Design Thinking -
Process investigation
and operationalization

Master Thesis

to obtain the academic degree of

Master of Science

in the Master’s Program

General Management
ABSTRACT

This thesis utilizes Design Thinking, a model used in practice to trigger creative processes, to connect to research efforts about creative problem solving and the creative process. The creative process is highly complex. If it would be possible to differentiate a creative from a none creative process, many companies would analyze and adapt their processes. However, it is not that simple. The creative process cannot be measured without knowing the outcome of the process and even if the outcome exists, it is not possible to deliver an opinion about the creativeness of a process. Thus, companies use different models to trigger creative processes. These models work well within practice, but not for scientists, who pursue to find answers to basic questions about the creative process. One concept often applied by companies to trigger creative processes is Design Thinking. When Design Thinking emerged, it was judged as transient management trend. That was not the case. Design Thinking is used in practice and discussed within books (mainly practitioner writings), but also scientific journals. However, one benefit of Design Thinking is the stimulation of a creative processes. Companies make use of this benefit, thus decomposing Design Thinking in single parts and investigating the procedures within the single parts, mirrors the creative process. The aim of the thesis is to describe procedures within the creative. One specific Design Thinking model will be used as template to analyze semi-structured interviews and generate scientific results. Using a qualitative method is just a first step and the results need to be reviewed by further qualitative and at a later point also quantitative analyses. Thus, the results of the thesis are not overly illuminating, since the thesis is just a first step, that must be followed by further research efforts. Nevertheless, the creative process becomes obvious while the categories of the Design Thinking model, become equipped with subcategories and descriptions of these subcategories. Moreover, interrelations are identified between the categories, showing the iterations and complex, overlapping procedures within the process. Nevertheless, as already mentioned, the thesis is a first step and should be followed by other qualitative, but also quantitative investigations.
STATUTORY DECLARATION

I hereby declare that the thesis submitted is my own unaided work, that I have not used other than the sources indicated, and that all direct and indirect sources are acknowledged as references.

This printed thesis is identical with the electronic version submitted.

(Linz, 15 January 2018, Josef Pühringer)
GENDER CLAUSE

In order to enhance the readability of this Master’s Thesis the masculine form for descriptions and formulations was used. It certainly does not imply any discrimination against the other sex. Women and men should be regarded equal.
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1 Introduction

Various businesses all over the world, consider innovation as an important instrument to differentiate from competitors. Companies like “Apple”, or “Google” are often perceived as role models, thus other companies crave to generate comparable competences (Beckman and Barry, 2007, p. 25). Yet, there is no uniform, verified description of the creative process. Various researches, e.g. Wallas (1926), Guilford (1950), Osborne (1952, 1953), De Bono (1967, 1971), or Amabile (1988) have investigated the creative process. The result of these investigations are mainly models or concepts, applicable in practice to yield processes that trigger innovations. Design Thinking (DT) is one of the latest concepts, introduced mainly for practitioners but also discussed within the scientific discourse about the creative process, and creative problem solving. In the early days of the concept, DT was rather perceived as a transient trend within management (Carlgren et. al., 2016, p. 39). However, DT turned out to be more than just a trend.

“What do standup toothpaste tubes, all-in-one fishing kits, high-tech blood analyzers, flexible office shelves, and self-sealing sports bottles have in common? Nothing actually, except that they’re all IDEO-design products that were inspired by watching real people.”

-(Kelley/Littman, 2001, p. 25)

Practitioners are contended with models that trigger innovation processes, but these models or concepts leave various open questions for scientists. Within this thesis DT, as flexible framework, is used as to analyze processes and subprocesses, as well as relationships between these processes, triggered through DT. These analyses are conducted based on semi-structured interviews with executives responsible for innovation. Additionally, the thesis should contribute to the operationalization of DT, to provide groundwork for further, quantitative research. The object of investigation are teams, departments or other groups within a company, in other words each entity responsible for innovation. As already described the subjects of investigation are the processes, subprocesses and relationships between processes, triggered through DT.
For this purpose, the thesis will be structured as following. The first part relates to the theoretical foundation. On the one hand, creative problem solving will be discussed, on the other hand DT as specific model. Existing concepts and theories will be explained and unanswered questions will be disclosed. Thereby the research gap will be displayed and finally the research questions will be stated. After explaining the method, the results will be explained. For the explanation of the results, prosaic descriptions, as well as tables and figures have been used. Beside the explanation, the results have also been discussed, their relevance for practice and theory, as well as limitations and implications for further development. Additionally, the model which was used as foundation for the qualitative analysis has been rearranged and a new version, is introduced within the discussion part.
2 Theoretical Foundations

DT connects to several approaches related to creative problem solving. Literature is far from describing all relevant issues that influence the creative processes. Nevertheless, literature provides a proper starting point for further investigations. Hereafter the emergence and development of creative problem solving is discussed, by means of different concepts, approaches and theories, illustrating which questions are already answered and which questions need further investigation. Additionally, it will be clarified why design practices are appropriate for creative problem solving, by referring to the nature of design and early research efforts about DT. Moreover, different models of DT will be explained, referring to rather practically orientated books, but also to scientific articles.

Providing an uninterrupted theoretical framework for DT is not possible, because at this point of time no appropriate theoretical framework exists. Therefore, a depiction of selected theories which partially relates to DT, will be provided as well. Anyway, these partially related theories are exemplary illustrations, explaining DT with the aid of other existing theories, might be possible but is not the purpose of the thesis. The main component of the thesis is a qualitative interview analysis. Therefore, a bounding framework is need, for this purpose a model composed by Bauer (2016) will be explained at the end of the theoretical part.

2.1 Creative Problem solving

Wallas (1926), one of the early pioneers, who investigated the creativity process suggests a four-stage model, including “Preparation”, “Incubation”, “Illumination” and “Verification”, to represent the creative process. Guilford (1950) was not satisfied with a description of the process. To dive deeper into the proceedings within the four stages, Guilford (1950) identified abilities essential for creativity. Namely, problem sensitivity, the capacity to yield a high amount of ideas, the ability to alter one’s own mental set, capacity for reorganization, an ability to handle complexity and to evaluate. However, it turned out that cognitive processes and abilities are relevant within creativity. Thus, research about these issues constantly continued (Lubart, 2001, p. 295).
Poincaré (1985/1908) a mathematician, reflected about his own behavior while investigating mathematical phenomena and contributes to the scientific discourse, by suggesting that solutions come up to one’s mind not while consciously dealing with an issue, but afterwards while one is occupied with other or no tasks. In other words, solutions unconsciously come up to one’s mind, while consciously dealing with something else or nothing (cited from Lubart, 2001, p. 295f.). Patrick (1935, 1937, 1938), investigated the innovation processes of artists on the one hand, and laymen on the other hand and found out, that basic proceedings within the creative process hold true for both, professionals and laymen.

Osborne (1952) explained creative problem solving, by introducing a process including seven stages. Within literature, these explanations are perceived as the origin of creative problem solving (Treffinger/Isaksen, 2005, p. 343). Osborne (1952, 1953) continued research about creative problem solving. Working together with his colleague Parnes, they focused on research about students and their use of creativity. Due to Osborne’s death, Parnes had to continue research on its own (Treffinger/Isaksen, 2005, p.344). Parnes (1967a, 1967b) published a modification of the 7-stage model. The new model included only five stages and was tested within various experiments. The concept was further developed and different graphics have been used to illustrate the creative process (cited from Treffinger/Isaksen, 2005, p. 344). Anyway, Parnes worked together with other colleagues, developing the so called “Osborne-Parnes Model Version 2.2”, which became popular and frequently applied. It was the first model which considered both, divergent as wells as convergent thinking as parts of one model (Treffinger/Isaksen, 2005, p.345). Indeed, current models of creative problem solving, including DT, cannot disguise their origins, since various characteristics remained until today.

Giangreco (1993) describes the fundamentals the “Osborne-Parnes Model” relies on. The model consists of different stages. At the beginning, it is essential to actively get to know the opportunities and challenges, which emerge within a certain process or situation, by dreaming about potential possibilities. “Initiating” requires thinking in divergent ways at the beginning, by imaging what might happen, what might be the challenges and so forth. While deciding which challenge to treat, the way of thinking changes into a convergent one. Once
a decision is made “Fact-Finding” starts. Within this stage, it is necessary to gather as much information and knowledge, about the challenge or problem, as possible, as well as to decide which facts are relevant and which are irrelevant. The following stage is “Problem-Finding”, the underlying problem within the chosen challenge must be clearly defined. Additionally, the aim of the process must be clarified. Once the problem is clearly defined, “Idea-Finding” starts. Within this stage triggering and collecting ideas is crucial, tools like brainstorming are often applied to support the process. All forms of ideas are welcome. Moreover, relationships between ideas should be made as well as connections detected and established. Additionally, building on someone else’s ideas is also an appropriate way of finding new ideas. These stage is followed by “Solution-Finding”, ideas are compared to the aim of the process, to be able to choose the idea that best fits to what is intended to be accomplished. The last stage is “Acceptance-Finding”, concerning about the feasibility of the idea. The idea should be converted into something applicable and the outcome should be useful and valuable for a certain purpose (Giangreco, 1993, p. 116).

Amabile (1988), also relevant within in literature and often quoted, outlined a five-stage model, discussing the creative process. Considering internal as well as external information is the first stage, followed by the collection of information (second stage). The third stage is the generation of ideas or products. Afterwards, ideas need to be checked, whether they fit to the task, or not (fourth stage). In the last (fifth) stage, the result of the process needs to be assessed, either it was a success or failure, in these cases the process is stopped, or it was a progress, in this case the process starts again. These steps are connected to three individual components. Namely, “Intrinsic motivation to the task” (connected to the first and third stage), “Skills in the task domain” (connected to the second and fourth stage) and “Skills in creative thinking” (connected to the third stage). The model is suggested for individuals or small groups (Amabile, 1988, p. 137 ff.).

De Bono (1967, 1971) introduced a concept named “Lateral Thinking”, which differs from previously described concepts. “Lateral Thinking” focuses on one part of the creative process. Namely, about how to treat and rearrange information to generate creative outcomes. De Bono (1967, 1971), emphasizes that creative ideas do not coincidentally occur.
Additionally, ideas do not simply appear because someone is seeking long enough. New ideas, rest upon information. But new information does not necessarily generate new ideas, just because of the novelty of information. Interpreting new information by means of what is already existing, does not lead to new ideas. Additionally, new ideas might also rest upon old information, by arranging old information in a new way. A precondition for new ideas is to abandon old ones, and start over again, it is suggested to take the lateral path than to follow the existing one (DeBono, 1971, p. 16-29).

De Bono (1971), formulates four principles of lateral thinking:

1. Recognition of dominant polarizing ideas.

2. The search for different ways of looking at things.

3. A relaxation of the rigid control of vertical thinking.

4. The use of chance.” (DeBono, 1971, p. 68)

“Recognition of dominant polarizing ideas” relates to the circumstance that existing ideas influence potentially following ideas. Existing ideas need to be challenged to break out of the system undermined by the old ideas and move forward (Sloane, 2010, p 39f). The second principle, “The search for different ways of looking at things”, emphasizes, that looking at things in only one specific way, might display a problem as impossible to be solved. Usually, things can be viewed from different points of view, changing the point of view might lead to a solution, for a problem that seemed to unsolvable from another perspective. “A relaxation of the rigid control of vertical thinking” is the third principle, which outlines, that vertical thinking limits participants by demanding logic, analyses and depictions, in contrast “Lateral Thinking” only demands to be right at the end of the process, does matter how to get to there. “The use of chance” is the last principle. This principle does not encourage to rely on chance, but to provide appropriate conditions, that trigger chances and allow an organization to use them (De Bono, 1971, p. 30-106).

Likewise, other researchers suggest that multiple subprocesses are included in creativity and investigated parts of the process. Especially problem-finding, -formulation and -redefinition
have been strongly investigated (Lubart, 2001, p. 299). However, according to Lubart (2001), one question, or specifically the major question, remains unanswered. None of the existing theories or concepts exhibits why creative processes are creative. Furthermore, concepts and theories do not provide information whether or how a creative process differs from a noncreative process. If a difference between the processes exists, this would mean that it is possible to judge processes about their extent of creativity (Lubart, 2001, p. 301). DT models try to trigger a creative process. Nevertheless, also literature about DT is far from answering these questions, about the creative process. Besides, DT-literature rather consists of practitioner writings (Carlgren et. al., 2016, p. 39) than writings that would provide answers to specific scientific questions.

