



THE APPLICATION OF DESIGN THINKING IN THE AUTOMOTIVE INDUSTRY

- AN EXPLORATORY STUDY

MASTER THESIS

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ABSTRACT

Purpose: The purpose of this master thesis is to explore the application of Design Thinking in the automotive industry in order to explain which factors influence the innovativeness of Design Thinking teams.

Motivation / theoretical framework: Seeking for innovation leadership, automotive manufacturers apply Design Thinking to enhance their competitiveness. Design Thinking is a multidisciplinary team-based methodology that adopts design principles to business management. Design Thinking teams produce innovative outcomes by working together in stimulating environments. In the literature and practice, however, it is not clear, what constitutes the relationship between the application of Design Thinking and team's innovativeness.

Design / methodology / approach: A grounded theory and template analysis approach is used to answer the research question. 15 semi-structured interviews with employees of a car manufacturer deliver practical insights about which factors and in which direction they influence the link. In sum, 14 Design Thinking projects were examined. By a differentiation of highly and less innovative projects, the study provides findings about how the factors differ in these clusters.

Findings: A full conceptual model explains influencing factors on a macro, meso and micro level. On a macro level, the organizational environment is a relevant factor for team's innovativeness. In detail, organizational encouragement, supervisory encouragement, freedom and challenging work enhance innovative team outcomes. In contrary, organizational impediments weakens the project's success. With regard to pressure and resources an inverted u-shaped relationship is found. Examining the meso level, team climate, team collaboration and leadership are relevant factors for team's innovativeness. Among all factors, the data analysis reveals that team climate is the most important factor. Moreover, team collaboration includes the positive factors interaction and intra-organizational network as well as the negative factor discrepancy. Transformational leadership is a beneficial leadership style whereas transactional and laissez-faire are described to be detrimental to DT team's success. At the micro level, intrinsic motivation supports whereas extrinsic motivation reduces team's innovativeness. The data analysis revealed that supervisory encouragement and freedom were only applicable to highly innovative projects. In contrast, in less innovative projects discrepancy and laissez-faire leadership decreased the innovative capability of the Design Thinking teams.

Theoretical / practical contribution: The literature focuses on elements of Design Thinking and how organizations profit from its application. However, literature about influencing factors of Design Thinking team's innovativeness is rare. This thesis elaborates on this gap. Furthermore, the findings show which factors are especially relevant aiming at radical innovation including a comparison of Design Thinking and other innovation teams (such as R&D and NPD teams). In practice, this thesis provides managers and decision-makers of multinationals with practical recommendations about how to improve the implementation of Design Thinking.

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COLOR CODING



Opening Quotation

Opening Quotation

Coming together is the beginning.
Keeping together is progress.
Working together is success.
— Henry Ford



1. Motivation

Companies have to introduce innovative products and services in order to stay competitive in a rapidly changing environment (Anderson et al. 2014). However, many organizations struggle to survive (Furukawa 2013; Mas-Verdú et al. 2015). Products that were known to be state-of-the-art become suddenly obsolete by technologies developed by agile startups (Miller & Keoleian 2015). Especially, the automotive industry faces rapid changes in market needs, policies and technologies (Pinkse et al. 2014; Pilkington & Dyerson 2004). New competitors, e.g. Tesla Motors and Google, enter the market and traditional car manufacturers have to react accordingly. As a result, the automotive industry is highly competitive in innovation leadership (Rese et al. 2015). Innovativeness is a critical factor for long-term success in competitive global marketplaces (West & Altink 1996; Allen et al. 2015; van der Panne et al. 2003).

It takes years until new ideas reach series-production readiness in the automotive industry (Zapata & Nieuwenhuis 2010). M. Meyer, Global Head of Automotive at KPMG, emphasizes that “although the automotive industry is undergoing unprecedented change, the relatively long development cycles [of car technologies] mean that some of these new advances may take as much as 5-10 years to evolve” (KPMG 2014). In addition, one major challenge for the industry is the rapidly changing needs of its customers. The automotive industry has to adapt to the fact that customers are digital natives with different expectations than today’s customers.

In order to tackle these challenges car producers have to find a way how they can stay competitive (Ili et al. 2010). Thus, a shifting trend towards a promising innovation strategy can be recognized: The application of Design Thinking in the automotive industry.

2. Introduction

In this chapter, the topic of this master thesis is briefly introduced and the research gap is explained. Accordingly, the research question and goal are presented, followed by an explanation of its theoretical and practical relevance. At the end of this section, the structure of this master thesis is stated.

2.1. Research Gap and Question

In the Design Thinking literature two discourses can be found: The “design discourse” and the “management discourse”. The traditional “design discourse” studies the cognitive styles and principles of designers, whereas the “management discourse” adapts these findings to business administration (Hassi & Laakso 2011; Johansson & Woodilla 2010; Badke-Schaub et al. 2010; Johansson-Sköldberg et al. 2013). As this study analyzes the application of Design Thinking in practice, this thesis focuses on the “management discourse” of Design Thinking.

In the “management discourse”, Design Thinking is “a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos” (Brown 2008, p. 89). One of the most cited and precise definition of Design Thinking is given by Brown (2008, p. 86) (Gobble 2014): “[Design Thinking] is a discipline that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity.”

Design Thinking is mainly driven and developed by IDEO consultants as well as by Hasso Plattner Institutes. Different elements of the application of Design Thinking are mentioned in literature: mindset, team diversity, process, tools and environment (Brown 2008; Brown 2009; Brown & Wyatt 2010; Mootee 2013; Collins 2013; Martin 2009; Seidel & Fixson 2013; Simons et al. 2011; Cross 2000; van Aken 2004; Yoo et al. 2006). In particular, the authors state that a Design Thinking team acts and thinks customer-centric, has a high diversity with regard to their backgrounds, follows a typical process, uses different tools for creative thinking and works in an inspiring environment.

These elements are used to differentiate a Design Thinking team and other innovation teams such as R&D and New Product Development (NPD) teams. Applying these elements, academic literature proposes Design Thinking to increase innovativeness (Hassi & Laakso 2011; Simons et al. 2011; Liedtka 2014; Carlgren et al. 2014; Brown & Wyatt 2010; Brown 2008; Mootee 2013; Wattanasupachoke 2012). Those findings are mostly derived from describing case studies which explain examples how managers successfully implemented Design Thinking in the organization to overcome internal challenges, engage customers, develop new processes and products (Liedtka 2014; Brown 2008). Hence, literature about Design Thinking describes elements characterizing Design Thinking teams and their influence on organizations' innovativeness. However, academic literature did not examine which factors influence Design Thinking teams' innovativeness. As a consequence there is no definite understanding why some Design Thinking teams deliver highly innovative project outcomes whereas others are less innovative. In addition, according to Chang et al. (2013) there is no systematic use of Design Thinking in practice which is problematic because differences in the application do not allow a description about how Design Thinking should be applied to deliver innovative outcomes.

In management research, influencing factors about team's innovativeness (such as R&D and NPD teams) have been under scrutiny but they did not explicitly examine Design Thinking teams. To build on literature about teams, these findings are taken into consideration to propose influencing factors. As such, the team climate inventory (Anderson & West 1996; Anderson & West 1994; West & Altink 1996; Kivimaki et al. 1997; Kivimaki & Elovainio 1999; Agrell & Gustafson 1994), organizational environment scale by Amabile (1996) and Amabile et al. (2005), team collaboration (Kratzer et al. 2004; Hargadon & Bechky 2006; Thompson 2003) and leadership styles (Kirkman et al. 2009; Chen et al. 2012; Judge & Piccolo 2004; Walumbwa et al. 2007; Avolio & Gardner 2005; Owens & Hekman 2012) are proposed as potential factors which might play a role in Design Thinking teams.

Thus, the goal of the thesis is to explore the application of Design Thinking in the automotive industry in order to explain which factors influence the innovativeness of Design Thinking teams. Accordingly, the main research question is:

Which factors influence the relationship between the application of Design Thinking and team's innovativeness?

This question goes hand in hand with the following sub-questions:

- Do the factors strengthen or weaken the link?
- How do they differ in highly and less innovative project teams?

2.2. Theoretical Contribution

The theoretical contribution of this study is twofold regarding theory-building and methodology.

First, as the “management discourse” about Design Thinking focused on describing case studies about how Design Thinking is applied in practice or stating that Design Thinking enhances innovativeness (Hassi & Laakso 2011; Simons et al. 2011; Liedtka 2014; Carlgren et al. 2014; Brown & Wyatt 2010; Brown 2008; Mootee 2013; Wattanasupachoke 2012), this study adds value to the current state of research by examining influencing factors in Design Thinking projects. For the first time, the importance of influencing factors provided by organizational literature – team climate, organizational environment, team collaboration and leadership – is tested with regard to Design Thinking. Therefore, this study will contribute to theory-building by developing a theoretical framework of influencing factors. As a differentiation of highly and less innovative Design Thinking teams is made in this study, the thesis' results will pioneer further research by explaining which influencing factors are of interest in enhancing Design Thinking team's innovativeness. In addition, this study contribute to the current state of research about R&D and NPD teams by a differentiation and comparison of the study's findings with existing empirical evidence about innovation teams. Moreover, answering to the reproval of Dorst (2010), Mootee (2013), Johansson & Woodilla (2010), Kimbell (2009) and Cross (2010) declaring that Design Thinking is a fad and

lacks theoretical understanding, this thesis provides empirical evidence for the importance of Design Thinking for business innovations. Beyond that, findings of this study will reveal how Design Thinking is applied in multinationals, thus elaborating on the definition of Design Thinking in literature by examining the elements of the application of Design Thinking.

Second, this study contributes to research by executing a differentiated methodology since Grounded Theory and Template Analysis are combined. At the one hand, Grounded Theory is appreciated and accepted in research as a theory-building qualitative methodology (Glaser & Strauss 1967; Strauss & Corbin 1990) – on the other hand, editors of the Academy of Management Journal, Robert Gephart, Sara L. Rynes and Roy Suddaby state common mistakes which they recognized in evaluating literature using Grounded Theory (Suddaby 2006). In order to benefit from the advantages of Grounded Theory and on the same time counterbalance its inherent drawbacks, Template Analysis is integrated in the procedure of Grounded Theory. This approach expands the current state of methodologies as it will provide first hand experiences of the combination of Grounded Theory and Template Analysis.

2.3. Practical Contribution

In business, Design Thinking is applied to increase the speed, vitality and inventiveness of project outcomes (Simons et al. 2011; Brown & Wyatt 2010; Denning 2013). Promoted as a tool for out-of-the-box thinking (Wattanasupachoke 2012), managers (e.g. in the automotive industry) apply the method in order to increase the project team's innovativeness (Liedtka 2014). However, managers do not know how to implement Design Thinking successfully. It is carried out without the understanding how the outcome might be positively influenced. The findings of this thesis will support managers, decision-makers and organizations with an in-depth analysis of factors that are relevant for the quality of Design Thinking projects. Focusing on automotive projects, conclusions will be specific for this industry. A comparison of Design Thinking and R&D or NPD teams will lead to specific answers which factors are especially relevant for Design Thinking teams. A conceptual model explains what influences the

success of Design Thinking projects. Moreover, a differentiation according to the team's innovativeness provides insights into which factors are relevant for radical ideas. As a result, practical recommendations are derived from the study's results which help decision-makers, managers and employees to implement Design Thinking successfully.

2.4. Structure of the Thesis

The next section (chapter 3) provides an overview of the academic literature. First, the concept Design Thinking is introduced. The explanation of the evolution of Design Thinking lays the foundation for the further analysis and results in the definition of Design Thinking for the purpose and scope of this study. The literature of Design Thinking in the "management discourse" is summarized by elements of the application of Design Thinking. Second, the innovativeness of Design Thinking teams is defined and its impact on organizations is explained. Lastly, influencing factors of the application of Design Thinking – team's innovativeness link are suggested. The literature review concludes with a theoretical framework of the study.

Section 4 explains the methodology used in order to answer the research question. The research design – aligned with the research paradigm – includes the data collection, sample and data analysis. Furthermore, to ensure a high level of credibility, quality issues of the methodology are explained.

The results are presented in section 5 – including the full conceptual model of the study. Collaborating on the theoretical framework, the result section explains the findings on how Design Thinking was applied in the projects. Next, the projects are clustered according an assessment of team's innovativeness. Moreover, the findings about the influencing factors are described in detail. The result section ends with a differentiated few of the full conceptual model by looking at highly and less innovative projects.

In section 6 the findings are discussed by comparing the results with existing literature. The structure of chapter 6 follows the previous section.

The last chapter concludes the study's findings. First, practical implications for the automotive industry are provided by stating the five most important recommendations

for practice derived from this study. Moreover, this section includes the limitations of the present master thesis regarding its methodology, sample and theoretical model. The study ends with providing promising areas for future research.

3. Literature Review

The literature review of this master thesis is structured as follows: First, the application of Design Thinking is analyzed. In doing so, the evolution of Design Thinking is discussed and Design Thinking is defined for the purpose of this thesis. Elements of Design Thinking are developed by summarizing relevant literature to explain the application of Design Thinking in practice. Next, the team's innovativeness is defined and findings about innovations in Design Thinking teams are summarized. At the end of the literature review, influencing factors of team's innovativeness are proposed.

3.1. Application of Design Thinking

This sub-chapter covers the evolution of Design Thinking by describing the “management-“ and “design discourse” of the Design Thinking literature and the growing interest of researchers in this field. Next, the definition of Design Thinking is discussed and elements of the application of Design Thinking are summarized.

3.1.1. Evolution of Design Thinking

There is an ongoing debate in the literature about how Design Thinking can be defined (Dorst 2010; Mootee 2013), which impacts it might have on the performance of employees and companies (Brown 2008; Brown 2009) and how it can be implemented (Brown 2008; Denning 2013; Kim & Ryu 2014). Design Thinking is used as a term both in a theory and practice context (Johansson-Sköldberg et al. 2013). As a result, Johansson and Woodilla (2010) describe the vagueness of Design Thinking as a problem, Kimbell (2009, p. 2) criticizes that “it seems, everyone should be a design thinker” and Cross (2010) even furthers this direction by saying that Design Thinking might lose its meaning because it is such a common-placed concept. To counteract those statements, Design Thinking is explained and defined for the scope of the study in the following.

Combing through the Design Thinking literature, two different discourses can be found: The “design discourse” / “traditional design thinking” and the “management discourse” / “the new Design Thinking movement” (Hassi & Laakso 2011; Johansson & Woodilla

2010; Badke-Schaub et al. 2010; Johansson-Sköldberg et al. 2013). The authors came up with this distinction because they recognized that there is one discourse with a history of (roughly) 50 years and one which appeared around the change of the millennium. The “design discourse” / “traditional design thinking” explain the cognitive capabilities of designers and how they work. For example, they examine how designers solve problems and which process they undergo during their work (Hassi & Laakso 2011).

The “management discourse” / “the new Design Thinking movement” can be seen as an expansion of the “design discourse” as it adopts and adapts findings of design research (Johansson-Sköldberg et al. 2013). The adoption of design research to organizational studies is highlighted by van Aken and Romme (2009) and Romme (2003). They suggest adding design science to the repertoire of management research. Design Thinking is associated with practice instead with theory (Johansson-Sköldberg et al. 2013) as the term Design Thinking is mainly driven and developed by principals and consultants (e.g. coming from IDEO) as well as by Hasso Plattner Institutes in Stanford and Potsdam (Johansson & Woodilla 2009). The authors describe how working styles of designers might be beneficial in the organizational context. Practitioners adopt design principals outside its general application and thereby form a new aspect how processes, products, software and services are developed (Denning 2013; Liedtka 2014; Chang et al. 2013).

The promotion of Design Thinking in business management, led to a growing attention of managers around the world. They draw their attention to Design Thinking as a concept of innovation management and a growing wave of enthusiasm of design practices were recognized (Klemmer & Carroll 2014). Magazines, books and media campaigns promoted the concept as a state-of-the-art approach how managers could impact the company’s innovativeness (Hassi & Laakso 2011). Johansson-Sköldberg et al. (2013) concluded that there is an increasing trend of publications sorted by academic journals, business & social media and books about Design Thinking from 1969 to 2009 in the “management discourse”. Figure 1 shows an exponential growth of the term Design Thinking in academic literature from 1985 until 2014. I searched for “Design

Thinking” in the EbscoHost Business Source Complete data base including all languages. The results were limited to “academic journals” and singly the document type “article” was of interest. The graph indicates the increasing interest of academics in the field of Design Thinking and supports the findings of Johansson-Sköldberg et al. (2013). The beginning of the exponential increase is around the millenium which is an indicator that the term Design Thinking was established and promoted by authors in the “management discourse”.

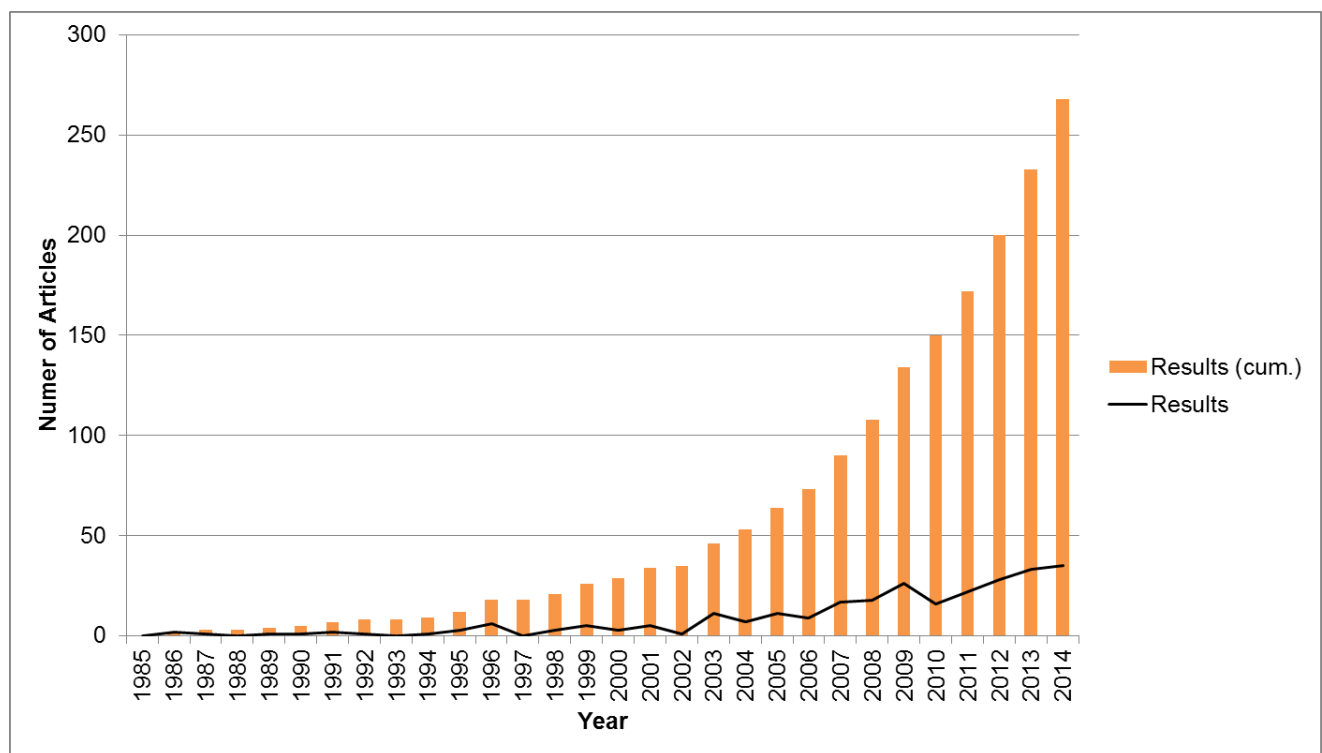


Figure 1: Timeline of publications about Design Thinking

This master thesis focuses on the “management discourse” of Design Thinking because it teaches organizations how they can learn from designers in being creative and innovative. Nevertheless, literature of the “design discourse” is beneficial for the understanding of the context and discussion of the thesis’s results (Johansson-Sköldberg et al. 2013).

3.1.2. Definition of Design Thinking

As elaborated above, this master thesis refers to the “management discourse” of Design Thinking which was developed around the millennium. One of the most concise definitions of Design Thinking in this discourse is the one given by Brown (2008) (Gobble 2014). It is “a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos” (Brown, 2008, p. 89). More specifically it “is a discipline that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity” (Brown, 2008, p. 86). Thus it combines technical feasibility, human desirability and economic viability to a holistic team-based approach. Brown (2008) summarizes those dimensions as “three spaces of innovation”. In a nutshell, Design Thinking is the adaption of design principals and cognitive styles to business management.

3.1.3. Elements of the Application of Design Thinking

The aforementioned definition might be too generic to reflect all aspects of the application of Design Thinking in practice. Therefore, Design Thinking aspects, which I call “elements” of the application of Design Thinking, are described in the following. These elements were drawn from relevant literature about Design Thinking in the “management discourse” and describe characteristics of Design Thinking teams. Furthermore, the elements of Design Thinking are used to explain the differences of Design Thinking and other innovation teams such as R&D or NPD teams.

In summary, the application of Design Thinking in organizations varies along specific elements namely the mindset, team diversity, process, tools and environment (Brown 2008; Brown 2009; Brown & Wyatt 2010; Mootee 2013; Collins 2013; Martin 2009; Seidel & Fixson 2013; Simons et al. 2011; Cross 2000; van Aken 2004; Yoo et al. 2006). As studied by Chang and colleagues (2013) there are multiple ways of applying Design Thinking in organizations. Thus it can be assumed that Design Thinking teams may apply all, ignore or make use of an element to some extent. Since there is no systematic use of Design Thinking in the automotive industry, this study has to examine the application of Design Thinking in the projects. In addition, it is not clear, if Design

Thinking was extended or adapted for the use in multinationals. This study is open to extend the elements of Design Thinking.

3.1.3.1. Mindset

The Design Thinking mindset is described by personality traits (e.g. empathy, integrative thinking and collaboration). Those characteristics are said to be inhibited by design thinkers (Brown, 2008) and thus imply that Design Thinking consists of a specific mindset (Owen 2006). There are several terms referring to the mindset of Design Thinking for example “way of thinking”, “thinking as a designer” or “design attitude” (Martin 2009; Brown 2008; Boland & Collopy 2004; Thompson 2009).

