2). In the SDL goods have no value by themselves, rather: *“value is defined by and co-created with the consumer rather than embedded in the output”* (Vargo & Lusch, 2004, p. 6). Appendix I. shows more details on how to distinguish between the GDL and SDL.

Maglio & Spohrer (2008) explain a service system as a type of sociotechnical system. (Vargo & Lusch, 2008) recognizes that smaller systems influence bigger systems and the other way around. Service science theory has characteristics of a theory in the C&C paradigm.

### 2.2.2 Co-Creation

In the SDL value is determined by the experienced value in use by the customer. The customer is a co-producer of the service (Vargo & Lusch, 2004). Prahalad & Ramaswamy (2004) point out the importance of co-creation from customer satisfaction point of view: *“Armed with new tools and dissatisfied with available choices, consumers want to interact with firms and thereby co-create value. The use of interaction as a basis for co-creation is at the crux of our emerging reality”* (Prahalad & Ramaswamy, 2004 p. 5). Through exponential technological development over the past years the customer has changed from isolated to connected, from unaware to informed, from passive to active (Prahalad & Ramaswamy, 2004). Prahalad & Ramaswamy (2004) propose the DART model of value co-creation; a process of co-creation through four building blocks: dialogue, access, risk assessment, and transparency. In short:

1. Dialogue: *“shared learning and communication between two equal problem solvers”* (p.6)
2. Access: *“to information and tools”* (p. 7).
3. Risk assessment: customers will *“insist that businesses inform them fully about risks, providing not just data but appropriate methodologies for assessing risks”* (p. 7)
4. Transparency: *“firms can no longer assume opaqueness of prices, costs, and profit margins. Information asymmetry is disappearing.”* (p. 7)

Payne, Storbacka & Frow (2007) explain that in the traditional view organizations operate inside-out: organizations make decisions about which products they make, and then sell these products to a target group. In the SDL, organizations operate outside-in: the organization starts from understanding the customer’s point of view, and both the customer and the organization create value together accordingly. *“Value co-creation demands a change in the dominant logic for marketing from ‘making, selling and servicing’ to ‘listening, customizing and co-creating’”* (Payne et al., 2007, p. 89).

### 2.2.3 Organizational Creativity

The literature review (Van der Voort, 2015) explains that research about the emergence of organizational creativity can be found within the three different paradigms explained in chapter 2.1. The literature review (Van der Voort, 2015) splits available research on creativity in two aspects: theories and instruments. Instruments provide practical steps plans for increasing creativity but often lack explanation of what mechanisms cause the instruments to work. Theories elaborate on the mechanisms causing the emergence of organizational creativity, but often lack practical guidelines for implementation in the organizational environment. A rigor-relevance gap exists between the creativity theories and instruments. Van der Voort (2015) used design propositions following the CIMO-logic to

evaluate several theories and instruments. The CIMO-logic is as follows: “in this class of problematic Contexts (C), use this intervention type (I), to invoke these generative Mechanism(s) (M), to deliver these Outcome(s) (O)” (Denyer *et al.*, 2008, pp. 395-396). Generally, theories were found to be strong on describing the generative mechanisms, and sometimes in describing the context. Creativity instruments are strong on providing interventions and outcomes. The only authors providing all CIMO-logic aspects are Bohm (1996) and Nonaka, Toyama, & Konno (2000), which are both studies fitting the C&C paradigm.

The remainder of this subchapter goes into two theories on organizational creativity; one based in the variable paradigm, and one based in the C&C paradigm. The chosen theories were found to be the most elaborate theories in the paradigms.

**Organizational creativity in the variable paradigm: Amabile (1988) componential model of organizational innovation.**

According to Amabile (1996) creativity is the production of novel and appropriate ideas. Creativity can be enhanced by increasing the individual’s domain related and creativity related abilities and motivation. Amabile’s (1988) componential model of organizational innovation describes the process and factors influencing innovation. Individual creativity has similarities with organizational innovation. Both are described as a sum of expertise, creative-thinking skills, and motivation (Amabile, 1996). These factors have to be existent at least to some extent within an individual or organization to overlap and create an area that is called ‘The Creativity Intersection’. “This is the area of highest creativity for individuals and highest innovation for organizations.”(Amabile, 1988, p. 157)

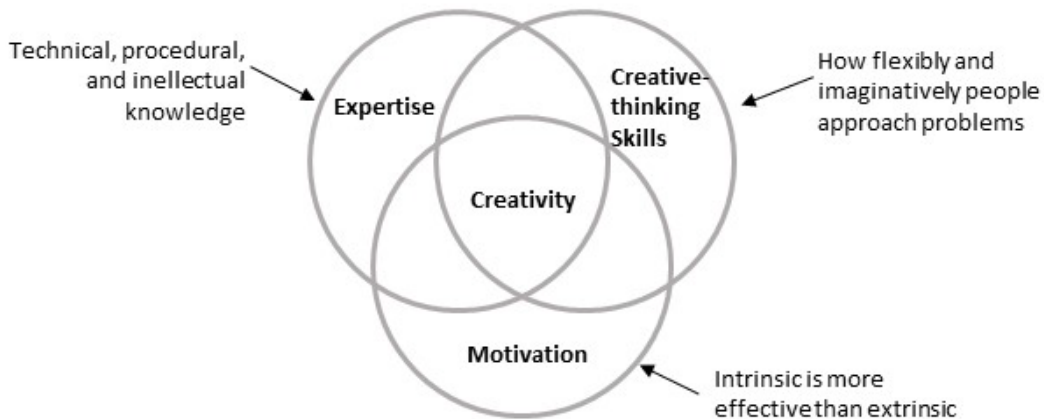


Figure 6. Three Components of Creativity, reproduced from Amabile (1998, p. 78).

Amabile (1998) describes that the managerial practices that affect creativity fall into six categories: challenge, freedom, resources, work-group features, supervisory encouragement, and organizational support. In later work of Amabile & Kramer (2012) three more mechanisms activating creativity can be found, namely: fostering positive emotions, positive perceptions and motivations (intrinsic, extrinsic and relational or altruistic). Emotions, perceptions and motivations create employees' 'inner work life'. A rich inner work life increases productivity and creativity. Three forces that support inner work life are: making progress, catalysts and nourishers (Amabile & Kramer, 2012).

Amabile & Kramer (2012) argue that 'making progress' and 'inner work life' create either a positive or negative self-reinforcing loop. The cycle can be broken by intervening events. Catalysts of innovation are: setting clear goals, allowing autonomy, providing resources, giving enough time – but not too much, helping with the work, learning from problems and successes, and allowing ideas to flow (Amabile & Kramer, 2012). Nourishment includes: respect, emotional support (validation and preferably empathy from management), encouragement (validation and expression that management believes individuals are capable of doing the work), affiliation (mutual trust, appreciation, and affection) (Amabile & Kramer, 2012).

Amabile's theory fits the variable paradigm since it mentions many variables that increase creativity. For instance, in Amabile (1998) creativity is the sum of its parts: expertise, creative-thinking skills and motivation. By increasing these parts with value X, the outcome is increased with value X as well. Amabile (1988, 1998) has a descriptive nature: the mechanisms activating creativity are described extensively but not much attention is paid to possible interventions. The Progress Principle (Amabile & Kramer, 2012) is focused at managers and leaders in organizations and therefore a good example of making scientific literature more appealing to management and bridging the rigor-relevance gap. It contains many personal and inspirational stories to support the mechanisms found in earlier research. Since The Progress Principle focuses more on mechanisms than interventions, in this literature study it is placed under theories instead of instruments.

### **Organizational creativity in the C&C paradigm: Nonaka *et al.* (2000) SECI model**

Nonaka *et al.* (2000) explain the dynamic process of knowledge creation. Organizations are not just information processing machines, but entities that create knowledge through action and interaction (Nonaka *et al.*, 2000). Organizations interact with their environments and reshape themselves and their environment by creation of knowledge.

Nonaka *et al.* (2000) describes that creation lies at the edge of order and chaos and sees knowledge as "*a dynamic human process of justifying personal belief toward the 'truth'*" (p.3) and as information put in context (Nonaka *et al.*, 2000). New knowledge is created through interaction between individuals, the organization and the environment; the notion of holon is present. Nonaka *et al.* (2000) recognizes that paradoxes are needed in the creative process and knowledge is created through a spiral in which the C&C system switches between opposites (e.g. chaos & order, tacit & explicit, logic & emotion, and action

& cognition). The spiraling process of interactions between tacit and explicit knowledge leads to new knowledge creation (learning). This process can be divided into four categories through which an individual, group, or organization moves to generate new knowledge. These four spaces are referred to by Nonaka (2000) as “*ba*’s” (see Figure 7).

*Ba* indicates a shared space for knowledge creation. This space can be physical (e.g. an office) or virtual (e.g. e-mail or a teleconference). Knowledge is created in the *ba*’s through the Socialization, Externalization, Combination, and Internalization (SECI) process. The four types of *ba*’s are connected to the four stages of the SECI model (Nonaka *et al.*, 2000). The space can be a physical or virtual space or a combination of both. Knowledge creation is a spiraling process of interactions between explicit and implicit knowledge in the four different *ba*’s. This model can only be applied in the context of distributed leadership or middle-up and middle-down management. It cannot be applied in the case of top-down leadership, since managers need to lead the knowledge creation process by providing the conditions creating the *ba*’s. Information flows cannot be managed in the traditional sense. Due to the spiraling process instruments used in one *ba* influence the input for the next *ba*.

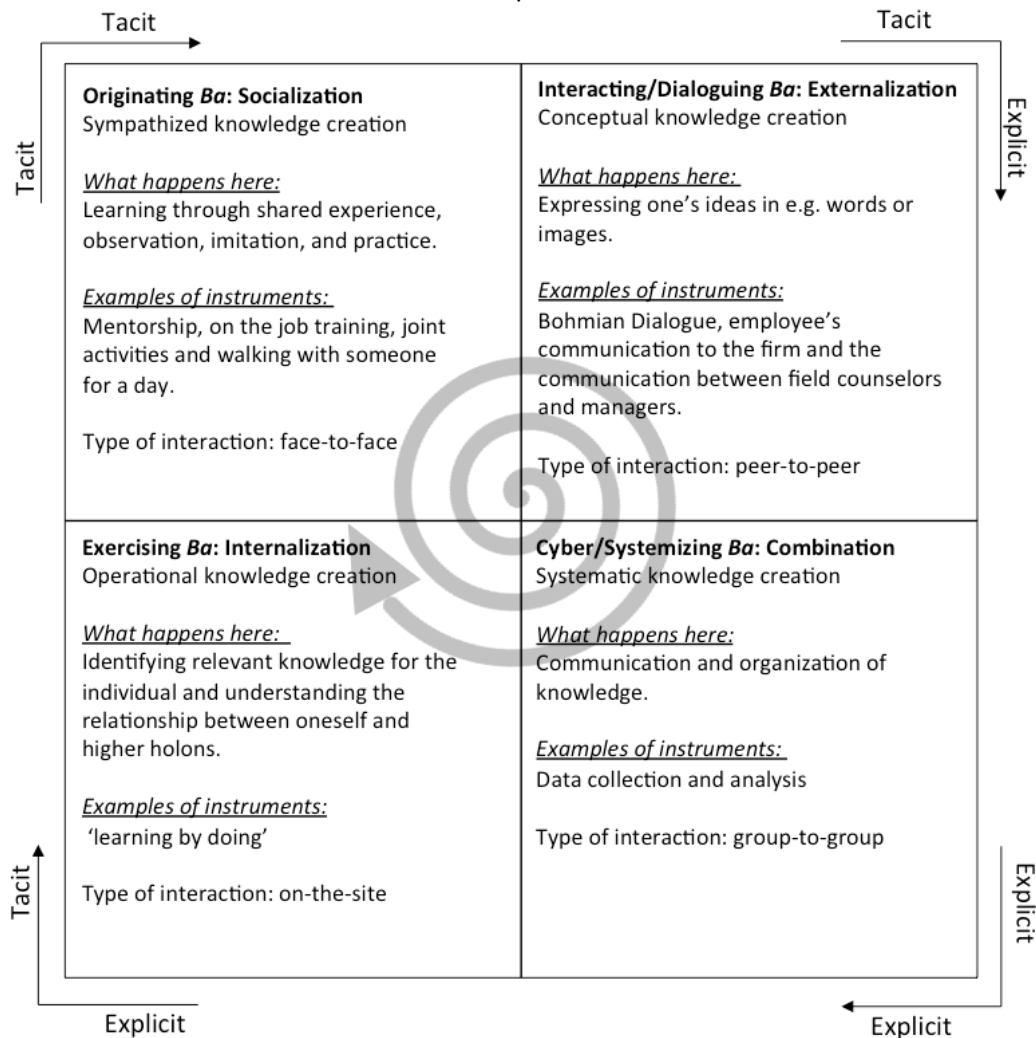


Figure 7. Spiraling process of knowledge creation in *ba* with explanations and instruments (Nonaka *et al.*, 2000).

## 3. Research Method

This chapter describes the research method that will be used in the diagnosis and the design phase.

### 3.2 Method Diagnosis Phase

This subchapter outlines the methods that will be used to perform the diagnosis phase of the research.

#### 3.2.1 Method of Data Collection

Data collection for the purpose of this thesis will be done by collecting company data and documentation and performing and analyzing semi-structured interviews.

##### **Data collection current state**

Use of Data: Data from performance management systems with quantitative performance indicators, if this is available and access is granted for the purpose of the thesis. Examples of qualitative and quantitative performance indicators are:

- Current revenue,
- Outcomes of Inspiration workshop (movies of pitches by clients, PowerPoints with ideas on post-it notes),
- Increased efficiency in terms of time and costs for both BM Department and the client
- Client feedback,
- Media attention,
- Amount of current TIPs,
- Amount of assignments for prototype development over time, and
- Amount of Inspiration workshops over time.

BM Department exists about 2,5 years, so data will be within that period.

##### Use of documentation:

- Current revenue,
- Documentation on the functions within BM Department/TIPs,
- Previous research on associated topics, and
- Yearly reports.

Relevant documentation will be found through snowball sampling.

Use of interviews: Semi-structured interviews will be performed with ICT Corp. co-workers who are familiar with ICT Corp.'s and BM Department's strategy. Eight interviews is an adequate sample size for this study. All interviewees should be closely involved in the TIPs. It is desirable to interview people from all areas involved e.g.: two interviewees in management functions, two project leaders, two business or user experience consultants, and two technical consultants. Interview checklists can be found in Appendix II.