2.2 Design Thinking

DT is one of the latest concepts, which intends to trigger a creative process. The emergence of DT and the appropriateness of design for creative problem solving tasks will be explained, in the following paragraphs. Additionally, the use of DT as management tool will be illustrated and two partially relating theories will be discussed.

2.2.1 Design and creative problem solving

Discussing creative problem solving, does not clarify why design practices are appropriate for generating creative solutions. Owen (2006) compares design to science and three other fields (art, law and medicine). The comparison is drawn by reviewing the needs/goals, values and measures, and exhibits the nature of design practices and the objectives of designing (Owen, 2006, p. 21).
Figure 1: Comparison - Design vs. science and other Fields (Source: Own Figure, based on Owen, 2006, p. 21)

Figure 1 exhibits the different purposes, values and measures of the five fields. Science is focused on understanding. Therefore, it includes values like correctness, thoroughness and testability. The listed measures project the values by assessing results as true or false, as correct or incorrect, etc. Art craves for expression, including values like insightfulness, novelty or stimulation. These values are expressed by measures assessing art as either, boring or exiting, as thoughtful-provoking or banal, etc. The ultimate objective of law is justice. Thus fairness, thoroughness, or appropriateness are some of the implied values. Law is expressed by dividing between fair and unfair, right and wrong, just and unjust, etc. Medicine is focused on health, including values like correctness and effectiveness. These values are measured by assessing medical treatment as true or false, as better or worse, works or does not work, etc. The purpose of design is to form. Values like, effectiveness, appropriateness or cultural fit are implied, these values are revealed while assessing outcomes by attributing
them as elegant or inelegant, as better or worse, as fresh or stale, as appropriate or inappropriate, etc. (Owen, 2006, p. 21). Based on the different values included within the fields Owen (2006) suggests thinking scientifically serves well as tool for analyzing. Nevertheless, those who analyze might become designers as well, by rearranging what they have found out (Owen, 2006, p.17). Owen (2006), exhibits that design is occupied with forming, and supports those who deal with complicated intricated problems within an environment of low restrictions. Thus, design practices are capable for inventing something new, for exploration (Owen, 2006, p. 27).

Connecting these descriptions to the “Investment Theory of Creativity” introduced by Sternberg and Lubart (1991, 1995), provides an answer to the question about design’s inherent creative potential. The theory proposes that creative people are used to invest in ideas which are unknown but have high potential to grow. Investing in such ideas usually causes resistance, by others, but creative people rely on such ideas and in some cases, are afterwards able to reap the profits (Sternberg, 2006, p. 87f.). Relating to the descriptions of design provided by Owen (2006), one can note that a designer by forming and trying out solutions in an area of low risk invests in unknown ideas. But as soon as one fits a designer will be able to provide an innovative or new solution. Early research, described in the following part, about DT strongly emphasize this difference between the disciplines e.g. Simon (1969) or Lawson (1979).

2.2.2 Emergence and Development of Design Thinking
Researchers started to investigate DT in the 1960s (Bauer/Eagen, 2008, p. 64). One of the first books, which can be related to DT is the ‘Science of the Artificial’, written by Simon (1969). These early investigations of DT focused on artificial intelligence. Simon (1969) outlines that being an engineer is not a precondition for being a designer. The incorrect assumption that engineers are the only professional designers, is based on the circumstance that engineering schools historically cope with the creation something new, what is the nature of design as described above. In contrast, natural science disciplines historically cope with how things are. The difference is obvious and it exhibits that a designer’s task is to create things how they should be and not to cope with how things are (Simon, 1969, p. 111ff).
Lawson (1979), also conducted research on DT, by analyzing architectural design processes. The results, mirrored the different education systems of designers and scientists (Lawson, 1979, p. 66). Within the experiment architects and scientists had to arrange blocks in a way that the construction at the end fulfills specific requirements (Lawson, 1979, p. 61f). Carrying out this experiment Lawson (1979), figured out fundamental differences between the proceedings of architects and scientist while solving a problem. Scientists analyzed and tried to understand the problem, whereas architects produced a high number of possible solutions and tested them since they have found the correct one (Lawson, 1979, p. 66). However, the experiment exhibits the nature or goal of design, namely to form and thereby supports Owen (2006), who suggests that the goal of design qualifies design procedures for exploration processes.

2.2.3 Design Thinking as management tool

Lawson (1979) and Simon (1969) focused on design procedures of professional designers, albeit, they did not argue that nonprofessionals would not be able to use the concept. Simon (1969), as stated above, even mentioned that the method is capable also for nonprofessionals. However, Johansson-Sköldberg et al. (2013) differs between two streams. Research efforts by, Simon (1969), Lawson (1979), or also Schön (1983) - ‘Reflection in Action’ as well as Buchanan (1992) - ‘Wicked Problems’, have been conducted within the context of design or the field of design, investigating professional designers. These efforts Johansson-Sköldberg et al. (2013) unify within a stream labeled “Designerly Thinking”. Whereas the adoption of practices from professional designers, of nonprofessional designers is labeled “Design Thinking”. Anyway, discussing the managerial use, DT is not embedded in the context of design itself. Those who use it apply practices from professional designer, who use them in a different context (Carlgren et. al., 2016, p. 39).

DT is frequently used in management practice, but empirical research is rare. As stated above, literature about DT consists of various practitioner writings (Carlgren et. al., 2016, p. 39), what gives grounds for the assumption that DT cannot incontrovertibly be associated with scientific theory. Yet, the DT concept or model, with respect to variations between the different representations, is accurately defined in literature, mostly as a practical tool. Within
literature books discussing DT two popular examples are Kelley/Littman (2001) – ‘The Art of Innovation’ and Brown (2009) - ‘Change by Design’. Kelley/Littman (2001), describe DT using the example of IDEO, the most popular design company. IDEO became popular after ABC news filmed and published IDEO’s process of designing a shopping cart and thereby made DT popular (IDEO, 2017). However, Brown (2009) as well as Kelley/Littman (2001) both draw their conclusions using the example of IDEO.

Brown (2009) promotes that although DT originates in the field of design, principals and procedures can equally be applied within other fields as well. DT encourages to form the natural world, so that it fits to human needs. This could not be done by technological innovation on its own. Additionally, it is not preserved to professional designers. DT encourages all who apply the concept to use their creative capabilities, does not matter in which field they are operating, thus various problems can be addressed with the approach. Layman as well have the ability design and create something new, but other problem solving methods do not trigger people to use them. Reliance on intuition, as well as the ability to recognize recurrent proceedings, are such abilities. Using those abilities design outcomes, which do not only fulfil functional requirements, but also emotionally please the users, might be generated (Brown, 2009, p. 4). DT goes beyond developing what we already know (Brown, 2009, p. 7). Anyway, the process is not rigid, or clearly replicable. Hence, there is no recipe providing ingredients and procedures that certainly lead to innovative outcomes. However, Brown (2009) defines steps which roughly lead those who use DT. Starting with, “Inspiration” referring to the problem that induced once motivation to finding a solution. “Ideation” refers to the generation and testing of possible solutions and ideas. “Implementation” relates to the way from the innovation room to the market. At this point, it should be indicated that those steps are rough landmarks and not fixed procedures. Additionally, there is no linear process, the steps are on the one hand overlapping and on the other hand those who apply DT, move between the steps in an iterating and oscillating way (Brown, 2009, p. 15f.). The nonlinear proceeding is founded in the explorative character of DT. Going different ways means to receive a vast amount of unknown, new impressions and ideas which could be tested. At this point of the process failure is usual and necessary,
because each failed test gets you closer to the solution (Brown, 2009, p. 17). Brown (2009) also explains that DT means to balance constraints. Constraints thereby appear as boundaries, regarding three overlapping properties. “Feasibility” concerning about what is doable and functionally possible. “Viability” relating to the fit within applied business models and “desirability”, referring to what customers want and what makes sense to them. DT aims to bring these constraints in a balance and to overcome them (Brown, 2009, p. 18).

According to Brown (2009) various conditions are important within a DT process. One such condition are teams. A well-performing team has the potential to generate great value, also within DT. Thus, from the beginning of a project teamwork is necessary (Brown, 2009, p. 28). Moreover, a culture that allows people to experiment, to fail and to take risk needs to be established, employees should not need to ask for an approval to try something. Everything employees try are opportunities and DT demands companies to seize these opportunities, thus an appropriate culture supporting this demand, should exists. Additionally, Brown (2009) emphasizes that customers do not demand what they actually need. In other words, DT should enable practitioners to provide solutions to problems, that those who face them are not aware of. Thus, viewing problems from a different perspective is necessary. Three principles are suggested, “insight” into the lives of others, to learn from their lives. “Observation” used to receive knowledge about others, how they behave, which processes are they committed to, etc. and “empathy” to feel as being one of them (Brown, 2009, p. 39-50). Moreover Brown (2009) suggests, to think in a divergent way while creating potential solutions and once it comes to a decision-making process convergent thinking is suitable. However, due to the iterations of DT it is necessary to oscillate between convergent and divergent thinking (Brown, 2009, p. 66ff.). Additionally, Brown (2009) refers to the power occupied within prototyping. On the one hand building and reviewing things triggers once imagination and on the other hand quick trials generate immediate results (Brown, 2009, p. 89ff).

Kelley/Littman (2001) describes the rising importance of innovation by referring to the history of IDEO, which was started as a small project and grown to a big company (Kelley/Littman, 2001, p. 3-5). Kelley/Littman (2001) describes DT, by referring to five
categories. It is not necessary to perform outstanding within all the five categories, performing well in the most and outstanding in some is enough (Kelley/Littman, 2001, p. 6). Understanding (1), regarding to the market, the customers, the constraints of the market and so on. Observing (2) refers to direct observation of people in their usual surroundings and real-life situations. Visualizing (3) refers to how the future will look like, by focusing on innovations and those who will use these innovations. Evaluate and refine (4), means to learn quickly from produced prototypes and to improve an idea, based on what has been found out. Implement (5) relates to the issue of getting a new concept into the market (Kelley/Littman, 2001, p. 6f.).

However, Kelley/Littman (2001) additionally describes practices used within the five categories during the process. One, very popular practice applied at IDEO is brainstorming. Many apply the method but only a few do it right. Sutton/Hargadon (1996) analyzed the brainstorming process, as well as the outcomes of the process at IDEO and question findings of experimental research which suggest, that brainstorming meetings are ineffective. According to Sutton/Hargadon (1996) these research results are based on inappropriate measures. Most studies focus on the number of ideas generated by one person, what led to the result that individuals or nominal groups produce more ideas than a group working together in a brainstorming session. Sutton/Hargadon (1996) suggest, that simply focusing on the number of generated ideas, does not provide reliable information about the effectiveness of brainstorming. It is important to indicate, that processes like brainstorming, when taking place in a social system, produce a broad set of consequences. Thus, there are many consequences to be considered, when discussing the effectiveness of brainstorming. Additionally, research about brainstorming has usually been conducted by analyzing the outcomes generated by groups of participants, who were not trained or experienced in brainstorming, did not have and will not have points of contact with the results of the brainstorming process, lacked the necessary technical expertise, etc. To put it another way, if brainstorming is applied with unexperienced and not trained people, the outcomes will be poor (Sutton/Hargadon, 1996, p. 688-700).
However, Kelley/Littman (2001) provide rules for brainstorming, which should enhance the outcomes of a brainstorming process. Sutton/Hargadon (1996) summarized the IDEO brainstorming rules:

“These rules are (1) defer judgment, (2) build on the ideas of others, (3) one conversation at a time, (4) stay focused on the topic, and (5) encourage wild ideas.” (Sutton/Hargadon, 1996, p. 694)

The introduction of rules should lead to outcomes. As explained before outcomes of brainstorming are not only the generation of new ideas. Sutton/Hargadon (1996) analyzed the consequences of brainstorming at DEO. And summarized their findings about the consequences within six parts:

“[...] (1) supporting the organizational memory of design solutions, (2) providing skill variety, (3) supporting an attitude of wisdom (acting with knowledge while doubting what one knows), (4) creating a "status auction" (a competition for status based on technical skill), (5) impressing clients, and (6) providing income.” (Sutton/Hargadon, 1996, p. 695)

Most of these consequences influence and support parts of the DT process. Thus, brainstorming at IDEO is more than just a tool to generate ideas (Sutton/Hargadon, 1996, p. 694-710).