Another important issue of the Design Thinking mindset is its inherent logic (Mootee 2013). Traditionally, organizations solve their problems by thinking about how something is today and how it must be in the future. In addition to this traditional way of thinking, Design Thinkers are concerned with how something may be (Collins 2013). A key factor in Design Thinking is to be able to balance intuitive and analytical thinking with abductive logic (Martin 2009). Lastly, a Design Thinking team acts customer centric (Brown 2008) which means to focus on the customer needs. This specific focus is reflected in the process and tools which have the overarching goal to understand, empathy and center around the prospective customer.

In sum, a Design Thinker sets the customer in the heart of thinking, is collaborative thus integrating different point of views, and focuses on the future instead of considering how things work today. This specific mindset is much more pronounced in Design Thinking teams compared with other teams such as R&D or NPD teams. For instance, R&D teams operate in an performance oriented environment in which the team’s mindset is limited to state-of-the-art processes and techniques in order to come up with new technologies (Zheng et al. 2010; Thamhain 2003).

3.1.3.2. Team Diversity

Another aspect of Design Thinking is its multidisciplinary team approach in which collaboration within the team is increased by different perspectives and backgrounds (Seidel & Fixson 2013). A multidisciplinary Design Thinking team may consist of

business experts, engineers and visual designers. Design Thinkers seek for inspiring people who offer a wide perspective and valuable viewpoints in order to challenge their own assumptions. In a multidisciplinary team the component of inspiration gathering is empathy. It is important that the team is not just grouped together from different departments of an organization but it is a team in which the team members want to hear and appreciate different opinions and viewpoints (Simons et al. 2011).

Likewise, team diversity is a prominently feature in other innovation teams (R&D or NPD teams) (van der Panne et al. 2003; Zaki & Othman 2013; Díaz-García et al. 2013; Sivasubramaniam et al. 2012; Sethi et al. 2001). One of the most frequently named characteristics of innovation teams is its team's configuration. The importance of the interdisciplinary with regard to technological and marketing skills is emphasized in those studies.

3.1.3.3. Process

A design process describes the steps which are carried out by a designer in order to create good design (Simon 1969; Cross 2000; van Aken 2004; Yoo et al. 2006). Most of the design process models describe four steps: the analysis of the problem, designing the solution, the implementation, and the evaluation of the solution. Visscher and Visscher-Voerman (2010, p. 714) mention that “the activities of analysis, design, implementation and evaluation are carried out and sequenced differently in different contexts”. This notion is supported by the design process proposed by Brown (2008). Brown (2008) observed process patterns of designers in a health care project. He called this process “a system of spaces [...] that form the continuum of innovation” (Brown, 2008, p. 88). Those spaces are labeled “inspiration”, “ideation” and “implementation” and comprise different activities (e.g. observations, generating ideas, developing and testing ideas). Brown's (2008) publication is among the most popular works about Design Thinking; however, in management literature, design process has been discussed intensively beforehand.

A characteristic of the design process proposed by Brown (2008) is that a project does not follow these steps linearly but design thinkers go back and forth between each

space. Brown (2008, p. 88) noted that “Design Thinking can feel chaotic [...] but the process makes sense and achieves results, even though its architecture differs from the linear, milestone-based process typical of other kinds of business activities.” A characteristic of a Design Thinking process is its iterations between each step.

The Hasso Plattner Institutes and IDEO provided a more detailed process of the five steps (see Figure 2). This approach is often cited and used in literature and practice (Bell 2008; Liedtka & Ogilvie 2011). The “Process Guide” of the Hasso Plattner Institute (2014) gives a precise description of the five steps.

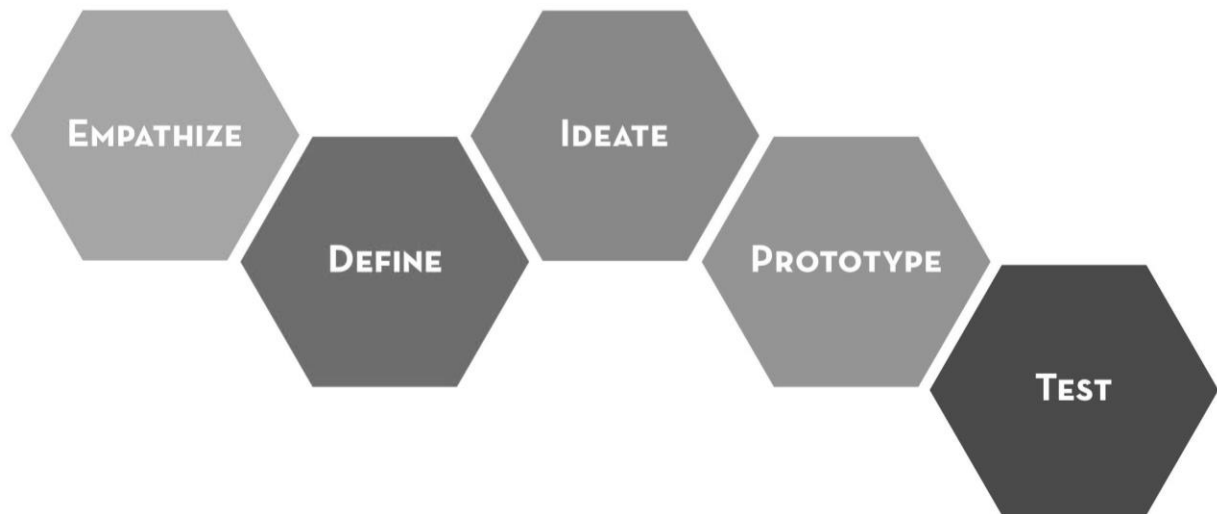


Figure 2: The Design Thinking Process (Hasso Plattner Institute 2009)

In practice, the implementation of the Design Thinking process as described above is not without its difficulties. That is because large organizations have already implemented their own standards, procedures and process how to market innovations or products. Comparing the Design Thinking process to R&D or NDP innovation processes, the following differences are recognized based on explanations given by Cooper (2014), Grönlund et al. (2010), Ettlie & Eisenbach (2007), Akroyd et al. (2009), Frezatti et al. (2015) and Robbins & Gorman (2015). First, as the Design Thinking process is iterative this means that the team goes back and forth between the different stages there are no control standards like stage-gate or milestones. Those control standards are typically placed between different stages of the innovation process in

organizations (Cooper 2014; Grönlund et al. 2010; Ettlie & Elsenbach 2007). Next, Design Thinking places importance to rapid prototyping (explained in the next chapter 3.1.3.4.) as a tool to understand and communicate the idea very quickly among team members. This can be seen as another differentiation between innovation teams and Design Thinking teams as innovations teams – following a standardized innovation process – systematically aim at producing a more complete version of a product prototype after the team went through weeks or months of evaluation and tests (Cooper 2008). The last difference is recognized in the first stage of the processes – “ideation”. As depicted in Figure 2 the Design Thinking process adds two major stages namely “empathize” and “define” before the actual “ideation” stage (Hasso Plattner Institute 2009). Those two process steps are concerned with understanding the customer needs in which the aforementioned mindset comes into place (Brown 2008). A customer-centric thinking assures the team members to come up with ideas which are relevant and value-adding for the customers (Brown 2009). In comparison, NPD or R&D teams typically start with an “idea stage” thus skipping the empathy and observation of the customer (Cooper 2014; Cooper 2008; Ettlie & Elsenbach 2007).

3.1.3.4. Tools

In addition to the Design Thinking process, the Hasso Plattner Institutes explain methods, often named toolkit, tools or ideation techniques, which can be used in each specific process step (Hasso Plattner Institute 2009). The “d.school bootcamp bootleg” provides a compilation of 39 tools which can be used by Design Thinking teams. The majority of those tools are used in the “empathize” or “define” stage of the Design Thinking process explained above. This underlines the importance of the first two process steps and explains once again the difference between innovation teams (i.e. R&D or NPD teams) and Design Thinking teams.

3.1.3.5. Environment

The work environment is another element of Design Thinking and goes hand in hand with the tools used in Design Thinking. The Design Thinking environment can be described as flexible, portable and inspiring. Design Thinking teams uses movable flipcharts and tables to create spaces needed to work efficiently together. Materials to

build prototypes, inspiring books, post-its, timers and boxes with materials are provided to the teams (Thoring & Müller 2011). The environment is thus different to standard office meeting rooms in which R&D or NPD teams typically work together. In organizations, it is often the purpose to avoid their own offices for a Design Thinking project in order to enhance their creative capability by an unknown and inspiring environment (Thoring & Müller 2011).

3.2. Innovativeness of Design Thinking Teams

In order to assess team's innovativeness in this study, dimensions and definitions are given in this section. Academic literature provides findings about the presence of innovations enabled by Design Thinking teams.

3.2.1. Definition of Team's Innovativeness

The purpose of the application of Design Thinking in practice is to generate innovations (Buchanan 1992; Thoring & Müller 2011). Through the adaption of the creative thinking processes and tools of designers, the team is able to come up with new ideas. Innovations are defined by the approach of Rogers (1995, p. 14): "An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behavior is concerned, whether or not an idea is "objectively" new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation." Thus, a first dimension of innovation is its perceived newness.

Adding another definition of innovation, Roberts (1987, p.3) says that "[...] Innovation = invention + exploitation. The invention process covers all efforts aimed at creating new ideas and getting them to work. The exploitation process includes all stages of commercial development, application, and transfer, including the focusing of ideas or inventions towards specific objectives, evaluating those objectives, downstream transfer of research and/or development results, and the eventual broad-based utilization, dissemination, and diffusion of the technology-based outcomes." Going into the same direction, West & Sacramento (2012) summarize that innovation encompasses the two

major stages namely creativity (as mentioned by definition of Rogers and by the invention process of Roberts) and innovation implementation (covered by the exploitation process of Roberts). In specific, West & Sacramento (2012) define creativity as the development of new ideas whereas the innovation implementation constitutes the introduction and practical application of new and improved products, services, and ways of doing things at work.

In summary, for the purpose of this master thesis innovation is assessed according two dimensions: creativity and implementation. First, creativity is essential to produce an invention, which is something qualitatively different form existing forms (Barnett 1953). Creativity as defined by the development of new ideas (West & Sacramento 2012), is the indispensable first stage of an innovation. Thereby, the perceived newness of the product, thing, process or service is of interest (Rogers 1995) in order to consider an idea as creative and new. After the invention is developed, the implementation of the idea is necessary (West & Sacramento 2012; Roberts 1987). The diffusion, application, transfer or commercialization of the invention transforms it to an innovation (Roberts 1987).

Next, the construct team's innovativeness can be defined for the purpose of the study. Each Design Thinking team might vary in their innovativeness. This variation is assessed using the aforementioned two dimensions (creativity and implementation). The team's innovativeness is thus the extent to which the team is able to generate innovations though the application of Design Thinking. A team, for example, is considered to be highly innovative, if they generate new and creative ideas and are able to implement the outcome. In contrast, a team shows a less innovative project outcome if the idea is only partially new and the idea is not further implemented at the company.

3.2.2. Innovations through the Application of Design Thinking in Organizations

Liedtka (2014) provided evidence of ten organizations in which Design Thinking enabled innovation. Those innovations range from processes, services to products in diverse industries. Wattanasupachoke (2012) explored the effectiveness of Design Thinking in Thai organizations. Findings show that Design Thinking does not have a direct effect on

the company's performance but it enhances the innovativeness and thus explain an indirect effect on the performance of the firm. Simons and colleagues (2011) found that specifically in R&D teams Design Thinking could enhance the teams' innovativeness. Moreover, Carlgren et al. (2014) conclude that Design Thinking can be exploited by organizations in order to enhance their long-term innovativeness. Consequently, empirical studies provided evidence for a positive effect between the application of Design Thinking in organizations and team's innovativeness (Liedtka 2014; Wattanasupachoke 2012; Simons et al. 2011; Carlgren et al. 2014).

At this point, it is important to mention that innovations are not the only one outcome or goal of Design Thinking in organizations. In addition, growth, speed and vitality are recognized as incentives to implement Design Thinking as well (Simons et al. 2011; Liedtka & Ogilvie 2011). Nevertheless, the overarching purpose of Design Thinking mentioned in the literature is to enhance the innovativeness.

3.3. Influencing Factors

As elaborated above, literature about Design Thinking in the “management discourse” focuses on explaining the Design Thinking elements and its influence on innovation. However, little is known about which factors influence the link between the application of Design Thinking and the team's innovativeness (see Figure 3). This exploratory study aims at discovering which factors and in which direction (positive, negative) they influence this link. In doing so, the theoretical framework of this study will be expanded by those factors. The framework can be used to explain why some Design Thinking teams are less innovative than others and how the relationship can be influenced and strengthened.

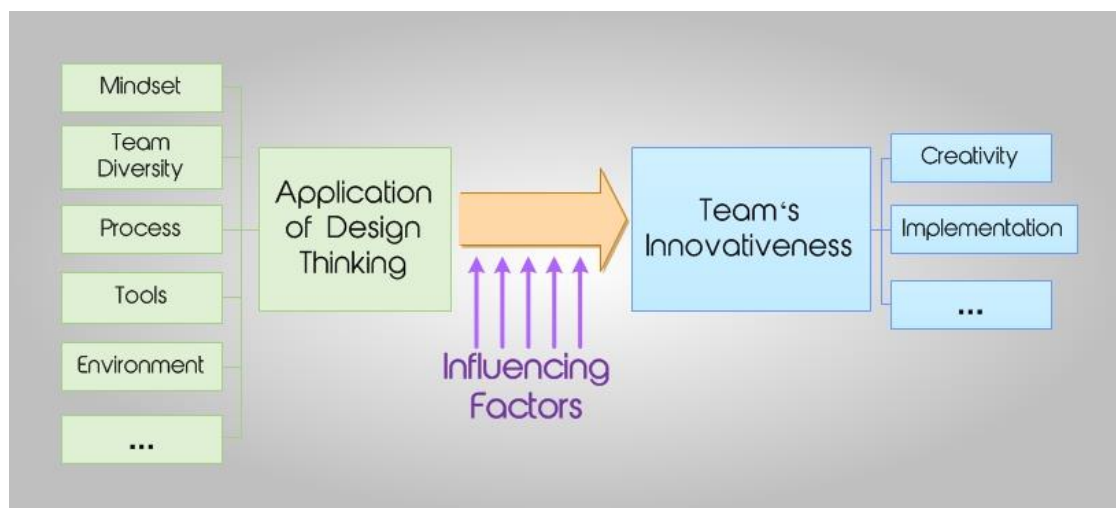


Figure 3: Theoretical Framework of the study

In order to broaden the view of potential factors, literature about teams in general (e.g. R&D or NPD teams) is reviewed. In the following, organizational literature is screened with regard to their potential to play a role in Design Thinking teams (see Figure 4). Existing innovation management literature elaborated on innovativeness and creativity in teams. Those organizational studies did not explicitly focus on Design Thinking teams but findings might give a hint about which factors could be important in the Design Thinking context. These findings serve as possible directions but it is not clear which and how these factors play a role in explaining the innovativeness of Design Thinking teams.

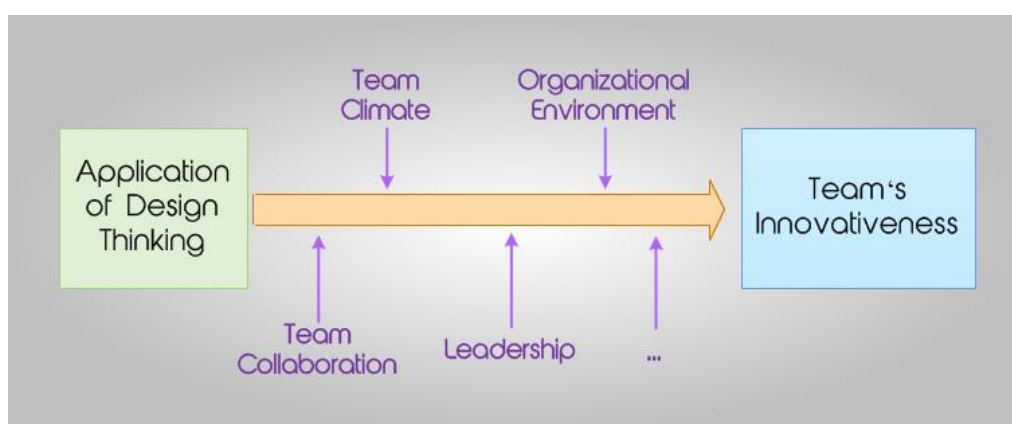


Figure 4: Proposed influencing factors of the application of Design Thinking and team's innovativeness link

It would be a great limitation of the study to pick a specific proposed factor e.g. team climate or leadership because of several reasons. First, this thesis aims at a holistic view of potential factors. At this stage of research, it is not clear which factors play a role and there might be factors which are not discovered in organizational studies because of the novel nature of the application of Design Thinking in companies. In addition, a focus on a single pre-selected factor would lead the participants into a specific direction and other, perhaps more important, factors could not be discovered. Lastly, there is no multidimensional theory available which includes all factors which could be important to describe factors which are of relevance for the study's purpose. Thus, this study is not limited to specific theory of the link between the application of Design Thinking and team's innovativeness. Rather, this study serves as a starting point for further research directions by observing factors which play a role in Design Thinking teams.

3.3.1. Team Climate

In the organizational literature, the climate within the team has been under scrutiny. Researchers met the general consensus that an innovative and open team climate significantly increases its creativity and innovation (Cirella et al. 2014). Team climate has been defined and measured in many different ways (West & Sacramento 2012).

Widely spread is the Team Climate Inventory – a measure of group processes and climate for innovation (Anderson & West 1996; Anderson & West 1994). The four factor model focuses on shared objectives and vision, group participation and safety, task orientation and support for innovation (Anderson & West 1996; West & Altink 1996; Anderson & West 1994; Anderson & West 1998). The authors understand by “vision” a clear commitment of the team to the project's objectives. The interaction between the individuals in a non-threatening climate is called “participative safety”. By “task orientation” they mean the shared concern regarding high quality outcomes and the enacted support for innovation attempts they call “support for innovation”. The conceptual validity of the team climate inventory construct has been tested and variations have been discussed (Anderson & West 1998; Kivimaki et al. 1997; Kivimaki & Elovainio 1999; Agrell & Gustafson 1994).

Bain et al. (2001) examined the importance of team climate in research teams and development teams and found that the relationship between team climate and innovation is stronger for research teams than for development teams. They explained that research teams have a greater scope for novel ideas and thus the team climate increases its importance. Going into the same direction, it can be proposed that the Team Climate Inventory construct may play a role in explaining influencing factors of the Design Thinking application and team's innovativeness link because Design Thinking teams have the goal to be innovative based on their creativity. Hence, the four factor model of team climate – vision, participative safety, task orientation and support for innovation – is proposed as influencing factors.

3.3.2. Organizational Environment

In addition to the aforementioned construct of team climate, organizational environment is proposed as a influencing factor of team's creativity and innovativeness (Cirella et al. 2014). Stimulus and obstacles of the organizational environment to team creativity has been researched (Amabile et al. 2005; Amabile et al. 1996). The authors introduced the survey instrument KEYS in order to measure the role of organizational work environment dimensions on individual's and team's creativity. Organizational encouragement, supervisory encouragement, work group support, freedom, resources, challenging work are KEYS factors which are positively associated with creativity. Workload pressure and organizational impediments are obstacles of team's and individual's creativity.

Amabile et al. (2005) and Amabile et al. (1996) define “organizational encouragement” as an organizational culture that encourages creativity by fair judgments of ideas and recognition for creative thoughts. Next, the supervisor supports the team and acts as a role model at work (“supervisory encouragement”). The authors argue that in diverse skilled teams, the group has to communicate well and to be committed to the work they do. This observation is measured by the scale “work group support”. By providing the team with sufficient resources such as materials, time, money and information, the team is said to be more creative – “resources”. If the team member has the feeling to work hard on challenging tasks, the measurement scale “challenging work” is observable and

if the member has a sense of control over one's work, the scale "freedom" is noticeable. The last two organizational environment scales are "organization impediments" and "workload pressure". The two are said to be negatively related to innovative team outcomes. Whereas the latter includes distractions from work and unrealistic expectations, the former becomes apparent if the organization hinders creative thoughts by internal political problems, bureaucracy and an overemphasis on the status quo.

Especially, it is assumed that sufficient resources provided to the team are of essential importance, if it comes to time constraints in Design Thinking teams. Ideas need time to settle down, have to be re-considered and further developed. Creative thoughts are going through unconscious processes to increase the chance of individuals to digging deeper into a first idea (Amabile et al. 2005). Chirumbolo et al. (2004) find that working under intense time pressure and need for closure is detrimental to the quality of ideas. The influence of time brakes between different tasks of individual's creativity has under scrutiny in natural sciences. Findings show that having enough sleep is beneficial for restructuring new memory representations, facilitates extraction of explicit knowledge and insightful behavior (Wagner et al. 2004). Thus, the organizational environment measurements – especially resources – might be factors which have a positive or negative impact on Design Thinking team's innovativeness.

3.3.3. Team Collaboration

A great advantage of teams is their variety of individual's knowledge and experiences. Especially in Design Thinking teams, the multi-disciplinarily is important (Seidel & Fixson 2013; Brown 2008). Through interaction, communication, debates and idea exchanges, teams are able to profit from the combination of the sum of their individual capabilities (Kratzer et al. 2004; Hargadon & Bechky 2006). However, teams could face problems which are the reason why they cannot elaborate on their full innovative potential. The Design Thinking approach suggests team brainstorming in order to "go for a quantity" of ideas (Hasso Plattner Institute 2009). Thompson (2003) examined face-to-face brainstorming teams and found several threats to their success. Production blocking, social loafing, evaluation anxiety and conformity and downward norm setting

are potential problems in face-to-face brainstorming sessions. Thus, aspects of team collaboration during the Design Thinking process might be a potential influencing factor.

3.3.4. Leadership

Lastly, leadership style is proposed as a potential area of interest for this study. Management styles of leaders influence the creative outcome of teams (Somech 2006; Kirkman et al. 2009; Furr & Dyer 2014). Literature mainly distinguishes between transformational, transactional (Kirkman et al. 2009; Chen et al. 2012), laissez-faire (Judge & Piccolo 2004), authentic (Walumbwa et al. 2007; Avolio & Gardner 2005) and humble leadership (Owens & Hekman 2012) styles. For instance, a transformational leader is able to positively influence team's outcomes such as creativity by articulating a shared vision, supporting subordinates through providing interpersonal and informational justice, recognizing individual differences and setting high expectations and innovation (Kirkman et al. 2009; Khazanchi & Masterson 2011; Chen et al. 2012). In contrast, a transactional leader is proposed to diminish innovative capabilities of teams by setting rewards or punishments based on monitoring (Kirkman et al. 2009). Especially Design Thinking teams operating in organizations might be influenced by the leadership style of their principals as they operate closely together.