### **Data collection desired state**

#### Use of documentation:

- Strategic plans,
- Performance goals of BM Department associated with the TIPs, and
- Yearly reports.

Use of interviews: Semi-structured interviews with ICT Corp. employees who are familiar with BM Department's and ICT Corp.'s strategy. This can be the same interviews as mentioned in the 'current state'. Interviews with (top-)management will be highly relevant in this step since these interviewees are likely to be more involved in strategy development which is needed to identify the desired situation of the TIPs. Eight interviews with the same people mentioned in the data collection of the current state will be sufficient.

## **3.2.2 Method of Data Analysis**

#### Methods of data processing

The type of data analysis considered appropriate depends on the nature of the data (qualitative/quantitative and objective/subjective).

1. Company data will be analyzed with help of descriptive statistics.
2. From the semi-structured interviews performed for the purpose of this master thesis the statements supported mentioned by the majority of the interviewees will be used (the aspects on which 60% consensus is attained). The greatest common denominator method is used. Statements about the current and desired situation will be collected in Excel and compared.
3. Company documentation can supplement and reinforce the interview data.

#### Gap-analysis

The gap-analysis will show the difference between the current situation of the TIPs to reach the strategic goals and the desired situation of the TIPs to reach the strategic goals. Due to the qualitative nature of the thesis the current and desired state and the gap are likely not to be expressed in quantitative data, especially if performance management systems with quantitative performance indicators are not present. Quantitative data is easier to interpret; therefore the goal is to quantify the data for the description of the current and desired state and the gap.

### 3.3 Method Design Phase

This chapter is elaborated upon the methods used in the design phase of the master thesis. The aim of the design phase is to find a fitting solution to mitigate the gap. The design method includes a requirements specification, method of data collection, method of data analysis, and method of design.

#### 3.3.1 Requirement specification

The aim of the requirement analysis is to define what conditions the design should meet to satisfy all involved stakeholders. The result of this subchapter is a list of system requirements with explanation that serves as an input for the design phase of the thesis. The expectation is that requirements can be divided into functional requirements (describing inputs, outputs, and behavior; what is the system supposed to do?) and non-functional requirements (what is the system supposed to be?) (Van Aken *et al.*, 2007). Requirements will be specified based on the results of the diagnosis phase.

#### 3.3.2 Method of Data Collection

The first step of the data collection in the design phase is to gather a wide range of fitting solutions relevant for bridging the current situation - desired situation gap described in the diagnosis phase. This will be done through three approaches:

Literature: will be especially helpful to find successful solutions.

Consulting experts and practitioners: all stakeholders of the TIPs are experience experts. Management, employees and clients will be valuable in co-designing solutions fitting the organization.

Best practices: how did other organizations deal with similar challenges? This data is probably most difficult to find due to confidentiality. Consulting experts on e.g. business management systems, human resource management, and management of service organizations can also be helpful.

The smallest denominator method is used to create a collection of possible solutions from literature, best practices, and experts.

#### 3.3.3 Method of Data Analysis

The design suggestions found in literature, best practices, and from experts will be evaluated on the requirements by the researcher. A design suggestions are rated as stated in Table 2 and Table 3.

Table 2. Method of data analysis for the design.

	Requirement A	Requirement B	Requirement C
<i>Design suggestion 1</i>	0	+	++
<i>Design suggestion 2</i>	-	-	++
<i>Design suggestion 3</i>	+	0	+

Table 3. Classification of adherence to requirements/mutual occurrence, reproduced from Vranken (2012, p. 39).

Classification	Definition	Symbol	Scoring
<b>Highly appropriate</b>	The design intervention highly contributes to either a requirement or another design intervention.	++	2
<b>Appropriate</b>	The design intervention positively contributes to either a requirement or another design intervention.	+	1
<b>Neutral</b>	The design intervention does not have an effect on either a requirement or another design intervention.	0	0
<b>Conflicting</b>	The design intervention conflicts with a requirement or another design intervention. Conflicting here refers to as having a negative effect on the implications of a requirement or workings of another design intervention.	-	-1
<b>Highly conflicting</b>	The design intervention is highly conflicting with a requirement or another design intervention. Conflicting here refers to as having a negative effect on the implications of a requirement or workings of another design intervention.	--	-2

### 3.3.4 Method of Design

The data analysis provides a basis for decision-making. There are three options available; there is a fitting design suggestion, a fitting solution can be made by combining design suggestions, or a fitting solution should be designed from scratch by the researcher in collaboration with BM Department.

## 4 Results

### 4.1 Results Diagnosis

#### 4.1.1 Results data collection

Company data: Some data was found on revenue over time in an Excel file (see Appendix III) Employee engagement is measured by ICT Corp. on department level. Client engagement is evaluated by the parent company as well but not useful for evaluation of specifically BM Department's clients. The researcher took the chance to develop a short survey and send this out to clients to have an indication of the experience of the partnership according to the client so this can be taken into account when describing current situation, desired situation, and gap. See Appendix IV for the client surveys and a summary of the results.

*Table 4. Found data.*

Topic	Document	Additional notes
Revenue per project over time Amount of projects over time Size of projects over time	Appendix II	April 2014-May 2015
Amount of partnerships over time	Contracts on BM Department Sharepoint	-
Client feedback	Appendix IV.	Collected during this research.
KPIs	Companywide level: yearly report department level: plan BM Department 2015 Co-worker level: Competence compass (appendix V)	Co-workers also have personal KPIs (e.g. follow specific course).
Employee engagement	E-mail company supervisor	Research done by Research Effactory. Only an average score provided for this research.

Company documentation: Documentation on company level was found through the yearly report and documentation on SharePoint. Due to the young age of BM Department not everything within the business unit is defined yet. A lot of information not found in documents was gathered during the interviews. During the interview with one of the managers it was said that the aim is to keep the time spent on documentation as low as possible. The researcher was given access to the department's SharePoint with much working documents on current and past projects.

Interviews: Nine interviews were performed as planned. The interviews took place between the 20<sup>th</sup> of October and the 30<sup>th</sup> of October 2015 at ICT Corp. The interviewees were three business consultants, three technical consultants, and three managers (one operational manager, one partner, and one division manager). The interviews took one to one-and-a-half hour each. The interviews with technical consultants and business consultants focused merely on the description of the current situation, bottlenecks, the role of the interviewee and decision-making processes in the current situation.

Depending on the progression of the interview sometimes some questions about the desired situation, success factors and challenges for the BM Department were added. The interview with the first manager was similar, with added questions on strategy. After the interview with the first manager the researcher realized she had a lot of information about the current process already and less on the strategy and desired situation, which was the main focus of the interview with the three managers. Therefore, the decision was made to adapt the interviews with the other two managers to focus merely on strategy and desired situation. To sum up: two types of interviews were held, ‘operational interviews’ (held with three business consultants, two technical consultants, and one manager), and ‘strategic interviews’ (held with two managers of which one division manager). The operational interviews are used for both the consensus analysis and further description of current and desired state, the strategic interviews are merely used for the description of the current and desired state and not for the consensus analysis.

*Table 5. Found documentation.*

<b>Topic</b>	<b>Document</b>	<b>Additional notes</b>	<b>Can be found</b>
<b>Strategic plans</b>	Companywide: In yearly report, Department level: in PowerPoint Presentation Dashboards	Department dashboard in development and first published December 2015.	Company website. Appendix VI.
<b>Yearly report</b>	ICT Corp., 2014	-	Company website
<b>Performance goals</b>	Dashboard		Appendix IV
<b>Outcomes inspiration sessions</b>	Pictures and video’s collected via Sharepoint folder	-	Few examples in Appendix VII.
<b>Previous research associated topics</b>	The Power of coordinating digital innovations (Peterse, 2015)	Master thesis	Via author.
<b>Function description co-workers and management</b>	Company wide competency compass	Contains company wide function description	Appendix V.
<b>Amount of TIPs, inspiration sessions and prototyping projects over time</b>	Counted via SharePoint folders.	-	Appendix III.

## 4.1.2 Results data analysis

### ***Current situation***

The current situation is described with help of the following elements: vision & mission, strategy, company structure, company culture, financial model, current performance, type of clients, and the roles within the department<sup>2</sup>. The goal is to define these elements for ICT Corp. and define whether or not BM Department and the TIPs fit in these aspects. There is not a lot of documentation available due to the young age of BM Department. Information in this chapter is derived from the interviews and informal conversations, unless stated otherwise. After description of several aspects this chapter shows the results of analysis of the interviews in the form of a consensus analysis. In the last part of this subchapter the bottlenecks are used to define aspects that influence the current situation.

### Vision and Mission

ICT Corp. forecasts that ICT will play a highly significant role in solving societal issues faced today. The company recognizes the importance of knowing the client and the organizational context the client operates in to develop fitting and sustainable solutions (ICT Corp, 2014). BM Department explores the possibilities of new technologies (such as Google Glass and Virtual Reality) together with clients. Due to the newness of the technologies, the amount of existing pieces of software is limited and often completely new software needs to be developed for each specific client. This makes expectation management more difficult and the close involvement of the client in the process even more important. BM Department fits well into ICT Corp.'s company vision and mission. It carries out the focus on innovation and client engagement. BM Department is actively creating the future.

### Company Strategy

High customer satisfaction is mentioned as a strategic goal for 2015 (ICT Corp, 2014) besides strategic goals related to higher turnover and profit margins. BM Department focuses highly on developing services together with the client while generating business. Client involvement is regular during development cycles of two to three weeks at the end and beginning of which evaluation is held and requirements for the next cycle are decided upon based on what is realizable from BM Department's side and desirable from the client's perspective. Not only the solution is custom made, also the price and process are custom made. BM Department and the innovation partnerships fit well into the client engagement and innovation sections of the strategy of ICT Corp.

The interview with one of the managers revealed that the desire exists for more departments with a start-up structure and culture like BM Department. The company strategy (ICT Corp., 2014) supports this statement by saying that the aim is to have an iterative lean approach as used in start-ups to new service development.

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<sup>2</sup>A small percentage of the results contain sensitive information. If this is the case, a reference to the confidential appendices is made.

BM Department is mentioned in the yearly report of 2014 quite often for a relatively small department. This shows the relevance of BM Department for ICT Corp.'s internal and external marketing. The projects BM Department does that have more societal relevance make BM Department and ICT Corp. more attractive for potential clients, partners, and employees. The marketing value of BM Department is supported in the interviews. As said in one of the interviews: "Everyone talks about it".

TIPs are introduced from client need to boost innovation and employee participation. The TIPs create an opportunity for BM Department and customer to co-create, quickly innovate, and realize new projects. Parts of software (building blocks) developed for one customer can be used for another customer and the other way around so both benefit from the collaboration.

### Company Structure

ICT Corp. has a divisional organizational structure. Each division focuses on a specific product, market and client. The advantage of this structure is that the individual divisions and departments can to some extent react autonomously to changes in the market the business units operate in. Products are developed in one place instead of in different departments, which makes communication less complex. Each division, department cluster and department has his own top executive who functions as the tie between the lower unit and the unit above. BM Department started as a part of another department, but stands on its own two feet since the beginning of 2016. Appendix VIII. shows the organizational structure of ICT Corp. and the place of BM Department.

Co-workers of BM Department work in multidisciplinary, self-organizing teams. Some aspects of Scrum<sup>3</sup> and Agile<sup>4</sup> management are used such as: the moneybox principle<sup>5</sup> and daily Scrum meetings<sup>6</sup>. Both BM Department and the client decide together what approximately should be delivered at the end of the sprint. Due to the explorative nature of the projects it is not feasible to define a strict list of requirements that should be adhered to at the end of the sprint.

Decision-making on which projects to take on, is done by the operational manager and director of BM Department in collaboration with other co-workers. Co-workers decide themselves upon which software structures and methods to use.

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<sup>3</sup> Scrum: framework to develop software in a multidisciplinary and self-managing team. It has simple rules and requires little overhead which makes it a beloved way of working in present-day software development companies (Schwaber, 2004).

<sup>4</sup> Agile: group of software development methods that decrease uncertainty by working in an iterative manner whereby every iteration contains all steps of a project (i.e. planning, analysis, development, testing, and documentation).

<sup>5</sup> Money box principle: instead of defining functionalities a prototype should have at the end of the process, a specified amount of money that is allowed to be spend during the project. Budget is fixed, functionalities of the prototype are flexible.

<sup>6</sup> Scrum meetings: team members gather once a day to reflect on the process so far. Inform each other what they have done since the last meeting and which bottlenecks they experience at this moment.

### Financial Model

ICT Corp. is a public limited liability consultancy company; meaning the only 'product' on their balance sheet is the 'man hour'. Availability is the time by an employee spent on other projects than projects directly in assignment of a client. So to say, hours spend in 'availability' do not directly generate money and availability is therefore kept as low as possible. BM Department performs some projects directly for clients, generating 'hours'. Due to the R&D kind of nature of the department, the department also performs projects not directly linked to clients. To some extent the parent company takes this into account and BM Department is allowed a higher availability than other departments.

Innovation projects have a relatively short cycle and generate a relatively low profit (prototypes and inspiration sessions). Doing only these type of projects would not generate enough revenue for BM Department and availability between projects would become too high. The learning curve is high, which causes uncertainty in throughput time of a project. Public tender projects generate most of the revenue at this moment in time. These projects are often done in collaboration with other departments.

The learning curve in innovation projects makes them less efficient and more expensive for customers. This is solved by BM Department with the idea of building blocks of software. In the partnerships the customer agrees that developed software is allowed to be used with other customers. In return, the first customer benefits from the use of building blocks previously developed for other BM Department customers. Ownership of software is most of the time with BM Department, a customer does most of the time not have much advantage in owning a piece of software. BM Department often takes on part of the costs by offering discounts for projects that require completely new technology. Costs are fairly distributed between the different customers and BM Department.

### Current performance BM Department

Figure 8 shows deals made by BM Department from April 2014 until May 2015. Note that revenue generated from these deals is spread out over time. 62,1% of the revenue over this period comes from one public tender client, 8,6% from two TIPs, 21,8% from prototyping projects, 6,3% from secondment and other projects, and 0,7% from inspiration sessions. While growing BM Department operated on a turning point between break-even and a small profit.

Revenue over 2015 is displayed in Appendix III. The graph shows instable growth. Appendix III shows also which project contracts were signed between April 2014 and May 2015.