Kelley/Littman (2001) also refers to some principles and hints, which have proven as useful while applying DT at IDEO. One principle is to be where your customers are. This is somewhat like a precondition for DT. Another one is to find crazy people, those who break the rules and observe them, because they do things differently. Moreover, it can be counterproductive to change processes customers are highly committed and used to, being innovative does not mean to ignore the existing systems and if an innovation goes too far, reducing the disruptiveness is an appropriate action (Kelley/Littman, 2001, p. 25-52).

Additionally, Hargadon/Sutton (1997) indicate, that consultants at IDEO grow the ability to connect technologies and solutions from different industries, because they get in touch with different companies within about 40 different industries. IDEO consultants try to become
familiar with their clients and their products. Consequently, gathered information within one project might be applied in other projects, in different industries (Hargadon/Sutton, 1997, p.729).

The books written by (Kelley/Littman, 2001), as well as Brown (2009), are based on the practices within the design company IDEO, are somewhat like introductions to use the concept and therefore practitioner readings. From a practitioner point of view, it is enough to know how DT can be applied. In contrast from a scientific point of view, many questions are left open. Thus, it is not enough to know how it works, additionally it would be necessary to know why it works. However, there is a need to investigate what happens within these categories, so to say the subprocesses.

Ancillary, various articles discuss DT. Beckman/Berry (2007), describe the model by refereeing to learning processes. Bauer/Eagen (2008) describe the concept referring to three movements (understanding, dreaming, building) and the oscillation between the lived world and the virtual, drawing their conclusions, to a certain extent, from studying IDEO.

Beckman and Barry (2007) relate the innovation process within DT, to different forms of learning. The innovation process is described based on four categories, these processes take place either in the concrete or in the abstract. Four different forms of learning are introduced. Within the first part of the innovation process, information about users is gathered often ethnographic or similar methods are applied at this point within the process. This part is labeled “Observation” and proceeds in the concrete. The learning style that fits to this part is the divergent learner, who moves beyond traditional ways to gather information, by not only asking the usual subjects, the divergent learner goes further. This is essential for an appropriate observation phase (Beckman and Barry, 2007, p. 29-35). The second category is “Frameworks” located in the abstract, responsible to make sense of all the collected data and to frame and reframe it, to uncover the real the underlying problem. The learning style that fits best for this part of the innovation process is the assimilating learning style, the assimilating learner arranges the data in a logic pattern and plays around with the data rearranges it and provides diverse forms of usable arrangements (Beckman and Barry, 2007,
“Imperatives”, also located in the abstract, is the third category, concerned with choosing a direction for a project. It should be decided which ideas are most promising, were to place the focus on. Clear goals must be set, based on the value that should be delivered to the users. However, the learning style that fits best for “Imperatives” is the converging learner. The converging learner is good in figuring out practical applications. Within this part of the process conflicts may arise, since a team consisting of different learning types and thus might have difficulties to agree on one specific objective (Beckman and Barry, 2007, p. 41f.). “Solution” is the part of the process where it moves back into the real world, the concrete. Within the last part of the process the best solutions need to be selected, by checking which solutions fulfills the objectives that have been set. The appropriate learning style for this part of the process is the accommodating learner, who is eager to do things, instead of only talking about it. They start building artifacts and testing ideas instead of talking about them for a long time (Beckman and Barry, 2007, p. 43f.). Thus, Beckman and Barry (2007) suggest that teams should be composed of people with different learning styles. The hierarchy in such teams should not be rigid, leaders should change within the innovation process depending on what is needed at a certain point of the process (Beckman and Barry, 2007, p. 43f.).

Bauer and Eagen (2008, 2010, 2012) define three movements (Understanding, Dreaming, Building), that have to be experienced to budge from the problem to the solution. Furthermore, the shifts between the lived world and the virtual are highlighted. Moreover, the three movements are connected to the Jungian epistemic modes (Thinking, Feeling, Sensing, Intuiting). “Thinking” describes the process of linking ideas, building constructs of thoughts and creating possible worlds, within one’s imagination, where risk is driven to a minimum. “Feeling” is what someone affectively feels, triggered through certain content (like or dislike, etc.). Thereby value is proposed to the content. “Sensing” refers to, how people perceive certain content, either as beautiful or ugly, exciting or dull, etc. Thus, “Sensing” is concerned a lot with physical appearance. “Intuiting” is unconscious knowing. Intuition is the effect of perceptions that have been made unconsciously and exhibit as certain but not rational. One cannot explain intuitive decisions, but intuitive decisions are made with certainty (Jung, 1921 cited from Bauer/Eagen, 2012, p. 146f.). Relating the epistemic
plurality to the three movements, design exhibits an own specific epistemic profile (Bauer/Eagen, 2012, p. 147).

Figure 2: Three Movements of Design (Source: Bauer/Eagen, 2008, p. 66)

Figure 2 depicts the three movements, as well as the shift between the lived and virtual world and the alteration between convergent to divergent actions. The first movement is “Understanding”. It leads the designer from the lived world into the virtual and includes “Immersing” and “Redefining”. The outcome of designing is what is in the designer’s mind. In other words, the experiences a designer made are reflected in the outcomes of the design processes. Hence, “Immersing” focuses on getting to know users as good as possible, designers might use ethnographic or other methods to study those they want to please with their design outcomes. “Immersing” demands to carry out divergent actions. Doing so designer get to know customers better and thus get closer to the problem at hand. “Redefining”, demands convergent actions and intends to get to know the intrinsic or underlying problem, by including knowledge about the system the problem is embedded in, into their efforts (Bauer/Eagen, 2012, p. 143f.). Regarding epistemic plurality, “Immersing” constantly moves between “Thinking”, “Feeling” and “Sensing”, by trying to figure out the user’s experience, to enable oneself to experience the world in the same way as the users do. “Redefining” bases on analyzing the system, what requires system thinking and therefore
“Thinking”. The boundaries for “Redefining” are set by what users like, what they perceive as beautiful, thus by “Sensing” and “Feeling” (Bauer/Eagen, 2012, p. 148f).

“Dreaming”, the second movement, entails “Imaging” and “Opting”. The whole movement takes place in the virtual. “Imaging” aims to generate various solution options. Thus, divergent actions are demanded. Since the whole movement remains in the virtual, solution options or ideas can be generated without adhering to any boundaries. “Opting” reverses the process from the virtual back into the direction of the lived world. Possible solutions composed during the “Imaging” process need to be harmonized with the existing world, meaning to shift the focus on ideas which have the potential to also exist in the real and not only in the virtual world. Thus, “Opting” demands convergent actions (Bauer/Eagen, 2012, p. 44f.). Related to epistemic plurality, “Imagining” as movement responsible for the generation of a vast number of ideas, is concerned a lot with “Thinking”. Ideas are related to each other, constructs of thoughts are generated and converted into ideas, etc. However, while thinking one might observe its own thinking processes. It is important to do so and escape from, continuously thinking in one and the same way, what would generate the same ideas again and again. Discussing ideas causes emotions and feelings, what might lead to another idea, as well as how an idea is perceived. Hence, while one is “Thinking”, the other motions “Feeling”, “Sensing” and “Intuiting” drive the process to a certain extent. “Opting” demands “Thinking”, rationally constructing the future. Rational constructions comprise interruptions, which are filled through “Intuiting” (Bauer/Eagen, 2012, p. 149f.).

The third movement “Building”, consists of “Prototyping” and “Presenting”. The whole movement is highly iterative, possible solutions are picked up and taken back from the virtual to the lived world by trying out if they work or not. Such trials might demand various cycles. The focus is not on building a perfect artifact, “Prototyping” is used to find out which ideas can be converted into products or services, it is about quick trials and not about perfect elaboration and aesthetic. “Presenting” as the last part of the process, starts when the designer leaves and delivers what has been accomplished. The designer releases the solution to the client, what is not the end of the process but the end of the design process (Bauer/Eagen, 2012, p. 145f.). After the designer left, the client needs to elaborate the perfect form of the
prototype and convert it into the product which will be sold. “Prototyping” converts ideas into artefacts, what demands combining and shaping, ideas and thus “Thinking”. Moreover, prototypes are refined within an iterative process. Based on how a prototype is perceived the following one will be adapted, what demands “Sensing”. Both “Thinking” and “Sensing”, within “Prototyping” are guided by “Feeling”, by how a designer perceives that the user will feel using the product, or service. “Presenting” is concerned with the communication about, how the result of the design process, will improve the experiences of the user, the user’s emotions and feelings (Bauer/Eagen, 2012, p. 151f.).

2.2.4 Partially related theories

Referring to the association with theories, at least some parts of the concepts can be related to existing and widely accepted theories. However, connecting DT to other theories is only possible to a certain extent, because as mentioned above empirical research is rare. Additionally, it would not make sense to squeeze DT into an existing, widely accepted and well investigated framework, that would not completely fit. Nevertheless, DT partially relates to theories, well established in organizational literature are, “Dynamic Capabilities”, as well as “Absorptive Capacities”. Following, both concepts will be explained.

Teece et. al. (1997) are the originators of the “Dynamic Capabilities” concept. Capabilities are the resources of a company (routines, knowledge, technologies, etc.), thus in strategic management literature it is associated with the “Resource based view” (Eisenhardt/Martin, 2000, p. 1105). It is suggested that those who are successful in frequently changing markets and environments are able to, react to changes, in form of new products or other renewed outcomes, but additionally are able to utilize what is already existing by, managing internal as well as external competences. The renewability of competences, was relatively new within strategic management. However, it is highly difficult to imitate competences, which support or unleash innovation and enable a company to react to changes. Thus, it is necessary to build these required competences, or capabilities on its own (Teece et. al., 1997, p. 515).

Lawson/Samson (2001) refer to “Dynamic Capabilities”, by promoting a specific “Innovation Capability”. The focus on innovation is justified with the circumstance, that in
changing environments innovation is essential for competitiveness. Lawson/Samson (2001) argue that the link between the above described two abilities is essential, for innovation. Successful companies continuously develop their products or services and innovation often emerges as a byproduct of daily business (Lawson/Samson, 2001, p. 384).

“Absorptive Capacities” a concept introduced by Cohen/Levinthal (1990) reveals the importance, of a company’s ability to recognize new, external, valuable knowledge and the ability to process this knowledge into new products or services. Cohen/Levinthal (1990) entitled this ability “Absorptive Capacity”. External knowledge is essential for innovation. Thus, innovation rather appears by borrowing outside knowledge than inventing. It is suggested that a company’s “Absorptive Capacity” is strongly depending on knowledge that already exists within a company. In other words, existing knowledge should enable a company to recognize, external knowledge and process it (Cohen/Levinthal, 1990, p. 128).

While investigating “Absorptive Capacities” and especially its relation to prior knowledge, significant cognitive structures appear. The existence of knowledge enables a remarkable self-reinforcing process. Hence, the ability to gather and develop knowledge depends on how much knowledge already exists. Consequently, the more knowledge is stored, the easier further knowledge can be store. However, beside the amount of knowledge stored also the organization and arrangement of existing knowledge significantly matters. Individuals access knowledge which is organized in groups or categories, which relate to each other in specific ways. These arrangements and relations, influence the way individuals make sense of prior knowledge and thus effect an individual’s contribution to new knowledge (Cohen/Levinthal, 1990, p. 129). Additionally, individuals improve their learning skills as well as their problem solving skills (Cohen/Levinthal, 1990, p. 130).

However, companies want to profit from “Absorptive Capacities”, hence the concept has to be lifted onto the organizational level. A company’s “Absorptive Capacity” is not solely determined by the individual’s abilities, a company needs to be able to exploit that abilities. An important issue is communication. To seek information from outside an individual or a group of individuals need to act as connectors between the external and internal and
communicate information internally. It is suggested that if the involved, have diverse backgrounds and background knowledge, this triggers creativity (Cohen/Levinthal, 1990, p. 131ff). Cohen/Levinthal (1990) also refer to path-dependence. It is suggested that, if a company once starts to develop in a certain direction, the direction will not change. The reason is, the self-reinforcement and cumulativeness of the method. Additionally, a company’s own R&D is crucial for “Absorptive Capacity”. Those who have an own R&D preferably develop the ability. It is suggested that the ability of exploiting external knowledge often occurs as a byproduct of own R&D efforts (Cohen/Levinthal, 1990, p. 134ff).