4. Methodology

The thesis aims to develop a theoretical model which explains influencing factors of the relationship between the application of Design Thinking and team's innovativeness. As elaborated in the previous section 3, the academic literature did not explain these factors. Thus, an exploratory study is suitable that enables theory building (Blumberg et al. 2008). The aim of the methodology is to generate a full conceptual model which serves as a basis for further research.

4.1. Research Paradigm

There is still an ongoing philosophical debate about how reasoning (theory) and observations (data) are related to each other and how researchers argue about how they develop new knowledge. Many researchers conduct studies without considering their underlying considerations (Blumberg et al. 2008). However, those assumptions influence the research design and how the data is analyzed. Thus, it is worthwhile to start with the research philosophy.

Hine & Carson (2007) describe different philosophical assumptions that clarify and distinguish the researcher's basic attitude (see Table 1). They provide a summary of research paradigms and explain that the realism paradigm is seen as neither value laden nor value free. In contrast, the realism paradigm is value aware as the researcher has to understand multiple perceptions of the reality. They argue that reality cannot be described or understood perfectly because of human mental limitations. This paradigm fits best to my attitude because I am interacting with the research participants caused by my professional work at a car manufacturer.

Philosophical Assumptions	Research Paradigms			
	Positivism	Critical Theory	Constructivism	Realism
Ontology	Reality exists driven by natural mechanisms. Discrete variables can be measured	Reality is shaped by social, ethnic, economic, political and other forces over time	Reality is constructed by people based on beliefs, feelings and experiences	Reality is imperfectly understood because of human mental limitations
Epistemology	Researcher is remote from reality	Researcher is involved with those being researched	Researcher is a passionate participant	Mutual interaction between researcher and interviewee
Methodology	Experiments and surveys. Mainly quantitative methods	Action research. Researcher is transformative, changing the participant's social world	In-depth interviews. Individual beliefs, feelings and views sought	Case studies. Convergent interviewing. Interpretation by qualitative and/or quantitative methods

Table 1: Philosophies underpinning research paradigms (Hine & Carson 2007)

4.2. Research Design

A qualitative approach following the realism paradigm is employed in this study. Table 2 shows an overview of the elements discussed in the subsequent chapters.

Data collection	Semi-structured interviews
Participants / Sampling	Employees at a car manufacturer / Snowball sampling
Data Analysis	Combination of Grounded Theory and Template Analysis

Table 2: Overview Research Design

4.2.1. Data Collection

Due to the complexity and novelty of the topic and to the alignment to the research paradigm, semi-structured interviews are carried out. Interviews are suited if the researcher has to examine distinct levels of meanings. These meanings are reflected by the interviewees' answers. Moreover, a qualitative study is of great use in studying organizational, work-group related interpersonal issues (Lämsäsaalmi et al. 2004).

Subjective and contextual perceptions and interpretations of employees are of interest in order to answer the research questions. These interpretations can be best understood by in-depth interviews with the unit under scrutiny.

For this purpose, participants are interviewed with the help of an interview guideline (see appendix A: Interview Guideline English Version and B: Interview Guideline German Version). After the first design of the interview guideline, it was reviewed by the thesis supervisor and by an external supervisor at a car manufacturer. The interview guide includes different types of questions (e.g. introducing, follow-up, probing, specifying, direct, indirect and structuring questions) (Kvale 1996). Furthermore, this guideline is based on the critical incident technique in which the interviewee is asked to describe specific situations. In doing so, the interviewee is taken back to a special situation. This approach minimizes the risk of social desirability bias (Flanagan 1954). For the purpose of this master thesis, the specific situation is a Design Thinking project which is described in-depth by the interviewees. Throughout the whole interview, the interviewee was asked to refer to a specific Design Thinking project the participant was part of.

The interview guideline is divided into three parts and based on the literature review and on the initial template (explained in chapter 4.2.3.4). First, the application of Design Thinking is assessed in order to find out which elements of Design Thinking the project team employed. Due to the fact that each Design Thinking project varies in its architecture, the interviewee was asked to explain how Design Thinking was applied in the project. With this open question, I was able to find out which elements are applicable to the project. If an element was missing in the explanation, follow-up questions were provided to examine if other elements played a role in the project. The second part of the interview focuses on the innovativeness of the Design Thinking team. In this section it was important to be able to judge the creativity of the project's outcome and its stage of implementation in the company. Finally, the influencing factors of the application of Design Thinking and team's innovativeness were covered. Again it starts with an open question in order to get a variety of aspects. If the interviewee does not cover all proposed influencing factors, I asked indirect, direct, follow-up or specifying

questions. At the end of section three, the interviewee got the chance to state additional factors which the participant did not mention before and which I did not cover with the follow-up questions.

Each interview followed the same procedure: In advance of the appointment of an interview, I explained the master thesis's purpose orally or via mail. After the confirmation to take part in the study, I informed the interviewees about the confidentiality. All participants signed a statement of agreement (see Appendix C: Statement of Agreement). This way, the interviewees were aware of being recorded and that the results are anonymous. The interview started with a short introduction of myself and the study's purpose. In addition, the interview structure was explained to the interviewee. The interviews have been conducted within 5 weeks and the individual duration was between 30-60 minutes. All interviews were recorded electronically and transcribed.

4.2.2. Participants / Sampling

The participants of the study were employees working at a car manufacturer. 16 interviewees of 14 different Design Thinking projects took part in the study. For one project I interviewed two persons in the same interview (project no. 8) and for project no. 10 I interviewed two persons in two separate interviews. In sum, I analyzed 14 projects and conducted 15 interviews. The number of interviews was determined by theoretical saturation. This means that although new interviews were conducted, no additional results developed.

In order to be assessed, the project had to meet the following requirements. First, the participant had to confirm that the project represents a Design Thinking project. This means, that the team did not worked together in a typical line function as a R&D or NPD team but rather that the project team came together to develop something new by using Design Thinking. In addition, the project had to be completed in order to assess the outcome of the project. Next, the overall purpose of the project had to be to develop something new for the brand or department. The interviewees confirmed that Design Thinking was applied in the project to accomplish this purpose. In some cases, the

interested parties did not match the requirements to participate. For example, 3 employees know Design Thinking in a theoretical way but did not apply it in a specific project yet. 2 potential participants did not finish the Design Thinking project which means that the team's innovativeness could not be assessed. Thus, I did not interview those employees.

For the sampling, I rely on my own social network within the car manufacturer to address potential participants. The car manufacturer with its twelve brands and over 570.000 employees can be seen as a huge network of potential participants. As there is no reference list of departments or employees working in Design Thinking projects, I was depended on colleagues who refer to peers. Accordingly, the selection of participants is made based on snowball sampling where participants refer to other employees who might suit the research setting. Snowball sampling is an effective method in qualitative research if it comes to social networks in which the population cannot be reached without the reference of others within the network (Noy 2008).

The unit of analysis is not limited to a specific department or management level since the study's purpose is to explore how Design Thinking is implemented at different angles of the group. Therefore, the participants come from different departments, such as sales, IT, production, R&D, product development, procurement, marketing, production planning and business development. The project teams consisted in average of 15 team members ranging from 7 to 40 team members. The interviewees held different roles in the projects e.g. project leader, initiator, team member or Design Thinking moderator. The duration of the projects ranged between 1 day and 1 year. Furthermore, 6 out of 16 interviewees were women and 10 were men which gives no indication of a possible gender bias in the sample. An overview is provided in table Table 3.

Project No.	Interviewee	Role of Interviewee	Department	Team Size	Project Duration
1	1	project leader	R & D	15	1 year
2	2	team member	IT	30	2 months
3	3	team member	R & D	40	1 year
4	4	initiator / project leader	Sales	15	10 months
5	5	initiator / project leader	Production	15	7 months
6	6	project leader / moderator	Sales / Product Development	11	1 day
7	7	team member	Product Development	7	4 months
8	8 + 9	project leader / moderator	Procurement	15	1 day
9	10	moderator	IT	10	2 months
10	11 16	project leader moderator	Sales	20	3 months
11	12	project member	Marketing / Sales	10	6 months
12	13	project leader	IT	5	5 months
13	14	initiator / project member	Production Planning	10	2 months
14	15	initiator / project leader	Business Development	10	1 year

Table 3: Sample Overview

4.2.3. Data Analysis

The interviews are analyzed using a combination of Grounded Theory and Template Analysis. In the following, both methods are explained. Next, reasons for a combination of the Grounded Theory and Template Analysis are described in detail. Lastly, the execution of the combination of two methods is outlined in the last section of this chapter.

4.2.3.1. Grounded Theory

Introduced by Glaser & Strauss (1967) in a general way, Grounded Theory has been further developed by Strauss & Corbin (1990) regarding its analysis procedure. Due to different philosophical and methodological positions of academics, the method became more and more diverse. Nowadays, researchers have to cope with the evolving nature

of the method (Suddaby 2006). On the one hand, the method is flexible and without restrictions but on the other hand, there is no given guideline which can be followed easily. Taking advice of Heath & Cowley (2004, p. 149), the researcher has to set “aside [the] “doing it right” anxiety [of the application of the Grounded Theory Method]”. Therefore, the following approach is adopted:

Grounded Theory aims to develop theory from qualitative data and it fits to the purpose of the study because the researcher is able to develop theory about phenomena which are not discovered completely as it is for Design Thinking (Glaser & Strauss 2009). It is a systematic and comparative way designed to encourage researchers to constantly interact with their data. Moving back and forth between empirical data and emerging new concepts, theory evolves successively during the study (Bryant & Charmaz 2010). Through constant comparison the researcher compares the data (interview answers) with additional findings and literature consistently. This procedure is referred to be inductive because the researcher try to develop theory coming from data but it also implies deductive elements when findings are compared with additional data.

In order to analyze the qualitative data, a specific coding procedure is applied (see Figure 5). The coding scheme ensures conceptual development and density through data reduction. The researcher goes through three stages: Open, axial and selective coding (Lämsäsaari et al. 2004). In terms of open-coding (=initial coding) it is preferred to use participants' words ('in-vivo' codes) to derive names for the initial codes rather than using terms of existing theory and literature. It is beneficial to be very detailed in the initial coding phase since in the later stages important information can be lost if it is not coded in the first place (Corbin & Strauss 2008). Axial coding is the intermediate phase of the coding procedure. The 'in-vivo' codes are clustered in order to recognize concepts. Those concepts are finally selected in the development phase (selective coding) where categories are represented by concepts (Heath & Cowley 2004; Bryant & Charmaz 2010).

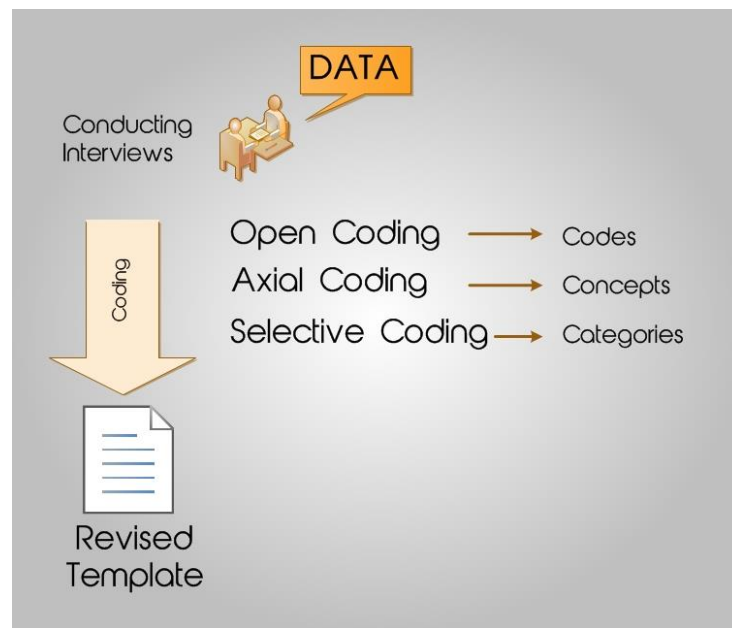


Figure 5: Coding Procedure

In addition, the researcher uses theoretical sampling throughout the data collection and coding procedure. This means that the researcher adds interviews with employees of other brands to refine concepts and categories developed so far. This process ends if theoretical saturation is reached where the researcher is not able to learn something new with additional data (Länsisalmi et al. 2004). Figure 6 summarizes the Grounded Theory methodology inclusive theoretical sampling, constant comparison and theoretical saturation.

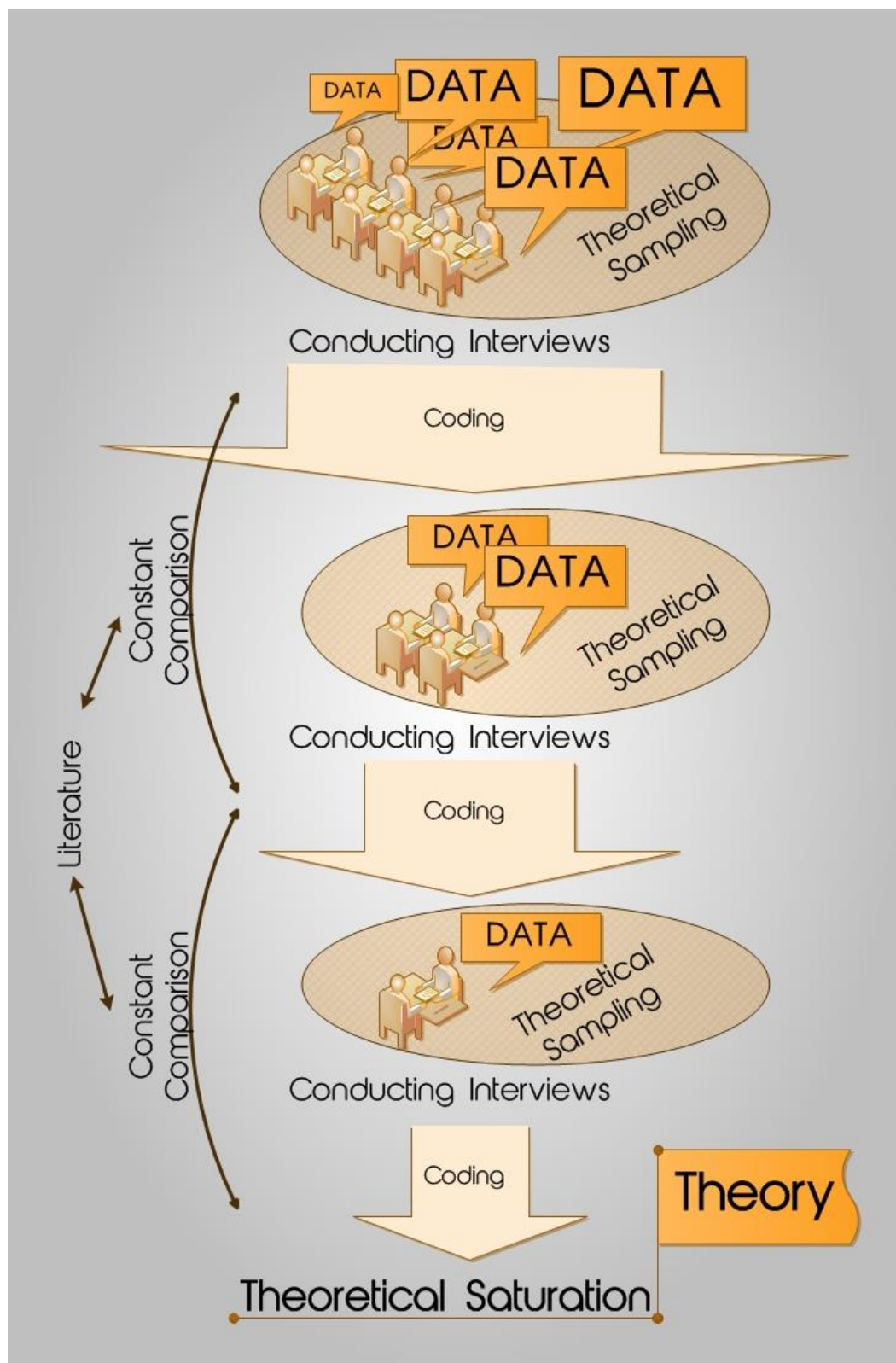


Figure 6: Overview – Grounded Theory

4.2.3.2. Template Analysis

Template Analysis as defined by King (2004, p. 86) is a “techniques for thematically organizing and analyzing textual data”. The method has been recently developed compared with Grounded Theory. However, it is well established in qualitative research of the healthcare sector (King 2004). As it is a new approach in business and management research, the execution of Template Analysis expands its potential range of application.

Template analysis deals with four major issues in data analysis: The definition of codes and the initial template, applying hierarchical organization of codes, the use of parallel coding and the revision of the initial template (Cassell et al. 2006; Cassell & Symon 2004; Flick 2002; King 2004). These aspects as described by King (2004) are presented in the following.

At the beginning, the researcher starts with at least a few pre-defined codes which are presented in the initial template. The initial template serves as a starting point for the further analysis and is based on the interview guideline. This procedure fits to the study as the proposed factors of innovativeness in teams in general could represent the pre-defined codes.

Second, in template analysis the researcher applies hierarchical coding as a major feature. The hierarchical organization of codes aims at producing a hierarchy between higher- and lower- order codes. Clustering groups of similar codes together, more general higher-order codes are defined. Thus, the researcher is able to analyze the text at different levels of specificity. Parallel coding is used in template analysis where the same segment of text is classified by different codes at the same level/hierarchy.

The revision of the initial template leads to its final form. The researcher uses the initial template and matches segments of text of the contextual data to the code(s). Working through the transcripts, the researcher modifies the initial template if the researcher recognizes inadequacies in the template. According to King (2004, p. 261), “insertion”, “deletion”, “changing scope” and “changing higher-order classification” are the five major types of modification, which can be used to revise the initial template. If the

researcher recognizes a segment of text, which helps to answer the research question but is not yet covered by the codes in the initial template, the researcher adds a new code in the relating hierarchy. The deletion of codes is likely since the researcher may not find evidence for some codes or codes may be found to overlap with others. Furthermore, the initial hierarchy and definition of codes have to be revised. Some codes may have to change the hierarchy from a three- to one- level code if the researcher recognizes that the factor is of greater relevance to answer the research question. Lastly, it might happen that a sub-category of a higher-order code relates to another and thus the researcher has to switch the higher-order classification of a whole sub-category.

4.2.3.3. Reasons to combine Grounded Theory and Template Analysis

The data gathered from semi-structured interviews is analyzed using the Grounded Theory and Template Analysis technique. Both data analysis techniques are qualitative methods in organizational research as described above (Cassell & Symon 2004). The combination of Grounded Theory and Template Analysis is applied because of two major reasons.

First, Grounded Theory embodies potential problems and Template Analysis is proposed to counterbalance those potential obstacles. The editors and reviewers of the Academy of Management Journal, Robert Gephart, Sara L. Rynes and Roy Suddaby, noticed growing difficulties of researchers in conducting qualitative studies (Suddaby 2006). Especially the term “grounded theory”, frequently used to describe researcher’s methodology, was stated to be a “big issue” (Suddaby 2006, p. 633). The authors summarized six common misconceptions about Grounded Theory:

Grounded Theory is not...

- an excuse to ignore the literature
- a presentation of raw data
- theory testing, content analysis or word counts
- simply routine application of formulaic technique to data

- perfect and easy
- an excuse for the absence of a methodology

I propose to apply Template Analysis to minimize the probability of those mistakes because of the following reasons. First, since the template analysis starts with the development of the initial template, the method ensures that the literature is not ignored. Second, a presentation of raw data is eliminated by the hierarchical structure of the final template. Next, the coding procedure of Template Analysis is somehow similar to the Grounded Theory coding procedure described above. However, template analysis has the advantage that the core analytic tenets of Grounded Theory (e.g. theoretical sampling, constant comparison) could be described in a better way by using hierarchical and parallel coding. As mentioned by Suddaby (2006, p. 640) it is important to describe “how the data were used to generate key conceptual categories.” This description can be reconstructed by comparing the initial, revised and final template.

Second, literature about teams provides evidence for influencing factors which are described in the study’s literature review. Those factors are proposed to play a role in Design Thinking projects. This theoretical foundation directs and affects potential outcomes of the study which in turn limits the Grounded Theory methodology. However, the direction of the outcome due to proposed influencing factors is of advantage for the Template Analysis as it comes to the initial template. In order to develop an initial template, a literature basis has to be present. This study does not test hypothesis and is open to further explore factors which are reasons for Grounded Theory. In addition, the exploratory nature of the study and the literature gap of factors in Design Thinking teams are reasons why a Grounded Theory is necessary. Therefore, a combination of both methods maximizes the potential outcomes of the study.

4.2.3.4. Combination of Grounded Theory and Template Analysis

In order to combine Grounded Theory and Template Analysis, the initial template had to be developed. The foundation for the initial template was the literature review. After the initial template was established, the supervisor of the master thesis reviewed it and

feedback was implemented. The initial template can be found in the appendix D: Initial Template. The numbers indicate the hierarchy of the categories.

At first, 5 interviews were conducted. After the transcription, the first coding procedure – as described in section 4.2.3.1. – started. Codes, concepts and categories (described in detail in the result section) were developed by constant comparison with the literature and the initial template. New categories were entered into the initial template (blue entry). Each category which was not confirmed by the data yet was crossed out (crossed entry). These changes led to the revised template (see appendix E: Revised Template). After the analysis of 5 interviews, the template was revised the first time.

This procedure was applied to the answers given by additional 11 interviewees (i.e. 10 interviews). The revised template was edited a second time which finally corresponded to the final template (see appendix F: Final Template). Accordingly, new categories were entered (green entry). Figure 7 illustrates the data analysis procedure of the master thesis, especially the combination of Grounded Theory and Template Analysis.