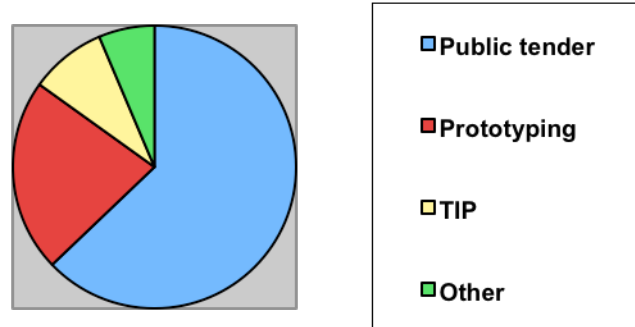


Figure 8. Distribution of revenue from closed deals April 2014 – May 2015.

### Company culture<sup>7</sup>

The interview with one of the managers pointed out that the enthusiasm of BM Department is distinctive for the department. For co-workers within BM Department their work is highly related to their personal vision and way of life. During informal conversations is confirmed that people ‘are not in it for the money’.

People, services, and processes need to be flexible to adapt to the quickly changing internal and external company environment. Interviews with management implied that hiring the right people with the right mindset is a crucial success factor. This mindset should be ‘to realize great things together’. When the mindset is right, this is expected to lead to people asking for help when needed, helping each other, create, communicate, and people living up to their promises and so on. The mindset leads to results, a high level of energy within the team, more assignments, and co-workers being proud of their work.

Co-workers have to keep developing their knowledge and skills. They should always be busy with the next step and avoid having their backs against the wall when new technologies come to market. Interviews with management indicated that the ability to adopt new technologies quickly and show its relevance in a specific situation (e.g. by prototyping) is rather unique for BM Department.

### Roles within BM Department

Within BM Department people have HRM function names (see Appendix V), which are defined by ICT Corp. According to many of the interviewees these function names merely define the co-workers’ salary. At the first of November 2015 BM Department existed of: twenty technical innovators, three business consultants, one consultant taking on both technical innovator and business consultant role, one operational manager, one director, and six interns of which five software developers and the writer of this thesis. *Table 6* shows a summary of what each role contains. It should be noted that this categorization is still somewhat generalized. The interviews with management explained that people sometimes focus largely on programming, but the aim is that co-workers take on different types of tasks. This information is merely derived from the interviews.

<sup>7</sup> Further elaborated upon in Appendix X.

Table 6. Brief summary of roles within BM Department derived from the interviews (see Appendix V. for elaborated version of companywide function descriptions).

Role	Description
Division manager	Supervisor of partner. Reports to Board of Directors.
Business unit director	Reports to division manager, director of business unit, contract owner, contract manager, visibility of BM Department, sales, hiring people.
Operational manager	Facilitating operational aspect of projects, resource planning, contracting, aligning new people with the BU, hiring people.
Technical consultants	Prototyping software (largest role), client contact, decision making within prototyping.
Business consultants	Client contact, marketing, sales, generating leads, closing deals, visibility of BM Department (e.g. client events).

### Type of clients<sup>8</sup>

For innovation projects it is important to build and make use of good client relations. Working from existing problems that the clients experience in their company environment works best. Working closely together with clients will be more likely to result in business. BM Department gains much of its revenue from industry clients. Large projects in the public domain often require public tenders, which fits less well with the explorative nature of BM Department innovation projects and the aim to build personal client relationships. Compared to other departments of ICT Corp., BM Department is involved in diverse projects that often have a high societal relevance. Some projects are small in terms of development and cost, but still have great value due to the story behind the project.

### Technological Innovation Partnerships Process

Based on collected documents and informal conversations a flowchart of the TIP process was created. This flowchart was evaluated during the operational interviews and adapted after each interview according to the feedback received. The final flowchart is displayed in figure x.

#### *General notes on the entire process:*

The main goal of the TIPs is to generate more continuous revenue and to innovate together with the client in a structured and systematic manner. Often, innovation does not have a fixed place in company processes. The goal of the partnerships is to provide a framework for innovation and enable the client to innovate. This framework should be flexible and adaptable to the client's desires and possibilities within BM Department.

The interviewees overall agreed on the process in *Figure 9*. However, often was said that this is a very formal way of describing BM Department's business process. One technical innovator recognized the process, but implied that an at least as strong flow was going from right to left; a large project causing

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<sup>8</sup> Further elaborated upon in Appendix X.

renewal cycles because old technology becomes outdated. Innovation is then inspired by the larger implementation and ICT management projects (e.g., a public tender project).

*Notes on subparts:*

- Identifying potential clients: this happens via the current network of the co-workers (including social media), the account managers of ICT Corp., client recruitment events, and contests and theme nights.
- Vision workshop: this step is often skipped since some clients have their vision shaped already.
- A concretizing step is sometimes necessary between the inspiration workshop and prototyping. The process is also more complicated than shown in this visual; e.g. it takes time for a client to find the right person with decision-making power. Budgeting and estimating are also steps that need to take place between inspiration workshop and prototyping. The operational manager can work with three aspects: budget, time, and functionalities of the prototype. In fixed price projects the Moneybox is fixed, often also time is fixed, then only functionalities can be adapted to available time and budget.
- Business case: in reality not performed yet within TIP projects, but could be done together with the client by BM Department. This entails more than just a financial business case. Implementation is often a big risk for a client, and often technology is not advanced enough to start a business case.
- Implementing & ICT management: two of the projects have been implemented so far and some more projects are in the pipeline.

Bottleneck analysis interviews

The bottlenecks are derived from the interviews. For analysis of the bottlenecks in the current situation a consensus analysis on the output of the interviews was done. Since the interviews with the division manager and director focused merely on desired situation and strategy and almost no questions were asked about what they run into, they are left out of this analysis.

First of all, individual bottlenecks were identified within every interview. A bottleneck was identified when interviewees pointed out to run into something, when an aspect in the current situation was “too little” or “too much”, or when more implicitly mentioned as a challenge or aspect of a desired situation: “we could have more of this or that”. It should be noted that bottlenecks are identified based on individual quotes; overall, the co-workers are very satisfied. However, there is always room for improvement.

An Excel file was made with a description of the bottlenecks, an indication of the moment in the partnership process the bottleneck referred to (e.g. inspiration session, customer, revenue), the number of the interviewee that implied the bottleneck and sometimes a short clarification. Next, the bottlenecks were categorized based on similarity and a fitting category name was chosen. This happened through an

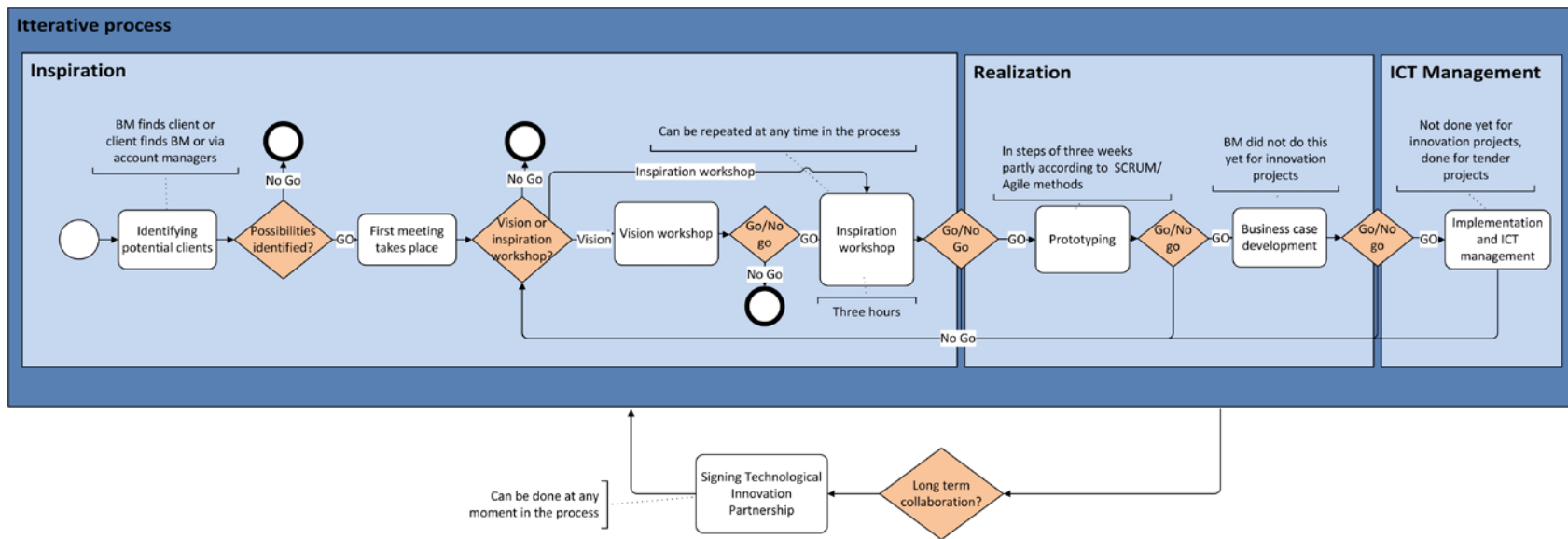


Figure 9. Flowchart Technological Innovation Partnership

iterative process until clearly distinguished categories with the same level of abstraction were found. The categories of which was a consensus of more than 50% (four out of seven interviewees) was established are selected for further analysis. The categorization of the bottlenecks can be found in Appendix VI.

### Consensus analysis

A total of 119 bottlenecks were identified from the seven interviews (see Appendix VI). Bottlenecks mentioned more than once by the same participant were counted as a single bottleneck. The largest amount of bottlenecks from a single interview was 29, the lowest amount was six. The bottlenecks of which consensus >50% is reached are shown in *Table 7*.

*Table 7. Bottlenecks with consensus >50% (four out of seven interviewees mentioned the bottleneck).*

Bottlenecks	Consensus of
<b>Insufficient output</b>	100%
<b>Client engagement too low</b>	71%
<b>Work approaches not enough defined</b>	71%
<b>Innovation culture parent company too low</b>	71%
<b>Too little stimulation of creativity</b>	57%
<b>Steps for investment too big for clients</b>	57%
<b>Insufficient expectation management</b>	57%
<b>Co-workers and team too young</b>	57%

### ***Description of bottlenecks***

Insufficient output<sup>9</sup>: All interviewees mentioned too little continuous revenues or too few large projects as output that could be better.

Client engagement too low: Often within large companies customer research is done by a separate marketing team, or not at all. At BM Department, client contact is managed within the department. This way, the client is relatively close involved in the development process. However, there is room for improvement. It was implied that the client can sometimes be more actively involved in the service development process and more client evaluations after projects could be helpful to improve processes. Developers might sometimes be too far removed from the client.

Work approaches not enough defined: It was mentioned that a more structured and common approach to prototyping could help the process. Overall, some aspects (e.g. inspiration workshop or prototype development) could probably be done different, more effective and/or with a more common approach.

Innovation culture parent company too low<sup>9</sup>: interviews indicated that the structure within BM Department can collide with the traditional company structure of the parent company that mainly focuses on short-term results. Innovation is not directly billable and overhead should be kept low.

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<sup>9</sup> Further elaborated upon in Appendix X.

Too little stimulation of creativity: compared to the other ICT Corp. BM Department is creative and gets more budget for innovation since the department is allowed to have more availability. However, it was implied that the creative mindset at during inspiration workshops and the stimulation of creativity in the working environment of BM Department could be improved upon. Informal conversations indicated that the focus on decreasing availability can be detrimental for a creative mindset.

Steps investment too big for clients: consensus was found on the idea that the steps between inspiration workshop, prototyping, and ICT management are too big for clients in terms of money and concept development.

Insufficient expectation management<sup>10</sup>: it was indicated that expectation management could be improved within the department, between the department and the client, and between BM Department and the account managers of ICT Corp. These three levels together led to a consensus >50%.

Co-workers and team too young<sup>10</sup>: it was mentioned that the level of experience within the team could be a bottleneck in some situations. BM Department hires a lot of young people who just finished university because overall they adapt more easily to new technology and new ways of working. The downside is that this causes extra uncertainty in the team because inexperienced people have less realistic view on what is actually involved in innovation and how much time it will take to realize development goals. This does not have to be a bottleneck when expectations are well managed.

### **Cause and effect diagram**

The possible relationships between the bottlenecks from Table 7 are further analyzed by creating a cause and effect diagram. This diagram is displayed in Figure 10. The blocks specify bottlenecks and the arrows specify causal relationships between the bottlenecks. Bottlenecks with only outgoing arrows are 'root causes', bottlenecks with both incoming and outgoing arrows are both cause and effect and therefore 'mediating bottlenecks'. Bottlenecks with only incoming arrows are symptoms, not causing any further bottlenecks. This cause and effect diagram gives a better understanding of what people run into in the current situation than the separate bottlenecks.

The consensus analysis and cause and effect diagram were discussed during a weekly team meeting. Seven out of nine people who participated in the interviews and about fifteen others were present. A small discussion took place during the meeting and some feedback was collected afterwards. The most occurring feedback was that the diagram is very much generalized, and therefore lacks the level of detail that is needed to be able to act upon a bottleneck. For this reason, detail in description was added to some of the bottlenecks that referred to specific aspects of the TIP process. 'Insufficient output' was made more detailed by adding points on which consensus was reached: too few large projects and too little continuous revenues. Besides this, symbols were added indicating the roles of co-workers that mentioned something in line with the bottleneck. Some extra relations were found and some relations

were thought of going into another direction than indicated in the CE-diagram shown during the meeting. With help of this feedback the cause-and-effect diagram in Figure 10. was generated. The initial CE-diagram as used during the evaluation can be found in Appendix VII.

During the team meeting discussion it was also pointed out that the uncertainty caused by the newness of the team and the young age of the people can cause less creativity; when you are insecure you are less likely to try new things. There were also found possible loops between the bottlenecks. Where the researcher ought “investments steps too big for clients” to be a result of a lack of client engagement, following the logic; when clients are engaged they are willing to take bigger risks and spend more, a possible even stronger relation exists from “investment steps too big for clients” to “too little stimulation of creativity”; when projects need to be performed within a tight budget this decreases room for creativity and it gets trickier to live up to the wishes of the client.

The idea was suggested that BM Department should perhaps be considered more of an R&D department of ICT Corp. than as one of the departments to generate short-term profit. This is already happening to some extent since BM Department is allowed to have more availability<sup>10</sup>. However, the department might be of even more value for ICT Corp. when it can completely focus on innovation.