2.3 Framing Concept

Based on, parts of the previously explained, other theory, experiences and observations of IDEO Bauer (2016) composed a DT model. The model consists of eight design competences. The competences are separated into two main groups, design enablers and design practices, both counting four categories each (Bauer, 2016).

<table>
<thead>
<tr>
<th>Design Practices</th>
<th>Design Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Immersing</td>
<td>3. Experimenting</td>
</tr>
<tr>
<td>2. Analyzing</td>
<td>4. Imagining</td>
</tr>
<tr>
<td>1. Multiple Perspectives</td>
<td>3. Memory</td>
</tr>
<tr>
<td>2. Switching Governance</td>
<td>4. Attitude</td>
</tr>
</tbody>
</table>

Table 1: Design Practices & Design Enablers (Source: Own figure, based on: Bauer, 2016)

Whereas design practices describe a process starting with identifying a problem and try to guide designers to an acceptable solution, design enablers refer to an organization, team, department, or any other agent and their ability of executing an innovation process (Bauer, 2016,). Hereafter the model will be explained into detail. The model serves as springboard for the qualitative analysis.

2.3.1 Design Practices

“Immersing” is the first of four design practices. The main contents of immersing, states that those who design need to see the world if they were users themselves. More than superficially
knowledge about customers is demanded. Designers need to know how customers use a company’s product and what they might expect from a company. One option to gain knowledge, is the use of ethnographic methods. However, due to the necessity of such deep knowledge direct contact between designer and customer is essential. The closer a designer feels to a customer the better. Designers need to identify themselves with their customers and if possible know their customers better than they know themselves, this equips designer with the ability to accurately predict what customers will need (Bauer, 2016).

The second design practice is “Analyzing”. The category copes with system thinking and encourages designer to find out, the underlying intrinsic problem, which might not be the obvious one within complex problem sets. Designers need to keep in mind that their task is to improve a whole system and not only a single part. The whole consists of single parts, which are connected, if designers make changes to one part, they need to be aware of the consequences (Bauer, 2016).

“Imaging” demands designers to dive deep into the virtual, where neither restrictions nor risks exist. Designers do not stay within the real world, while dreaming up or imaging new ideas, which would shift the world into the direction they perceive as perfect. Ideas are tested within the virtual and connected to the real world. Designer generate a balance between their imagination and the real world, forming the world in their mind and equalizing it to the real world. This process is hard to be assigned to an employee who should handle that issue during the working hours, it is rather a lifestyle, designers do not stop the process after leaving their working place (Bauer, 2016).

Designers do not rack their brains whether an idea works out or not, they simply jump into action and try it. “Experimenting” is the shortest way of proving if an idea works out, designers create artifacts they can experience, by touching, tasting, feeling, etc. Thereby they learn about their own ideas and explain it to others who might provide useful contributions. The process is iterative and various cycles might take place. Prototypes or any other experiments, are cheap and quickly produced artifacts which are reviewed and constantly improved by repeating the process. Mistakes are accepted and serve as useful information for
the following experiments. Since rapid prototyping or other quick experiments are neither costly nor time consuming, valuable knowledge can be generated under relatively low risk (Bauer, 2016).

2.3.2 Design Enablers

“Multiple Perspectives” are expressed by teams consisting of members who differ from each other (cross-functional teams). Differences might occur, based on their educational or professional backgrounds, on lifestyles or any other characteristics. Thereby, different forms of solving problems, perceptions of problems, etc. should be comprised. Teams characterized by diversity are perceived as generating creative outcomes, but diversity might also lead to conflict. Thus, team members need to find an appropriate balance between cooperation and insisting on own ideas (Bauer, 2016). As already described Hargadon/Sutton (1997) investigated IDEO and conclude that combining technologies (perspectives), from different industries, often lead to an innovation (Hargadon/Sutton, 1997, p. 747f.). Of course, design companies might have a bigger pool of technologies they are used to, because they work with clients from many different industries and thus are familiar with many different perspectives. Nevertheless, the many notion of including as many perspectives as possible is realizable for any company (Hargadon/Sutton, 1997, p. 718).

“Switching Governance” demands flexible roles, all members should be able to slip into diverse (hierarchical) roles. The ability to adjust the team structure to different situations and environments within the process, is essential. In some situations, a rigorous leader is needed, whereas in other situations it is necessary that all are equal, regarding to hierarchical positions. Anyway, different situations demand different forms of governance, design teams switch between different governance forms (Bauer, 2016).

Designer are engaged with a vast number of ideas, only some are converted into projects and still less are converted into products or services. One might argue that those ideas, which have not been converted into products or services, are a waste of time. “Memory”, well managed knowledge and experiences supports designer’s actions and may lead to following ideas or influence future decisions. Thus, the generation of ideas as well as experiments are
not generally a waste of time. Within an organization databases, documentations, prototypes, other artifacts and any other source comprising knowledge from previous ideas or projects, should be exploited. However, designers make use of their knowledge and experiences, by rearranging it to generate new ideas (Bauer, 2016). Hargadon/Sutton (1997), conclude that one does not need to invent something new, inventive combinations of what is already existing, might occur as an innovation as well (Hargadon/Sutton, 1997, p. 718).

Designer are optimists and prefer challenging, complex task. “Attitude” as a precondition, demands designers to be open and self-responsible, as well as optimistic. Facing a problem is an opportunity and a designer always assumes that a problem can be solved and that they are able to convert an opportunity into an advantage. Designers are continually looking for new ideas and perceive that the world as it exists was formed by humans, within various creative processes (Bauer, 2016).

The working paper is used as handout for managers or others, willing to learn about DT and provides basic knowledge about DT. Additionally, it serves well as a framework for a qualitative analysis. The concept does not answer what happens within the eight practices. It does not answer if it is possible to judge a process as creative or not. Anyway, also the literature described above has no answer to these questions.

2.4 Research questions

Writings about creative problem solving as well as DT is strongly focused on providing models to guide others through a creative process. Wallas (1926) introduced a model including several stages. Guilford (1950), was interested in psychological aspects. He admitted that such models are superficial and do not mirror the mental processes within creative processes. (Guilford, 1950, p. 451). However, various models, including different numbers of stages have been introduced e.g. Osborne (1952, 1953), De Bono (1967, 1971), Amabile (1988). Other researches focused on subprocesses, e.g. De Bono (1967, 1971) by launching “Lateral Thinking”. However, Lubart (2001) concludes on writings about creative problem solving, by stating that none describes why creative processes are creative. DT is one of the latest approaches introduced for creative problem solving. At the beginning
perceived as temporary fad within management, DT received attention as it became frequently applied in practice, consequently also writings haven been published, e.g. Kelley/Littman (2001), or Brown (2009). Carlgren et. al. (2016) exposes that these writings about DT are rather practitioner writings and it stays unclear what happens in the context within companies, while applying DT. Many questions about the creative process and also DT, highly interesting for the scientific discourse, are still unanswered. Questions like, how do creative processes differ from noncreative processes? Why is a creative process creative? How can one assess the creativeness of a process? Referring to DT, what are the subcategories contained within the single categories, used to exposed the process? Is it possible to find key measures for DT? If so, which are those key measures? Are the single categories used to exposed the process, interrelated? If so, how? What happens within the context of a company, when applying DT?

Based on the described research gaps, and bounded by the framing concept three research questions have been formulated:

- Which subcategories do appear within the eight categories of Design Practices and Design Enablers, while reviewing the concept, by reference to a qualitative analysis of semi-structured interviews?
- Do key indicators exist to measure how well or less marked the different design practices and design enablers are? If so, which are these key indicators?
- Do the single categories relate to each other? If so, how?

The answers to these questions, should on the one hand give insight into the processes and procedures happen within the single parts of the DT model and on the other hand establish a foundation for further research. The questions are not answered with the purpose to cover all the gaps within literature about the creative process. Preliminarily, the focus is on DT. Nevertheless, the results of the analysis might be used as a foundation to conduct further studies, which may contribute to the scientific literature about the creative process as well.
3 Method

To answer the research questions a qualitative method has been chosen. Specifically, interviews have been conducted and analyzed. Hereafter, the collection of the data, the conditions during the interview process, the interviewees and the method used to analyze the data are briefly described.

3.1 Data Collection

Due to the aim of the thesis a qualitative method has been chosen. None of the existing patterns describing DT, in relation with creative problem solving, is accurate enough to draw on them using quantitative methods. Thus, semi-structured interviews have been chosen to collect data. The interviewees have been approached by the “Institut für Organisation”. To collect enough data, a snowball-sampling has been executed. In other words, interviewees have been asked after the interview, if they know interesting interview partners, the institute should contact. In total seven semi-structured interviews, have been conducted. Before conducting the interviews, a rough guideline has been formulated, to draw boundaries for the interviews. During the interviews, the guideline was used to ensure that the interview covers all relevant topics. Questions have been adapted to the specific situations within the interviews (Lamnek, 2010, p. 301-372). This method was chosen because creative, or innovation processes proceed differently within different companies, thus collecting data about these processes requires to adapt to specific situations and to inquire about stories and other information the interviewee has already shared. It must be indicated that the transcripts and consequently the results, are based on descriptions and representations of executives responsible for innovation, about their innovation process. No additional data has been used to compile the results presented hereafter.

3.2 Interviewees and Conditions

The following table, contains basic information about the companies, the interviewees and the interviews.
Table 2: Interviews (Source: Own Figure)

<table>
<thead>
<tr>
<th>Interview 1 (I1)</th>
<th>Industry</th>
<th>Position of Interviewee</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview 2 (I2)</td>
<td>Home Automation</td>
<td>Divisional Director</td>
<td>German</td>
</tr>
<tr>
<td>Interview 3 (I3)</td>
<td>Heat Treatment &amp; Plant Manufacturing</td>
<td>Head of Innovation</td>
<td>German</td>
</tr>
<tr>
<td>Interview 4 (I4)</td>
<td>Plant Manufacturing</td>
<td>Head of R&amp;D</td>
<td>German</td>
</tr>
<tr>
<td>Interview 5 (I5)</td>
<td>Plastic Industry</td>
<td>Head of R&amp;D</td>
<td>English</td>
</tr>
<tr>
<td>Interview 6 (I6)</td>
<td>Plant Manufacturing and Engineering</td>
<td>Divisional Director</td>
<td>German</td>
</tr>
<tr>
<td>Interview 7 (I7)</td>
<td>Software</td>
<td>Authorized Officer for Operations &amp; Member of Executive Board</td>
<td>German</td>
</tr>
</tbody>
</table>

All interviews have been conducted in the usual surrounding of the interviewees. Moreover, all interviewees have been informed, that all information and statements will be anonymized and are only accessible for the “Institut für Organisation” at JKU. The interviews have been conducted by two people, one main-interviewer and one supporting-interviewer. All interviews have been recorded and afterwards transcribed. The interviews lasted between 51 minutes and 1 hour and 35 minutes.

### 3.3 Analysis Method

Principles defined by Mayring (1995) have been applied for the analysis. The analysis has been based on categories provided by the underlying concept. The software MAXQDA has been used as supporting tool. The transcripts have been fragmented and single quotes have been assigned to the categories. Although the categories of the underlying concept have been used for the categorization of the data, the procedures described within the concept are not rigid. In other words, quotes referring to a specific category, but suggesting a different procedure or approach within a specific category are as well assigned to the category as those which support the procedures and approaches suggested by the underlying concept. Thus, the underlying concept was used as a flexible template and to draw superficial boundaries for the
analysis. The codesystem and the number of quotes assigned to the main categories are displayed in figure 3.

![Figure 3: Codesystem – MAXQDA (Source: Own Figure)](image)

Afterwards subcategories have been formulated by considering the quotes assigned to the main categories. This arrangement of the data has been used to derive the results, presented in the following chapter. Parts of the results have been derived based on logical coherences of different quotes, or logical consequences or conclusions. Some parts are directly relating to one or more quotes, some of them have been excerpted from the transcripts and added to the results to support the results and serve as clue of verification.
4 Results

In the following chapter the results, derived from the qualitative analysis, are presented and explained. Explanations and answers to the first two research questions are presented separately, for each of the eight design competences. Additionally, a short comparison between results and the underlying model, conceptualized by Bauer (2016), has been drawn. The third research question, about interrelations is answered separately, since the previously provided explanations are the foundation for the discussion of interrelations.

The answer to first research question is depicted, by written explanations, supported by quotations from the transcripts. Referring to the second research question, tables have been constructed, listing and explaining key indicators. To provide an answer to the third research question, a figure has been derived from the qualitative analysis. The figure illustrates all categories and subcategories. To exhibit interrelations arrows have been added to the figure. Consequently, interrelations are explained by decomposing the figure and step by step explanations of the single parts.