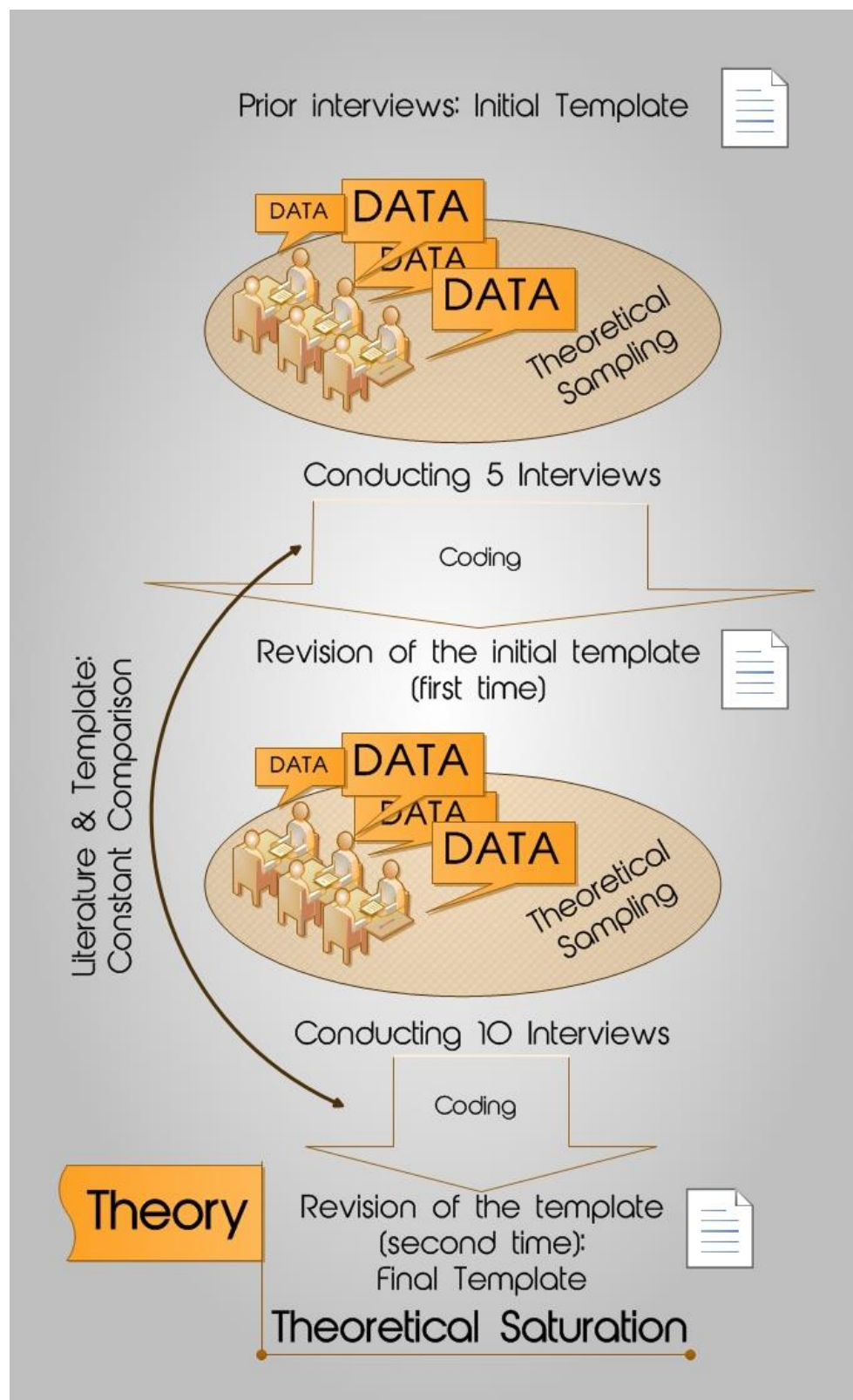


Figure 7: Overview – Data Analysis

4.3. Credibility of the Methodology

It is important to be aware of certain issues that impact the quality of the methodology. To ensure a high level of credibility, this thesis meets the requirements suggested by Corbin & Strauss (2008):

- The researcher has to recognize the influence he/she is having upon the research and vice versa.
 - Due to the fact that I rely on my personal network at a car manufacturer, it is important that I am aware that some answers might be socially biased. This is taken under consideration in the discussion section.
- The author writes frequent memos, which help to perceive these biases. Thinking about feelings and impressions during the interviews aids the researcher in being aware of certain influences.
 - If I recognized something noteworthy, for example controversial answers about what the interviewee explained and what I already knew about the project, I took notes. Sometimes I asked a probing question like “Did I understand it correctly that ...” or I tried to figure out the issue after the interview. In addition, I added perceived feelings or pauses of the interviewee to my transcript.
- The research is rich in details, must not be superficial and provides a detailed description of the data and examples.
 - In the results section, examples of interviewee’s answers are provided. In addition, concepts and categories are summarized. A full conceptual model explains the data in much detail.
- The last requirement to ensure credibility is to make use of peer reviews and member checkings. Especially for the coding it is helpful to ask others to review the codes because it is very subjective to code interview answers.
 - Due to a constant interaction with the supervisory committee consisting of two academic supervisors and an external supervisor at a car manufacturer , I reduced the subjectivity of the coding procedure.

5. Results

This section is structured as follows: Section 5.1 summarizes how Design Thinking was applied in the projects. In section 5.2 the projects are grouped according their team's innovativeness which is necessary in order to explain how the influencing factors differentiate in high and low innovative projects. The research questions are answered in section 5.3. The last point of interest is how the factors differ according to the team's innovativeness. This research sub-question is answered in section 5.4.

Overall, the coding procedure of the Grounded Theory methodology resulted in 533 codes in the open coding stage. In the second coding phase – axial coding – the “in-vivo” codes are clustered into 81 concepts which in turn were sorted into 30 categories in the selective coding phase. For each category the associated concepts are presented in tables. With regard to the template analysis, 9 new categories had to be integrated into the initial template and 11 categories were not confirmed by the data analysis. All changes to the template are explained in the following sections.

For each section, a table shows all projects with regard to the respective categories. A cross indicates that the category is applicable to the project. The projects in the overviews are clustered into two groups: Highly (project no. 1, 3, 5, 7, 9, 11, 13, 14) and less (project no. 2, 4, 6, 8, 10, 12) innovative projects teams. However, the order does not indicate the degree of team's innovativeness. Within the two groups is no hierarchy of innovativeness. The clustering is explained in detail in section 5.2.

All interviews were held in German. The quotations of the interviewees given in the following sections are translated word-for-word. However, at some points the translation had to be liberally in order to communicate the exact meaning of the quotes.

5.1. Application of Design Thinking

As explained in the literature review, organizations apply Design Thinking in multiple ways. The proposed elements of Design Thinking are mindset, team diversity, process, tools and environment. Each of the proposed elements was confirmed by the data

analysis (for the concepts and categories of the application of Design Thinking see appendix G: Application of Design Thinking – Concepts and Categories).

Against the assumption that the application of Design Thinking varies in the project, the data analysis revealed that overall the proposed elements did not vary significantly across the projects (see appendix H: Application of Design Thinking – Project Overview). Mindset, team diversity, process and tools are explained by the participants in nearly every project. However, environment which is coded by the two concepts “work with different materials” and “work in a stimulating area outside the company” emerged only in half of the projects.

Newness of the method emerged during the data analysis as an additional element of Design Thinking. This new category was added to the initial template after the analysis of the first 5 interviews because it does not fit to an existing element and it is mentioned to be a unique characteristic of the Design Thinking methodology in the projects. After analyzing all projects, the category was mentioned in 8 out of 14 projects which affirm the decision to add this category to the template after the first 5 interviews. The participants explained that Design Thinking was promoted in the company as something totally different, innovative and “fancy”. Some of the interviewees applied Design Thinking for the first time. These statements resulted in the concept “application of a method which is new and different to the employees”. In addition, the project members were curious about the method before the project started and expressed their surprise about the setting and outcome afterwards. A statement which corresponds to the second concept “project setting and outcome is surprising” is:

“[...] we just showed the outcome to the other subgroup and watched how they reacted to it. They were surprised [by the outcome] and wondered how such a solution can be interpreted. To date, they did not believe that something we built is possible and that something can be implemented. [...]” (interviewee_1, project_1)

In section 3.3 the theoretical framework of the study was developed and explained. This framework was brought up for investigation. After the data analysis, the elements of the application of Design Thinking consist of mindset, team diversity, process, tools,

environment and newness of the method which was added to the template after the data analysis. The full theoretical model is shown in section 5.2 after the innovativeness of Design Thinking teams are analyzed. The full theoretical model serves as the foundation to further investigating the influencing factors of team's innovativeness.

5.2. Innovativeness of Design Thinking Teams

The second part of the interviews focused on the innovativeness of Design Thinking teams. As proposed in section 3.2.1 team's innovativeness is measured with two categories – creativity and implementation. The overview of concepts and categories is given in Table 4. Furthermore, efficiency is added as a new category. Overall, the assumption that the sample might vary in innovativeness is confirmed by the data. Out of 14 projects, 8 are clustered into the highly innovative project group and the remaining 6 are less innovative projects. The clustering procedure is based on the coding procedure and explained in the following.

	<u>Axial Coding: Concepts</u>	<u>Selective Coding: Categories</u>
TEAM'S INNOVATIVENESS	the outcome is not surprising but feasible and tendentially new applying an existing solution, technology or idea to a new field	Incremental Idea
	develop something new for the world fascinate people within and outside the company the solution is creative rather than obvious	Radical Idea
	implement parts of the project or the whole prototype	Implementation of the result
	no implementation of the solution or idea it was not the goal to implement the idea	Termination of the project prior implementation
	work at a low level of expenses get results very quickly	Efficiency

Table 4: Team's Innovativeness – Concepts and Categories

To the category creativity lower order categories namely incremental and radical ideas were added to the template. Incremental idea is explained by the two concepts “the outcome is not surprising but feasible and tendentially new” and “applying an existing solution, technology or idea to a new field” whereas radical idea consists of the concepts “develop something new for the world”, “fascinate people within and outside

the company” and “the solution is creative rather than obvious”. With this differentiation of incremental or radical idea a first evaluation of the innovativeness could be made.

The second category of team’s innovativeness – implementation – is coded by the concept “implement parts of the project or the whole prototype”. Design Thinking projects often aim to generate a lot of different ideas at the beginning of the project which are clustered or further developed later on. This process leads to more than one solution, outcome or prototype. Hence, a project could be implemented partially and still it is considered as a holistic implementation of the whole project.

“Well, out of 24 ideas we have chosen 4 ideas. There was a very close cooperation with the managing director [...]. It was really important to make sure that the implementation is realized. We have finished the project with an implementation workshop. [...] There, we have thought about what is the minimal viable product to implement. Falsely, sometimes they think that they have to implement the whole project ideas at once. That is why we made sure that a version is existent which is at the market very quickly. [One idea] for example is at the [...] market already. [...]” (interviewee_16, project_10)

Termination of the project prior implementation was added to the template as a category which corresponds to implementation. Two concepts – “no implementation of the solution or idea” and “it was not the goal to implement the idea” – describe termination as an alternative to implementation. Since Design Thinking was new to some of the employees, they applied Design Thinking in the project to evaluate the methodology itself and to develop new ideas. In such cases the goal of implementation was secondary and not perceived as something important for the success of the project.

“[the question of the implementation stage] could not be answered very well because there was no implementation of the ideas planned at the first place. This means that it was clear to everybody that we want to test the method and that we want to evaluate which additional value we can generate with the method for our projects in our department. [...] This was my goal which I accomplished. [...]” (interviewee_6, project_6)

In addition to creativity and implementation, efficiency as a new category of team's innovativeness emerged during the data analysis. Participants explain that through the Design Thinking method they were able to implement prototypes very quickly at a very low level of expenses compared to other projects. Money and time savings are realized by test drives and early feedback iterations within the multidisciplinary team. They described that the efficiency of getting results (i.e. an innovation) is increased by Design Thinking if they compare their outputs with other projects in the company. Those explanations recurred in only 3 projects, however, those participants stressed that it is very important information. Thus, efficiency is described by the concepts "work at a low level of expenses" and "get results very quickly".

"[...] we tried [the prototype] out. We started to build it directly. [...]. Interestingly, this is why we saved time. And we realized it with very low expenses, although you did not believe in it at the first try. That is a very important information. [...] We were able to develop it by investing a third of the time. [...]. This means we have a potential cost saving and we are extremely efficient in our way of working. The [Design Thinking] methodology is totally different." (interviewee_1, project_1)

After all projects were analyzed, they were clustered into two groups. As elaborated in the literature review, a team is considered to be highly innovative, if they generate new and creative ideas and are able to implement the outcome. Hence, into this group belongs project no. 1, 3, 5, 7, 9, 11, 13, 14 because the participants explained that they developed radical ideas and implemented the solution later on. An exception is project 7 which is not further implemented at the company today. However, after consultation with the project leader of project 7, I decided to cluster the project as highly innovative because the project leader explained that they are planning to build on the radical innovative ideas later on. Thus, the possibility that they are going to implement the ideas at later stages is present. Interestingly, the category efficiency was only applicable to highly innovative projects.

On the contrary, project no. 2, 4, 6, 8, 10, 12 are considered to be less innovative in comparison with the other projects. The incremental ideas are only partially new. The

outcome of the project is either not implemented at all or there was no intention to implement it. Project no. 10 and 12 are distinctions because their incremental ideas were implemented. Nevertheless, these projects were considered to be less innovative compared to the radical and implemented ideas of the other group. Table 5 shows the two groups and the corresponding categories.

Project No.	Radical Idea	Incremental Idea	Implementation	Termination prior implementation	Efficiency
1	x		x		x
3	x		x		x
5	x		x		
7	x			x	
9	x		x		
11	x		x		x
13	x		x		
14	x		x		
2		x		x	
4		x			
6		x		x	
8		x		x	
10		x	x		
10		x	x		
12		x	x		
TEAM'S INNOVATIVENESS					

Table 5: Team's Innovativeness – Project Overview

Summarizing the results of the application of Design Thinking and the team's innovativeness, a full theoretical model is developed. Figure 8 shows all categories found in the data and revises the theoretical model of the study. As elaborated above, newness of the method, efficiency and termination emerged as new categories during the data analysis. All remaining categories are confirmed by the data and none of the proposed categories had to be refuted.

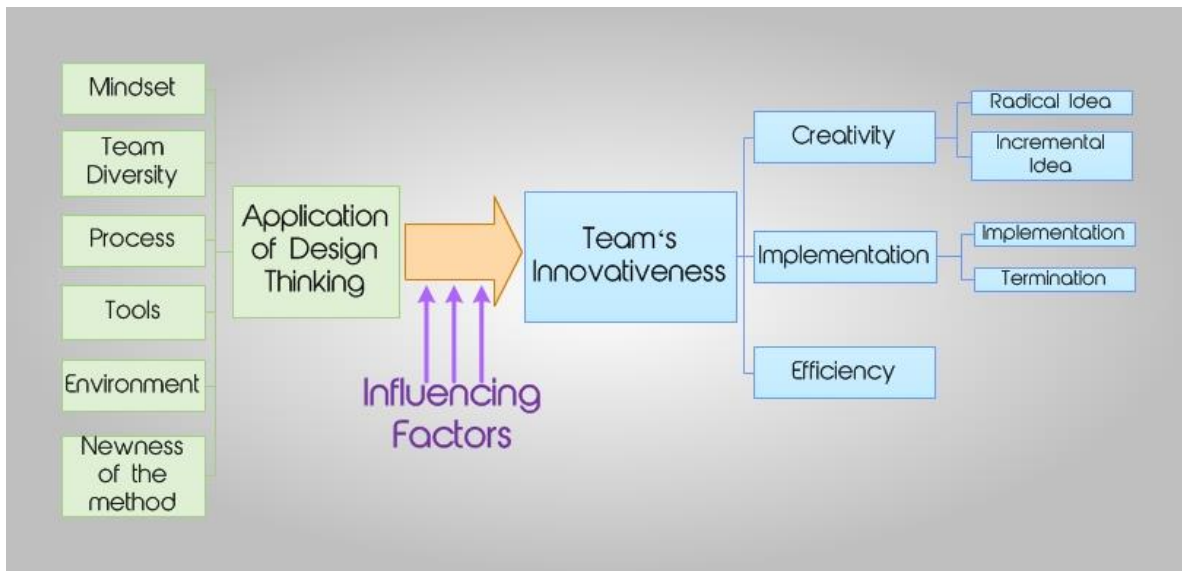


Figure 8: Full Theoretical Model

5.3. Influencing Factors

The literature review revealed a research gap about influencing factors in Design Thinking projects. Therefore, organizational literature about innovation and creativity in a managerial context was taken into consideration. Team climate, organizational environment, team collaboration and leadership are proposed as influencing factors which might show an impact in Design Thinking projects. These multidimensional constructs were studied in the academic literature and empirical evidence has proven their importance to innovation management. The third section of the interview aimed at providing information about these factors in Design Thinking projects.

In summary, the data analysis confirmed that all proposed higher level factors are of importance in Design Thinking projects. However, closely inspecting each multidimensional factor variations to the previous literature was discovered. Moreover, an additional factor – employee's motivation – emerged during the data analysis. Please note, that a differentiation of the importance of the factors to team's innovativeness is made in the next chapter. In this chapter, all emerged factors are explained which matter in Design Thinking projects.

In order to present the factors in a structured way, they were divided into three levels: The macro, meso and micro level. The macro level describes factors on an organizational perspective, team aspects are presented in the meso level and lastly, categories of the individual team member are shown in the micro level. A summary of all factors and categories illustrates Figure 9. Factors that influence the link between the application of Design Thinking and team's innovativeness positively are marked with a plus and written on the left hand side. In contrast, negative factors are presented with a minus on the right hand side. Besides there are factors which could have a positive or negative impact marked with a plus and minus in the middle.



Figure 9: Full Conceptual Model of Influencing Factors

5.3.1. Macro Level

The macro level consists of the organizational environment construct which is explained in section 3.3.2. The data provided evidence to all organizational environment dimensions except work group support. Positive associated are 4 out of the 7 categories namely organizational encouragement, supervisory encouragement, freedom and challenging work. The latter was supported by the data after analyzing all projects and the first three after the analysis of the first 5 interviews. Organizational impediments and challenging work were described as negative factors whereas freedom, pressure and resources could be positively as well as negatively associated. Figure 10 gives an overview of the macro level factors influencing the application of Design Thinking and team's innovativeness link. Each category and concept is explained in the following. For an overview of respective concepts of each category please see appendix I: Influencing Factors Organizational Environment – Concepts and Categories.

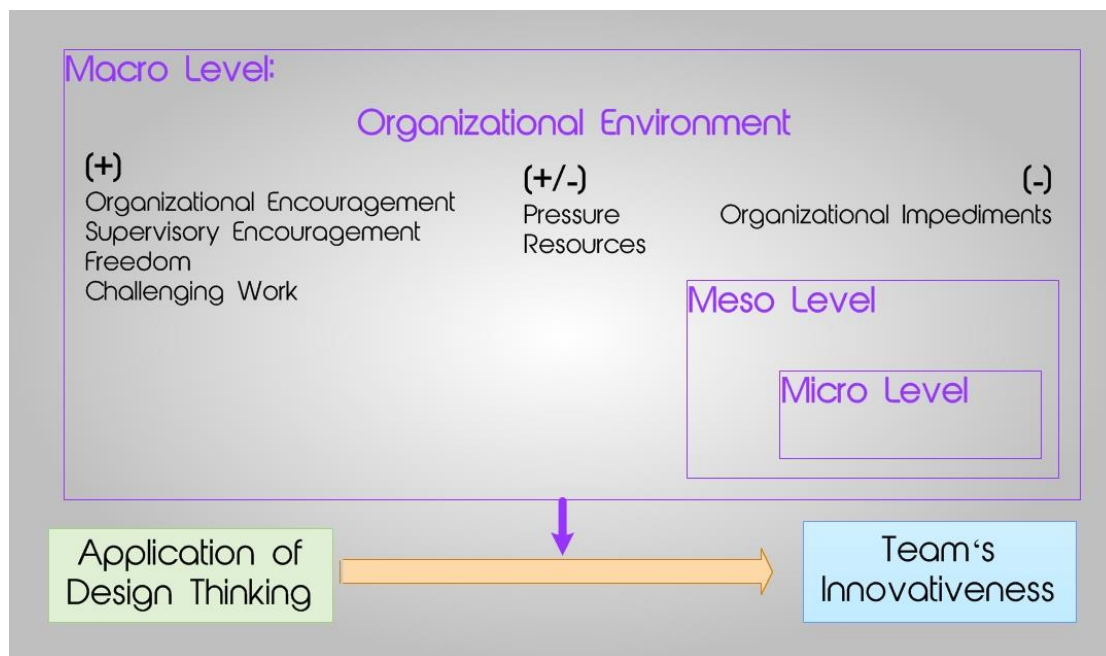


Figure 10: Influencing Factors Macro Level

Organizational encouragement was found to be a positive factor, coded by the concepts “everybody is able to participate” and “have a culture which is open to experience”. The Design Thinking project is organized and structured in such a way that every team

member is encouraged to participate. This encouragement was enforced by a division of the team into smaller sub-groups. This leads to a more intimate atmosphere in which timid or introverted employees express their views and contribute to the project. In addition, the culture of the organization has to be open to make experiments. The interviewees mentioned that it is important that collaborating employees who are not directly involved in the project team – but are responsible for implementation of the prototype – have to be open-minded for radical and new ideas. This is an organizational issue which can be improved only through the organizational culture itself.

“It is obvious that [our company] has to work on a cultural level. The culture [of the company] matters. We have met our boundaries in the way that if we went outside [to other employees of the company], we needed time to inform and instruct the colleagues. [...]. Sometimes there are open-minded people who are open and supportive. [...]. That is not always the case, there is also rejection. [...].”
(interviewee_1, project_1)

Supervisory encouragement is another positive factor which describes the support given to the project team coming from a committee or board team on a higher hierarchical level. It is coded with the concept “an organizational committee supports innovations”. In such a committee declarations about their decisions are given to the project teams. They decide about resources (e.g. funds) and strategic directions (e.g. which idea has to be implemented). With supervisory encouragement the organization accelerates the project progress.

„At the moment we have an appointment in May with the “locationscommittee” [in German: Standortstrukturkreis]. At this meeting we need a decision and money for our ideas in order to go on. [...].” (interviewee_14, project_13)

Next, freedom is coded by the concept “give the team enough space to work creative” and is described by the interviewees of perceiving control over the project. They explained to be open minded within a framework of restrictions and that they had enough freedom to choose the method or the project setting. On an organizational level, the project members experienced enough space to be creative which supports the

team's innovativeness. Asking about the freedom the organization provided to the team a participant explained:

“Freedom! [We are] totally free. There are no limitations. They gave us a “go” and because we were a self-organized team, they said – think about that issue. [...]. Just see what will happen. [...]. Until today, we have no limitations which might put us into a specific direction.” (interviewee_14, project_13)

The category challenging work describes the perception of the employee to work hard on challenging tasks given the amount of time and money. It is coded by the concept “the task is challenging within the given project setting”. The participants explained that they felt overcharged, lost and without a plan because they had to deal with problems they never tackled before. However, they were able to cope with it by applying Design Thinking.