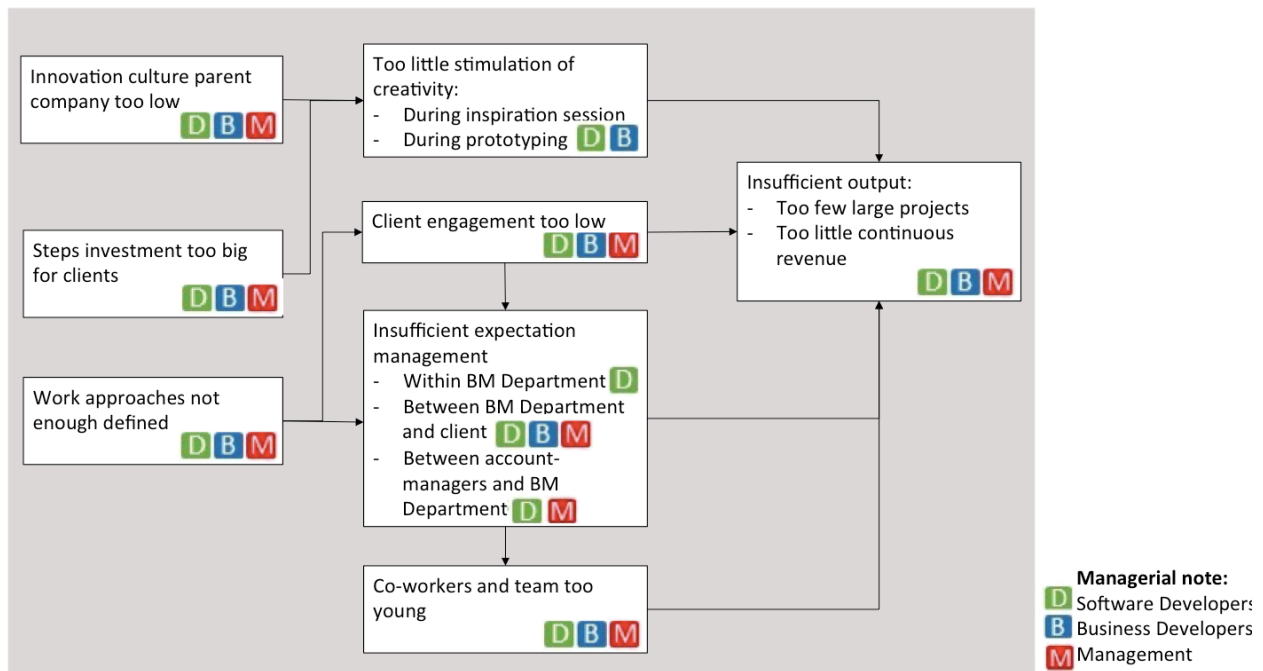


Figure 10. Cause-and-Effect diagram (Porras, 1987) based on interviews followed by a consensus analysis.

<sup>10</sup> Availability: time that is allowed to be spent on other projects than projects that the client directly pays the hours for.

### ***Description of relationships between bottlenecks in the CE-diagram***

It should be noted that only bottlenecks for which consensus was found are mentioned in the CE-diagram. It is possible that other external factors also contribute to the bottlenecks in the diagram. The definition of relationships between the bottlenecks is based on interpretation of the researcher, made a little less subjective by evaluating the relationships in the team meeting.

#### Innovation culture parent company too low → too little stimulation of creativity

BM Department is evaluated on revenue and gross margin. These performance indicators result in a short-term focus on generating revenue at cost of creativity and innovation for which a more long-term focus and more freedom is desired.

#### Steps in investments too big for clients → too little stimulation of creativity

Clients often have no time or budget for radical innovation, hence steps from inspiration workshop to prototype are often found too big. When a deal is made but budget is tight, this causes pressure for BM Department to focus on quick results at the cost of creating something completely new.

#### Work approaches not enough defined → Insufficient expectation management

Well-defined tactics for collaboration will increase the cohesion of the team. Making sure that everyone is on one line increases expectation management. Besides, more defined approach for expectation management itself is helpful as well.

#### Work approaches not enough defined → client engagement too low

One of the results of not having a defined work approach is that client engagement is not as good as it could be when an approach for client engagement would be defined based on literature and best practices.

#### Insufficient expectation management → co-workers and team too young

When expectations are not well enough managed, it becomes a problem that co-workers are young and the team composition is new; inexperienced co-workers have difficulty guessing the time a project will take and the newness of the composition of the team makes that the team is not perfectly attuned.

#### Too little stimulation of creativity → insufficient output

If there is no room for creativity this will decrease the quality of innovation projects, which is expected to lead to a less innovative corporate image and a decrease in new or larger assignments.

#### Client engagement too low → insufficient expectation management

If the client is more involved in the development process, expectation management on the client level will automatically be enhanced.



#### Client engagement too low → insufficient output

Listening to the client is required to deliver an output that adheres to the client's wishes. When the client is not enough involved in the process, there is more room for miscommunication and projects starting to live their own life within the department.

#### Co-workers and team too young → insufficient output

Without sufficient guidance the a team with many young people and a new team projects will not be finished in time and/or less well than expected.

#### **Aspects that influence the current situation:**

The following aspects that influence the current situation are derived from the bottlenecks:

- Performance indicators; whatever is evaluated on influences the perception of the current outcome. The interviews with management indicated that BM Department's performance is evaluated mostly on revenue and gross margin. As long as performance goals set on these aspects are reached, BM Department gets the freedom to operate however it wishes.
- Innovation culture parent company.
- Innovation culture in the market; when there is no budget available at BM Department's potential clients, there is no business for BM Department.
- Climate for creativity; stimulation of creativity in the work environment and with clients during e.g. inspiration sessions.
- Innovation tactics; in a small company it is easy for co-workers to be aligned, when the company grows defined tactics which do not immolate freedom and creativity are advantageous.
- Team cohesion; effectiveness is achieved when people know what they can expect from each other. When the team is attuned it is easier to deal with changes.
- Experience of co-workers.
- Client engagement.

#### **Summary current situation**

The parent company is a traditional consultancy firm that aims at sustainable long-term client relationships. It has a divisional structure. BM Department differs itself from the rest of the company by focusing on new-to-the-world innovation, high client engagement, and by creating a highly creative environment. There is room for smaller projects with higher societal relevance than the average ICT project. The department is treated as a start-up within the parent company. At this moment the department is growing and starting to generate profit. The department has an informal culture and structure. Typical clients are clients with whom a personal relationship can be build up. The bottleneck analysis revealed seven aspects influencing the current situation: performance indicators, innovation culture of the parent company, innovation culture in the market, climate for creativity within BM Department, innovation tactics, team cohesion, level of experience of co-workers, and client engagement.

### ***Desired situation***

Information for this subchapter is derived from management interviews, informal conversations and the documents mentioned earlier in the chapter.

### Strategy

One of the managers envisioned that companies will look a lot different in 15-20 years. Relationships with employees change; the employee is treated as a partner rather than an asset. Employees are expected to continue to demand more freedom and independence. If ICT Corp. continues to adapt to these developments, the best co-workers will continue to be attracted to the company. The parent company will perform as a sort of network agent where employees apply and get an assignment. ICT Corp. experiments with this structure by allowing freelancers to take courses at ICT Corp. with a discount, in return the freelancers take on assignments via ICT Corp.

For BM Department the most important thing at this moment is to increase profit. The department should continue to develop value propositions together with clients. There should continuously be sought for balance between generating value for customers and the parent company, and innovating. Growing in amount of co-workers will help to increase allowed availability hours which means more hours can be used for innovation projects. A continuous stream of interns also helps to take on projects and challenges BM Department or their clients face at lower costs for ICT Corp. while creating opportunities for students.

### Structure

*Companywide*<sup>11</sup>: For ICT Corp., a more cell-structured company is desired wherein autonomous cells operate individually with a few aspects that are managed at a central point in the company. The cells themselves take care of the tasks that are now outsourced to staff departments.

*BM Department*: BM Department has an informal culture and relatively little structure providing a lot of freedom to the co-workers. It shows similarities with an autonomous cell. An advantage of this company structure is that a cell that does not have work at a given moment in time can easily take on another task for a while. Managers are facilitators, they know what goes into a cell and what comes out, but everything else is organized by the cell itself (self-organizing teams). People and cells work autonomously and independently. Responsibilities are shared and not only the responsibility of the managers. This is expected to lead to a higher success rate. The structure of BM Department is desired to be similar as it is now, only with more teams for the different sectors BM Department operates in. The business unit exists of a network of people that can be arranged to form a new entity to work on a specific project together.

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<sup>11</sup> Further elaborated upon in Appendix X.

## Culture

*Companywide<sup>11</sup>*: Co-workers should be actively creating their own future. Knowledge of today is outdated in five years and people need to find their own route through this. People need to take responsibility instead of pushing the responsibility for their career to the company. Management can imply technology will be outdated soon and that people need to start learning something new, but people are themselves responsible for their development. It is sometimes difficult to explain employees they need to learn something new when the old thing is still working at this moment in time and revenue is fine. Placing people, who are used to a traditional structure in this new structure often does not work. Traditional ICT developers wait for their tasks; this attitude should be changed to be successful at ICT Corp.

*BM Department*: Teams should be a mixture of business developers and technical innovators; co-workers should preferably have a bit of both worlds. It is desired to keep the freedom and creativity of the informal culture within the business unit should be kept while generating more continuous revenue, growing as a business unit, and increasing quality of work.

## Process

As indicated in the interviews and the bottleneck analysis, the steps within the partnership process are experienced too large by clients concerning resources needed to invest. Besides this, according to management, it is desired to perform more vision workshops, business cases, ICT implementation & management processes, and to create more long-term collaborations. These are the aspects that can be improved upon in the process.

## Ideal Clients

Ideal clients for BM Department are not necessarily the common ICT Corp. clients. Concerning the assignment of large projects, industry clients are easier to approach and build a client relationship with than public clients, since public clients are obligated to hold public tenders. Building personal client relationships makes closing deals more likely for innovative projects. It should be avoided to take part in projects for 'the client of the client', which happens a lot in the public sector. This causes difficulties in aligning stakeholders and ICT Corp. to find itself somewhere in between.

## Ideal projects

The ideal size of a project is a project that BM Department can finish successfully, create value with and for the customer and that is still feasible. The ideal size of a project for BM Department is lower than the ideal project size for ICT Corp. In the near future the aim would be to do more piloting and production projects. These projects are expected to generate revenue closer to the ideal revenue of general ICT Corp. projects. Parallel to this the department aims to keep looking at public tender projects which can generate a lot of revenue for the department.

Content wise, BM Department will likely shift a bit more towards data analytics. Combined with predictive information and sensor technology this creates a distinctive profile within ICT Corp. Management indicated that BM Department should focus on two or three large clients at the time.

### Financial results

Financial results should be increased. It is desirable to close more TIPs, have more large projects, and to decrease the cutting loss. The prototyping projects require relatively a lot of hours. According to the management interviews it is not possible to let BM Department be profitable with only these kinds of projects. From the graphs in Appendix III. the conclusion can be drawn that BM Department not only desires a more continuous income, but continuous growth compared to 2015.

### **Aspects influencing the desired situation**

Aspects that influence the current situation can be improved to reach the desired situation.

According to the result of the interviews the following is desired:

- Performance indicators evaluating results based on long-term results or innovation rather than direct results of selling hours.
- A better fit with the parent company without losing innovativeness and freedom to operate.
- Creating more possibilities in the market for long-term projects.
- A more creativity-stimulating environment.
- More defined innovation tactics and working methods.
- More team cohesion.
- Higher levels of expertise in the team.
- Higher client engagement.

### **Summary desired situation**

For BM Department the most important objective is to generate more and continuous revenue. There should continuously be sought for a balance between generating value for customers and the parent company and innovation. It is desired that BM Department can keep its free informal atmosphere, while performing well in the traditional consultancy parent company.

### 4.1.3 Gap analysis

The common idea within BM Department is that things can always be improved. *Table 8* shows the qualitative gap found during the diagnosis phase.

*Table 8. Quantitative gap analysis. Numbers are scaled for confidentiality reasons (Appendix VIII).*

	<b>Jan 2015 - Nov 2015</b>	<b>Desired in 2016</b>	<b>Found</b>
Revenue	100%	286%	Presentation (appendix III)
FTE	26	50	Presentation (appendix III)
Client engagement	>7	10/10	Client evaluations (appendix X)
Employee engagement	>7	10/10	E-mail company supervisor
Number of partnerships	100	250	Informal conversation company supervisor
Number of Vision Workshops	100	350	Informal conversation company supervisor
Number of Inspiration Workshops	100	180	2015 counted presentations on SharePoint, desired 2016 via informal conversation company supervisor
Number of Prototyping projects (deals closed)	100	133	Informal conversation company supervisor
Number of Piloting projects	100	400	Informal conversation company supervisor
Number of ICT Management projects	0	1	Informal conversation company supervisor

#### 4.1.4 Design scope

The researcher made the decision to focus on the bottlenecks concerning the definition of work approaches, creativity and client engagement since these fit the subject scope of this thesis and are related to each other in literature (e.g. implementing the Bohmian dialogue approach will increase both creativity and engagement of employees and/or clients. Nonaka *et al.* (2000) SECI process increases knowledge creation and sharing which is beneficial for both creativity and client engagement). The literature review (Van der Voort, 2015) shows that creativity tools focus often on intensive collaboration between parties, increasing team engagement and cohesion simultaneously.