4.1 Immersing

Based on the number of quotes assigned to the category within the qualitative analysis, “Immersing” is one of the most critical parts within the DT concept. Hereof it needs to be considered that there is no reliable indicator that would suggest a hierarchical ranking of the different categories. Albeit customers, are perceived as essential for an innovation as well as for the survival and success of businesses.

\[16: \text{„Es gibt ka erfolgreiche Innovation, die da Kunde ned braucht.“} \]

However, “Immersing” goes beyond looking superficially at customer’s wants or needs. All interviewees agree that companies need to equip themselves with broad knowledge about their customer’s worlds. “Immersing” should put a company in a situation where it knows the customer and the customer’s world better than the customers themselves. That generates the opportunity of providing solutions that customers do not expect to be offered.
Based on the qualitative analysis “Immersing” comprises three subcategories and exhibits interrelations with two other categories. Additionally, key indicators have been developed, to operationalize the DT concept.

4.1.1 Subcategories

The first subcategory that resulted from the analysis is, “Sensory Knowledge vs. Degree of Separation”. Information or knowledge about customers and their worlds needs to be raised. This happens during interactions with customers. These interactions occur in various forms. In other words, knowledge is received through sensory perceptions.

Companies use different methods to receive or experience sensory knowledge. A highly critical circumstance is the degree of separation. One can either be personally present in the customer’s world, or interact with someone who has been present in the customer’s world. The more steps are between the one who provides the knowledge (customer) and the one who receives the knowledge (designer), the higher is the degree of separation.
The interviewees did not agree on an acceptable limit, regarding the degree of separation. Within the analysis interaction with sales people as well as looking at competitors, occurred as usual methods of raising knowledge if one is not personally present within the customer’s world. That means the highest degree of separation within in the analysis was one person between the one who provides the knowledge and the one who receives it. However, it must be indicated that there is a difference between experiencing your customers or knowing them from hearsay.

A specific method of raising knowledge about customers, is to have customers employed within the company. This results in a situation where employees design products for target groups that include themselves. This method reduces the degree of separation to a minimum.

“Proactivity vs. Reactivity” is the second subcategory that emerged based on the analysis. As already explained, “Immersing” handles not only the issue of gathering information and subsequently developing the products or services customers asked for. Companies need to act proactively. In other words, they need to develop products which customers have not yet thought about. Companies need to know, how the future challenges of their customers will look like and provide solutions. At this point a first blurred boarder between “Immersing” and “Analyzing” becomes obvious. Especially the proactivity of a company strongly depends on “Analyzing” as well as on “Immersing”.

I3: „Donn wos hoid, wo ma auf Messen unterwegs sand jo, wos mocht die Konkurrenz...“

I1: „Also den Personalakt hob ma eingeführt und erst intern ausprobiert und die Begeisterung bei unsrer Finanzchefin woa unendlich.“
“Immersing” is not about asking what customers want and having conversations over the fence, it is about plunging into their worlds. Hence, simply reacting to wishes about new products of customers is not enough. Proactive development of products, which solve basic problems that customers face is essential. It must be indicated that, customers are generally satisfied with standardized solutions. Innovations are new solutions that must fit into the customers world, which should become the future standardized solutions.

The third and last subcategory within “Immersing”, is “**Human Centered Design**”. The subcategory refers to the concept of “Human Centered Design”. This concept emphasizes that the usability of an innovation is crucial, whether customers can explore the whole potential of a product or not (Eason, 1984, p. 133f.). Analyses have shown that highly complex technical solutions, which confuse customers, or which are too complicated to use, are perceived as useless. IDEO also strongly relies on “Human Centered Design”, the company observes customers using certain products to evaluate what their intuitive actions and what is unnatural and would not fit within their usual routines and procedures (IDEO, 2017). However, none of the interviewees mentioned that they observe customers using certain products, but they suggest that companies need to refer to what customers already know, to ensure a seamless introduction of their products or services. Resulting, to develop a product that does not simply solve a problem, but is composed simple enough that
customers can use it, companies face the task of hiding complexity and try to connect to customer’s intuition. This task can be solved in different ways, e.g. by using hidden background process, by using interfaces designed similar as popular ones the customers already used to, or with other methods. Within the analysis, keeping procedures simple and referring to what customers already know occurred as the usual methods.

4.1.2 Key indicators

To operationalize the concept, key indicators have been derived from the analysis. This has been done for each of the subcategories of “Immersing”. In the following table, the key indicators are listed and shortly described, grouped by the previously explained subcategories.
<table>
<thead>
<tr>
<th>Key indicators</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensory Knowledge vs. Degree of Separation:</strong></td>
<td></td>
</tr>
<tr>
<td>Number of meetings, visits, observations, interviews or similar forms of contact between customers or potential customers and members of the innovation teams.</td>
<td>Personal presence at customers.</td>
</tr>
<tr>
<td>Number of meetings or similar forms of information exchange (about customers) between non-members of innovation teams with members of innovation teams (e.g. sales people, competitors, etc.)</td>
<td>Available amount of second hand information.</td>
</tr>
<tr>
<td>Number of “customers”, employed in the company.</td>
<td>Employees who are “customers” as well.</td>
</tr>
<tr>
<td>Number of knowledgeable employees, who once have been working for one of the company’s customers.</td>
<td>Employees formerly working for a customer.</td>
</tr>
<tr>
<td>Weighted average number of steps between the origin of information until those who need it, receive the information.</td>
<td>The degree of separation. (Knowledge Structure) (^1)</td>
</tr>
<tr>
<td><strong>Proactivity vs. Reactivity:</strong></td>
<td></td>
</tr>
<tr>
<td>Comparison of:</td>
<td>Idea generation process.</td>
</tr>
<tr>
<td>(1) Number of product ideas developed within the company, based on problems of customers and not specific product wishes.</td>
<td></td>
</tr>
<tr>
<td>(2) Number of product ideas/wishes proposed by the customer.</td>
<td></td>
</tr>
<tr>
<td>(3) Solutions (products), to “problems” identified by the innovator, exceeding the frames of the customer.</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Weighting a company’s knowledge about customers, initially demands a mapping. To map existing knowledge, in a meaningful manner, a qualitative intermediate step is necessary to categorize the knowledge. Briefly speaking, figuring out the knowledge structure of a company is a challenging task, thus far, due to a lack of methods, probably even impossible.
Number of delayed product launches, caused by unready markets (products which have been successfully launched at a later point of time.)  
Knowing what customers will demand in the future.

<table>
<thead>
<tr>
<th>Human Centered Design:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average time customers need to be able to appropriately use the product.</td>
<td>Invested time before customers can use a product.</td>
</tr>
<tr>
<td>Length of user guidelines, describing the core function of a product. (measured in relation to the basic complexity of a product)²</td>
<td>Complexity of a product.</td>
</tr>
<tr>
<td>Number of steps/actions that need to be executed to receive the core benefit of the product. (Depending on the product either all steps/actions or only those steps/actions customers are not used to and which they would have to “learn” before they can use the product)</td>
<td>Customer input, until they receive the core benefit.</td>
</tr>
</tbody>
</table>

Table 3: Key indicators - “Immersing” (Source: Own Figure)

4.1.3 Comparison

Compared to the suggestions made by Bauer (2016), differences occur as the qualitative analysis has shown that companies operate rather unsystematically within the “Immersing” process, however looking at design companies like IDEO would support systematical operations (IDEO, 2017), it should be suggested that this issue might depend on how strong DT is pronounced within a company. Additionally, the analyses indicate a strong interrelation with “Analyzing”, which will be discussed in a later part of the thesis.

Comparing the main contents with Bauer (2016), receiving sensory data, to generate a situation where the company knows the customers and the customer’s worlds better than the customers themselves, can be confirmed. However, “Immersing” offers companies a big pool

² Measuring the complexity of a product, by analyzing user guidelines might be difficult. Thus, this indicator should rather be perceived as a signpost, leading into the direction of considerable circumstances within the process.
of choices about how to proceed within the process. Analyses have shown that the proceeding does not matter, if the main criteria are fulfilled.

4.2 Analyzing

For designing innovations, it is essential to understand the intrinsic task and the underlying problem, aimed to be solved with the innovation. Designers need to make sure they are improving a whole system and not one part of the system which negatively effects other parts. Therefore, technical as well as social issues need to be considered, to understand the system and to improve it.

"Analyzing" is closely linked to “Immersing”, to a certain extend the categories are overlapping. Additionally, the analysis has revealed that two subcategories are comprised within the category. In comparison to the other categories “Analyzing” happens to a certain extend hidden behind “Immersing” processes, or while deciding if a potential innovation fits to the strategy of the company, or not.

4.2.1 Subcategories

“Social Integration” is the first subcategory. Anything companies try to sell needs to fit in an established system. Depending on the products, these systems might include actions that need to be executed by employees in a company, or also simple processes in daily life, like switching on or off light. However, designing an innovation requires to understand these systems. Without knowledge about, how customers proceed in a situation, which is aimed to be improved, it is impossible to design a product that fits into the system. Improving these systems means to make them less work intense for costumers, to reduce manual work, or similar developments. The analysis reveals that companies try to keep systems unchanged and simple. Customers should not recognize changes within a system, therefore companies need to know the systems in detail, to be able to offer a benefit without heavily compromising established routines.

15: “…he can make some different ways how to create a product, but he has to understand really the requirements.”
Additionally, companies use one specific method to examine at the very beginning of an innovation process whether a product basically fits into a certain system or not. Companies look at their strategies or visions and prove if an innovation fits to their strategy. If it does, it fits into the system, if not the product does not fit into the system, even if the product as such seems to be of high potential.

The second subcategory is “Technical Integration”. Products need to be integrated not only in a social system but also in a technical system. Therefore, it is necessary that companies know the technical system and ensure that innovations do not constrain the already existing system. All different forms of side effects need to be considered and technical system integrity needs to be tested.
4.2.2 Key indicators

To operationalize the concept, key indicators have been derived from the analysis. This has been done for each of the subcategories of “Analyzing”. In the following table, the key indicators are listed and shortly described, grouped by subcategories.
<table>
<thead>
<tr>
<th>Key indicators</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social Integration</strong></td>
<td></td>
</tr>
<tr>
<td>How much time (or number of meetings, etc.) is spent to define the underlying</td>
<td>Definition of the underlying problem.</td>
</tr>
<tr>
<td>problem a product should solve?</td>
<td></td>
</tr>
<tr>
<td>How many different additional products (not offered by the company) do</td>
<td>Completeness of the solution. (Platform-</td>
</tr>
<tr>
<td>customers need to solve a problem/handle a situation?</td>
<td>Embeddedness)</td>
</tr>
<tr>
<td>Number of ideas denied because they do not fit to the company’s overall</td>
<td>Examination of the strategic fit.</td>
</tr>
<tr>
<td>strategy?</td>
<td></td>
</tr>
<tr>
<td><strong>Technical Integration</strong></td>
<td></td>
</tr>
<tr>
<td>How many products offered by the company can be used at the same time?</td>
<td>Detection of mutual constrains.</td>
</tr>
<tr>
<td>(Without any mutually constrains)</td>
<td></td>
</tr>
<tr>
<td>Number of tests a product must pass, before it will be integrated in the</td>
<td>Securing that a product can be technically</td>
</tr>
<tr>
<td>system?</td>
<td>integrated into a system.</td>
</tr>
<tr>
<td>Number of customer complains after an update was released or additional</td>
<td>Number of problems occur referring to technical</td>
</tr>
<tr>
<td>functions are available? (Customer complains referring to new functions,</td>
<td>integration.</td>
</tr>
<tr>
<td>updates, etc)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Key indicators - "Analyzing" (Source: Own Figure)

### 4.2.3 Comparison

Comparing the findings with Bauer (2016), the result that companies match ideas for new products with the company strategy or vision, to examine whether a product fits into a system, or not, is new. Furthermore, the close interrelation with “Immersing” is a new finding. Interrelations will be discussed more into detail in a later part of the thesis.

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3 A reliable measurement of the time spent to analyze the underlying problem is hardly possible. Thus, the indicator should rather be perceived as a direction of thought, which should be considered during the process.
The other findings strongly support the suggestions, made by Bauer (2016). Those parts, supported by the findings, are the main contents of “Analyzing”. Hence, the basics can be confirmed by the analysis.