“At the beginning, [the project] was very challenging because we did not know how to approach the topic. At the end of the project, the [Design Thinking] gave us a good guideline. So that no one got lost anymore and everyone know where we are in the project and what to do next.” (interviewee_5, project_5)

Pressure is another factor which influences the application of Design Thinking and team's innovativeness link. On the one hand, participants explained that they do not feel any pressure at all on the project. However they admitted that no or too little pressure was detrimental to their success because they did not focus on the project and got easily distracted. These statements are covered by the concept “feel too little pressure to deliver outcomes”.

“[...] With respect to the implementation, there was a little bit of pressure but that was not enough. The pressure was too little and I am not satisfied with the outcome.” (interviewee_2, project_2)

On the other hand, interviewees reported that too much pressure on the project was also detrimental to their innovativeness. They further explained that if they perceive a lot of pressure to be extraordinary creative they could not think freely. The concept “feel too

much pressure to deliver outcomes” represents these expressions. Thus, the data provides evidence there is an inverted u-shaped relationship between pressure and team’s innovativeness. Furthermore, pressure exerted by a given deadline was said to increase the efficiency of the project team. The concept “a given deadline supports the team's speed” was added as a concept of pressure.

“I think there are several positive influencing factors, one is for example that we focused on a fixed date for the market launch [...]. Since the date was fixed, it was totally clear that we launch it on this day. This helps all stakeholders for making priorities and decisions. That forces you to make a solution and it puts immense pressure on me and the team. However, the pressure to deliver an outcome on this specific day was of great benefit to the project – of extreme benefit.” (interviewee_15, project_14)

Going into the same direction, the category resources is coded by the concepts “time is a critical factor” and “money is a critical factor”. In general, resources are funds, materials, facilities and information but time and money were associated with resources by the participants. Having sufficient resources was both perceived as positive as well as negative to the project outcome. On the one hand, employees complained having a problem to handle the project within the given time frame. They expressed that they would have needed more time to understand the problem at hand. On the other hand, participants also admit that without a limitation with regard to time and money, they might be not working as efficient as they might work with a limitation. It is noticeable that the category resources were of importance to nearly all projects. In sum, findings provide evidence for both a positive and negative effect of resources with regard to time and money resulting in an inverted u-shaped relationship.

“In our project there was a constant time pressure. That was restrictive. We have to be fast but with time pressure that was very complicated. There was no time to really be creative and to develop new ideas. Sometimes there were new ideas but they were not really sophisticated. Within the timeframe that is not possible. Of cause, [in order to be creative] you need a lot of time.” (interviewee_3, project_3)

In contrast to organizational, supervisory encouragement, freedom and challenging work, organizational impediments is an influencing factor. The category organizational impediments are constituted of an organizational culture which is detrimental to innovation. Participants described situations in which they have to cope with rejection outside the boundary of the project setting. They complained about political problems and bureaucracy within the company which expanded the duration of the project. The two concepts summarizing those expressions are “employees outside the project team dismiss the solution” and “bureaucracy within the company slow down the project's progress”.

“[...] The question is what is possible in a multinational company in general. How is the way of working [in a multinational company]? As a freelancer for example one can work much quicker and in a different way [compared to an employee in a multinational company], because there are no rules and regulations and procedures how to get official approvals. You just do it. [In the project] you have to work in a different way and some websites [for research purposes] are even restricted. That means that you have to find “workarounds” all the time. You have wrench in the works. [...]. That is why there is a constant high stress level in the Design Thinking project. [...]. ” (interviewee_16, project_10)

Table 6 lists all projects and categories explained in this section. As mentioned before, resources have been mentioned as an influencing factor in almost every project. Organizational encouragement, freedom and pressure were explained by the participants in about one third of the 14 projects. Supervisory encouragement, challenging work and organizational impediments are of less importance according to the data analysis.

Project No.	Organizational Encouragement	Supervisory Encouragement	Free-dom	Resources	Challenging Work	Pre-ssure	Organizational Impediments
1	x		x	x		x	
3	x		x	x		x	
5			x	x	x		
7				x			
9	x			x	x	x	
11	x		x	x			
13		x	x	x			x
14		x		x		x	
2	x			x		x	
4				x			
6							
8				x			
10				x			
10	x			x	x	x	x
12							
Organizational Environment							
INFLUENCING FACTORS							

Table 6: Influencing Factors Organizational Environment – Project Overview

5.3.2. Meso Level

On the meso level perspective, the team is influenced by team climate, team collaboration and leadership categories. All aspects of the proposed team climate factors are supported by the data. All team climate categories are found to influence team's innovativeness positively. Next, the data analysis provided evidence only for interaction, intra-organizational network and discrepancy as team collaboration factors. Intra-organizational network and discrepancy was added to the template during the data analysis and were not suggested as influencing factors in the literature review. With regard to leadership, none of the participants explained their project leader as showing characteristics of authentic or humble leaders. Figure 11 provides an overview of all meso level factors including their positive or negative direction. All categories and concepts are explained in the following in detail. An overview of all concepts is given in appendix J: Influencing Factors Team Climate – Concepts and Categories.

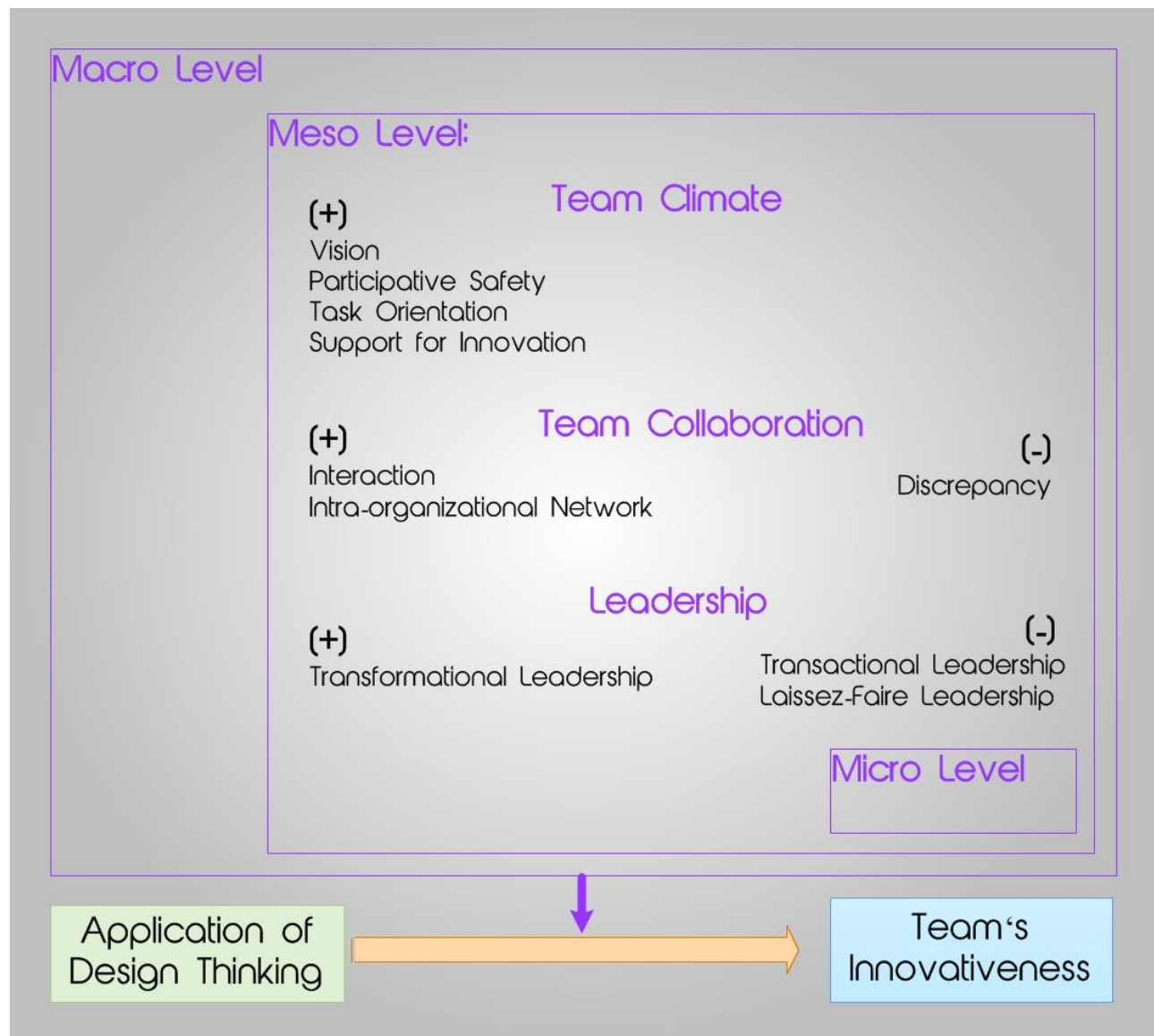


Figure 11: Influencing Factors Meso Level

5.3.2.1. Team Climate

Team climate consists of the categories vision, participative safety, task orientation and support for innovation which are proposed in section 3.3.1. In sum, the data provided evidence for all four factors influencing team's innovativeness in a positive manner. Each of the team climate factors is explained in the following.

Vision is coded by the concept "develop a team spirit and vision". Participants agree to have a common understanding of the vision and goals of the project. They perceived

vision as an idea how the outcome of the project relates to the company's perspectives. Moreover, they explained that vision is a motivating force at the project.

"[...] we expanded our perspective with the [Design Thinking] method and enabled ourselves to create something. Without this visionary view of the project we would not have been able to deliver this outcome. This would not have been possible without this vision by just sitting together and thinking about [the issue]."
(interviewee_14, project_13)

Second, participative safety is mentioned by the interviewees in almost every project. The participants explained that the atmosphere in the project was non-threatening, supportive and different to other project settings. Employees were encouraged to take action and state their opinions even if they represent the minority. The participants said that there was no bias about anything and everybody could come up with creative thoughts. Thus, they felt safe to speak up in the team because the atmosphere was trustworthy and they knew that disagreements would be accepted. For participative safety it was stressed to be important that organizational hierarchy must not play a role in the project. Due to its complexity, this category is explained by four concepts namely "encourage somebody to take action", "build an atmosphere which is supportive and different to other project settings", "be not biased about something" and "organizational hierarchy must not play a role".

"[...] Over and over again, we had to remind ourselves to say "yes, it is great if an idea is totally out-of-the-box and crazy" because everything which is technically possible is already out there on the market. That would then be really boring. [...]"
(interviewee_2, project_2)

Task Orientation is another positive factor which consists of four constructs: "team aims at delivering results quickly", "shared goals within the team to deliver a creative outcome", "adjustment of the method according to specific needs in the project" and "team members make compromises to carry on". Based on shared concerns, the Design Thinking teams aimed at achieving the best possible outcome in a short period of time. In doing so, they adjusted the Design Thinking method. For example, if they

needed additional new ideas to modify an first idea they picked different brainstorming tools in the ideation phase of their Design Thinking process and directly moved on to prototype the new ideas. This way, they focused on their task and delivered outcomes quickly. Moreover, the interviewees explained that they experienced a high level of compromises in the team because everybody was task oriented.

“Well, I have the opinion, that is was not important that everybody got an introduction to the Design Thinking methodology. That is not necessary. [...]. However, it was important that someone chooses the right tools [of the Design Thinking methodology] of the process. Pick the tools! Focus not on the method itself but on the project task!” (interviewee_12, project_11)

The last positive category of team climate is support for innovation. Participants explained that the team members were especially curious about the project because they have heard about Design Thinking before. They were surprised how much fun it is to work for the project. Moreover, the interviewees agreed that they articulated in the project to give up typical pattern of thinking and doing things. In detail, they explained that the Design Thinking mindset enabled them to welcome a creative thought instead of routinely dismissing it. Besides the articulated support of innovation, they perceived enacted support in such a way that they were provided with materials to implement and test their prototypes. Another important aspect is the given setting the projects took place in. The interviewees described that it was of great value to not work in the standard offices but in inspiring facilities. In summary, these explanations are covered in the concepts “have fun at work”, “awake curiosity for the project with method”, “give up typical pattern of thinking and doing things”, “welcome a creative thought instead of routinely dismissing it” and “work in project facilities different to company's standards”.

“[...] it was a completely different approach to solve the problem. The biggest difference was that we worked with new tools which the team members did not know before. However, they got their selves into it. It was something new and to some extent something playfully. That was positive. In a normal project, the point comes very quickly at which everybody looks at their department specific goals. A

lot of people would come and say “hey that is not possible, because...” Yes, to quickly dismissing new ideas and this is not the case in Design Thinking projects. [...]” (interviewee_4, project_4)

Table 7 summarizes all projects and the categories explained in this section. Overall, it is noticeable that for all four team climate categories a strong support could be found in the data. Almost all projects provide evidence for vision, participative safety, task orientation and support for innovation. However, support for innovation is the strongest among the team climate factors.

Project No.	Vision	Participative Safety	Task Orientation	Support for Innovation
1	x	x	x	x
3	x	x	x	x
5	x	x	x	x
7		x	x	x
9		x		x
11	x	x	x	x
13	x		x	x
14	x	x	x	
2	x	x	x	x
4	x		x	x
6		x	x	x
8		x		x
10	x		x	x
10	x			
12				x
Team Climate				
INFLUENCING FACTORS				

Table 7: Influencing Factors Team Climate – Project Overview

5.3.2.2. Team Collaboration

Team collaboration is described by the categories interaction, intra-organizational network and discrepancy. Interaction is confirmed by the data after the analysis of the first 5 interviews. Intra-organizational network is a new category and describes another aspect of interaction at a lower order in the template. Discrepancy is the only negative category of team collaboration found in the data. In appendix K: Influencing Factors

Team Collaboration – Concepts and Categories the concepts of the three team collaboration categories are provided in a table. Debates, idea exchanges, production blocking, social loafing, evaluation anxiety, conformity and downward norm setting are proposed categories of the initial template which are not confirmed by the data.

The category interaction consists of three concepts namely “the team composition is decisive”, “get to know each other very quickly” and “reliability of team members is important”. The interviewees explained that through the work in a multidisciplinary team they could develop a wide variety of ideas. The team atmosphere was supported by the Design Thinking method because they got to know each other very quickly. In addition, participants remarked that it is important that the team members do not change a lot among the duration of the project.

“I liked that [...] the team was as heterogenic as possible. Let’s not just say – man and women – but also the functionalities of the team members. There were different departments within the procurement in the team – like they say – we were an interdisciplinary team. This was totally supportive.” (interviewee_8, project_8)

As a lower order category of collaboration, intra-organizational network emerged during the data analysis. As described in the citation of interview 8 above, the teams consisted of many different departments. Often, they did not know each other and met the first time. To work together with employees of different departments of the company is described as something special for the Design Thinking project. By the collaboration in a multidisciplinary team, an intra-organizational network of experts developed which worked together on the specific project goal. Hence, intra-organizational network is coded with the concept “build a network of experts” and added to the template as a new category.

“Because of the special team we had the total expert knowledge. The reality [without Design Thinking] would have been that you sit together with colleagues of your own department – maybe 2 colleagues – and you would have thought about it. However, bringing together colleagues of the production, IT, Design,

procurement departments, that would not have happened. (interviewee_4, project_4)

In contrast to collaboration and intra-organizational network, the negative factor discrepancy was added to the template. This category summarizes a couple of inner-team problems mentioned by the participants. The proposed negative factors (i.e. debates, idea exchanges, production blocking, social loafing, evaluation anxiety, conformity and downward norm setting) of the initial template are represented by discrepancy and for this reason they were removed from the template. The participants explained that they had problems in communicating, finding consensus, trusting each other and having different goals within the same project. These issues are presented by the concepts “no communication among the team members”, “no consensus among the team members”, “no trust among the team members” and “different goals within the same project team”.

“The collaboration with the [other team members] were negatively because we talked at cross purposes. [...]. The team collaboration was not good, because it was no democratic process. The project leader controlled the others, I did something, and then my results were played off against the other team members. [...]. Everybody worked for their own.” (interviewee_10, project_9)

With regard to the distribution of the team collaboration categories, it is apparent that especially interaction is frequently found in comparison with intra-organizational network and discrepancy. The overview is given in Table 8.

Project No.	Interaction	Intra-organizational network	Discrepancy
1	x	x	
3	x		
5	x		
7	x		
9			x
11	x	x	
13			
14	x		
2	x	x	
4	x	x	
6	x		
8	x		
10	x		x
10	x		x
12			x
Team Collaboration			
INFLUENCING FACTORS			

Table 8: Influencing Factors Team Collaboration – Project Overview

5.3.2.3. Leadership

In the literature review different leadership styles are proposed as factors which influence Design Thinking team's innovativeness. Transformational, transactional, laissez-faire, authentic and humble leadership were suggested as possible styles shown by the team leaders. Overall, three – transformational, transactional and laissez-faire leadership – are supported and two – authentic and humble leadership – are refuted by the data. Transformational leadership is perceived as a positive factor for team's innovativeness whereas transactional and laissez-faire are described as having a negative influence on their performance. The corresponding concepts of these categories are presented in appendix L: Influencing Factors Leadership – Concepts and Categories.

Transformational Leadership is coded by the concepts “leader supports the team actively”, “project leader expects the team to be creative” and “project leader sets realistic project goals”. Participants explain their transformational leaders as visionary,

inspiring and someone who is committed to the project team. They agreed that this type of leadership enhanced their project progress and innovativeness. Showing the commitment, a project leader him/herself explained how he/she had to fight for the Design Thinking project against other employees outside the team:

“I had to say it over and over again: “Yes, the team is professional. No, the findings [of the team] will not be discussed. Yes, the findings are substantial and I want you to use these findings. (interviewee_13, project_12)

Transactional leadership was described by the participants as a negative factor and is summarized by the concepts “project leader is sceptical towards the project outcome”, “project leader sets up different teams to work on the problem” and “project leader do not appreciate the DT outcomes”. As the concepts indicate, the participants explained that their leaders did not trust the team and were overly monitoring them by setting up two teams for the case that one fails.

“[...] I said that we want to be radical in approaching the project. The principal of the project said that our presented ideas are somehow too radical. That is why he decided to have both a radical project/team and an incremental project/team. So we had two teams working on the issue. The leader was critical about how it might work out at the end and if this is just a crazy method. [...] The incremental project/team was a back-up for the leader if the other fails.” (interviewee_5, project_5)

The last leadership style which is supported by the data is laissez-faire. This leadership style is described by the two concepts “a loose coordination of activities instead of a specific project leader” and “no expectations of the project leader towards the result of the project”. Thus, it is an absence of a leader or the carelessness of the leader.

“[...] there was no project leader; it was more a kind of coordination by an external company. [...]. No, there were no expectations towards the project, not really. That was actually the problem!” (interviewee_2, project_2)

As summarized in Table 9, leadership styles are not that often coded compared with the previous categories. Moreover, transactional leadership is supported in only 2 projects.

Project No.	Transformational Leadership	Transactional Leadership	Laissez-Faire Leadership
1			
3	x		
5	x	x	
7			
9			x
11	x		
13			x
14			
2			x
4	x		
6			x
8		x	
10	x		x
10			
12	x		
Leadership			
INFLUENCING FACTORS			

Table 9: Influencing Factors Leadership – Project Overview

5.3.3. Micro Level

The micro level explains factors which focus for an individual team member. On this level, the data analysis provided evidence for the employee's motivation. This new category was not proposed in the literature review and emerged after the analysis of the first five interviews. In specific, intrinsic and extrinsic motivation was mentioned by the interviewees as a factor which influenced their innovativeness. Defined by Ryan & Deci (2000) and Oudeyer & Kaplan (2008) intrinsic motivation is the doing of something for its inherent satisfaction rather than for separable consequences and extrinsic motivation is the doing of something for achieving a separable outcome and given goals. Intrinsic motivation is found to be positively associated whereas extrinsic motivation was negatively associated with team's innovativeness in the present sample. Figure 12

illustrates the categories on a micro level perspective and appendix M: Influencing Factors Motivation – Concepts and Categories provides an overview of the concepts.

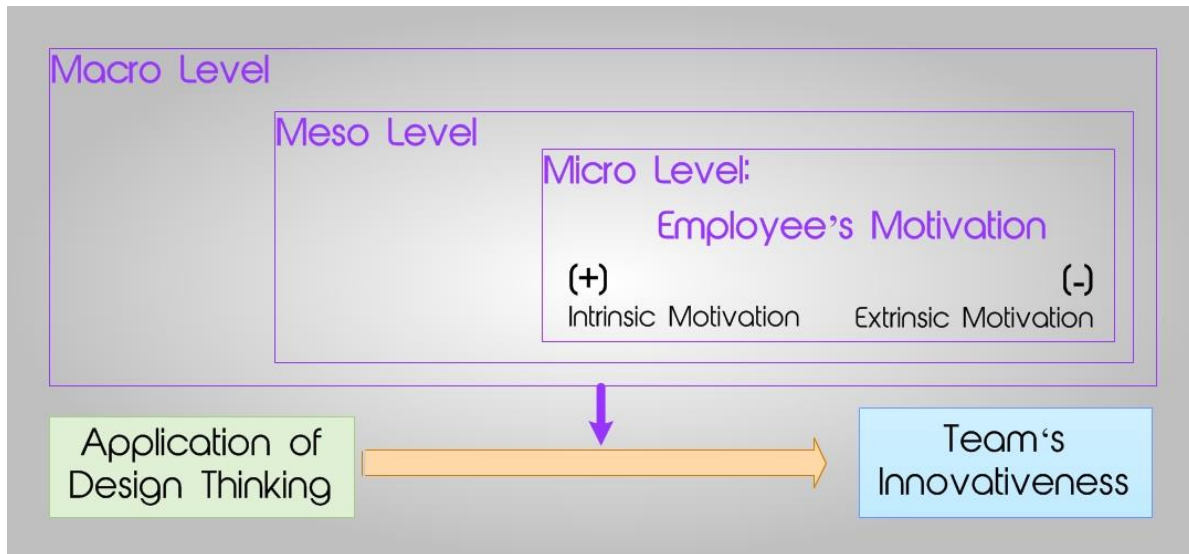


Figure 12: Influencing Factors Micro Level

First, intrinsic Motivation is added to the template as a positive influencing factor. Participants explain that they were positively motivated through the methodology. They explained that they enjoyed working on the project. It is coded by the concept “do something from within”.

„Everybody is able to say something, this is fun. This awakes the curiosity that is totally positive. This implies that the team members have fun and they motivation is intrinsic. [...]” (interviewee_1, project_1)

Second, extrinsic motivation is coded by the concept “specific given specifications and targets have to be delivered” and perceived as detrimental to their innovativeness. By an overemphasis on the deliverables, the individual were adhered to specifications and limitations which were described to be demotivating.