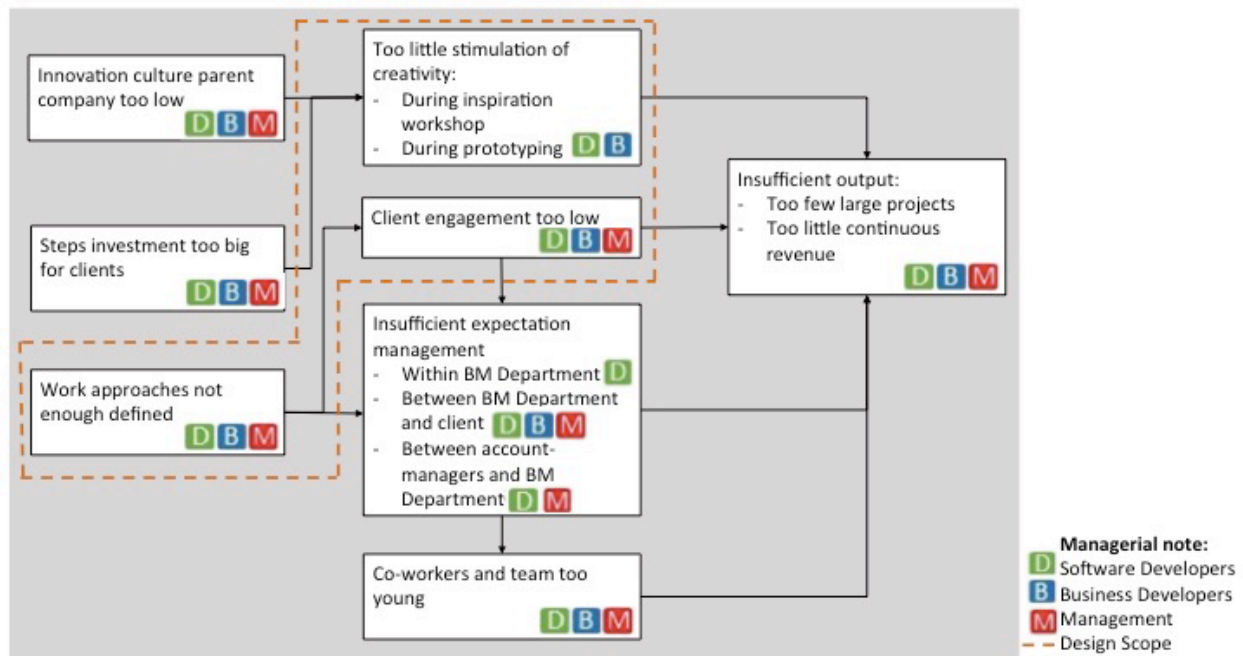


Figure 11. Cause-and-Effect diagram (Porras, 1987) with design scope.

## 4.2. Results Design

Data collection in the design stage aims to gather design requirements and suggestions, which could be relevant for the final design. In the results of data analysis the design suggestions are categorized and evaluated on the design requirements. “Proposed Design” shows the final solution.

### 4.2.1 Design Requirements

Work approaches need more development within BM Department. Now, every project approach needs to be developed individually for the client. The advantage of this approach is a lot of flexibility. The disadvantage is that the degrees of freedom are too high causing unacceptable risks and projects to be unpredictable for BM Department, co-workers, and clients. When approaches are defined, co-workers are more likely to choose the optimal solution for a specific client case. The design in this thesis should be a framework that helps to decrease these degrees of freedom, while keeping a lot of flexibility. The aim is to increase predictability without creating obduracy. Freedom should endure while defining essential parts of the organizational process. Knowledge sharing management is an essential aspect for improvement of the process. Furthermore, work approaches to increase creativity and co-creation are searched for. The set of design requirements in Table 9 is composed.

*Table 9. Design requirements.*

<b>A</b>	<b>Functional requirements</b>
<b>A1</b>	The design should provide a framework on how to start up and go through innovation projects
<b>A2</b>	The design should increase predictability
<b>A3</b>	The design should not create obduracy
<b>A4</b>	The design should increase the quality of knowledge creation, knowledge sharing, and knowledge management within BM Department
<b>A5</b>	The design should lead to an increase of client engagement
<b>A6</b>	The design should lead to an increased creative atmosphere within ST BM Department and between BM Department and the client
<b>B</b>	<b>User requirements</b>
<b>B1</b>	The relevance of the design should be clear for all co-workers
<b>B2</b>	The design should be easy to use for all co-workers
<b>C</b>	<b>Boundary conditions</b>
<b>C1</b>	Design must increase or keep the fit with the parent company
<b>C2</b>	Design must be easy to implement without disturbing current business
<b>C3</b>	The design should be useful in a fast changing software development environment
<b>C4</b>	The design should be useful in a wide range of projects
<b>D</b>	<b>Design restrictions</b>
<b>D1</b>	The design should not take much time and financial resources to implement
<b>D2</b>	The design should not take much time and financial resources to use

The design requirements are used as a direction in which to gather design suggestions. All together, the design will provide an approach that brings people together to learn from each other. It will provide a structure to develop projects.

## 4.2.2 Results of Data Collection

Design suggestions are gathered via literature, best practices, and experts. This subchapter goes into the found design suggestions during data collection. The data collection resulted in ideas on how to structure the overall business approach and in tools that can be used to fill in these approaches.

Literature: The gap analysis served as input for the literature search. The focus was on the one hand on how to visualize a working structure high on co-creation and on the other hand on theories and methods to improve creativity, co-creation, and knowledge management.

Best practices: Many best practices were found in management literature, see section 4.2.3.

Experts: During the design phase more interaction took place compared to the diagnosis phase between BM Department and the researcher to evaluate and co-create new ideas. The researcher expected that informal evaluations with BM Department co-workers would generate enough value at this moment in the research project. A formal participative session would have cost the researcher and BM Department a lot more time to plan and execute. For these reasons the idea of a formal participative session was eliminated. People consulted during design process: were the director of BM Department and two business consultants from BM Department, and an ICT Corp. Innovation Manager. Summaries of the feedback gathered during these conversations can be found in Appendix IX. Advantages of the informal evaluations were that this method allowed for short feedback loops while increasing support for the design with BM Department.



## 4.2.3 Results of Data Analysis

### Approach 1: Bohmian Dialogue

#### Introduction to Bohmian Dialogue

Bohm (1996) explains the practice of Bohmian Dialogue. The aim of Bohmian Dialogue is to create common understanding and new knowledge from combined views. It is ideally performed with a group of 20-30 people in a circle with one facilitator<sup>12</sup>, but in practice it is also performed in smaller groups. The ideal timeframe of one session is two hours. This is ideal since the conversation needs some time to get going but the process should not become too tiring. Participants need to prepare because the process of Bohmian Dialogue differs from the meetings that are normally held in organizations. Important to notice is the difference between Bohmian Dialogue and discussion. The goal of discussion is to win; the goal of Bohmian dialogue is to create understanding of oneself, the others, and the organization. Participants should suspend judgment and build on each other's ideas in the conversation. Everyone should be as honest and transparent as possible. There are no decisions made during the conversation itself. Further explanation of the difference between Bohmian Dialogue and discussion can be found in *Table 10*.

*Table 10. Dialogue vs. discussion, reproduced from Atlee (n.d.).*

<b>Dialogue</b>	<b>Discussion</b>
Finding common ground is the goal	Winning is the goal
Collaborative: two or more sides work together toward common understanding.	Oppositional: two sides oppose each other and attempt to prove each other wrong
One listens to the other side(s) in order to understand, find meaning, and find agreement	One listens to the other side in order to find flaws and to counter its arguments
Enlarges and possibly changes a participant's point of view	Affirms a participant's own point of view
Reveals assumptions for reevaluation	Defends assumptions as truth
Causes introspection on one's own position	Causes critique on the other position
Opens the possibility of reaching a better solution than any of the original solutions	Defends one's own positions as the best solution and excludes other solutions
Creates an open-minded attitude: an openness to being wrong and an openness to change	Creates a closed-minded attitude, a determination to be right
One submits one's best thinking, knowing that other people's reflections will help improve it rather than destroy it	One submits one's best thinking and defends it against challenge to show that it is right
Temporarily suspending one's beliefs	Investing wholeheartedly in one's beliefs
One searches for basic agreements	One searches for glaring differences

<sup>12</sup> Facilitator: person who does not participate in the dialogue session but makes sure practical aspects like time restraints are adhered to, and every participant gets the chance to talk. The facilitator reminds the participants of the rules of dialogue at the start of the session (e.g. by posting the rules of Table 10 on a wall) and refers back to these rules when they are not lived up to by one or more of the participants. The role of the facilitator can also be fulfilled by some or all of the participants, e.g. by writing each rule on a card and give every participant one of the cards so everyone is responsible for the compliance of one rule on behalf of the group. (Atlee, n.d.).

One searches for strengths in other positions	One searches for flaws and weaknesses in other positions
One has a real concern for the other person and seeks to not alienate or offend	Involves countering the other position without focusing on feelings or relationship and often belittles or deprecates the other person
Assumes that many people have pieces of the answer and that together they can put them into a workable solution	Assumes there is a right answer and someone has it
Remains open-ended	Implies a conclusion

## Tools fitting Bohmian Dialogue with CIMO-logic

Bohmian Dialogue (Bohm, 1996) requires participants to learn the rules and gain experience in a few dialogue sessions before the benefits can be experienced. The process is highly structured and an experienced facilitator should be available. The researcher expects the resistance of BM Department to implement traditional Bohmian Dialogue to be high, since the focus is on short-term results and BM Department gets paid per hour spent on client projects. Luckily, there are some simple tools, which will take little implementation time and can improve everyday meetings with dialogue aspects. In addition to the described tools all tools require a facilitator guiding the process and the shared center being maintained<sup>13</sup> (Atlee, (n.d.)).

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<sup>13</sup> Maintenance of shared center: when any of the participants notices that others are not adhering to the rules he/she can point this out to the group and the group can reflect on why this is happening and come back to its shared center. This can be done when e.g. some participants are having a back-and-forth discussion and other participants feel themselves wondering off (Atlee, n.d.).

Table 11. Summary of found design tools that fit the approach of Bohmian Dialogue. Context: during ideation, the meeting will lead to new knowledge and ideas. Other tools are needed for selection and further development of ideas.

No.	Name tool	Description (Intervention)	Mechanism	Outcome	Reference
1	Bohmian Dialogue	Divergent process that exists of a sequence of group sessions in which participants share their views with the goal to create a common ground. In a way this is the opposite of a group discussion, wherein participants share views with the aim to narrow the focus and choose one idea. See rules in Table 10.	Intense interaction, suspension of judgement, absence of purpose or agenda, thinking together, examination of prejudices and preconceptions, emergence, and reflection.	Similar outcome all No 1. tools:  Open ended result, new and deeper understanding, development of team spirit, unstated common frame of reference, and a possible transformation of culture.	Bohm (1996)
1.1	Popcorn meeting	An object is put into the center of the group. Whoever wishes to speak, takes the object and puts it back after his/her turn. This gives people time to speak and gives more time between the speakers providing the individuals with the opportunity to reflect. To guide the session further, a limitation on speaking time or how many times an individual can speak can be added.	Mechanisms tool No. 1. Bohmian Dialogue, with the addition of: externalization of thoughts of less dominant people.		Atlee (n.d.)
1.2	Chime and stone	Only difference between this tool and a normal conversation are the chime (or gong) and stone (or other object). Use of the chime: any time a participant feels like the group needs to go back to its center, he can move to the physical middle of the group and use the chime. The group is now silent until the sound fades away. Use of the stone: whoever grabs the stone gets the next turn to talk after the person that is currently speaking.	Mechanisms tool No. 1. and 1.1, with the addition of: setting boundaries with sound instead of words.		Atlee (n.d.)
1.3	Penny for your thoughts	Every participant gets an amount of pennies or poker chips (e.g. four) and has to put one into a hat in the middle of the group before speaking. When one has run out, the individual must wait until everyone else has run out as well. Variation: pennies represent an amount of time and/or people are allowed to give other people extra pennies.	Mechanisms tool 1. and 1.1.		Atlee (n.d.)

## Evaluation of tools fitting Bohmian dialogue based on requirements

The Bohmian dialogue variations help to let more reflective, introvert people share their thoughts. It promotes participation of less dominant, more reflective people who aren't inclined to compete for turns in fast-moving, often competitive conversations. In the long run a common way of thinking is generated. Downsides of Bohmian dialogue are that practiced dialoguers are needed to let dialogue come easy. Furthermore, participants need to be very committed to generate a valuable outcome. The outcome is expected to be experienced as vague, impractical, and intangible. The outcome does not immediately generate more productivity, which makes the tool difficult to accept.

Table 12. Evaluation of Bohmian Dialogue variations, managerial note: ++=2, +=1, --=1, ---=2.

### Tool 1.1 Popcorn meeting, 1.2 Chime & Stone, 1.3 Penny for your thoughts

Req.	Score	Reasoning
A1	0	The tool does not provide this framework but possibly fits another tool that does.
A2	++	On the one hand, the outcome is open ended and uncertain. On the other hand, tacit knowledge is shared which is predicted to lead to a lesser amount of unwanted surprises down the road. The increased uncertainty is a positive aspect in this sense.
A3	++	Result is open ended and participants should experience more freedom than during normal meetings.
A4	++	Dialogue is a good way to transfer and create tacit knowledge. By transferring knowledge from one individual to the other a common frame of reference is created and knowledge management is increased as well.
A5	0	Not directly. The common frame of reference within BM Department could lead to better communication with the client since provided information will be similar apart from the person who communicates with the client. When it is more clear for the client what is possible, the client will be likely feel more engaged in the process and have a more proactive attitude.
A6	++	Tacit knowledge sharing leads to new knowledge creation within participants.
B1	-	It won't be in the beginning, but it will become more clear over time.
B2	+	Participants need to get familiar with the rules (C2, implementation) but after that it will be easy to use. However, before every meeting it might take some time to get into the right mindset.
C1	++	Dialogue can be performed within the department, rest of the company does not have much to do with it.
C2	--	It will take a few meetings before participants will experience the effect. The company focuses on short-term results, therefore it can be experienced as difficult to implement.
C3	-	The variations are different from usual methods and will ask for some changes in attitude from the consultants.
C4	++	The tool provides approaches for meetings on any subject.
D1	0	It will cost some time before the advantages can be experienced, but no other resources than time are needed.
D2	++	The variations 1.1 – 1.3 can be used during meetings that would take place anyway.
<b>Total score</b>	<b>11</b>	

## Approach 2: Physical Workspace Design for Creativity

### Introduction to Physical Workspace Design for Creativity

Many creative thinkers recognize the influence of the workspace on creativity (McCoy & Evans, 2002). Academic research and management literature indicate many variables of the workspace that can be adjusted to optimize creative performance of individuals. McCoy & Evans (2002) show that individuals produce more creative ideas in environments that are perceived by the individuals as creativity stimulating. In the study (McCoy & Evans, 2002) collages made by participants in a setting perceived as highly creative were rated higher in flexibility, fluency, innovation, originality, and aesthetics by independent raters. McCoy & Evans (2002) find that creative workspaces perceived as creativity stimulating are spaces that show spatial complexity, are visually detailed, have a view on a natural environment, use natural materials, use few cool colors, use less manufactured or composite surface materials and involve a set up wherein people can see and interact with each other. In the discussion McCoy & Evans (2002) go into the mechanisms that are activated by the creativity stimulating environmental aspects, these are summarized in *Table 13*. McCoy & Evans (2002) focus largely on static architectural and static interior aspects of creative spaces. The first part of the research on which spaces are perceived as creative was done by letting participants compare pictures. Judgement of the participants was based on a part of the room that was shown in the picture and non-visual aspects (e.g. temperature, smell, and noise) were not taken into account (McCoy & Evans, 2002).