4.3 Imagining

Each innovation starts as an idea in someone’s mind, in the virtual world. Hence, companies need people who have high power of imagination. As well as individual imagination, the development of ideas in the virtual world on group level or team level is important.

4.3.1 Subcategories

As described in the introduction of “Imagining”, the imagination power of individuals is essential for innovations. Relating to this statement it is necessary that companies realize ideas, also crazy ideas, and take them as seeds that may grow the company a successful innovation. Derived from those circumstances the first subcategory is “Appreciation”, describing the high value of new ideas. Individual imagination power needs to be trigger as well as used if it exists at hand.

11: „Disruptiv is ned so wahnsinnig schwer ma muss die Dinge nur konsequent zu Ende denken.“

14: „Schau i hoid, dass ma von der Prozessseite auch wirklich die Möglichkeiten ham ma von allen Ideen, seien sie noch so kreativ, sozusagen herabzukommen und ernsthaft bewerten.“

The analysis has shown that employees with high power of imagination are often called or labeled as “the Creatives”. Their strengths are, having various creative ideas and solving problems in extraordinary ways. Their weaknesses are keeping to a given process and focusing on one topic for a longer time. The analysis suggests that two subcategories are covered within “Imagining”. Moreover, three interrelations to other categories have been detected. Additionally, key indicators have been derived from the analysis, to operationalize the DT concept.
However, “the Creatives” regularly break the mold, but since these ideas only exist in the virtual world, others have the possibility to shape and develop the ideas within an organizational imagining process, where risk is low, before converting ideas back into the lived world. It should be added that imagining is not focused only on the development of new technologies or products, e.g. using existing technologies in a different way, might be a highly successful innovation as well.

The second subcategory is “Transfer and organizational development of ideas”. As previously explained the origin of every innovation is an idea of an individual, these ideas need to be shaped and adapted. This happens not on an individual basis. Ideas need to be transferred into an organization to make development on an organizational level (in teams, or departments) possible.
However, organizational development requires different personalities. At this point an interrelation with “Multiple Perspectives” could be identified based on the analysis, which will be discussed into detail in a following part of the thesis. It needs to be stated, that organizational development does not necessarily mean that the whole organization is involved in the process. The groups or teams responsible for innovation are those, the term “organizational development” is referring to.

4.3.2 Key indicators

To operationalize the concept, key indicators have been derived from the analysis. The key indicators are listed and shortly described in the following table, grouped by subcategories.
### Key indicators

<table>
<thead>
<tr>
<th>Appreciation</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of total ideas introduced by individual employees.</td>
<td>Ideas available in an organization.</td>
</tr>
<tr>
<td>Number of “wild” or “extraordinary” ideas/solutions introduced by individual employees.</td>
<td>Creative ideas available in an organization.</td>
</tr>
<tr>
<td>Number of customers employed, who have these “wild” or “extraordinary” ideas in relation to the total number of employees. (Either in a relevant part of an organization, or in the total organization)</td>
<td>Individual imaging power available in an organization.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transfer and organizational development of ideas</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio of ideas introduced by a single employee to ideas introduced by a group of employees.</td>
<td>Regularity of transferring ideas.</td>
</tr>
<tr>
<td>Number of formal opportunities (or time spent) to exchange and discuss ideas (Meetings, etc.)</td>
<td>Time groups spent officially on sharing, discussing and developing new ideas.</td>
</tr>
<tr>
<td>Number of product ideas introduced by a group of employees, although no official meeting has taken place before.</td>
<td>Time groups spent unofficially (in breaks, after work, etc.) on sharing, discussing and developing new ideas.</td>
</tr>
</tbody>
</table>

*Table 5: Key indicators - “Imagining” (Source: Own Figure)*

**4.3.3 Comparison**

The findings suggest that the transfer of ideas and organizational development processes are highly important. Bauer (2016) rather focuses on individuals. Moreover, an interrelation between “Imagining” and “Attitude” is implied, by Bauer (2016). This interrelation can be confirmed, but the findings suggest also other interrelations, between “Imagining” and “Multiple Perspectives” as well as “Imagining” and “Memory”.

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The basic suggestions made by Bauer (2016), to build something perfect in the virtual that might not be realizable but works as a trigger or seed and might be shaped and converted into an innovation, are supported by the analysis. The new findings are additions to the statements made by Bauer (2016) and do not disprove them.

4.4 Experimenting

The DT concept bides designers to act in the virtual as well as in the real world (Bauer/Eagen, 2010, p. 152 f.). “Experimenting” is the gate where ideas are converted into artefacts and moved from the virtual back into the lived world. Additionally, the analysis has shown that “Experimenting” is the most important indication when it comes to deciding whether a project will be started (moved on) or not.

It should be indicated that “Experimenting” does not only include building prototypes, it also includes simulations and similar forms of tests which are intended to display the impact and appearance of a products in the real world. It strongly depends on the industry and the costs of experiments, how the experiments look like. “Experimenting” implies two subcategories and exhibits an interrelation to “Attitude”. Furthermore, key indicators have been developed, to operationalize the DT concept.

4.4.1 Subcategories

The time needed to convert ideas into physical objects and to gain new knowledge about the main function of a potential product is highly important. Additionally, to receive precise results, the experiments need to be accurately accomplished. Thus, the first subcategory is “Creation and Response Time vs. Accuracy”.

I5: „You have […] to handle some products, you have to make some tests by yourself in the abbriaty […] to get a better feeling […] about the product, you cannot do it only […] on the screen…”
Accurate does not mean that every single feature or function needs to be integrated in the first experiments. On the contrary, the main function, the clue that solves the problem at hand, should be tested with the first “Experiments”. Moreover, the interviewees agree, that the results of the first experiments, are the most important when decisions about the start of a project are made.

However, at that point the second subcategory “Result Incorporation” emerges. The analysis has shown the importance of the first experiments on the one hand and on the other hand the importance of the decisions made based on the results of the experiments. If experiments show that a product is promising or not, comprehensible conclusions need to be drawn.
The analysis has revealed that under certain circumstances stopping projects appears as highly difficult, even if the experiments are not promising. For example, if companies have invested a high amount of money in a project and do not want to admit to themselves that they will fail, companies often do not stop projects. A similar problem might occur if a project was, introduced by a person who is in a hierarchical high position. At this point an interrelation to “Attitude” becomes obvious.

Anyhow, specific or extraordinary circumstances should not be important when results are incorporated. The results themselves should be the only decision criteria, since the results give clear answers, either something works or it does not. Another result that the analysis reveals, is that companies accept failure, if the issues that cannot be solves are technical issues.

4.4.2 Key indicators

To operationalize the concept, key indicators have been derived from the analysis. This has been done for each of the subcategories of “Experimenting”. In the following table, key indicators are listed and shortly described, grouped by subcategories.
**Table 6: Key indicators - "Experimenting" (Source: Own Figure)**

<table>
<thead>
<tr>
<th>Key indicators</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creation and Response Time vs. Accuracy:</strong></td>
<td></td>
</tr>
<tr>
<td>Time needed, measured from the first appearance of the idea till the first experiments are made.</td>
<td>Measures the lead time.</td>
</tr>
<tr>
<td>Time need to accomplish experiments.</td>
<td>Rapidness in accomplishing experiments.</td>
</tr>
<tr>
<td>Estimated average percentage of certainty, about whether the core feature of a product works or not. (Is a company equipped with the ability to judge whether the core functions work or not, based on information derived from the first experiments.)</td>
<td>Accuracy of experiments.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Results Incorporation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of projects that have been moved on although tests were negative/not promising.</td>
<td>Making the right decisions, based on results of “Experimenting”.</td>
</tr>
</tbody>
</table>

### 4.4.3 Comparison

The analysis supports the statements about time and the importance of haptic perception made by Bauer (2016). Hence, one part of the main principals can be verified with the analysis. Moreover, Bauer (2016) refers to excepting mistakes, or failure. The analysis has shown that, although it appears as a logic consequence of “Experimenting”, under certain circumstances it might become difficult to accept failure.

Bauer (2016) suggests that experimenting processes are iterative, that there are various rounds and prototypes or other forms of experiments which are shaped in between these rounds. There is consensus in the literature about that topic e.g. Bauer/Eagen (2008, 2010, 2012), Kelley/Littman (2001), Brown (2009). In contrary, most of the interviewees agreed that in nearly all cases only one experiment is needed to equip oneself with the necessary
information for making decisions. However, that does not mean that companies do only make one experiment, it rather means that after reviewing the first experiments, a potential innovation is verified or denied. The results do not disprove that various rounds of experimenting are conducted, but it adds that the first experiment is highly important within the decision process. At a later point within the process, when the decision is made, that a project will be started, of course, either a iterative or (in most cases) a linear process of continuously building prototypes takes place.

4.5 Multiple Perspectives
The importance of diversity is strongly supported by the findings. Based on the analysis innovation teams or departments with members who differ from each other, generate better results. Referring to the interviews, the degree of differentiation is limited to the offers on the labor market, the interviewees agree that they would like to have a higher degree of differentiation, but the labor market does not offer enough appropriate candidates. In technical industries, especially women are rare.

I4: „... die gesunde Mischung ist das, was ich mir wünsche in den F&E Abteilungen...“

I7: „Na, des is genau deswegen do, weil, des is des Problem, wenn a Haufen ITler bieteinder san dann – jeder is irgendwie in ana gewissen Schiene drinnen. Und wir sagen immer die ITler die haben ein bissl an Schraubenzieher im Kopf, ja. Wenn ana a Idee hat überlegt er schon wie ers realisiern kann und dann – des blockiert aber natürlich teilweise. 'Ja, des geht ja sowieso ned, und des is so aufwändig, des wü i ned!' – ja. Jetz braucht ma do irgendwen, dem des vollkommen Wurscht ist, weil er goaned waß, dass des aufwändig ist.“

I1: „I glaub, dass wir kein Engineering Team haben wo ma ned zumidest eine Frau drin haben aber es bewegt si irgendwo im Bereich von 20-25% das was auch die Absolventinnen Quote is schaffen wir auch intern, aber mehr schaffen wir nicht.“
“Multiple Perspectives” exhibits two subcategories. Furthermore, two interrelations could be identified. Additionally, key indicators will be presented to operationalize the DT concept.

4.5.1 Subcategories

Referring to “Multiple Perspectives” one important part is the educational background of the employees. Thus, the first subcategory is “Profession”. Therefore, a team or a department working on innovation, e.g. for the software sector, should not solely consist of software engineers. People with different educational background, do influence the innovation process by contributing statements derived from a different knowledge base, or qualification base.

*I1: “… also des Schönste is an von da FH, an von da Kunst Uni, an von da JKU und die miteinander kreativ sein lassen.“

*I7: „Wir ham an Mitarbeiter der hat die Kunstuni besucht, hat ganz wenig mit IT zu tun, der is eben in diesem Innovationteam dabei ...“

Different people have different strengths, weaknesses and traits. An innovation team needs a mixture of different personalities, at this point the second subcategory emerges “Personal Traits and Skills”. As explained above the educational background should be considered, the second important part are personal traits and skills. An innovation team or department needs creative people. At this point the category exhibits a point of contact with “Imagining”. Beside creative people also those how can work on an idea and do not constantly have new ideas which seem to be more interesting to them than those they are already working on, are essential for the process.

Different points of view often lead to conflicts. These conflicts need to be exploit and lead to a status, where a conflict is the basis for a new idea, or product. At this point “Multiple Perspectives” exhibit an interrelation with “Imagining”, more specifically with “Transfer and organizational development of ideas”.

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### Key indicators

To operationalize the concept, key indicators have been derived from the analysis. In the following table, the key indicators are listed and shortly described, grouped by subcategories.