„Well in that case, we were not free at all. The output – which was needed – was set. There were only little changes possible. Even these little changes were not possible because they were set as well. That is why I am happy about minor

achievements. But working with such limitations and pre-assumptions was demotivating.” (interviewee_10, project_9)

In sum, Table 10 shows in which project the individual perceived to be motivated extrinsically or intrinsically. In comparison with all other influencing factors, the data analysis provided the least support for motivation.

Project No.	Extrinsic Motivation	Intrinsic Motivation
1		x
3		
5		
7		
9	x	
11		x
13		
14		
2	x	
4		
6		
8		
10		
10		
12		
Motivation		
INFLUENCING FACTORS		

Table 10: Influencing Factors Motivation – Project Overview

5.4. Differences According to Team's Innovativeness

In this section, the question is answered how the factors explained in section 5.3 differ in highly and less innovative projects. The foundation of this analysis is the distinction of highly and less innovative projects explained in section 5.2. Moreover, the comparison is based on the project overviews provided in the previous section given for each category. Hence, a factor is considered to be especially important for radical innovation if the category mainly emerged in projects which are clustered into the highly innovative project group. In contrast, if a factor is primarily applicable to less innovative projects, the category is proposed as responsible for incremental innovations.

On a macro level perspective, two out of the seven categories are found to be especially important in highly innovative projects. In specific, these are supervisory encouragement and freedom. Both positive factors are only applicable to projects grouped to highly innovative projects.

In contrast, in less innovative projects two factors at the meso level are noticeable. Discrepancy is mentioned by the participants more frequently in less innovative projects than in highly innovative projects. Going into the same direction, laissez-faire is found to be a leadership style of leaders who are responsible for less innovative project outcomes.

No significant difference is shown with regard to support for innovation, resources and interaction. These categories are mentioned in almost every project and are thus equally important to both highly and less innovative projects.

6. Discussion

This section discusses the findings of the study's qualitative research explained in the previous section. The findings of this study are compared to the existing literature about innovation teams such as R&D or NPD teams. It is not about drawing generalizable conclusions about the application of Design Thinking – it is rather a question of whether this study's conclusion can be supported. Moreover, explanations of the findings are given and critically reflected. This section follows the structure of the previous one. If applicable, the requirements suggested by Corbin & Strauss (2008) in section 4.3 are addressed.

6.1. Application of Design Thinking

As the elements of Design Thinking (mindset, team diversity, process, tools and environment) do not significantly differ in the projects, the conclusion can be drawn that the application of Design Thinking projects in the automotive industry seems to be similar. In many projects, the Design Thinking team focuses on the customer, is diverse in their backgrounds, follows the Design Thinking process (roughly divided in inspiration, ideation and implementation), applies different tools and works in an inspiring environment outside the typical offices. Those descriptions go hand in hand with the explanations given by Brown (2008) who illustrates a Design Thinking team. A reason for the similarity of the application of Design Thinking in the projects could be that the Hasso Plattner Institutes providing education and guidelines are pioneers. Many employees explain that they have worked together with moderators coming from the d.schools. On top of that some employees went to the Hasso Plattner Institute in Potsdam to study the methodology in-depth. Moreover, the similarity of the application of Design Thinking in the projects strengthens the comparability of the sample and indicates that the selection of the projects has been made precisely.

An explanation why environment was coded by only half of the projects could be that it is perceived as complicated to work outside the plant grounds. Often, it is more pleasant to meet in standard meeting rooms to do group works. However, these facilities are

described to be less inspiring than to work outside the plant grounds. Nevertheless, in two projects the interviewees explained that they were surprised by the modern and innovative spaces available in their plant grounds. Those facilities are especially designed for enhancing team's creativity providing a great variety of materials for rapid prototyping. Thoring & Müller (2011, p. 143) supports the importance of the environment in Design Thinking by saying that "the presence of visualized materials in the workspace might activate inspiration and 'cross-pollination' [...]".

6.2. Innovativeness of Design Thinking Teams

Collins (2013) proposed that people applying Design Thinking as a methodology might be disappointed. The authors questioned the ability of organizations to apply Design Thinking for business purposes. Against these propositions, the study's sample provides evidence for projects' success. In every project the team achieved their goals which meant to be creative and to deliver innovative ideas. Based on the sample, the proposition can be made that the application of Design Thinking in the automotive industry leads to creative team outcomes and innovation. Beyond that, Wattanasupachoke (2012) found that organizations applying Design Thinking are able to enhance their performance through an indirect impact of Design Thinking on company's performance via innovativeness.

Taking the duration of the projects into consideration it is obvious that all projects with the longest duration (i.e. 1 year) developed radical ideas and implemented it. In contrast, the two projects with duration of 1 day came up with less creative ideas and did not realize the outcome. Coherence between project duration and innovation can be proposed which is in line with the findings of Wagner et al. (2004).

To add the category efficiency to the template is supported by Simons et al. (2011) who state that Design Thinking teams are able to foster rapid innovation by working efficiently. The interviewees were comparing the Design Thinking methodology with a standard project setting and came to the conclusion that efficiency is a unique characteristic of Design Thinking. Efficiency was only mentioned in projects which are grouped as having highly innovative project outcomes. This underlines the proposition

that Design Thinking enables radical innovation stated by Hassi & Laakso (2011), Simons et al. (2011), Liedtka (2014), Carlgren et al. (2014), Brown & Wyatt (2010) and Brown (2008).

6.3. Influencing Factors

In the following, the findings about the influencing factors are discussed and explanations for the findings are provided. The focus is on factors which are supported or refuted by the literature existing about innovation teams such as R&D or NPD teams. Furthermore, it is explained why these factors are especially important for Design Thinking teams referring to the elements of Design Thinking. Again, in order to discuss the factors in a structured way, they are clustered into a macro, meso and mirco level.

6.3.1. Macro Level

In line with the findings of Amabile et al. (1996), this thesis found positive influencing factors namely organizational encouragement, supervisory encouragement, freedom and challenging work at the macro level perspective. Moreover, the master thesis's findings provide support for the negative influencing factor of organizational impediments. It has to be mentioned that deviating from Amabile et al. (1996) the definition of supervisory encouragement is adapted to the macro level of organizational environment in the present thesis. Hence, a comparison of supervisory encouragement to Amabile et al. (1996) is not feasible for this category.

More specifically, one of the strongest effects in the organizational environment measurement of Amabile et al. (1996) were found for organizational encouragement. This category is reflected by the organizational culture. Similarly to the situation described by Martin (2011), a company which aims at being innovative through the application of Design Thinking has to empower their employees by organizational culture. In line, Jassawalla & Sashittal (2002) report that organizational culture is a powerful frame for product innovations in time of uncertainty and ambiguity in multidisciplinary teams. This finding might be explained by the importance of the Design Thinking mindset. As described in the literature review, a Design Thinker does focus on what is technically feasible at the moment, what is relevant for business and cares

about what the customer really needs. It is of importance to rapidly develop first prototypes instead of developing a fully functional product. Hence, the traditional way of thinking (i.e. analytical thinking) as applied by a R&D or NPD team is particularly different from a Design Thinking approach. This explains why an organizational culture which is open for a new way of thinking is particularly important for a Design Thinking team.

According to the master thesis findings, there is an inverted u-shaped relationship between pressure/resources and Design Thinking team's innovativeness. Confirmed by the literature, empirical evidence is provided for these findings. Working under time pressure is detrimental to creativity in innovation teams (Chirumbolo et al. 2004; De Grada et al. 1999) which explains the negative effect found in this study. On the opposite, a situation in which pressure enhances creative outcome can be explained by the tendency of teams to long for consensus if they have to meet a given deadline (Kruglanski et al. 1993). The innovation team rejects divergent thoughts which delay the decision making process and seek to reach a rapid decision if they are under time pressure (Chirumbolo et al. 2004). Hence, an inverted u-shaped relationship for pressure/resources as influencing factors is both found in the study's sample and in literature. However, the negative effects of pressure/resources prevail in the literature about other innovation teams such as R&D and NPD teams (Daniel & Davis 2009; Thong & Lotta 2015; Salomo et al. 2010). Comparing Design Thinking teams with R&D or NPD teams, it can be proposed that especially in Design Thinking projects, time pressure might show a positive effect because of the iterative approach of the Design Thinking process. Interviewees explained that it was difficult to find a balance between going back to a previous process step and setting the project to a next level. As a result, they had the feeling of a never ending story of iterations which could only be disrupted by an external given deadline. As a R&D or NPD team operates within an innovation process consisting of pre-defined milestones, they have their own control mechanisms which serve as conditions to proceed to the next stage (Cooper 2014; Grönlund et al. 2010; Ettlie & Elsenbach 2007).

6.3.2. Meso Level

At the meso level, team climate measured with the categories vision, participative safety, task orientation and support for innovation are found to be positively influencing factors. This finding goes hand in hand with results of West & Sacramento (2012), Anderson & West (1998), Anderson & West (1996) and Cirella et al. (2014). Moreover, West & Anderson (1996) found that support for innovation is the most important team climate factor in predicting overall innovativeness in teams. This master thesis provides the similar finding. Both the thesis's findings and academic literature provides evidence for the significance and validity of the team climate measurement (Anderson & West 1998; Kivimaki et al. 1997; Kivimaki & Elovainio 1999; Agrell & Gustafson 1994).

Overall, the team climate measurement can be proposed to be the most substantive scale across all influencing factors in Design Thinking teams. There are several reasons for explaining this finding. First, vision plays a substantive role in the Design Thinking mindset as the Design Thinking teams often have to realize radical innovative products or services which are rooted in visionary thinking (Kantabutra 2008). Similarly, Akgün et al. (2012) found that in NPD projects open-mindedness leads to a better development of vision for the project. Second, the participative safety category creates a supportive, open and non-threatening atmosphere which is especially helpful in projects with a different approach such as Design Thinking compared with standard project settings such as R&D and NPD projects. This was outlined by interviewees explaining that the Design Thinking approach was new to many team members who in turn were curious and on the same time anxious about how to behave and how to meet demands. Next, since the Design Thinking process is flexible, non-standardized, yet not established into organizational project management processes, it is important for Design Thinking projects teams to be task-orientated as the teams operates self-organizing and – monitoring. Lastly, support for innovation was found to be important in almost every project team. This result is due to three elements of Design Thinking namely mindset, newness of the method and environment because the team gives up typical pattern of thinking, awake curiosity for the project with the new method and work in project

facilities different to company's standards. Hence, it could be suggested that support for innovation is a vital success factor in Design Thinking projects.

Next, positively influencing factors of team collaboration namely interaction and intra-organizational network are found after the data analysis. It became apparent that especially the aspect of interaction is important in Design Thinking teams because they work in multi-disciplinary teams implying a need for communication and exchange which is supported by Seidel & Fixson (2013), Kratzer et al. (2004) and Hargadon & Bechky (2006). As other innovation teams such as R&D or NPD teams typically consist of a diverse team as well, researchers found similar findings about the importance of communication in innovation teams (Tsai et al. 2014; Sivasubramaniam et al. 2012; Magni et al. 2013; Thong & Lotta 2015). However, the participants of this study stressed the importance of the frequency of interaction as it came to rapid prototyping in the Design Thinking project. The interviewees explained that they were surprised about the pace in which they developed prototypes of their ideas. In standard innovation projects without Design Thinking, they realized their ideas after several months of development. In comparison, the rapid prototyping helped them to communicate their ideas at a very early stage of the project and thereby every team member understood others' ideas.

To build a network of experts is another positively influencing factor in Design Thinking teams. A dense intra-organizational network is described to enhance the ability to recognize ideas (Burt 2004) which supports the finding of this thesis. It is not only about building a network of technical experts of different departments – it is also about building a group of colleagues who are experienced with the Design Thinking methodology. As mentioned, the methodology was a new method for the majority of the participants in this study and they attributed a value added to Design Thinking in innovation projects. Almost every employee asked me to connect them among one another as they wanted to share experiences and follow up on the Design Thinking methodology. Due to the great wish of the participants to build a network of Design Thinkers, I assume that the influence of the factor network of experts will be of greater importance in the future. If a dense intra-organizational network of technical and Design Thinking experts will have developed, this factor will be different to R&D or NPD teams.

Thompson (2003) studied debates, production blocking, social loafing, evaluation anxiety, conformity and downward norm setting as negative factors in teams. As described in the results section, these factors were canceled out the initial template. However, the participants explained some of the aspects which are summarized in the category discrepancy. There are two major reasons for this finding. First, taking the aspects of Corbin & Strauss (2008) into consideration, an explanation of the dismissal of the former factors could be that participants are somehow reserved and self-conscious to speak about negative influencing factors on a team level perspective. Although the anonymity of the interviewees were ensured and explained at the beginning of the interviews, it is human to be reserved to speak freely about social loafing or evaluation anxiety problems in teams. Thus, it could be assumed that an under-representation of discrepancy is shown in the data. Another explanation could be that the Design Thinking teams do show a lower level of discrepancies compared with other innovation teams because they obeyed specific Design Thinking rules. Participants explained that they used brainstorming rules for group work which reduced the likelihood for discrepancies in teams.

The thesis supports leadership styles as an influencing factor for innovation in Design Thinking teams. However, leadership is found not to be as important to team's innovativeness as, for example, team climate. This finding is contradicting to the findings by Mumford et al. (2002) who state leadership styles as the most important factor for innovativeness in teams. Hence, although leadership styles are researched intensively in R&D and NPD teams it might not be the most important factor in explaining Design Thinking team's innovativeness. Going into the same direction, Hill et al. (2014) explain that the leader is of less importance for innovative teamwork. They claim that "the role of a leader is not to set a vision and motivate others to follow it. It is to create a community that is willing and able to innovate" (Hill et al. 2014, p. 97). This finding also supports the category of intra-organizational network described above.

The positive effect of transformational leadership on team's innovativeness which is found in the thesis is widely supported in research about teams in general. Academic literature provides empirical evidence that R&D and NPD teams' innovative capability is

increased by a subordinate incorporating a transformational leadership style (Kirkman et al. 2009; Chen et al. 2012; Khazanchi & Masterson 2011; Bucic et al. 2010; Gumusluoglu & Ilsev 2009b; Gumusluoglu & Ilsev 2009a; Abfalter 2013; Zheng et al. 2010). Beyond that, Paulsen et al. (2013) found that transformational leadership positively influences perceived support for creativity and group identification in R&D teams. This mediating effect might explain the weaker results on leadership factors in the present study since support for innovation and collaboration were coded as separate factors without studying interaction effects. Similarly, Sun et al. (2014) found a mediation effect of team climate on the relationship between transformational leadership and NPD team performance which is another reference for an interaction effect of leadership and innovativeness via other influencing factors.

As another leadership style, the master thesis found transactional leadership as detrimental to Design Thinking teams. A explanation is given by Rosing et al. (2011) saying that a transactional leader does not encourage experimentation, seeks to improve existing knowledge and is thus not facilitating innovation or creativity. Another negatively influencing leadership style supported by the data analysis is laissez-faire. Aasland et al. (2010), Sosik & Dionne (1997) and Bass & Avolio (1994) underline the laissez-faire leadership style as detrimental. These scholars explain that the absence of a leadership style – laissez-faire – is the most ineffective because leaders do not intervene, act or emphasize appropriate resulting in conflicts with followers.

6.3.3. Micro Level

On a micro level perspective, motivation of the individual employee emerged during the data analysis as a new coding factor in Design Thinking projects. The data analysis provided evidence for individual intrinsic motivation as a positively influencing factor whereas extrinsic motivation was perceived as a negatively factor.

Supporting these findings, authors state that intrinsic motivation flourishes innovative and creative outcomes in R&D and NPD teams (Chen et al. 2013; Amabile 1997; Jiang & Zhang 2014; West & Altink 1996; Amabile 1996). Comparing both types of motivational states, Amabile (1985, 1996) found that intrinsic motivation enhances

creativity whereas extrinsic motivation decreases creative thoughts. In specific, Amabile (1985) found that people are extrinsically motivated if they are motivated by incentives like promise of reward, expectation of evaluation, surveillance, competition with colleagues and dictates of their subordinates. In contrast, intrinsic motivated employees do something because they are interested, excited or personally challenged in doing it (Amabile 1997).

Moreover, Amabile (1996) suggested a distinct view of extrinsic motivation. The author explained that extrinsic motivation is not universally negatively associated with creative outcome. In detail, controlling (i.e. no synergetic) extrinsic motivation is found to decrease creative thoughts whereas informational and enabling (i.e. synergetic) extrinsic motivation can be conducive to creativity. The distinction of extrinsic motivation is not made in the data analysis which is proposed for investigation for further research in section 7.3.

After the data analysis, there was a relatively weak support for the importance of motivation compared with the other influencing factors. This finding might not be as valid as the other findings in this study because motivation emerged during the interviews as a completely new factor which was not proposed beforehand in the template. Keeping the validity consideration of Corbin & Strauss (2008) in mind, it has to be mentioned that the interview questions did not emphasize on motivational states of the interviewees. As a consequence, employees did not especially focus on their intrinsic or extrinsic motivation. Due to the strong empirical evidence of academic literature about motivation for creativity, it could be proposed that motivational states are undervalued in the studies data. Furthermore, the analysis of Hargadon & Bechky (2006) suggests to further examine intrinsic motivation for understanding collective (i.e. teams) creativity. Those investigations would imply to change the perspective of individual motivation towards the meso level (teams motivation).

6.4. Differences According to Team's Innovativeness

On a macro level, freedom and is found to be especially important in highly innovative Design Thinking projects. According to the participants of this study, the necessity of

freedom was due to the complex and novel nature of the Design Thinking methodology. As most of the teams were not experienced with the method, they perceived the freedom given to them as positively enhancing their flexibility to decide which Design Thinking tool or process step they wanted to use. Moreover, highly innovative project teams were not put into specific limitations regarding possible project outcomes. Instead, they were free to experiment and to come up with unconventional and radical ideas. Since Design Thinking is not a standardized methodology in innovation management in the automotive industry yet, the study's findings propose that freedom is especially necessary for Design Thinking teams pursuing radical innovation if compared to R&D or NPD teams which operate within a given set of organizational procedures. Indicating the importance of freedom for radical innovation, Patanakul et al. (2012) found that teams are more effective in developing radical innovations if the team is able to act autonomous and free. Beyond that, Chen (et al. 2015) supported their hypothesis saying that freedom is important for NPD teams operating under technological turbulence. Adding the findings of Nicholson & West (1988) and West (1987) who state that innovation teams are more likely to be innovative if they have autonomy to try out new things and control over their work, the proposition of this study is supported. This finding is explained by Mumford et al. (2002) who state that freedom and autonomy is especially important for highly skilled employees who have to be creative and innovative.

Moreover, organizational committees (e.g. innovation committees) or the board of management is found to be especially important for highly innovative Design Thinking projects on a macro level perspective. As mentioned beforehand, the Design Thinking process is not yet established into the project management organization in the studied companies. This implies that the Design Thinking project teams acts without standardized milestones and reporting tools which are common in for example R&D or NPD projects. As a result, participants mentioned that they were stuck in a cycle of iterations without a structured gate-way decision making (as they were used to in innovation projects). This is where organizational committees are especially helpful for Design Thinking teams as they accelerate the decision making process on a higher

organizational level if compared to R&D and NPD projects. Supporting this argument, the importance of supervisory encouragement is stressed as a factor for innovation (Hill et al. 2014). Likewise, Zona et al. (2013) found that the board of directors have a significant influence on innovation which is moderated by firm size. On an organizational level, Robeson & O'Connor (2013) provided empirical evidence of the influence of board members on the overall innovativeness of the company especially if they promote projects which are radical innovative.

This study showed that discrepancy is only applicable in less innovative projects at the meso level. As described by Thompson (2003) teams might face various problems. The author claims that “teams can be much more creative than they often are.” (2003, p. 106). Especially the problems of communication, finding consensus and trust destroy the potential of teams to create something new. Among them, Taylor & Greve (2006) found that the exchange of diverse knowledge is the most important effect on the production of innovations. Particularly in Design Thinking projects which are dependent on a trustworthy and open atmosphere within the team as described earlier discrepancies might harm the success of the project.

Another negatively factor of Design Thinking team's innovativeness at the meso level is laissez-faire leadership. It is found to be especially applicable in less innovative projects. An explanation of the negative influence of laissez-faire leadership on innovation is given by Skogstad et al. (2007). The authors examined that laissez-faire leadership is associated with role stress and interpersonal conflicts among leaders and their subordinates which results in a stressful environment. Similarly to team's discrepancy, laissez-faire leadership affect the atmosphere negatively. As a result, the Design Thinking team is inhibited and confused because of the absence of a leader. This finding is supported by Aasland et al. (2010) who state that among three other leadership styles laissez-faire was the most prevalent destructive leadership style. Moreover, Khan et al. (2012) showed that laissez-faire leadership negatively predict innovation at work.

7. Conclusion

This study examined the application of Design Thinking in the automotive industry. Findings show that the application of Design Thinking in projects leads to creative team outcomes and innovation. The elements of Design Thinking (mindset, team diversity, process, tools, environment and newness of the method) are similar in the projects independently of the department in which the project took place. Thus, an automotive Design Thinking project team focuses on the customer, is diverse in backgrounds, follows processes, applies diverse tools and works in inspiring environments. This first finding contributes to the “management discourse” of Design Thinking by providing characteristics of Design Thinking teams as differentiation aspects to other innovation teams such as R&D and NPD teams.

The main research goal of this study was to find which factors influence the relationship between the application of Design Thinking and team’s innovativeness. This question was answered by a qualitative methodology analyzing 14 Design Thinking projects. A full conceptual model explains influencing factors on a macro, meso and micro level contributing to the current state of literature about Design Thinking and innovation management.

On a macro level perspective, the organizational environment is a relevant factor for team’s innovativeness. In detail, organizational encouragement, supervisory encouragement, freedom and challenging work enhance innovative team outcomes. Especially organizational encouragement is found to be important in Design Thinking teams since the Design Thinking mindset is merely fruitful in a culture which is open to experiment. In contrary, organizational impediments weakens the project’s success. With regard to pressure and resources an inverted u-shaped relationship is found. Examining the meso level of influencing factors, team climate, team collaboration and leadership are relevant factors for team’s innovativeness. Among all factors, the data analysis reveals that team climate is the most important factor and incorporates vision, participative safety, task orientation and support for innovation. The study’s findings propose that team climate is especially important for Design Thinking teams compared

to R&D or NPD teams because the team climate categories are supported by the characteristics of the Design Thinking mindset, newness and process. Team collaboration includes the positive factors interaction and intra-organizational network as well as the negative factor discrepancy. As described by the participants of this study, interaction is positively influenced by the Design Thinking tool rapid prototyping through the possibility of an early communication of their ideas. With regard to discrepancy it came apparent that a relatively small number of projects had to cope with inner team problems. This finding is explained by employees stating that they used specific brainstorming or Design Thinking rules which reduced the possibility of discrepancies. Moreover, three leadership styles were supported by the data. Transformational leadership is the only leadership style which enhances the innovativeness of Design Thinking teams. Transactional and laissez-faire is described to be detrimental to team's success. At the individual perspective – micro level – intrinsic motivation supports the employee's capabilities whereas extrinsic motivation is unfavorable to Design Thinking team's innovativeness.