Doorley & Witthoft (2012) started the development of tools for creativity stimulating workspace design from their own experience with creative environments. The tools contain practical, detailed, and tangible guidelines on how to design space to shape a creative culture and creative habits.

Nonaka's SECI model and the concept of *ba* is discussed in the theoretical background of this thesis. *Ba* indicates a fertile environment for knowledge creation. In *Table 13* Nonaka's SECI model is used as mechanism to explain the working of the physical workspace design tools provided by McCoy & Evans (2002) and Doorley & Witthoft (2012).

### Tools fitting Physical Workspace Design for Creativity with CIMO-logic

See table on the next page.

Table 13. Tools fitting Physical Workspace Design for Creativity with CIMO-logic.

No.	Name tool	Context	Description (intervention)	Mechanism	Outcome	Reference
2	Physical workspace design for creativity	Differs per specific intervention	The workspace is recognized to influence creativity by many creative thinkers (McCoy & Evans, 2002). Academic research and management literature shows many variables of the workspace that can be adjusted to optimize creative performance of individuals.	Differs per specific intervention	Differs per specific intervention	McCoy & Evans, (2002)
2.1	Architectural elements	Differs per specific intervention	Physical workspace design aspects that have to do with the overall architecture and fixed interior design aspects (e.g. walls)	Differs per specific intervention	Higher creative performance (meaning higher score on flexibility, fluency, innovation, originality, and aesthetics) (McCoy & Evans, 2002).	McCoy & Evans, (2002)
2.1.1	Nature	Through-out the whole development process	View of natural environment and the use of natural materials (McCoy & Evans, 2002)	Biophilia (Ulrich, 1993), exposure to restorative elements replenishes cognitive capacity (Kaplan & Kaplan, 1989)		
2.1.2	Sociopetal and sociofugal spaces and furniture	Through-out the whole development process	The arrangement of furniture in a room can influence whether and how individuals interact with each other. For instance, airports and most classrooms, libraries, and supermarkets are designed for isolation and e.g. parks are designed for social interaction (Design for Service, 2008). Within the office, chairs around a table are sociopetal and cubicles are a good example of a sociofugal setting (McCoy & Evans, 2002).	Individual encouragement, cooperation, collaboration, social support (Amabile, 1988)		
2.1.3	Spatial and visual complexity	Ideation	Space design high in spatial and visual complexity (McCoy & Evans, 2002), this can be achieved by e.g. using different types of materials, the architecture of a building, and decoration.	Visual interest and the opportunity for discovery may provide intellectual and cognitive stimulation consistent with values of creative personality (McCoy & Evans, 2002).		
2.1.4	Open spaces	Ideation	Open spaces with lots of windows and natural views (McCoy & Evans, 2002)	Permitting distraction and variety of work places -> autonomy, openness to experiences, engaging in unconventional thought processes (McCoy & Evans, 2002)		
2.2	Room Configurations	Differs per specific intervention	Differs per specific intervention	Differs per specific intervention	Differs per specific intervention	n.a.
2.2.1	Huddle rooms	Ideation (for	Space for team collaboration where everyone can walk in, some to	Taking away hurdle of not	Focused work	Doorley &

		'flare' type) or reflection (for 'focus' type)	'focus' and some to 'flare'. Characteristics of good huddle room: near open space (so people will be likely to drop in), some dynamic furniture so the room can be used in different ways, some visibility of what happens in the room from the outside. Flare: sociopetal dynamic furniture, make walls writable with whiteboards, possibility to play music. Focus: comfortable seats, dimmers, bit less visibility from the outside.	having the resources or room to concretize ideas. Externalization (for 'flare' type) or internalization (for 'focus' type).	groups	Witthoft (2012)
2.2.2	Prototyping room	Prototyping	Space where everyone can drop in any time. This space should have: many uninterrupted work surfaces with enough room to move around them, floors upon it is okay to build, more than enough electrical power, chargers, raw materials (such as sheets, cardboard and foam board), connection resources (screws, staples, scissors, tape, etc.). These are resources mainly for product making, can be extended with resources relevant for service development.	Taking away hurdle of not having the resources or room to concretize ideas. Combination.	A 'maker' culture	
2.2.3	Hiding place	Reflection	This place provides a setting to get out of the normal workspace and a place to think. The characteristics of this room are that: it contrasts the setting of the rest of the office, the furniture is fixed (there are no decisions to be made), it's no tech (outlets, switches, and data jacks are hidden from view), it's small (3.5x2.5m), it's dark and warm, it's laid back, it's hidden, it smells good – or at least different (e.g. use cedar wood furniture), it requires a ritual to enter.	Providing a place to order one's thoughts in silence. Internalization.	Insights, ideas, and epiphanies	
2.3	Dynamic artifacts	Differs per specific intervention	McCoy & Evans (2002) found that participants were more creative in spaces perceived as dynamic.	Permitting variety of work places, leading to: autonomy, openness to experience, and engaging in unconventional thought processes (McCoy & Evans, 2002)	Higher creative performance (meaning higher score on flexibility, fluency, innovation, originality, and aesthetics) (McCoy & Evans, 2002).	McCoy & Evans (2002)
2.3.1	T-walls	Socialization, externalization	T-shaped wall that can be made easily out of DIY shop materials and allows <i>"for the creation of rapid configurations of intimate or open spaces in any context"</i> (Doorley & Witthoft, 2012, p. 130). It can be used to create sociopetal or social fugal settings and it can be used to create a background for a lecture, different configurations of team settings or as a background for a spontaneous exposition.	Visual interest and the opportunity for discovery may provide intellectual and cognitive stimulation consistent with values of creative personality (McCoy & Evans, 2002).		Doorley & Witthoft (2012)
2.3.2	Around the campfire	Socialization, interpersonal sharing, addressing sensitive topics, debriefing	<i>"Get rid of all the seats in the room and try sitting in a low circle. Try low stools, the foam cube (other intervention of Make Space), or cardboard boxes, or simply sit on the floor"</i> . Meeting should last maximum of 25 min to avoid participants getting physically uncomfortable.	Increased feeling of safety, heightening of awareness of group participants and the activity topic.		Doorley & Witthoft (2012)

## Evaluation of tools fitting Physical Workspace Design based on requirements

Table 14. Evaluation of Architectural element tools, managerial note: ++=2, +=1, --=1, ---=2.

### Tool 2.1 Architectural elements

Req.	Score	Reasoning
A1	0	Tool doesn't provide a framework but would possibly fit into another framework
A2	0	Doesn't influence predictability
A3	++	Provides more freedom rather than obduracy
A4	+	Sociopetal design increases knowledge sharing
A5	0	N.a.: Focused at office BM Department design
A6	+	Proven to increase creativity
B1	++	Easy to understand CIMO-logic
B2	++	Just being in the space is enough
C1	0	Doesn't influence fit parent company
C2	0	Change of architecture of workspace doesn't disturb business processes
C3	++	Doesn't matter whether environment is fast changing
C4	+	Useful in any development project, not especially for this environment
D1	--	Many aspects depend on the company building, or on buying expensive furniture
D2	++	None
<b>Total</b>	<b>11</b>	
<b>Score</b>		

Table 15. Evaluation of Room configuration tools, managerial note: ++=2, +=1, --=1, ---=2.

### Tool 2.2 Room configurations

Req.	Score	Reasoning
A1	+	It provides the environment for different phases of the process
A2	0	Doesn't influence predictability
A3	++	Provides more freedom rather than obduracy
A4	+	In a very broad sense it helps the knowledge creation process of the SECI model (Nonaka, 2000)
A5	0	Doesn't influence this
A6	++	It provides the environment for different phases of the process, stimulating creativity when appropriate
B1	++	Well-known fact that it is comfortable to be in a quiet space when you want to think and in a more open, social space for idea generation, etc.
B2	++	Just being in the space is enough
C1	+	Can be done by BM Department itself
C2	++	Change of workspace doesn't disturb business processes
C3	++	Especially focused on service development environment
C4	++	Useful in any development project
D1	+	It will cost some effort and money to turn existing spaces into consciously developed rooms. However, many things can be done on a budget.
D2	++	None
<b>Total</b>	<b>20</b>	
<b>Score</b>		



Table 16. Evaluation of Dynamic artifact tools, managerial note: ++=2, +=1, --=1, ---=2.

Tool 2.3 Dynamic artifacts		
Req.	Score	Reasoning
A1	0	Tool doesn't provide a framework but would possibly fit into another framework
A2	0	Doesn't directly influence predictability
A3	++	Provides more freedom rather than obduracy
A4	+	Spaces can be adapted to fit the moment in the knowledge creation process
A5	0	N.a.: Focused at office BM Department design
A6	++	Interior can be adapted to fit moment in creative process
B1	++	Easy to understand
B2	++	Just using furniture
C1	0	Doesn't influence this
C2	++	Change of workspace doesn't disturb business processes
C3	++	Especially focused on service development environment
C4	++	Useful in any project
D1	+	DIY furniture
D2	++	None
<b>Total</b>	<b>18</b>	
<b>Score</b>		

## Approach 3: Design Thinking

### Introduction to Design Thinking

The foundations of design thinking lie with global design company IDEO. Founded in the 80's this company mainly designed products in the traditional sense, e.g. chairs and computer mice (Brown & Wyatt, 2010). Over time, IDEO got a wider range of questions from clients. For example, the company was asked to create alternative learning environments for a university or asked to help restructuring an organization (Brown & Wyatt, 2010). With the execution of these types of projects Brown & Wyatt (2010) say the focus shifted from designing consumer products to designing consumer experiences. The Design Thinking process is said to balance between analytical thinking and feeling, inspiration, and intuition.

Literature shows many variations on the design thinking process in *Figure 12*. The three phases 'inspiration, ideation, and implementation' are often used in these variations. For the purpose of this thesis the researcher adapted the process in *Figure 12* for BM Department. A few changes were made to fit the company context:

- 'Understand' and 'Observe' have a similar goal: getting to know the end users and other stakeholders of a product or service. D.School (2010) refers to these phases together as one phase called 'empathizing'. The empathizing phase is then split up in 'observe, interact, and immerse'.
- The term 'Research' rather than 'Empathizing' was found more appropriate for BM Department because it is simply easier to pronounce in Dutch and it sounds less woolly.

- Technical ‘Testing’ at BM Department is integrated in prototyping.
- The researcher sees the phase ‘story telling’ of *Figure 12* as a tool that can be used during the phases than as a separate phase.
- A few ‘Select’ moments were added to the phases to emphasize that informed decisions should be made and documented at these moments in time.

This led to the following Design Thinking process for BM Department: (1) Research, (2) Frame point of view, (3) Ideate concepts, (4) Select concepts, (5) Prototype, (6) Pilot test & reframe, (7) Ideate sustainable strategy, (8) Select sustainable strategy, (9) Implementation.

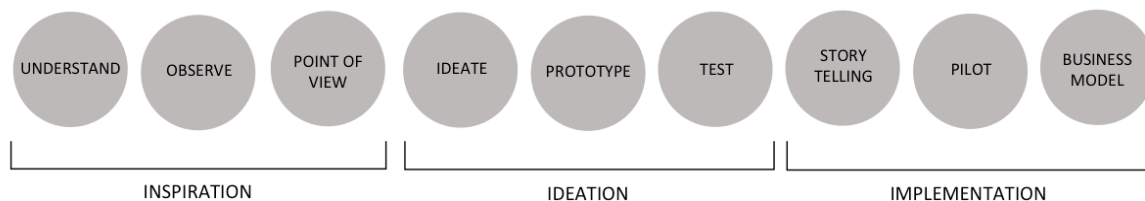


Figure 12. Design thinking process, reproduced from d.school (2010)

Brown & Wyatt (2010) mention the ability to recognize patterns as a prerequisite for Design Thinking and explain that the Design Thinking process should be thought of as a “*system of overlapping spaces rather than a sequence of orderly steps.* [...] *The reason to call these spaces, rather than steps, is that they are not always undertaken sequentially. Projects may loop back through inspiration, ideation, and implementation more than once as the team refines its ideas and explores new directions.*” (Brown & Wyatt, 2010, p. 33). Moreover, it is said that design thinking can feel chaotic when first used, but participants will over time experience the results, and make sense of the process. Design thinking differs itself from “*the linear, milestone-based processes that organizations typically undertake*” (Brown & Wyatt, 2010, p. 33). The mentioning of overlapping spaces, chaos, and the ability to recognize patterns show the beginning of complexity thinking.

### Tools fitting the Design Thinking approach with CIMO-logic

For every phase of design thinking many tools are available. A selection of tools that are thought to be appropriate for BM Department is made in *Table 17*.

Table 17. Summary of found design tools that fit the Design thinking approach.