<table>
<thead>
<tr>
<th>Key indicators</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Profession:</strong></td>
<td></td>
</tr>
<tr>
<td>Number of employee’s different educational backgrounds.</td>
<td>Diversity referring to profession.</td>
</tr>
<tr>
<td>Ratio of teams/departments working on innovation consisting of only members of one educational group and of teams/departments working on innovation consisting of members of various educational groups.</td>
<td>Degree of mixture, referring to profession.</td>
</tr>
<tr>
<td>Average number of different educational groups within one team/department.</td>
<td>Degree of diversity referring to profession.</td>
</tr>
<tr>
<td><strong>Personal Traits and Skills:</strong></td>
<td></td>
</tr>
<tr>
<td>Number of different personalities, measured by personality tests and potential analysis, or by observation, or assessment centres, etc.</td>
<td>Diversity referring to personality.</td>
</tr>
<tr>
<td>Ratio of teams/departments working on innovation consisting of only members of one personality group and of teams/departments working on innovation consisting of members of various personality groups.</td>
<td>Degree of mixture, referring to personality.</td>
</tr>
<tr>
<td>Average number of different personalities within one team/department.</td>
<td>Degree of diversity referring to personality.</td>
</tr>
</tbody>
</table>

*Table 7: Key indicators - “Multiple Perspectives” (Source: Own Figure)*
4.5.3 Comparison

Bauer (2016), goes further than the findings reveal. Thus, differences appear when viewing the differences themselves. The findings do not prove that specifically age, religion or also ethnic backgrounds are important for diversity. However, people with different strength and weaknesses (in most cases divided into creatives and non-creatives) are important for the success of an innovation. Beside these differences the interrelations are new findings.

Bauer (2016) also refers to gender and profession. These two key indicators are evident based on the findings. Also, the basic importance of “Multiple Perspectives”, can be confirmed based on the analysis. Moreover, managing different knowledge to generate innovative outcomes can be verified based on the analysis.

4.6 Switching Governance

“Switching Governance” is under represented in the analysis, this might be a drawback of the applied empirical method. However, based on the analysis “Switching Governance” hardly exists. Most decisions are made either by CEOs, or any other hierarchically high positioned employees, or by those who lead a project (entrepreneurs). These decisions are made based on a rather formal procedure, or at least those how make decisions have been appointed based on formal criteria. Again, it must be indicated that the results are based on descriptions of executives, who might be perfectly informed about the formal decision-making process, informal decision makers might be out of their observation area.

Nevertheless, “Switching Governance” comprises two subcategories. Since the analysis only exhibits knowledge about formal decision processes, the subcategories are described based on those findings. But, that does not mean that the content of “Switching Governance” is disproved by the analysis. There is neither evidence to disprove nor to prove “Switching
Governance”. Especially for the second subcategory it can be assumed (but not verified) that switching governance, informal decision processes and decision-making by various group members, are of high importance.

4.6.1 Subcategories

Looking at the decision-making process two subgroups emerge, the first one is “Decisions about Projects”. There is evidence that decisions about projects (whether they are started, moved on, or stopped) are often made by CEOs, or other people in high hierarchical positions. These decisions are often derived from monetary issues or capacity limits. Therefore, some companies regularly have summits or similar meetings were all noticed ideas are discussed.

The analysis does not clarify the question about the influence of those who would work or are already working in an innovation team, or department, on the projects. Thus, relating to informal decision processes, no evident statement can be made. Referring to formal rules the analysis reveals a centralized decision-making process.

Decisions are necessary not only about, but also within projects. At this point the second subcategory “Decisions within Projects” emerges. Within the analysis there is no evidence that decision makers change, during the innovation process. The analysis rather exhibits that individuals who drive projects forward, also called “Entrepreneurs”, are those who make the decision.
Moreover, analysis suggests that the severer a problem, the more likely it will be communicated to people in hierarchically higher positions. However, the analysis does not exhibit knowledge about informal decision-making processes, therefore “Switching Governance” is underrepresented and partially remains as unclear. Referring to the situation, where an “Entrepreneur” leads a project, the decision-making process is centralized. Without an “Entrepreneur” the governance process remains as unclear based on the analysis.

### 4.6.2 Key indicators

To operationalize the concept, key indicators have been derived from the analysis. In the following table, key indicators are listed and shortly described, grouped by subcategories.

<table>
<thead>
<tr>
<th>Key indicators</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decisions about Projects:</strong></td>
<td></td>
</tr>
<tr>
<td>Number of decision makers deciding about projects.</td>
<td>How many make decisions about projects.</td>
</tr>
<tr>
<td>Ratio of the number of decisions made about projects, to the number of decision makers.</td>
<td>Degree of centralization.</td>
</tr>
<tr>
<td><strong>Decisions within Projects:</strong></td>
<td></td>
</tr>
<tr>
<td>Number of formal decisions makers within an innovation process.</td>
<td>Number of empowered decision makers.</td>
</tr>
<tr>
<td>Number of informal decisions makers (detected by, e.g. filming the process and reviewing it, asking team/department members after the process about these issue, etc.)</td>
<td>How many do make decisions, although they are not empowered.</td>
</tr>
<tr>
<td>Ratio of decisions made within a project to decisions makers within a project.</td>
<td>Degree of centralization.</td>
</tr>
</tbody>
</table>

*Table 8: Key indicators - "Switching Governance" (Source: Own Figure)*
4.6.3 Comparison

Compared to Bauer (2016), many differences occur. Even the basics are different. Bauer (2016) suggest that decisions are made based on switching governance, whereas the analysis reveals that decisions are made based on centralized governance. But, comparing the findings with Bauer (2016) is to a certain extend impractical, because “Switching Governance” is underrepresented within the analysis. Informal decision making could not be reviewed, due to the limitations of the method. Therefore, it cannot be stated that the analysis disproves or supports the suggestions made by Bauer (2016).

4.7 Memory

“Memory” is the consequence of a high number of ideas, prototypes, projects, etc. “Memory” occurs in different forms. The analysis shows that, depending on the industry and the market, “Memory” can contribute to potential innovations.

However, it is important to distinguish between the different forms of “Memory”, based on that issue two subcategories have been developed. Moreover, analysis exhibit two interrelations. Additionally, key indicators will be presented to operationalize the DT concept.

4.7.1 Subcategories

Especially during the communication about projects or potential innovations, help full hints are received. Experiences or memories shared by colleagues are often the origin for the development of innovations. Therefore, the first subcategory is labeled “Personalized/Informal Knowledge”.

I6: „Des hams immer wieder, dass die Idee kommt `da war doch schon mal was!`“

I1: „Des heißt i frog dann mein Bruder […], du wie host du des glöst …“

I5: “A lot of experience from the last years ya.”
Employees make new experiences each day. These experiences are not formalized and captured only in those people’s minds as memories. Therefore, sharing knowledge is important. Referring to this issue the analysis exhibits a strong relation to “Imagining”. Companies gain new experiences within each project and use them for following projects, although this knowledge is not stored in a database or archive.

**I5:** “At the end of the project we are making a meeting about lessons learned…”

However, experiences are a certain form of memory which might also be the trigger by reviewing archives or old prototypes. At this point the analysis exhibits the second subcategory, “**Formalized Knowledge/Data**”. The interviewees did not agree that they are deliberately look in a database for old ideas, or ideas that once failed to use them somehow. Some even delete documentations of projects that once failed.

**I1:** „Mein Gott, ja, man archivierte, aber im Wesentlichen brauchen sie's nie wieder [...]. Dinge die nicht unmittelbar in ein Produkt resultieren kannens einfoch wegschmeißen."

**I2:** „Es bleibt ungefähr a hoibs Johr erhalten, wir haum ah, i nenns amoi a Archive wo ma des zaumfossed des jedes Johr zum Johresende geraumpt wird wird."

**I4:**

Q: “...what happens than to those projects that don’t make it and also those idea?”
A: “Nothing ((laughing)) You can [...] find all the data in the files. If you need something.”

Whether formalized knowledge is useful or not strongly depends on the industry. In those industries where technologies are continuously developed, stored knowledge becomes outdated very quickly. However, outdated knowledge will not lead to success, thus companies need to accurately select on which memories they rely.
4.7.2 Key indicators

To operationalize the concept, key indicators have been derived from the analysis. In the following table, key indicators are listed and shortly described, grouped by subcategories.

<table>
<thead>
<tr>
<th>Key indicators</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personalized/Informal Knowledge/Data (Experiences):</strong></td>
<td></td>
</tr>
<tr>
<td>Number of projects employees (responsible for innovation) have already been involved.</td>
<td>Amount of experiences.</td>
</tr>
<tr>
<td>Percentage of projects, where afterwards experiences and gained knowledge (technical and non-technical) are reviewed.</td>
<td>Learning from projects that are already finished.</td>
</tr>
<tr>
<td>Number of meetings people from outside the team are involved to share experiences.</td>
<td>Seeking personalized information from outside.</td>
</tr>
<tr>
<td><strong>Formalized Knowledge/Data:</strong></td>
<td></td>
</tr>
<tr>
<td>Number of documents available about past projects.</td>
<td>Available documentations.</td>
</tr>
<tr>
<td>Number of views at stored prototypes or documents available about past projects.</td>
<td>Use of documentation.</td>
</tr>
<tr>
<td>Average timeslot prototypes or documentation data are stored.</td>
<td>Actuality of stored memories.</td>
</tr>
</tbody>
</table>

Table 9: Key indicators - "Memory" (Source: Own Figure)
4.7.3 Comparison

Referring to the basics of “Memory” minor differences occur, comparing the findings with Bauer (2016). The interrelations are new findings. As well is the relatively high importance of informal knowledge.

The greatest novelty, or difference is that the importance of “Memory”, especially the importance of the second subcategory “Formalized Knowledge/Data”, is not perceived as high, based on the findings. What leads to the assumption, that the importance of this part strongly depends on the industry, on the implementation frequency of new technologies or similar alterations. Overall, the findings exhibit that informal, personalized knowledge is of higher importance than formalized knowledge.

4.8 Attitude

The last category appeared as the most comprehensive one, within the analysis. “Attitude” refers to failure and to group dynamics within a company, but also to openness, as well as to seeing opportunities instead of problems and various other issues. However, DT demands participants to act visionary.

Based on the analysis “Attitude” covers two subcategories. The category exhibits two interrelations to other categories. Moreover, key indicators have been derived from the analysis, to operationalize the DT concept.

4.8.1 Subcategories

There is evidence that especially company founders, CEOs, or also heads of innovation departments, drive innovation forward with an appropriate attitude. Thus, the first subcategory is “Leadership”. Leaders show their attitude in different ways. Some are simply rushing out of their offices and ask their employees to try out an idea that just came up to their mind.

I2: „…Firma XY is 2009 gegründet worden, ahm, mit dem Ziel den Home-Automation Smart Home Bereich zu revolutionieren…“

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Moreover, there is evidence that leaders do accept failure, as far as they have made sure that all actions that might lead to success have been exhausted and that failure did not occur because of slackness or incompetence within the workforce. “Attitude” also demands leaders to encourage employees to experiment and trigger creativity instead of finding reasons why ideas will not work out.

Appropriate leadership should lead companies in a situation, in which employees will imagine an idea and immediately try it, to know whether an idea works out or not. As already mentioned failure is an important issue referring to “Attitude”, leaders need to treat that issue carefully, because those who have ideas are convinced that they will not fail, therefore an appropriate explanation for each failed project or denied ideas should be provided to the employees.
The second subcategory is “Support”, the category reflects a company’s overall attitude to creativity and innovation. “Support” refers to the legitimacy of being creative at work. The analysis has shown that companies, need to show their employees that being creative during their working hours is not a waste of time. This can be done by implementing an appropriate item in the time-tracking system, by offering tools employees need to experiment, or in similar ways. Companies need to support creativity, throughout the whole organization. At this point, interrelations with “Imagining” and “Experimenting” are shown within the analysis.
“Support” on the other hand also refers to group dynamics within innovation teams or departments. An appropriate mindset within organizational units, responsible for innovation, as well as an appropriate culture of communication are essential. Different perspectives might come into conflict, these conflicts are to a certain extent intended conflicts, to generate creativity processes. Thus, organizations need to handle them in a way they can profit from those conflicts. At this point an interrelation to “Imagining” emerges.

I3: „Und was a Besonderheit is, ist einfoch so der Mindset von da ganzen Mannschaft ‘probieren man einfoch amoi aus’. Jo. In die Richtung zu gehen nochand, ma griag a Aufgabenstellung, [...] und sagt ’Passt, wie probiern ma des, wie kumman ma do ins Ziel’ und ned probiert ewig lang Punkte zu finden wieso es ned geht…“

I4: „Najo ma muss scho...es is sicher a wichtiger Punkt und i hobs eh vorher gsogt es gibt immer die Leute, die sofort drauf reagieren ’Ah is eh a guade Idee, ABER’ Als dieses, wenn i her ’ah is eh a guade Idee’ dann was i scho jetzt kummts ABER jo. Also des is halt etwas, wos wie Sie sogen a kulturelles Thema is an dem ma arbeiten muss.“
4.8.2 Key indicators

To operationalize the concept, key indicators have been derived from the analysis. In the following table key indicators are listed and shortly described, grouped by subcategories.