Another sub-question is the difference of these factors in highly and less innovative project teams. In order to make this distinction, the projects were grouped into higher and less innovative projects teams by analyzing team creativity, implementation and efficiency. The data analysis revealed that supervisory encouragement and freedom were only applicable to highly innovative projects. Supervisory encouragement as incorporated by an organizational committee is proposed to be especially important for Design Thinking projects since the Design Thinking process lacks standardized gateway decision points. In comparison, R&D and NPD teams operate within the established project management of the organization with their own milestones and decision processes. Moreover, freedom developed as an important factor in Design Thinking projects because the method were new to many of the employees who in turn perceived autonomy as positively influencing their flexibility to adapt the method to their needs. In less innovative projects both discrepancy and laissez-faire leadership destroyed the team's atmosphere.

7.1. Practical Implications

Facing ongoing challenges and the risk of turbulent markets, executives and employees in the Automotive industry increasingly bet on Design Thinking as a method for business innovation. As managers pursue to build creative capabilities within their work force, the question how to apply Design Thinking in a project successfully is of importance. As the analysis of 14 Design Thinking projects demonstrated, the application of Design Thinking leads to radical and incremental innovation in the automotive industry. This finding strengthens the intention of executives to use Design Thinking in order to facilitate innovation.

The automotive industry has to make full use of the opportunities of Design Thinking. In order to utilize Design Thinking, the first attempt of applying Design Thinking has to be satisfying for all stakeholders. This is emphasized by Sobel & Groeger (2013, p. 30) who state that “when businesses adopt Design Thinking, it is crucial that the first experience be a good one. A good experience will predispose a business to become more interested in the benefits of design; a bad one may color attitudes for years to come”. In this regard, this master thesis aims to provide guidelines for the application of Design Thinking to make the project a success. Since the analysis is based on automotive projects, the recommendations are specific only for this industry.

The five most important practical implications are explained which reflects the benefit of the study's findings in practice. These practical implications are summaries of the results and are chosen according to three selection criteria. First, the finding has to be highly significant in the study's sample. This means either that the influencing factor is applicable in many projects or that the literature supports the finding heavily. Second, the result has to be easily convertible in practice which is assessed by the effort the organization has to expend to implement the advice. Lastly, the practical implication has to be stressed by the participants as overly important in the interviews. These subjective expressions were not taken into consideration in the previous chapters but focusing on practice I emphasize the comments of practitioners as an additional variable. Hence, the five guidelines are significant findings, convertible in practice and emphasized by

interviewees. In the following, these guidelines are given to managers, decision-makers and employees who seek to apply Design Thinking to enable business innovation:

#1 A Design Thinking Project has to be different! This thesis studied different project settings of Design Thinking. Examining the application of Design Thinking, the study found six elements which have to be thought about at the beginning of the project. Compared with common projects a Design Thinking project is different in the team's mindset & diversity, the project's process, tools & environment and the newness of the method itself.

First, the mindset of the team is crucial (Brown 2008; Mootee 2013). The team has to be open-minded towards the result of the project. This implies that the team tries and tests new approaches without an understanding what will be the outcome. To do so, they have to remind themselves not only to think what is technically feasible and how they do things at the moment, but rather how things may be (Collins 2013). The balance between analytical thinking (i.e. the question "how is it today?") and intuitive thinking (i.e. the question "how could it be in the future?") is of importance in the Design Thinking's mindset (Martin 2009). Most importantly, the customer of the new idea has to be central to the approach. An employee has to incorporate the customer-centric mindset to become a Design Thinker.

Second, the staffing of the team has to be considered. Diverse team members increase the inventiveness of the whole team (Seidel & Fixson 2013). Ideally, a Design Thinking team consist of experts of different departments with diverse backgrounds and Design Thinking coach(es). The Design Thinking coach can either be an external consultant or an employee who is an experienced Design Thinker. Interviewees explained that it is favorable to include an expert for the methodology throughout the whole project duration who is responsible for facilitating the Design Thinking process and tools.

Next, the Design Thinking process was mentioned in each interview as a part of the application of Design Thinking. The process is roughly separated in the inspiration, ideation and implementation stage. At the beginning of the project, the team tries to understand the problem at hand. In doing so, some interviewees explained that they

observed the environment of the customer in order to understand the customer needs. After brainstorming sessions, the team clusters ideas into groups and concentrates on (a) specific idea(s). In the following, the Design Thinking team builds a rough prototype of their idea(s) and asks others for feedback. These different stages are not linear – rather the interviewees described to iterate between these stages.

The Design Thinking process goes hand in hand with the Design Thinking tools as an additional element of Design Thinking. The tools used in the projects were highly diverse. They include brainstorming, voting, storytelling, brainwriting, sketching, conducting interviews and taping customers.

Furthermore, the environment in which the team is coming together is described as essential in Design Thinking projects (Thoring & Müller 2011). Interviewees explained that they worked in inspiring environments which are different to the standard offices. Many project teams went to design firms, education offices, other countries or cities to work in a stimulating environment. Not only the location is of interest –the furniture and materials provided to the project team were equally important. These materials include movable furniture which could easily move around to build working spaces. In addition, the Design Thinking teams needed different materials to develop a prototype which expressed their ideas (e.g. colored paper, pencils, pens, plastic modelling mass, LEGO-bricks, scissors, tapes, cords or wood).

Lastly, some employees pointed out that they had no experience with the method or that at least one team member did not work with the method before. They explained that they were surprised by the project outcomes. The newness of Design Thinking is, however, no shortcoming since the method is described to be intuitive to learn and no effort has to be made in order to learn the tools or process.

#2 A Design Thinking Team has to be free! The study examined which factors are of relevance to the innovativeness of Design Thinking teams. For this purpose, a comparison of highly and less innovative project teams were executed. It is found that on an organizational perspective – the macro level – freedom is especially necessary for radical innovation. The task given to the project team has to be open with regard to

the outcome and solution. Projects in which the solution was predetermined or in which the way of thinking was restricted by specific requirements were not as creative as projects without limitations. On an organizational level, it is favorable for team's innovativeness to give the project team enough space (Patanakul et al. 2012; Nicholson & West 1988; West 1987; Mumford et al. 2002). The analysis highlights that it must not just considered the freedom with regard to project outcomes but rather the power to decide which tools they choose to solve problems and the approach the team takes to develop or implement the idea. Freedom may, for instance, be provided by supervisory encouragement. Institutionalized by a committee, the organization supports innovation on a higher organizational level.

#3 A Design Thinking Team has to give up typical thought patterns! On a team perspective – meso level – the support for innovation has found to be essential for the innovativeness of Design Thinking teams – underpinned by West & Anderson (1996). The participants explained that they were curious about the project because they associate something new and different with Design Thinking. Indeed, many employees agreed that they had fun working in the project and enjoyed being part of it. Within the project, the team has to give up typical patterns of doing things. As explained by the participants a Design Thinking project could not be compared with a standard project procedure. In detail, the teams had to actively remind themselves to welcome creative thoughts instead of routinely dismissing it. Interviewees stressed that in common projects they reject ideas which are not technically feasible immediately. In fact, a participant said that he does not mention his ideas in ordinary projects because he is sure that someone will find a reason why it is not doable. In contrast, a Design Thinking team is open towards strange, weird or crazy ideas and considers all ideas as potentially important to build on.

#4 A Design Thinking Project Leader has to create visions! The fourth advice which can be drawn from the study concerns the Design Thinking project leader. Among three leadership styles, transformational leadership is found to enhance the team's creativity. A transformational leader "is one who articulates a shared vision of the future, intellectually stimulates subordinates, provides a great deal of support to subordinates,

recognizes individual differences, and sets high expectations” (Kirkman et al. 2009, p. 744). Especially vision is an important factor for Design Thinking team’s innovativeness since vision is also a factor of team climate at a meso level perspective. The vision of the Design Thinking project is not the same as a generic corporate vision. A corporate vision concerns the large-scale organizational view of the company whereas the project vision is the fundamental future impact of the innovation which has to be created (Kantabutra 2008). Obviously the corporate vision and the project vision has to be aligned but in a broader sense the Design Thinking project vision is the big picture of what the team are working towards. The Design Thinking project leader has to communicate the vision clearly at the beginning of the project (Carton et al. 2015; Larwood et al. 1995). To create a picture how things might look like in the future and how the project is part of it, has to be the essential goal for the project leader in order to stimulate the team’s creativity. This guideline expects the leader to be committed to the project aim and its methodology. As mentioned by the interviewees, the project leader has to put oneself out for the project outcomes in order to communicate the solution outside the team boundaries if it comes to the implementation stage. In comparison, the laissez-faire leadership style is found to decrease the team’s innovativeness. A leader who has no expectations towards the Design Thinking project or who allows a loose coordination of activities influences the team negatively.

#5 A Design Thinker has to be intrinsically motivated! The last implication for practitioners is the motivation of the individual employee to be part of the project. On a micro level, the intention of the employee is of importance. The intention to contribute to the project arises from within the individual as it is perceived to be intrinsically rewarding (Chen et al. 2013; Amabile 1997; Jiang & Zhang 2014; West & Altink 1996). Mentioned by the participants, they perceived the aforementioned freedom and vision as a motivation. Learning something new and working different compared to other projects are expected and perceived as internal rewards. Moreover, as explained earlier, the associated curiosity and fun at work let the employees enjoy what they do and provides justification for their efforts.

7.2. Limitations

In this sub-section, limitations are explained regarding the study's method, sample and theoretical model.

First of all, the methodology (i.e. Grounded Theory, Template Analysis and Interviews) incorporates several limitations of this study. Since Grounded Theory implies major misconceptions (Suddaby 2006), Template Analysis was applied to minimize the possibility of these mistakes. The assumption that Template Analysis is suitable to counterbalance the misconceptions of Grounded Theory was proven throughout the study. There is no guideline how to combine these methods which led to a procedure without evidence of validity. In addition, the methodology led to conclusions concerning the specific sample and is not generalizable or replicable. The conclusions are applicable to the studied projects and to the individual employee. By focusing on projects in the automotive industry, the conclusions of this study are specific only for this industry. Next, there are issues regarding the conduction of the interviews which have to be noticed. In order to examine a specific project, the critical incident technique was applied. However, some interviewees did not rely on the specific project setting which was initially selected for the interview. Rather, they got off the subject and explained their general opinion about Design Thinking projects. These statements were not coded and analyzed. In these instances, I was able to return to the specific project by using inverting questions. On top of this, the interviewees had different understandings of the term implementation of the project idea. These differences were noticed and questioned directly or brought into question after the interview. Nevertheless, these problems do limit the study as there might be interviews in which these misunderstandings were not recognized.

Second, the sampling of the study is a constraint to some extent. In order to acquire interviewees for the study at a car manufacturer, snowball sampling was used. This sampling methodology comes not without its inherent drawback which is the willingness of employees to contribute to the thesis. It is most likely that the majority of the employees who are willing to take part in the study have a positive attitude towards

Design Thinking. In contrast, employees who have negative experiences with Design Thinking projects are less willing to participate. Thus, a positive sample bias could be assumed leading to an overestimation of the outcome of Design Thinking. The second constraint towards the sample is the amount of team members interviewed. Due to access restrictions, I was able to interview one to two team members of the same project. These interviewees reported their individual opinions, single experiences and subjective feelings. However, this reflects only a small proportion of the whole team. As recognized in project 10 – in which I interviewed a second team member – an additional interview can lead to deviations. Thus, it would have been favorable to conduct interviews with several project team members. At last, it would have been of value to include other innovation teams such as R&D and NPD teams into the sample as a reference point as this study is comparing Design Thinking teams based on the study's sample and literature about innovation teams.

Lastly, the full conceptual model of influencing factors has to be critically assessed regarding its limitations. Due to the literature gap in the “management discourse” of Design Thinking the influencing factors of Design Thinking team's innovativeness could be proposed by including literature about R&D and NPD teams. The selection of the influencing factors was based on the most important factors in literature about teams. Accordingly, the initial template and the interview guideline were developed. As a result, the data analysis is mainly limited to these factors. To counterbalance this limitation, open questions were used to gather information about other influencing factors. Moreover, the importance of these factors was rated equally. If an employee expressed that the factor was of importance, the factor was counted as applicable to the project. An individual assessment of each of the factors in the project in a quantitative manner is missing since the methodology rather aimed at capturing individual expressions of meanings than quantitative measurements. Lastly, the assessment of implementation with regard to Design Thinking projects might be problematic. The present study did not examine the influence of Design Thinking on the implementation stage of the idea. As mentioned before, some of the interviewees explained that they had no intention to implement the idea at all; rather they wanted to test Design Thinking. To some extent, it

might be valuable to separate the implementation of an idea and the application of Design Thinking. However, in order to assess the innovativeness of a project the implementation is a relevant characteristic which is needed to transform an idea or invention into an innovation.

7.3. Theoretical Implications and Further Research

This study provides areas of further investigation for researchers. Following the structure of the limitation chapter, research is needed in respect of its method, sample and theoretical model.

Due to the applied methodology of Grounded Theory and Template Analysis, the study's conclusions are specific only for the automotive industry, are not replicable and not generalizable. To further prove the study's conclusions, a quantitative methodology could be proposed. For instance, a team creativity measurement named TC scale is a possible quantitative approach to further examine Design Thinking team's creativity on a meso level perspective. The TC scale developed by Jiang & Zhang (2014) proposes that creativity should be measured from three dimensions: team creative thinking, team creative action and team creative outcome. The scale comprises nine items for creativity of these dimensions measured by questionnaires with five-point Likert scales. Moreover, a question which remains unclear is which factor is the most important for the success of Design Thinking in projects. Since the study did not measure the influence of the factors quantitatively, future research might focus on the assessment of the factors. I propose to test the impact of Team Climate Inventory scales on team's innovativeness in Design Thinking projects as these factors occurred to be applicable in nearly each project. Next, during the examination of this study, practitioners posed the question of whether a commission of an external Design Thinking coach is actual needed to enhance team's creativity. Since some of the interviewees developed their Design Thinking skills at the Hasso Plattner Institutes and some assigned external coaches, the question remains unclear if it is preferable to develop Design Thinking skills internally or to assign external agency employee. Hence, a study focusing on the difference of

external or internal Design Thinkers on team's innovativeness could be of interest especially for practice.

In the study's sample, a positive bias was proposed as a limitation. To counterbalance this drawback, an approach is advantageous which includes all project team members. This would lead to an inclusion of all subjective meanings and opinions without an overestimation of well-disposed participants. Furthermore, in order to generalize the findings a longitudinal study is required. For this purpose, the sample would be augmented and data would be collected in two different points of time. It is conceivable to collect data before and after the application of Design Thinking in projects to be capable of comparing the impact of Design Thinking in the organization. Next, since this study focused on the automotive industry, it remains unclear to which extent the conclusions are transferable to other industries. In line, it would be interesting if small and medium enterprises (SME) profit more compared to large firms as SME show for instance lower organizational impediments such as bureaucracy. Lastly, researchers might examine a comparison analysis of different innovation teams. As this study shows, Design Thinking teams are both similar and different to R&D and NPD teams and thus implying similarities and differences in their influencing factors. A sample including these types of innovation teams would empower the findings of this study.

The full theoretical model of this study is proposed as the major finding of this master thesis and serves – as intended – as a starting point for further research in the area of Design Thinking. A next step in academic research could be to study in-depth individual influencing factors. Since the study showed strong support for organizational environment and team climate scales it would be promising to start with one of these scales. Moreover, what is not covered by the present study are the dependencies and correlations among each of the factors. For instance, Avolio & Bass (2002) note that transformational leaders influence the employees' motivation which in turn enhances the innovativeness of teams. Thus, motivation might be tested as a mediating variable linking leadership styles and innovativeness. In addition, academics might be interested in examining both types of extrinsic motivation with regard to Design Thinking outcomes. As proposed by Amabile (1996), both controlling and enabling extrinsic

motivation might play distinct roles in Design Thinking projects. Lastly, further research might take into account that the impact of Design Thinking on the implementation of the project is not fully discovered. The recommendation derived from this study is twofold regarding the implementation stage of the project. On the one hand, it is preferable to include the implementation aspect into the data collection because an idea has to be implemented to transform an idea into an innovation. On the other hand, the Design Thinking project was not seen as necessary including the implementation aspect in practice. Thus, if the researcher aims at focusing on creativity outcomes of Design Thinking, it is recommended not to include the implementation aspect. On the opposite, if the researcher wants to examine innovativeness of Design Thinking teams, the implementation stage should be of interest.

Closing Quotation

*If I had asked people what they wanted,
they would have said faster horses.*

— Henry Ford



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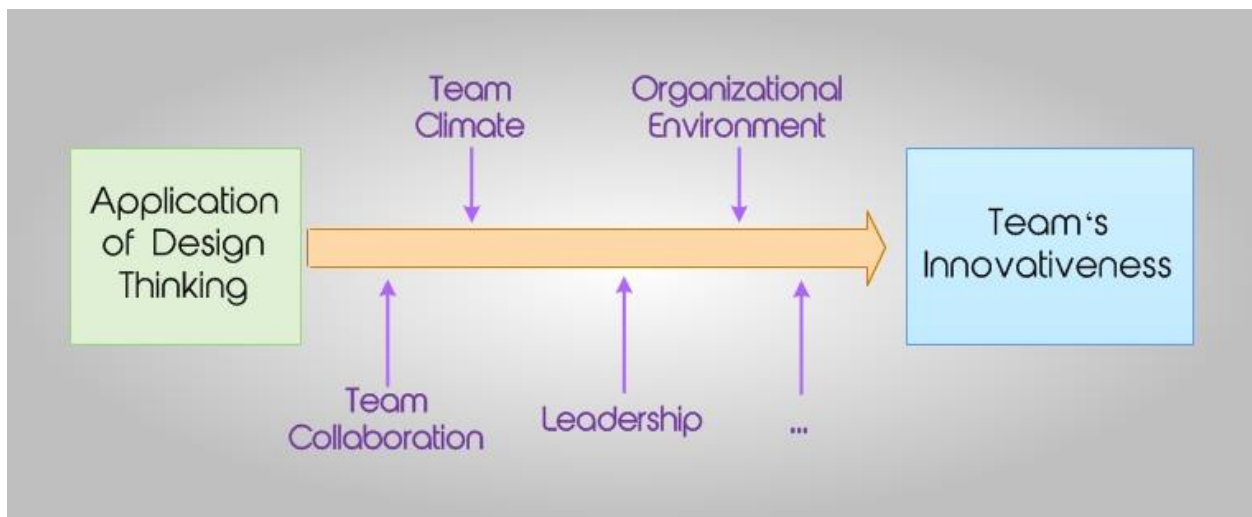
APPENDIX

A: Interview Guideline English Version

Introduction and purpose:

I am a master student of “Innovation Management & Entrepreneurship” writing my master thesis. The topic of my thesis is the application of Design Thinking in the automotive industry. The purpose is to explore the application of Design Thinking in the automotive industry in order to explain which factors influence the innovativeness of Design Thinking teams.

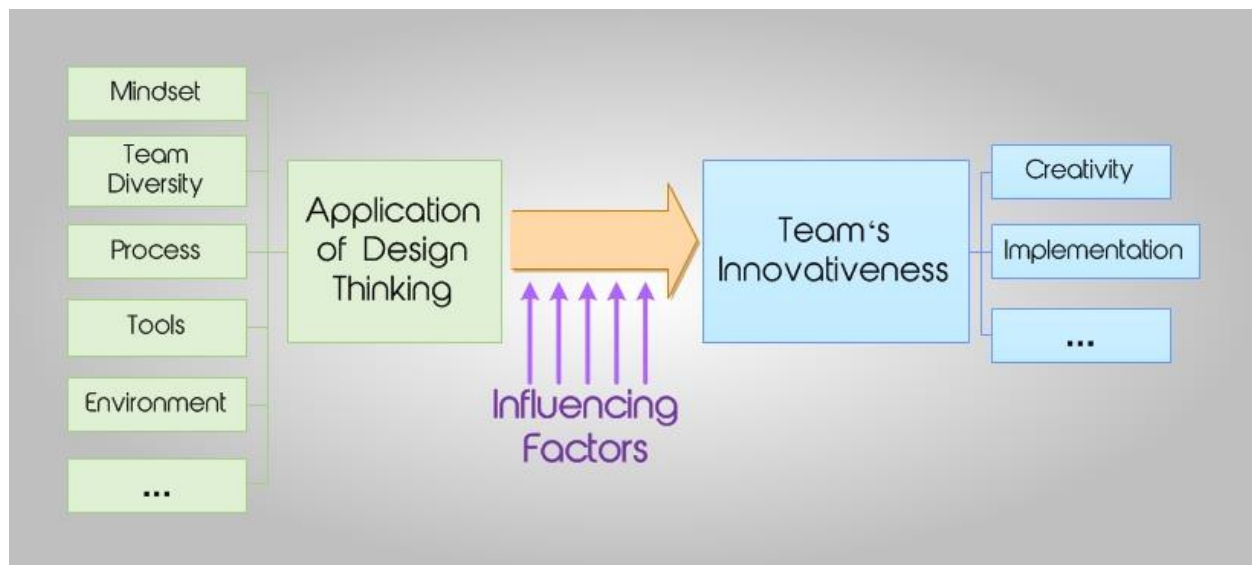
At any time, you can skip, ignore or discontinue the interview. Feel free to ask if you do not understand the questions.



Graph: Proposed influencing factors of the application of Design Thinking – Team's innovativeness link

Overview of the interview structure:

The interview is separated into 3 major parts: The first part is about the application of Design Thinking in your project, the second part focuses on the innovativeness of the project's outcome and in the last part I am interested in factors which influence the outcome of the project. If you have applied Design Thinking in more than one project, please pick one specific project for this interview.



Graph: The interview is divided into three parts. First, the application of Design Thinking, second, the innovativeness of the project team and lastly, the influencing factors between these two.