No.	Name tool	Context	Description (Intervention)	Mechanism	Outcome	Reference
3	Design Thinking	Complete process	Design thinking is a human-centered iterative process. The phases should be seen as overlapping stages. <i>“Design thinking relies on our ability to be intuitive, to recognize patterns, to construct ideas that have emotional meaning as well as being functional, and to express ourselves in media other than words or symbols”</i> (Brown & Wyatt, 2010, p.33)	Structuring but allowing for freedom at the right moments	Human-centered products and services	Brown & Wyatt (2010)
3.1	User Camera Study	Research: observe	<i>“(1) Identify subjects whose perspective you are interested in learning more about. (2) Briefly explain the purpose of the study, and ask if they would be willing to take photographs of their experiences. Get permission to use images they take. (3) Provide a camera to your subject and instructions such as: “We would like to understand what a day in your life feels like. On a day of your choosing, take this camera with you everywhere you go, and take photos of experiences that are important to you.” Or you could try: “Please document your [morning routine] experience with this camera.” Or, “Take pictures of things that are meaningful to you in your kitchen.” Frame your request a little broader than what you believe your problem space might be, in order to capture the surrounding context. Many insights can emerge from that surrounding space. (4) Afterwards, have your subject walk you through the pictures and explain the significance of what they captured. Return to a good empathetic interviewing technique to understand the deeper meaning of the visuals and experience they represent.”</i> (d.school, 2010, p8)	Externalization	Understanding of a user’s experience, and understanding of the environment (without needing access to this environment)	d.school (2010, p.8)
3.2	Interview Preparation	Research: interact  Or in following up with users	There should always be room for interviews to take a spontaneous route. However, a plan is advantageous to make sure information is collected in the appropriate areas. This tool provides some ideas on how to prepare for an engaging interview: <i>“(1) Brainstorm questions: Write down all of the potential questions your team can generate. Try to build on one another’s ideas in order to flesh out meaningful subject areas. (2) Identify and order themes: Have your team identify themes or subject areas into which most questions fall; once you’ve identified the themes of your question-pool, determine the order that would allow the conversation to flow most naturally. This will enable you to structure the flow of your interview, decreasing the potential for hosting a seemingly-scattershot interaction with your user. (3) Refine questions: Once you have all the questions grouped by theme and order, you may find that there are some redundant areas of conversation, or questions that seem strangely out of place. Take a few moments to make sure that you leave room in your planning to ask plenty of “why?” questions, plenty of “tell me about the last time you _____?” questions, and plenty of questions that are directed at how the user FEELS.”</i> (d.school, 2010, p.9)	Combination	A Plan for engaging interview	d.school (2010, p.9)
3.3	Interview for Empathy	Research: interact	This tool provides rules for interviewing: (1) Ask why, (2) Never say “usually” when asking a question (ask for specific instance), (3) Encourage stories. (4) Look for inconsistencies, (5) Pay attention to	Combination of knowledge of researcher	<i>“Understanding a person’s thoughts,</i>	d.school (2010, p.10)

		Or in following up with users	nonverbal cues, (6) Don't be afraid of silence, (7) Don't suggest answers to your questions, (8) Ask questions neutrally, (9) Don't ask binary questions, (10) Only ten words to a question, (11) Only ask one question at a time, one person at a time, (12) Make sure you're prepared to capture. (d.school, 2010, p. 10)	and user, externalization of user's experience.	<i>emotions, and motivations so that we can know how to innovate for him or her</i> " (d.school, 2010, p.10)	
3.4	Guided Tour	Research: immerse	<i>"Arrange with someone you're designing for to get a Guided Tour of their home or workplace. [...] Come with two team members, one to ask questions and the other to take notes. Pay close attention to the space that you're visiting, the rituals you see there, what's on the walls, who uses it, and where it's located. All are key pieces of information. [...] Ask a lot of questions about the person's habits and space. Why does she do the things she does? Who uses the space and where are things kept or why are things organized the way that they are?"</i> (IDEO.org, 2015, p. 64)	Socialization	Understanding of the physical details of a person's life, routines, and habits.	IDEO.org (2015, p. 64)
3.5	Download your learnings	Frame point of view & Ideate concepts	Activity to make sense of all the notes, photos, impressions, and quotes. First of all, the group should get rid of distractions and sit in a circle. Everyone takes turns putting insights on post-its and share stories. Next, post-its can be clustered so the discussion is recorded. Ideally this takes place right after an interview or day in the field (IDEO.org, 2015, p.77)	Externalization and combination of knowledge of individuals	Documentation of insights	IDEO.org (2015, p.77)
3.6	How might we ...	Ideate concepts	Make questions that start with "How might we..." that are neither too narrow nor too wide, good example: <i>"How might we create a sense of safety in public toilets?"</i> The question should allow for a variety of solutions but be narrow enough to know where to start the brainstorm (IDEO.org, 2015, p.85).	Externalization	Starting point for brainstorm	IDEO.org (2015, p.85)
3.7	Brainstorm Rules	Ideate concepts	A list of rules should be displayed during a brainstorm session, e.g. on an A1 poster. Participants should stick to and remind each other of the rules. The rules are in short: (1) Defer judgement, (2) Encourage wild ideas, (3) Build on the ideas of others, (4) Stay focused on the topic, (5) One conversation at the time, (6) Be visual, (7) Go for quantity.	Externalization	Lots of ideas, collaboration, openness to wild solutions, increase in creativity, generative group mindset.	d.school (2010, p.28)
3.8	Actor Network	Frame Point of View	<i>An 'actor network' can help to describe the various problem-owners, from individuals and NGOs to media groups and government ministries. Visualizing the different actors in the network creates insight into how each actor can effectuate a total solution. In the visualization each actor is denoted with a color for their role, space indicates degrees of separation from the problem and ability to influence the outcome, and arrows indicate how actors are connected. Technologies are also depicted as actors, as they can exert agency on the problem. Drawing an actor network is not a document of absolute fact, but instead serves as a discussion piece. It assists the co-creation facilitator in knowing who to involve in the co-creation workshops and helps in managing the motivations and agendas of various</i>	Externalization and combination	Overview of involved stakeholders	Butterfly Works (n.d.)

			stakeholders.” (Butterfly Works, n.d., p.8)			
3.9	Selection	Select concepts/ select sustainable strategy	<p><i>“In the selection process, don’t narrow too fast. Don’t immediately worry about feasibility. Hang on to the ideas about which the group is excited, amused, or intrigued. An idea that is not plausible may still have an aspect within it that is very useful and meaningful.</i></p> <p><i>Different selection techniques can be used, including these three:</i></p> <p><i>(1) Post-it voting – each team member gets three votes and marks three ideas that he or she is attracted to. Independent voting allows all team members to have a voice. (2) The four categories method – the method encourages you to hang onto those crazy but meaningful ideas. Elect one or two ideas for each of these four categories: the rational choice, the most likely to delight, the darling, and the long shot. (3) Bingo selection method – like the four categories method, this is designed to help preserve innovation potential. Choose ideas that inspire you to build in different form factors: a physical prototype, a digital prototype, and an experience prototype.</i></p> <p><i>Carry forward multiple ideas into prototyping. If an idea is so far out there that it seems pointless to test, ask yourselves what about that solution was attractive, and then test that aspect or integrate it into a new solution.”</i> (d.school, 2010, p.30)</p>	Internalization	Selection of the most valuable ideas and most valuable aspects of ideas	d.school (2010, p.30)
3.10	User Driven Prototyping	Research and Prototyping	<p><i>“Watching the user create something, rather than try something that you developed. [...] The goal is not to take what they made and integrate it into your design, but rather to understand their thinking and perhaps reveal needs and features that you may not have thought of.”</i> How to do this: <i>As an example, if you were creating a website to allow users to create custom t-shirts, a traditional early-stage prototype might be a mock-up of the webpage with the features and buttons that you think might be appropriate. A user-driven prototype could be to give your user a blank piece of paper and ask her to draw what she thinks the features should be. You might provide a light scaffolding to get her going, such as a piece of paper with boxes in the layout of a possible website, and then ask her to create the content for those boxes. Of course, there is an entire spectrum of how much you provide and how much you ask your user to create. You need to find the balance, depending on your project progress, for a prototype that is scaffolded enough that the user feels that she can be generative, but open enough that you learn outside of your own biases and assumptions. Other examples of user-driven prototypes include: asking a user to draw something (“draw how you think about going to the doctor”), to make an object with simple materials (“make a bag for diapers and baby supplies, using this paper and tape”), or to compile things (“tear out pictures from these magazines that represent your ideal mall shopping experience”).”</i> (d.school, 2010, p.38)</p>	Externalization	Better understanding of the user and his reaction to the solution-in-progress, revealed assumptions and desires	d.school (2010, p.38)
3.11	Testing with Users	Pilot	<p>Procedure: <i>“(1) Let your user experience the prototype. Show don’t tell. Put your prototype in the user’s hands (or your user in the prototype) and give just the minimum context so they understand what to do. Don’t explain your thinking or</i></p>	Internalization of prototype by user,	Refined solution and refined understanding	d.school (2010, p.35)

			<p><i>reasoning for your prototype. (2) Have them talk through their experience. For example, when appropriate, as the host, ask “Tell me what you are thinking as you are doing this.” (3) Actively observe. Watch how they use (and misuse!) what you have given them. Don’t immediately “correct” what your user tester is doing. (4) Follow up with questions. This is important; often this is the most valuable part of testing. “Show me why this would [not] work for you.” “Can you tell me more about how this made you feel?” “Why?” Answer questions with questions (i.e. “well, what do you think that button does”).” (d.school, 2010, p. 35)</i></p>	<p>externalization of tacit knowledge of the user. Combination of new insights</p>	<p>of the user</p>	
<b>3.12</b>	Business Model Canvas	Ideate sustainable strategy	<p>The Business Model Canvas can be used throughout the development process to define and refine the business model. Steps: “(1) Print out a Business Model Canvas for each of your team members. (2) Sit down with your team and start to fill out the sections of the Business Model Canvas. When you fill it out the first time, expect for there to be holes. It’s okay not to know exactly how everything will work. (3) You may need to pause filling out the sheet to get more information. That’s fine. (4) When you’re done, post the Business Model Canvas in your workspace. Like everything else in the human-centered design process, you’ll refine it. Consider doing a new one as your project progresses.” (IDEO.org, 2015, p.123)</p>	<p>Externalization of ideas, combination of ideas of different individuals.</p>	<p>Definition of ‘why, what, how, and involved stakeholders for the project. Common frame of reference for all involved stakeholders.</p>	<p>IDEO.org (2015, p.123)</p>
<b>3.13</b>	Keep getting feedback	Implementation	<p>“Gathering feedback from the people you’re designing for is a never-ending process and it’s critical as you push your idea forward”. Steps: (1) As you move into prototyping and piloting, make sure that you’re collecting feedback. Interviews and Group Interviews are a great way to learn from the people you’re designing for. (2) Reach out to key partners as well for their input. They’ll often have expertise that the design team may not and can help point the way forward. Convening the right group of stakeholders at once can bring up a lot of feedback in a single session. (3) Capture feedback in your notebook and share back with the design team.” (IDEO.org, 2015, p.157). Sharing the feedback with the design team can for instance be done with help of the ‘Download Your Learnings’ tool.</p>	<p>Externalization</p>	<p>Feedback, success after implementation.</p>	<p>IDEO.org (2015, p. 157)</p>

## Evaluation of tools fitting Design Thinking based on requirements

Table 18. Evaluation of Design Thinking tools

Tool 3 Design Thinking		
Req.	Score	Reasoning
A1	++	Clear framework with spaces that can be used to guide innovation projects
A2	++	Tools within the framework have clearly defined outcomes which increases predictability
A3	++	Still a lot of freedom on filling in the spaces with tools and flexibility to move back and forth through the spaces
A4	++	Everyone knows what to expect, framework is filled in with tools that provide different levels of knowledge creation.
A5	++	Includes tools for co-creation and client will know better what to expect since the work processes are more defined.
A6	++	Provides a defined approach for creativity and co-creation
B1	++	Easy to understand, used in many companies
B2	++	Clear guidelines, easy step plan to follow.
C1	0	Doesn't decrease or increase
C2	++	Can be implemented step by step
C3	++	Specifically developed for the service development context
C4	++	Useful in every development project, set of tools can be adapted for every project.
D1	++	Tools can be tried out directly by following guidelines.
D2	+	Tools often only require pens and paper and 30mins-2hours of time to execute.
<b>Total</b>	<b>25</b>	
<b>score</b>		

### 4.2.4 Summary of evaluation

Table 19 summarizes the evaluation of the design tools. Implementation of tool 2.1 would require ICT Corp. to make expensive changes to the building and is therefore rated 'Low' in total usability. As mentioned before, the researcher expects most resistance against the implementation of Bohmian Dialogue. However, the tool can lead to substantial changes in company culture over time. Tools 2.2, 2.3, and 3. are clear step plans, do not need a lot of resources, are expected to generate short-term results, and can be implemented directly by BM Department.

Table 19. Summary evaluation of tools on design requirements.

No.	Name tool	Score on requirements					Total score	Evaluation of usability
		A. Functional requirements	B. User requirements	C. Boundary Conditions	D. Design restrictions			
1.	Bohmian Dialogue Variations	8	0	1	2	11	Medium	
2.1	Architectural Elements	4	4	5	0	11	Low (implementation costs are extremely high)	
2.2	Room Configurations	6	4	7	3	20	High	
2.3	Dynamic Artifacts	5	4	6	3	18	High	
3.	Design Thinking	12	4	6	3	25	High	

## 4.2.5 Assessment of relations between tools when used in combination

The researcher intuitively assessed the effect the design tools would have on each other when combined. *Table 20* shows whether design tools are expected to have an impact on each other, and if so, whether this is expected to be a positive or negative impact.

*Table 20. Assessment of relations between tools when using them in combination.*

Tool	1.	2.1	2.2	2.3	3.
<b>1. Bohmian dialogue variations</b>	x	++	++	++	0
<b>2.1 Architectural aspects</b>	x	x	++	++	+
<b>2.2 Room configurations</b>	x	x	x	++	+
<b>2.3 Dynamic artifacts</b>	x	x	x	x	+
<b>3. Design Thinking</b>	x	x	x	x	x

*Managerial note:* += highly appropriate combination, +=appropriate combination, 0=tools do not have an effect on each other, -=conflicting tools, --=highly conflicting tools.

### ***Reasoning behind the rating of Table 20:***

Tools 1.1 -1.3 have similar context, outcomes, and mechanisms (see section Approach 1: Bohmian Dialogue. These Bohmian Dialogue variations cannot be used at the same time since only one variation can be used at a single meeting. However, the variations are expected to strengthen each other's effect when used in sequence.

Tools 2.1.1 - 2.1.4, 2.2.1 - 2.2.3, and 2.3.1 - 2.3.2 can be supported by the same literature. Therefore these tools are expected to strengthen each other as well.

Design Thinking tools (tools 3.1 – 3.13) all strengthen each other since these tools provide instruments for the different phases of the same framework

As mentioned before, the Bohmian dialogue variations do not provide a complete framework but can be placed in e.g. the Design Thinking framework under idea generation techniques. Tool 2.1-2.3 support the creation of an ideal work environment for the distinct phases of the development process and is therefore rated as highly appropriate to use with Design Thinking as well. Tool 2 provides the setting for tool 1 and 3. For instance, 2.3.2 "Around the campfire" provides appropriate setting for dialogue.



### 4.3 Proposed Design

Section 4.2.4 Summary of evaluation indicates that tools 1, 2.2, 2.3, and 3 are expected to be appropriate to implement in the organizational context of BM Department. Section 4.2.5 Assessment of relations between tools when used in combination, explains that the tools have either a positive or a neutral effect on one another. The various stages of the service development process each ask for different ways of working. It seems most appropriate to combine the tools 1, 2.2, 2.3, and 3. This leads to an extensive menu of tools out of which a tool can be chosen for every step of the development process. BM Department can select appropriate tools by looking at the context and the outcome in Table 11, Table 17, and Table 19. The tools can be tried out, altered to the preferences of BM Department, and new tools can be added if desired. This way the organizational process slowly becomes more defined while it also continues to be flexible. The menu of tools can grow together with the department while creating more defined work approaches on co-creation and creativity.