<table>
<thead>
<tr>
<th>Key indicators</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leadership:</strong></td>
<td></td>
</tr>
<tr>
<td>Amount of time CEOs or other executives, spend with employees to discuss ideas.</td>
<td>Leaders effort and participation.</td>
</tr>
<tr>
<td>Time past until company stops a project.</td>
<td>Acceptance of failure.</td>
</tr>
<tr>
<td>Time leaders need to decide, about projects or ideas.</td>
<td>Decision making.</td>
</tr>
<tr>
<td><strong>Support:</strong></td>
<td></td>
</tr>
<tr>
<td>Number of “tools” (e.g. machines) offered for experimenting.</td>
<td>Organizational support for experiments.</td>
</tr>
<tr>
<td>Amount of time tracked, referring to development of new ideas/products.</td>
<td>Employees effort.</td>
</tr>
<tr>
<td>Ratio of conflicts to team dissolves, or personal changes within innovation teams.</td>
<td>Managing conflicts.</td>
</tr>
<tr>
<td></td>
<td>(Creative conflicts)</td>
</tr>
</tbody>
</table>

Table 10: Key indicators - "Attitude" (Source: Own Figure)

4.8.3 Comparison

“Attitude” is the broadest of the perspectives. Bauer (2016) strongly refers to individuals. The findings go one step further. Within organizations it is unusual that only one designer is responsible for innovations. Thus, a group of designers is working on a project. Therefore, findings a rather organizational perspective of “Attitude” has been added, referring to group dynamics and legitimacy of creativity within an organization.

Bauer (2016) suggests that designers are openminded optimists, who see an opportunity in each problem and have visions to shape the world by creative human actions. These statements can be confirmed based on the analysis. Moreover, the analysis exhibits findings about interrelations, to other categories, which will be discussed in the following part of the thesis.
4.9 Interrelations

The eight design competencies, are not unattached categories which do not relate to each other, quite the contrary is revealed by the analysis. Various interrelations and blurred boundaries exist. These interrelations occur either between the eight main categories, the subcategories or between main categories and subcategories. Hereafter these interrelations are described. Figure 4 depicts an overview of the interrelations, subsequently figure 4 will be decomposed and each interrelation will be explained.
Figure 4: Interrelations (Source: Own Figure)
“Immersing” strongly interrelates with “Analyzing”. The subcategories “Proactivity vs. Reactivity” and “Human Centered Design” both act like blurred border areas between the two categories (see figure 5). Focusing on the customers and understanding customer is somewhat like a precondition for understanding the system, the surrounding, the environment (social and technical) around the customer, but understanding the system as well, is a precondition for conducting human centered actions. However, companies do not separate these categories, they initiate oscillating processes and extract what they need to give rise to innovations.

The subcategory “Sensory Data and Degree of Separation” also interrelates with “Memory” (see figure 6). Knowledge also includes experiences about customers someone made in the past. Moreover, knowledge might have been codified and stored. In return knowledge perceived through immersion contributes to “Memory”. It needs to be remarked that, while describing the interrelation between “Sensory Data and Degree of Separation” and “Memory”, knowledge comprises data about customers and the customers world. However, this interrelation needs to be treated carefully, since data or knowledge about customers quickly gets outdated. In some industries, where product life cycles are longer, companies might rely on stored, rather old data. In other industries storing information seems useless,
due to short product life cycles and permanent technological alterations. Nevertheless, especially informal knowledge and experiences are often included into ideas.

“Imagining” demands different points of view, thus it interrelates with “Multiple Perspectives” (see figure 7). Especially creative people are important within “Imagining” processes. Hence, “Imagining” is strongly founded in the employee’s traits and viewpoints, important for the generation of ideas. Moreover “Imagining” on an organizational level is useful because different opinions or ideas encounter each other. Thus, without different points of view, no creative conflict, which shapes and develops ideas would occur. In return “Imagining”, especially on an organizational level ensures that the benefits resulting out of “Multiple Perspectives” and creative conflicts are exploit.
The analysis exhibits also an interrelation between “Imagining” and “Memory” (see figure 8). Especially experiences, but also formalized data contributes to the organizational development of ideas. Thus, the second subgroup of “Imagining” interrelates with “Memory”. Additionally, taking part at organizational development of ideas and getting to know thoughts of other people enlarges one’s own experience. In other words, those who are included into the process learn during the process, on the one hand about ideas and imaginations from others and on the other hand about the process itself.
“Imagining” is a process taking place in the virtual and needs to be triggered or at least allowed. At this point an interrelation between “Imagining” and “Attitude” arises (see figure 9). On the one hand the basic “Attitude” about risk, failure or problems, influence whether employees feel comfortable sharing, also crazy, risky ideas. On the other hand, an organization needs to support employees, during an imagining process, e.g. by providing time, or by mediating when conflicts arise. However, imagining processes might also shape an organization’s “Attitude”, for example by allowing extra ordinary ideas.
The analysis as well exhibits an interrelation between “Experimenting” and “Attitude” (see figure 10). An appropriate “Attitude” is essential and referring to “Leadership” it is important that leaders convey that it is fine to try and fail. Moreover, “Experimenting” requires support. In form of specific tools, time or other assets. However, “Experimenting” might also trigger others to stop looking for reasons why an idea might not work out and instead start trying and review the experiment.
Discussing about interrelations, exhibits that the basic relation between “Design Practices” and “Design Enablers”, is left unclear. Nevertheless, interrelations between and within the categories and subcategories exist.
5 Discussion

The results illustrated in the last chapter must be perceived from two different viewpoints. On the one hand as results, providing new knowledge to the scientific discourse. On the other hand, as foundation for subsequent qualitative and quantitative investigations. Regarding subprocesses and subcategories, the results provide insight into the creative process, since the main and most important tasks within the single categories, are identified. Additionally, key indicators are proposed within the thesis, which are derived from the subcategory analysis. These key indicators should not be perceived as fixed or unalterable, especially measurement units and reference values should be perceived as flexible, since different industries demand different procedures within the process. However, the thesis does not particularly discuss measurement units or reference values, hereof a quantitative investigation would be necessary. Nevertheless, generating key indicators is a first step within the operationalization of DT and in combination with other qualitative studies, the key indicators are a precondition for quantitative investigations. Regarding interrelations, the thesis provides a superficial overview, of how different categories influence each other. It turned out, that the basic interrelation between design practices and design enablers is unclear. The illustrated interrelations exhibit, that trying to improve the performance in one category influences also others. Thus, those who apply DT must not view the categories as insulated procedures. Anyway, literature about DT already suggests that the different parts or movements are overlapping. The results displayed in the previous chapter, reveal specific and concrete interrelations, which have been identified within the analysis.

Relating the results to the basic literature about creative problem solving, once more elucidates that the creative process is tremendously complex and includes various aspects. Nevertheless, by making first proceedings within the operationalization of DT, the results contribute to the measurability of creativity. Although it may be expected that measuring creativity and thereby producing an ultimate process for the generation of innovations, is not possible. Anyway, the thesis might be used as a springboard for subsequent investigations, since various questions, also one of the main questions, trying to distinguish a creative process from a noncreative process, could not be answered. Referring to DT, it can be
proposed that investigating DT always means to investigate a creative process. Thus, practitioners profit from DT by receiving a framework for actions and scientists profit by receiving a framework for investigations. The DT concept itself is arranged in different ways, the results propose that uniform underlying processes, or in other words subcategories exist. The subcategories contribute to the accuracy of the concept. Although talking about accuracy, DT and creativity in the same breath seems irrational, science demands it and even though an ultimate, exact and detailed description of DT will never be established, recurring parameters, subprocesses, etc., exhibited by analyzing DT enables those who investigate DT to establish continuously more detailed concepts or models.

By reference to the results of the qualitative analysis and the knowledge provided by the theoretical introduction, a rearranged model can be suggested, within the discussion of the thesis. Following the model is presented (see figure 11) and described afterwards. It must be indicated that the suggestions for the rearrangement is part of the discussion and the suggestions cannot entirely be verified by reference to the interviews.
“Attitude” is utilized as a broad foundation for DT. Once “Attitude” exists in a proper pattern, the subsequent processes can build on it. If one looks at the outcome of the process and at “Attitude” as an unattached category, it is hardly possible to determine its contributions to the outcome. Thus, “Attitude” influences rather indirectly and enables the process. This circumstance has also been taken in account by Bauer (2016), since “Attitude” is assigned to the group of “Design Enablers”. Nevertheless, the position of “Attitude” or the level within the model changed. Supporting other “Design Enablers” and “Design Practices”, “Attitude” is located at the bottom as a foundation and precondition. “Multiple Perspectives” as well as
“Switching Governance” build on “Attitude” and surround the process. “Switching Governance” is closer to the team or group executing the tasks (to the design practices) within the process than “Multiple Perspectives”. Both are suggested to be less fundamental than “Attitude”, but nevertheless constantly present during the process. “Memory” possesses a special role, because it is the only “Design Enabler” capable to directly influence the outcome, e.g. by introducing specific ideas designers remember, but also indirectly by unconsciously adapting actions based on experiences and memories. Thus, “Memory” on the one hand enables the process and on the other hand directly contributes to the outcome. Another peculiarity of “Memory” is, that it is not present during the whole process, only at those points where designers consciously or unconsciously introduce their memories.

Referring to “Design Practices”, the changes that could be suggested after conducting the qualitative analysis and discussing the results are superficial, in comparison to those suggested for “Design Enablers”. Nevertheless, as also presented in the previous part of the thesis, especially interrelations should be investigated. The arrow in figure 11 illustrates interrelations between all “Design Practices”. This illustration might appear as superficial and vague, the reason for that is the complexity of the process. Introducing the interrelations that have been discussed in the previous part of the thesis would lead to an incomplete figure, because presumably many more interrelations than those presented in the previous part of the thesis exists. Therefore, the importance of interrelations can be suggested, but due to the complexity of interrelations no faithful and justifiable suggestions for an all-embracing amount of interrelations can be suggested. Moreover figure 12 exhibits that “Design Practices” are not located next to “Design Enablers”, “Design Practices” build on them. Thus, the existence of “Design Enablers” is a precondition to start a DT process and should be ensured, before the processes starts.

5.1 Limitations

Talking about processes within teams, departments or companies, always means to talk about humans and their behavior. Descriptions provided by executives do not exactly mirror these processes. Additionally, within creative processes various not consciously intended actions
and procedures are executed, therefore executives are not aware of them. Moreover, teams or departments might also protect themselves by not communicating everything to the executives. However, the analysis relies on executive’s descriptions and while reviewing the results this must be kept in mind.

The seven interviews have been conducted in basically five different industries. It can be suggested, that interviews in only one industry would have led accurate results. Although it might be suggested that the creative process is one and the same, does not matter in which industry it takes place, the underlying procedures are different. Additionally, analyzing seven interviews does not allow to specifically look at different industries, looking in different industries demands a higher number of interviews, but analyzing such a high number of interviews, generating results for different industries and afterwards merge it, is beyond the scope of the thesis. Additionally, the data had to be interpreted. Such interpretations diminish the validity of results although the author conducted the analysis and interpretations in all conscious.

5.2 Implications for practice and research

Within practice DT is well established and a vast amount of literature is offered to those who apply DT. Nevertheless, some further implications, can be suggested. Practitioners need to take in account interrelations, while applying DT. Moreover, as the analysis has shown practitioners can establish a measurement system by taking in account key indicators. Thereby, practitioners enable to look at their performance within the single categories. However, the results of such measurements demand an adequate interpretation, also considering the interrelations between the categories.

Research does basically focus on models, the thesis might be a springboard for deeper investigations, with a stronger focus on underlying processes, their interrelations and the measurement of these processes. However, qualitative analyses are not enough. As a first step, subsequent qualitative analyses should be conducted, separately viewing industry, interviewing not only executives but also people directly involved in the process and also observations should be accomplished. Once such qualitative investigations have generated
results, they need to be verified by quantitative analyses. Such a procedure for further research can be suggested for the investigation of subprocesses, key indicators, interrelations between different categories and similar issues about DT.

Additionally, a theoretical approach, for a deeper understanding of the underlying processes within DT, can be exercised. Looking for existing theories relating to certain parts of DT might lead to a mosaic composed of different theoretical concepts, that jointly describe the whole DT process. Anyway, various issues within in DT and the creative process are not clarified, yet. Probably some issues will never be solved.
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