Semi-structured interview questions:

Note: The following interview questions are adapted, skipped or changed wherever is it necessary in order to dipping deeper into an interesting issue. The follow-up questions are used if applicable. At the beginning of the interview, basic information about the interviewee is collected (e.g. age, gender, education, brand and department).

Part 1: Application of Design Thinking

Introducing Question: Could you please provide general information about the project (including team members, type, duration and goal of the project)? Which role did you play in the project (initiator, team leader, team member)?

Open Question: Could you describe in much detail as possible the setting of the project regarding the application of Design Thinking?

- What do you understand by a Design Thinking project?
- How did you apply the Design Thinking method? In which way?
- Which tools did you use and how?

- What do you think what distinguishes a Design Thinking project from a project without the Design Thinking method?
- Are there any further issues you want to add?

Part 2: Design Thinking team's innovativeness

Open question: I want now focus on the outcome of the project. Could you please describe the outcome of your project?

- Was the outcome or solution obvious to you as you thought about it the first time?
- Did the team accomplish the objectives of the project?
- Did the team developed new and creative ideas? What was new and creative in that sense? For whom was the idea new (team, organization, new to the world)?
- Could you please describe if and how the outcome is applied, transferred or implemented in the organization?
- Are there any further issues you want to add?

Part 3: Influencing factors

Open question: In my study, I am interested in factors which influence the innovativeness of Design Thinking teams. Could you please describe, in much detail as possible, circumstances, factors, or influences which you have experienced during your Design Thinking project? Did they influence the team positively or negatively?

- Team Climate.
 - (Vision) Did you have the feeling that each team member has been clear about the goal of the project? How would you describe the commitment of the team regarding your objectives?
 - (Participative safety) Could you please describe the atmosphere within the team?

- (Task orientation) How would you describe the team's orientation to achieve the best outcome?
 - (Support for Innovation) Could you please describe an example where you experienced expectation, approval, and practical support for new ideas (rather than routinely rejecting and ignoring them)?
- Organizational Environment:
 - Could you please describe the environment of your project setting?
 - Please provide further information about supervisory encouragement, work group support, freedom, resources, challenge of the project and pressure of the team to deliver an outcome.
- Team Collaboration:
 - How would you describe the collaboration within the team?
- Leadership:
 - Please describe the leadership style of the project / department leader. How has he/she supported / distracted the team? What was the expectation of the leader regarding the project's outcome?
- Are there any further issues you want to add?

I want to thank you to share your experiences with me. You are a great support for the success of my master thesis project.

B: Interview Guideline German Version

Einführung und Ziel:

Ich studiere “Innovation Management & Entrepreneurship” und schreibe meine Masterarbeit. Das Thema der Arbeit ist die Anwendung von Design Thinking in der Automobilbranche. Ziel ist zu erklären, welche Faktoren die Innovativität von Design Thinking Teams beeinflussen.

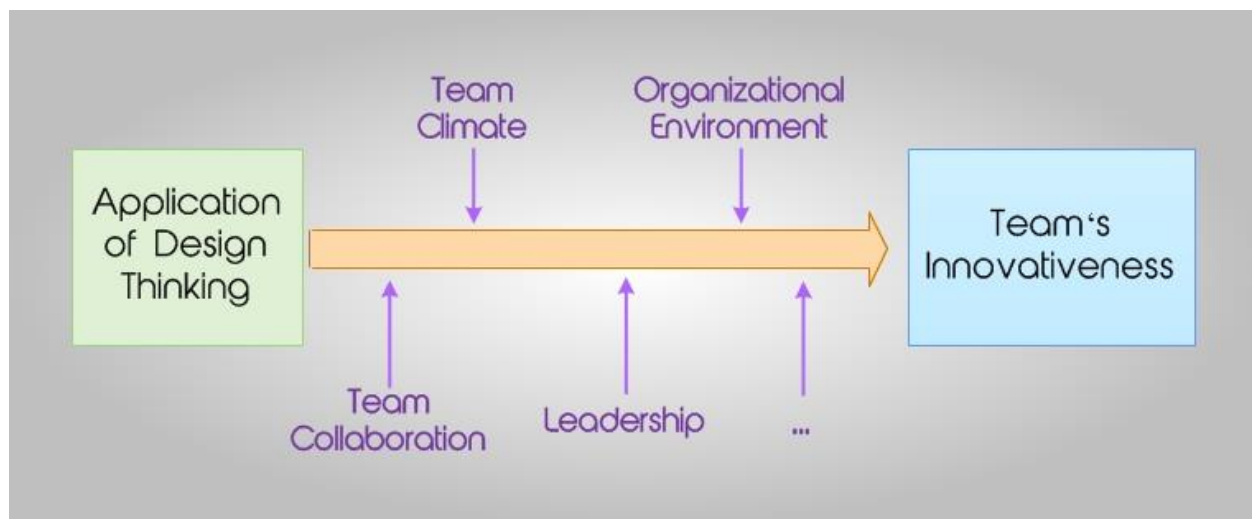


Abbildung: Mögliche Einflussfaktoren auf die Innovativität von Design Thinking Teams

Jederzeit können Sie das Interview abbrechen oder Fragen auslassen. Bitte fragen Sie nach, falls Sie Interviewfragen nicht verstanden haben.

Überblick des Interviewablaufs und Struktur:

Bitte legen Sie sich auf ein Innovationsprojekt im Vorfeld fest, wenn Sie in mehr als einem Projekt Design Thinking angewandt haben. Das Interview ist in drei Hauptteile unterteilt. Der erste Teil behandelt die Anwendung von Design Thinking in Ihrem Projekt, der zweite fokussiert sich auf die Innovativität des Projektergebnisses und im letzten Teil interessiert mich, welche Faktoren das Projektergebnis beeinflussen.

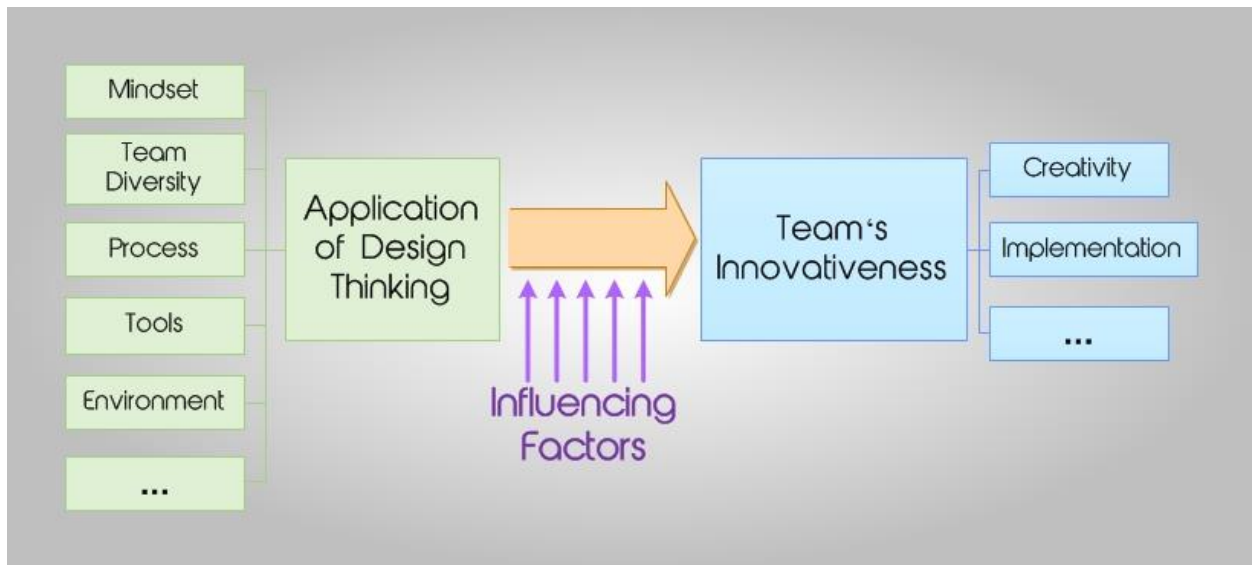


Abbildung: Das Interview ist in drei Teile geteilt. Erstens die Anwendung von Design Thinking, zweitens die Innovativität des Teams und drittens die Einflussfaktoren auf die Innovativität

Semi-strukturierte Interviewfragen:

Anmerkung: Wenn es nötig ist sind die folgenden Interviewfragen angepasst, ausgelassen oder verändert um ein interessanten Aspekt zu vertiefen. Die Folgefragen sind angewandt, wenn sie zutreffend sind. Am Anfang werden Basisinformationen über den Interviewpartner gesammelt (z.B. Alter, Geschlecht, Ausbildung, Marke und Abteilung).

Teil 1: Anwendung von Design Thinking

Einführende Frage: Bitte geben Sie generelle Informationen über das Projekt (inklusive Thema, Teammitglieder, Dauer und Ziel des Projekts). Welche Rolle hatten Sie im Projekt (Initiator, Projektleiter, Teammitglied)?

Offene Frage: Können Sie bitte das Projekt so teilreich wie möglich bezüglich der Anwendung von Design Thinking beschreiben?

- Was verstehen Sie unter einem Design Thinking Projekt?
- Wie haben Sie die Design Thinking Methode angewandt? In welcher Art und Weise?

- Welche Tools haben Sie verwendet und wie?
- Woran unterscheiden Sie ein Design Thinking Projekt mit einem Projekt ohne die Design Thinking Methode?
- Gibt es weitere Anmerkungen Ihrerseits?

Teil 2: Innovativität von Design Thinking Teams

Offene Frage: Ich möchte nun den Fokus auf das Resultat/Ergebnis des Projektes legen. Können Sie bitte das Ergebnis des Projektes beschreiben?

- War das Ergebnis offensichtlich für Sie, als sie über die Fragestellung das erste Mal nachgedacht haben?
- Hat das Team das Ziel des Projektes erreicht?
- Hat das Team neue und kreative Ideen entwickelt? Was war daran neu und kreativ? Für wen war die Idee neu (für das Team, Unternehmen, die Welt)?
- Können Sie bitte beschreiben, inwieweit das Ergebnis im Unternehmen angewandt, transferiert oder implementiert/umgesetzt wurde?
- Gibt es weitere Anmerkungen Ihrerseits?

Teil 3: Einflussfaktoren auf die Innovativität von Design Thinking Teams

Offene Frage: In meiner Studie möchte ich Faktoren herausfinden, die die Innovationskraft/Innovativität von Design Thinking Teams beeinflussen. Können Sie bitte so detailliert wie möglich Umstände, Faktoren oder Einflüsse beschreiben, die Sie während des Design Thinking Projekts als Einflussfaktoren wahrgenommen haben? Haben diese Einflussfaktoren das Team positiv oder negativ beeinflusst?

- Teamklima:
 - („Vision“) Hatten Sie das Gefühl, dass jedes Teammitglied das Ziel des Projektes gleich verstanden hat? Wie würden Sie das

Engagement / Leistungsbereitschaft des Teams bezüglich des Projektziels beschreiben?

- („Participative safety“) Können Sie bitte die Atmosphäre im Team beschreiben?
- („Task orientation“) Wie würden Sie die Orientierung des Teams beschreiben, das bestmögliche Ergebnis zu erzielen?
- („Support for Innovation“) Können Sie eine Situation beschreiben, in der neue Ideen explizit erwartet, gewilligt oder unterstützt wurden (im Gegensatz zu routinemäßiger Ablehnung oder Ignoranz von neuen Ideen)?
- Organisatorische Umfeld:
 - Können Sie bitte das unternehmerische Umfeld des Projektes beschreiben?
 - Wie sah die Ermutigung der Vorgesetzten bezüglich des Projekts aus? Welche Unterstützung bekam das Team von dem Unternehmen? Welche Freiheit wurde dabei gelassen? Welchen Stellenwert hatten die Ressourcen – Spielen Sie eine Rolle? War das Ziel herausfordernd oder überfordernd? Gab es Druck auf das Team, ein bestimmtes Ergebnis zu liefern?
- Zusammenarbeit im Team:
 - Wie würden Sie die Zusammenarbeit im Team beschreiben? Wie war die Stimmung? Kannten sich die Teammitglieder vorher? Wie gut kannten sich die Teammitglieder?
- Führung:
 - Bitte beschreiben Sie den Führungsstil des Abteilungsleiters/Projektleiters. Wie hat er/sie das Team unterstützt oder behindert? Was war die Erwartungshaltung des Abteilungsleiters/Projektleiters gegenüber dem Projektergebnis?
- Gibt es weitere Anmerkungen Ihrerseits?

Ich möchte mich bei Ihnen für das Gespräch bedanken. Sie waren mir eine große Hilfe für den Erfolg meiner Meisterarbeit.

C: Statement of Agreement

Masterarbeit über Design Thinking

Vielen Dank, dass Sie sich als Interviewpartner zur Verfügung stellen.

Ich studiere "Innovation Management & Entrepreneurship" und schreibe meine Masterarbeit. Das Thema der Arbeit ist die Anwendung von Design Thinking in der Automobilbranche. Hierbei erforsche ich, welche Faktoren die Innovativität von Design Thinking Teams beeinflusst.

Einverständniserklärung:

Hiermit erkläre ich mich dazu bereit, an einem Interview zu oben genannten Thema teilzunehmen. Das Interview dauert ca. 30-45 Minuten und wird elektronisch aufgezeichnet. Mir ist bewusst, dass die Antworten im Rahmen der Masterarbeit ausgewertet und analysiert werden. Die Teilnahme erfolgte auf freiwilliger Basis.

Alle Daten, die hierbei entstehen, werden anonymisiert und nicht an Dritte weitergegeben. Ein Rückschluss auf Person, Marke oder Abteilung ist nicht möglich. Die betreuende Universität hat eine Verschwiegenheitserklärung unterzeichnet. Die Masterarbeit wird nicht veröffentlicht.

Ja, ich möchte eine Kurzdarstellung der Studienergebnisse per Email erhalten:

(E-Mail Adresse)

Ja, ich habe die Einverständniserklärung gelesen und nehme sie an:

(Unterschrift)

D: Initial Template

1	APPLICATION OF DESIGN THINKING	
1	1	Mindset
1	2	Team Diversity
1	3	Process
1	4	Tools
1	5	Environment
2	TEAM'S INNOVATIVENESS	
2	1	Creativity
2	2	Implementation
3	INFLUENCING FACTORS	
3	1	Team Climate
3	1	1 Vision
3	1	2 Participative safety
3	1	3 Task orientation
3	1	4 Support for innovation
3	2	Organizational Environment
3	2	1 Organizational encouragement
3	2	2 Supervisory encouragement
3	2	3 Work group support
3	2	4 Freedom
3	2	5 Resources
3	2	6 Challenging work
3	2	7 Pressure
3	2	8 Organizational impediments
3	3	Team Collaboration
3	3	1 Interaction
3	3	2 Debates
3	3	3 Idea Exchanges
3	3	4 Production blocking
3	3	5 Social Loafing
3	3	6 Evaluation anxiety
3	3	7 Conformity
3	3	8 Downward norm setting
3	4	Leadership
3	4	1 Transformational
3	4	2 Transactional
3	4	3 Laissez-faire
3	4	4 Authentic
3	4	5 Humble

E: Revised Template

1	APPLICATION OF DESIGN THINKING		
1 1	Mindset		
1 2	Team Diversity		
1 3	Process		
1 4	Tools		
1 5	Environment		
1 6	Newness of the method		
2	TEAM'S INNOVATIVENESS		
2 1	Creativity		
2 1		Radical idea	
2 2		Incremental idea	
2 2	Implementation		
2 1		Termination prior implementation	
2 3	Efficiency		
3	INFLUENCING FACTORS		
3 1	Team Climate		
3 1 1		Vision	
3 1 2		Participative safety	
3 1 3		Task orientation	
3 1 4		Support for innovation	
3 2	Organizational Environment		
3 2 1		Organizational encouragement	
3 2 2		Supervisory encouragement	
3 2 3		Work group support	
3 2 4		Freedom	
3 2 5		Resources	
3 2 6		Challenging work	
3 2 7		Pressure	
3 2 8		Organizational impediments	
3 3	Team Collaboration		
3 3 1		Interaction	
3 3 1		1	Intra-organizational network
3 3 2		Debates	
3 3 3		Idea Exchanges	
3 3 4		Production blocking	

3	3	5	—	Social Loafing
3	3	6	—	Evaluation anxiety
3	3	7	—	Conformity
3	3	8	—	Downward norm setting
3	4	Leadership		
3	4	1		Transformational
3	4	2		Transactional
3	4	3		Laissez-faire
3	4	4	—	Authentic
3	4	5	—	Humble
4	5	Team Member's Motivation		
4	5	1		Extrinsic
4	5	2		Intrinsic

F: Final Template

1	APPLICATION OF DESIGN THINKING		
1 1	Mindset		
1 2	Team Diversity		
1 3	Process		
1 4	Tools		
1 5	Environment		
1 6	Newness of the method		
2	TEAM'S INNOVATIVENESS		
2 1	Creativity		
2 1		Radical idea	
2 2		Incremental idea	
2 2	Implementation		
2 1		Termination prior implementation	
2 3	Efficiency		
3	INFLUENCING FACTORS		
3 1	Team Climate		
3 1 1		Vision	
3 1 2		Participative safety	
3 1 3		Task orientation	
3 1 4		Support for innovation	
3 2	Organizational Environment		
3 2 1		Organizational encouragement	
3 2 2		Supervisory encouragement	
3 2 3		Work group support	
3 2 4		Freedom	
3 2 5		Resources	
3 2 6		Challenging work	
3 2 7		Pressure	
3 2 8		Organizational impediments	
3 3	Team Collaboration		
3 3 1		Interaction	
3 3 1		1	Intra-organizational network
3 3 2		Discrepancy	
3 3 3		Debates	

3	3	4	Idea Exchanges
3	3	5	Production blocking
3	3	6	Social Loafing
3	3	7	Evaluation anxiety
3	3	8	Conformity
3	3	9	Downward norm setting
3	4	Leadership	
3	4	1	Transformational
3	4	2	Transactional
3	4	3	Laissez-faire
3	4	4	Authentic
3	4	5	Humble
4	5	Team Member's Motivation	
4	5	1	Extrinsic Motivation
4	5	2	Intrinsic Motivation

G: Application of Design Thinking – Concepts and Categories

	<u>Axial Coding: Concepts</u>	<u>Selective Coding: Categories</u>
APPLICATION OF DESIGN THINKING	be open-minded towards the result of the project try and test things without an understanding what will be the outcome customer-centric thinking get customer's feedback through user testings focus on the goal, not the DT method itself	Mindset
	work within a team of experts and creative members work together with experts of different departments work with Design Thinking coaches or experts	Team Diversity
	cluster ideas into groups observe the environment ask others for feedback understand the problem at hand rapid prototyping concentrate on a specific idea iterations between different stages of the process	Process
	brainstorming as a tool for creating ideas votings as a tool to reach a consensus storytelling as a tool to describe the idea brainwriting as a tool for creating ideas rough sketch or visualization of the idea apply Design Thinking tools as a method to generate new ideas conducting interviews with the customer	Tools
	work with different materials work in a stimulating area outside the company	Environment
	application of a method which is new and different to the employees project setting and outcome is surprising	Newness of the method

H: Application of Design Thinking – Project Overview

Project No.	Mindset	Team Diversity	Process	Tools	Environment	Newness of the method
1	x	x	x	x	x	x
3	x	x	x	x		
5	x	x	x	x		x
7	x	x	x	x	x	x
9	x	x	x	x		x
11	x	x	x	x		x
13		x	x	x	x	
14	x	x	x			
2	x	x	x	x	x	
4	x	x	x	x	x	x
6	x	x	x	x		x
8		x	x	x	x	x
10	x	x	x	x		
10	x	x	x	x	x	
12	x		x	x		
APPLICATION OF DESIGN THINKING						

I: Influencing Factors Organizational Environment – Concepts and Categories

	<u>Axial Coding: Concepts</u>	<u>Selective Coding: Categories</u>	
INFLUENCING FACTORS	everybody is able to participate	Organizational Encouragement	Organizational Environment
	have a culture which is open to experience		
	an organizational committee supports innovations	Supervisory Encouragement	
	give the team enough space to work creative	Freedom	
	time is a critical factor	Resources	
	money is a critical factor		
	the task is challenging within the given project setting	Challenging Work	
	feel too much pressure to deliver outcomes	Pressure	
	feel too little pressure to deliver outcomes		
	a given deadline supports the team's speed		
employees outside the project team dismiss the solution	Organizational Impediments		
bureaucracy within the company slow down the project's progress			

J: Influencing Factors Team Climate – Concepts and Categories

	<u>Axial Coding: Concepts</u>	<u>Selective Coding: Categories</u>	
INFLUENCING FACTORS	develop a team spirit and vision	Vision	Team Climate
	encourage somebody to take action	Participative Safety	
	build an atmosphere which is supportive and different to other project settings		
	be not biased about something		
	organizational hierarchy must not play a role		
	team aims at delivering results quickly	Goal-oriented Teamwork	
	shared goals within the team to deliver a creative outcome		
	adjustment of the method according to specific needs in the project		
	team members make compromises to carry on		
	have fun at work	Support for Innovation	
	awake curiosity for the project with method		
	give up typical pattern of thinking and doing things		
	welcome a creative thought instead of routinely dismissing it		
	work in project facilities different to company's standards		

K: Influencing Factors Team Collaboration – Concepts and Categories

		<u>Axial Coding: Concepts</u>	<u>Selective Coding: Categories</u>		
INFLUENCING FACTORS		the team composition is decisive			Team Collaboration
		get to know each other very quickly		Interaction	
		reliability of team members is important			
		build a network of experts		Intra-organizational Network	
		no communication among the team members			
		no consensus among the team members			
		no trust among the team members		Discrepancy	
		different goals within the same project team			

L: Influencing Factors Leadership – Concepts and Categories

	<u>Axial Coding: Concepts</u>	<u>Selective Coding: Categories</u>	
INFLUENCING FACTORS	project leader supports the team actively project leader expects the team to be creative project leader sets realistic project goals	Transformational Leadership	Leadership
	project leader is sceptical towards the project outcome project leader sets up different teams to work on the problem project leader do not appreciate the DT outcomes	Transactional Leadership	
	a loose coordination of activities instead of a specific project leader no expectations of the project leader towards the result of the project	Laissez-Faire Leadership	

M: Influencing Factors Motivation – Concepts and Categories

<u>Axial Coding: Concepts</u>		<u>Selective Coding: Categories</u>	Motivation
INFLUENCING FACTORS	specific given specifications and targets have to be delivered	Extrinsic Motivation	
	do something from within	Intrinsic Motivation	