When the aim is to create new products and services, a linear way of thinking is not enough. New ideas emerge from interaction on different levels. There is little experience on creativity tools in the C&C paradigm. This proposed design combines many linear tools which is expected to lead to new behavioral patterns. Mulder (2012) indicates that the use of one intervention is insufficient. However, using a combination of relatively simple interventions at the same time can lead to behavioral transformation, which according to literature is needed for the emergence of creativity.

## Conclusion

This chapter outlines the conclusions of this research.

The research questions were split in questions about the current state, the desired state, the gap. The design questions focused on how the gap between the current and desired state can be mitigated.

The first research question contains sub questions about the current state of the TIPs. In section 4.1.2 is answered what the current performance of the TIPs looks like. Bottlenecks were found with help of the interviews with management, business developers, and software developers. There was little documentation found on the work processes. The researcher took the opportunity to define the work processes with help of the interviews. Research question 1. was answered.

The second research question was about the desired state of the TIPs. Research question 2 was answered, although the desired performance in terms of amount, dimensions, outcomes, and profitability was mainly based on an informal conversation with the company supervisor and not on any formal documentation. The difference between the current and desired process was defined by the researcher based on the interviews. Several factors influencing the desired state were found.

The qualitative gap is defined with several elements. The consensus analysis shows bottlenecks that can be improved upon to mitigate the gap. The quantitative gap is based information gathered during an informal conversation with the company supervisor and by counting presentations on BM's SharePoint. It was expected that there would be more formal documentation on the current and desired state to be able to define a grounded qualitative gap. The qualitative gap (question 3.1) is defined to some extent.

The qualitative and quantitative gap, and the bottlenecks show factors which can be improved upon to mitigate the gap. Research question 3.2 was answered.

Requirements were developed by the researcher. Question 1.1 of the design goals is answered. Several design directions were extracted from literature, best practices, and experts. Question 1.2 is answered. The researcher decided on a combination of solutions that fit the company context (question 1.3 was answered).

To decrease the gap between the current and desired state of the TIPs, BM Department can use the final design as a menu to choose simple tools that help defining the creativity and co-creation working processes (question 1.4 was answered).

## Reflection

The reflection on this research is split up in three parts. First of all, the fit of this research with Innovation Management is discussed. Next, I'll reflect on the actual performed research method, comparing this to the planning and proposal and pointing out the differences. After this, there's some reflection on the theoretical foundation of the thesis, contemplating the advantages and disadvantages of the chosen eclectic research method and providing recommendations for practice and future research. Finally, there's a small personal reflection that describes my personal experience of this thesis project.

### Fit with Innovation Management

Project contains the aspects that are expected from an Innovation Management graduation project, namely:

- (1) Managing processes in organizational environment.
- (2) Modeling: visualizing organizational processes. Before this project there were loose ends. The flow diagram helps to show the phases of the organizational process. It turned out that the dynamic company environment does not let itself be described in static terms. A solution to this is found through the use of Design Thinking phases in the proposed design.
- (3) Finding solutions to improve the organizational process without restraining flexibility.

### Reflection on research method

It was easy to plan interviews with people at BM Department, even the interview with the division manager and director could be arranged within a week and a half. All interviewees were motivated to participate. I had more difficulty finding appropriate data and documentation to use. Due to the young age of BM Department there were not so many standardized procedures, which might have led to less available data and documentation to work with. Informal conversations with the company supervisor and others of BM Department were valuable for the right information to use. I used the documents and data that I thought were most relevant and mentioned where I found it to provide transparency so the reader would be informed about the reliability and validity of the data and documents used. All in all, I spent a bit too much time searching and wandering around. However, the diagnosis phase was still pretty much finished according to planning and I can't think of other difficulties worth mentioning.

Where in problem-based research the researcher looks to prove or disapprove a hypothesis, in design-oriented research the researcher searches for the optimal solution. This can cause a lot of diverging of ideas. Due to the use of an eclectic approach the pool of solutions to choose from became even larger. Often, I had to ask myself which (combination of) tools I could ground using scientific literature and how I could put the literature and tools together in a successful manner. Throughout the process there were moments I found myself to want to 'tell everything', which led using literature that would either collide or overlap too much to make sense. Colliding especially took place when I was trying to use variable and C&C theories and instruments together. A lot of adaptations to the literature review took place.

During the research I experienced the importance of generating support for your work within the company.

At the end of the diagnosis phase I presented my findings in the form of a cause-and-effect diagram with explanation to the whole department during a team meeting. Looking back on this, I think it might have been more valuable if I would have asked one person for feedback at the time instead of the group. Asking for feedback one-on-one might have led to more succinct and to the point feedback. Most of the feedback I got by asking people after an informal gathering following the meeting. I think this presentation helped generating support and thereby increased the possibility that solutions provided by this thesis will be accepted. However, having generated some more support prior to the presentation would have been useful for a more polished presentation. In the future, I would like to give and ask for feedback a bit more frequently.

The presentation not going that smooth made me more reluctant to use a more participative method and e.g. organize a participative session to co-design solutions with co-workers of BM Department. This was the biggest drawback for me personally during this project. Looking back at this, the participative sessions at the end might have caused more confusion due to the difference in working methods between my university style and the consultants. My process is, compared to the consultancy environment, very slow. I think a lot before I act where most consultants rather try out things to see if they work and prefer quick results. This also explains why ideas that are not directly generating results are not as positively received as ideas that do generate quick results. Perhaps a bit of distance was needed to generate valuable results. This distance made it possible to come up with insights that BM Department would not have found through their own way of working. I noticed that I needed to give ideas some time to grow.

## **Theoretical reflection**

The research takes place in a dynamic company environment. For this reason one could lean towards a C&C approach. However, this approach is very much based on analyzing current situations and does not provide clear instructions on improvements yet (e.g. Nonaka's SECI model). Theories in the variable paradigm provide both theory and instructions. Management literature explains instruments with help of variable-based theories; therefore those instruments are based in the variable paradigm. For this research I chose for an eclectic approach because I could not find all the aspects of the research in one of both approaches. Mulder (2012) suggests that the combination of variable-based tools can have a significant effect on patterns of behavior and attitudes of involved people. Tools can be used either parallel or sequential to achieve this effect and one should decide which tool to use based on the current situation. In the final design I made a combination of tools of which the workings can be explained using variable-based theories. Furthermore, I explain the use of the combination of these tools with help of Nonaka's SECI model, which fits the C&C paradigm. This is in line with the findings of

Mulder (2012). The use of the combination of tools can lead to a transformation in the relationship between ST Department and their clients.

There are a lot of aspects involved in Nonaka's SECI model; it is very extensive on what the four *ba*'s should look like (e.g. outside in nature or not, temperature, mental models, literally everything you see and experience should fit the specific *ba*). This is difficult to put into practice. It is a very holistic view on management. My goal for this thesis was to take into account these situations (*ba*), but also provide a set of tools that could be easily used in practice. In the final design of this thesis, the describing aspects are based on the C&C approach, but the interventional aspects are based on the variable-based approach.

During this research I found a lot of similarities between the theories and instruments that I used. Nonaka is clearly a C&C theory that does not provide a lot of solutions. However, both Nonaka and Design Thinking (tool that hints towards a C&C description, but the developers do not really go into depth on the mechanisms of the tool) show a lot of similarities. Both mention, for instance, the importance of tacit knowledge transfer (immersion) between client and organization. Although Design Thinking and its tools are mostly described in a simple variable-based manner, Design Thinking steps are sometimes referred to as 'spaces', indicating a holistic view. Nonaka & Takeuchi (1995) show how the mechanisms of the four different *ba*'s are related to the production and service development process. These steps in the process show many similarities with the Design Thinking process. As "sharing tacit knowledge" happens in the "empathizing" space, "creating concepts" and "justifying concepts" is comparable to "define", and "ideate" and "building an archetype" basically means "prototyping". Cross leveling happens to some extent when pilot-testing a prototype; here the created knowledge is to some extent internalized by the end user. When a final prototype is developed, "test" is replaced by "implementation" where the link with "internalization" becomes even more clear; the end users make the developed product or service part of their own mental model.

Following this logic, it might be possible to link "socialization, externalization, combination, and internalization" of Nonaka's SECI model to the spaces of Design Thinking. I thought it would be interesting to try to put these two models together to see if it is possible to use Nonaka's SECI model to provide a strong theoretical C&C background for Design Thinking, while simultaneously providing tools for the C&C paradigm. A first idea on what this could look like is given in *Figure 13*.

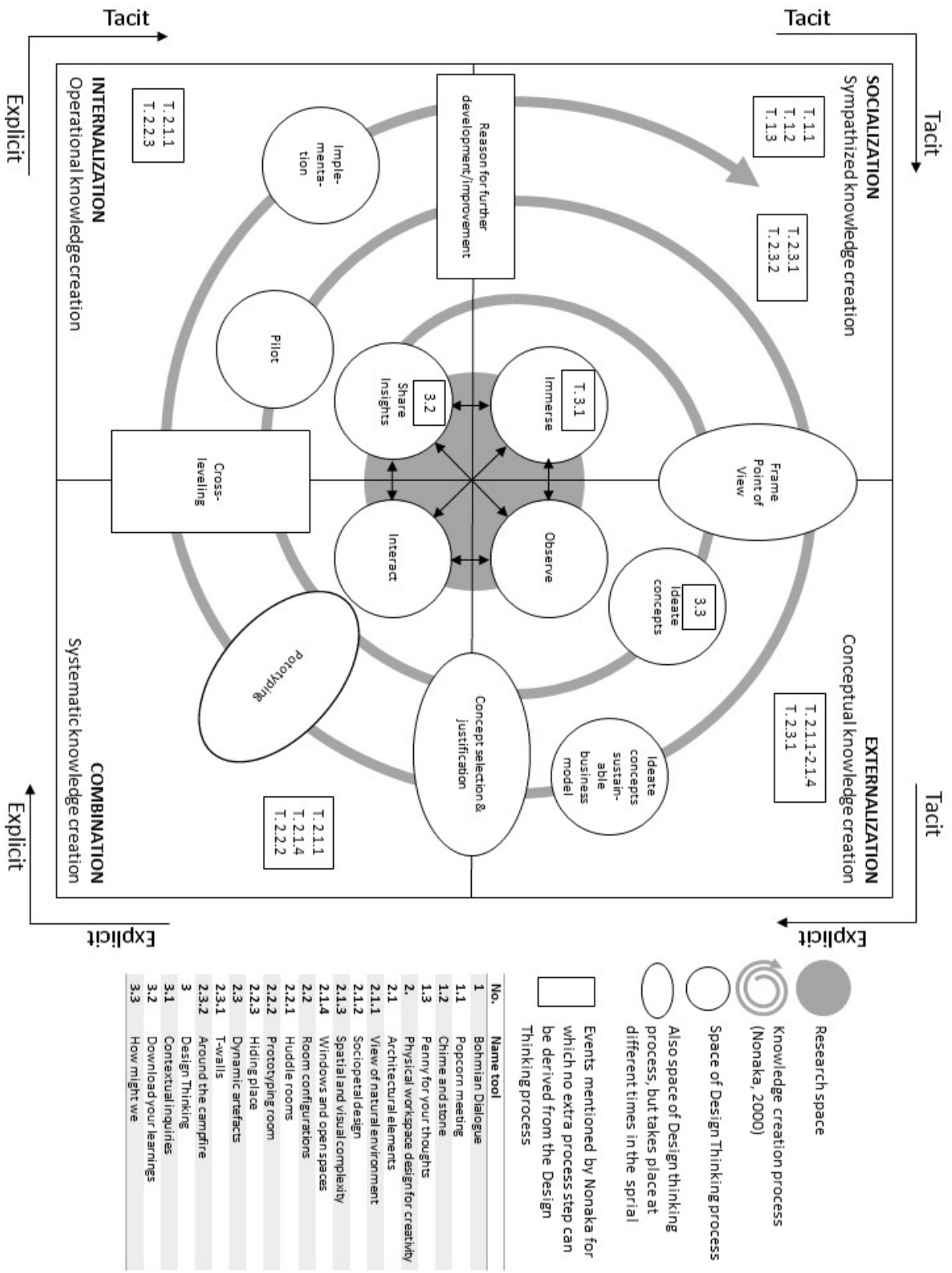


Figure 13. Nonaka et al. (2000) and design thinking (d.school, 2010) combined.

## **Recommendations for future research**

First of all, further research can be done by further developing the idea in Fig. 3. in depth. Secondly, the actual effect over time of combining several variable-based tools might be evaluated. As mentioned in section xx and figure xx implementation and evaluation was outside the scope of this project.

## **Recommendations for use in practice**

Only time can tell whether or not the combination of tools works like it is grounded in theory. BM Department should try things out and analyze over time, whether or not a change in behavioral patterns takes place in consultants and clients. If a tool does not seem to work, BM Department should stop using it or replace it with another tool from management literature (e.g. using the references provided for the final design of this thesis) that is described to be applicable in that specific situation. An unintended consequence of the implementation of the combination of instruments could be that the instruments turn out to influence each other, negatively. I expect that the dialogue practices will be most difficult to implement since it requires the most direct change in attitude from the consultants. However, when the time is taken to implement dialogue practice, it could over time lead to a great change in behavior, and lead to a common mental model.

## **Personal reflection**

During this project I experienced a high contrast between the way of working in the university and in the company. To be able to graduate at the TU/e it was desired that I would follow defined work approaches for the diagnosis and the design. Within the dynamic company environment an approach of rapid trial and error seemed more logical than going through extensive diagnosis and design.

People at BM Department are very enthusiastic about what they do, and it was great to be a part of this for six months. People love their work and strongly support the department. The actual workspace can change quickly, since people go in and out for consulting assignments. It felt like people could be 'themselves', which I imagine being less in a more formal or traditional department or company. The weekly team meetings helped a lot to keep in touch with what's happening in the department.

Where the diagnosis phase went easier than I expected, I experienced more difficulties during the design phase than I thought I would. I expected the design to follow logically from the literature and diagnosis and thought my background in Industrial Design would come in handy. I expected to feel more creative than I did.

Graduating felt like a continuous and slow process. In the rest of my studies I experienced more ups and downs due to more deadlines, exams, and working in project teams. The graduation project is not comparable to any other of the assignments that I did at the TU/e. This project had a lot more depth and width, and it was a lot less concrete how it should be performed and what should be delivered in the

end. Half a year is a long time to stay focused on one project This project taught me a lot about my own working process and gave me confidence that I can handle projects on this scale.

Overall the whole graduation project was a great learning experience to further get to know my own capabilities and a good preparation for working life.



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