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Applying Customer Insight Studies to Enhance Radical Innovation

An action based case study in the construction tool and equipment industry

*Master of Science Thesis
in the Management and Economics of Innovation Programme*

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Abstract

That radical innovation supports economic growth is well known since long. Even so, many large companies show poor performance in the field and innovation initiatives often fail. This has led to that companies have started to request their own organisation to work with innovation with the purpose to increase their performance. One of the main reasons to failure in radical innovations is described to be the lack of deep customer insights.

Gathering customer insight is often underestimated, but there are some methodologies (Ethnographic Studies and Repertory Grids Technique) that have shown previous success in this field. One company that puts major effort in innovation and that aims to become even better is the technology-oriented company Hilti AG. Hilti provides tools and equipment to a global market in the construction- and energy industry. The purpose of this project is therefore to investigate how the company can use a more customer centric approach in innovation by applying the Deep Customer Insight methodologies. It also explores how these methodologies can contribute to the overall radical innovation capabilities and also, the overall benefits and challenges of applying the same. In order to fulfil this purpose the project applies an action research approach, meaning that the methodologies are practised in the context of Hilti. This iterative course of action enabled to continuously make adjustments in the methodologies, and thereby better explore the applicability but also the benefits and challenges of the methodologies.

The study reveals the challenges in applying the methodologies in a rigid organisation as it caused complications in the preparation as well as in the execution. Besides, the methodologies are also strongly dependent on the customers' business and environment, which resulted in difficulties when trying to access the operator who had a central role in one of the methodologies. However, the Ethnographical studies show high potential in execution due to its very structured approach that reveals new perspectives meanwhile the Repertory Grids Technique has poor outcome due to the participants' insufficient reasoning abilities and the stressful work environment. In general, the methodologies show potential in supporting overall radical capabilities as they, among other things, enable to establish a complete innovation process that encourages working across boundaries. For successful implementation, the methodologies require major organisational- and cultural changes and investment in education and training.

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1. Introduction

The introducing chapter encompasses the project background and clarifies the purpose of the project. The purpose is then further described in form of three research questions that compose the core and therefore the main focus of the project. For better understanding of the project frames, the delimitation clarifies what is excluded from the project. Lastly, an overall description of the structure and the content in the report can be found in the project outline.

1.1 Background

That radical innovation supports economic growth and creative destruction is well known since long. Even so, companies show poor performance in the field (Robbins, P., 2014) and innovation initiatives often fail due to difficulties in establishing a sustainable innovation capacity. (Pisano, G. P, 2015) The importance of innovation and the tendency to have lacking capabilities can be noticed in the list of Fortune 500 companies where 87% of the companies that were present in 1955 were replaced in 2011. (Perry, M., 2011) The continuous failure in radical innovations has led to that companies have started to request their own organisation to work on innovation (Robbins, P., 2014) with the target of achieving better results.

The innovation capability is a complex term consisting of both internal and external variables (Metz, I., *et al*, 2007) but is in relation to radical innovation expressed by Stanley F. Slater *et al* (2013) to be the dynamic ability to retain alignment with changing customer needs. In line with the previous definition, Keith Goffin *et al* (2010) also argue that one of the key reasons to failure in innovation is due to lack of understanding of customer needs. This highlights the importance of preparing the company with the ability to understand and incorporate customer needs for successful innovation. But understanding customer needs or gaining customer insight is not always that easy as the customer might not be aware of- or able to articulate their needs. It is therefore essential to use dedicated methodologies for this purpose. (Goffin, K., *et al*, 2015) But, gaining insight is not only to understand the need per se but also to understand the reason why the customer think and behave like they do. (Price, R., *et al*, 2015)

One market leading company that provides tools and equipment for the construction- and energy industry and that shows major effort in innovation is Hilti AG. The company is characterised by the strategic focus to continuously provide highly differentiated and qualitative products, services and

software for their customers. Furthermore, the high importance of the customer is shown in the company's unique organisational structure, which includes a market organisation that has daily contact with the customer. This has created a network built on strong relations and with daily customer contact. Regarding innovations, Hilti has mainly taken a strong technical focus, which is in line with the characteristics of their products. At the same time, the management expresses the need of more long-term ideas whereby it will in this report be investigated how the technology driven company can use customer driven methodologies to steer the innovation towards this direction.

1.2 Purpose

The purpose of this project is to evaluate how customer insight methodologies and techniques can be implemented and used to enhance radical ideas, and this is done by a case study in the construction- and energy tool industry. By applying an action research approach, the project aims to bring understanding of benefits and challenges from such implementation and also, investigate how that can contribute to the overall radical innovation capabilities.

1.3 Description of Purpose and Research Questions

Revealing hidden needs by gathering customer insights is still an evolving field and therefore there are no techniques that are generally accepted. However, there are some techniques that have been recognised in leading edge market research (Goffin, K., *et al*, 2010) and it is therefore of interest to explore how these can be used and adapted to this particular case. Furthermore, the study aims to investigate how the implementation and usage of the methodologies can contribute to the overall radical innovation capabilities, and what benefits and challenges there are in applying these.

- 1. How can identified techniques for gaining and interpreting deep customer insights be used in the construction- and energy tool industry for enhancing radical innovation?*
- 2. How could implementation of such methodologies facilitate overall radical innovation capabilities?*
- 3. What are the benefits and challenges in implementing and using these methodologies?*

1.4 Delimitations

Customer Insights, which is the core of this project, is a broad term and can be approached in several stages and ways during the innovation process. This project is limited to the early phase of the innovation process and considers only gaining, interpreting and translating customer needs. The direct outcome of the studies will therefore not be evaluated, as for example the quality of the discovered needs and their level of novelty. Furthermore, the study is limited to two techniques that are proven to be successful in the relevant area; Ethnographic studies and Repertory Grids Technique. The project is based on one field of application in the targeted industry, and it is also mainly concentrated on one market organisation. Since the business trades are considered to be quite similar in terms of organisation, relation and customer profile, this choice is assumed to not have had any remarkable impact on the study. However, the impact of using one market may have had some influences, as there are can be differences in, for example, cultures and regulations between organisations. The limitation in time impeded making any further studies on other markets, whereby this impact could not be avoided.

1.5 Outline of the Thesis

The initial part of the report contains the literature review, which describes the area of study by presenting existing literature in the field. This is followed by the methodology chapter, which explains how the study is approached to answer the research questions. This chapter only contains how the methodologies have been applied meanwhile insights and evaluation from the studies are discussed in Chapter 4. *Empirical data*. That chapter contains all the empirical data that is in the following chapter analysed in combination with the earlier presented literature. The final part, the conclusion, is a summary on how well those techniques for deep customer insights can be applied in this particular industry and also, how well they facilitate overall radical innovation and what the benefits and challenges are in using those.

2. Literature Review

The literature review explores earlier existing literature that is relevant for the study. The review considers the key areas; *Radical Innovation, Innovation Strategy and Process, Customer Integration in Front End Innovation (FEI)* and *Customer Needs and Customer Insight Methodologies*.

2.1 Radical Innovation

The correlation between business growth and innovation is commonly accepted (Leifer, R., *et al*, 2000) and indicates the importance of innovation in large companies. One way of explaining innovation is as follows; *lean* makes a company competitive, *incremental innovation* enables the company to remain competitive and *radical innovations* make the game change. (Leifer, R., *et al*, 2000) Out of these, the main focus in this report is on radical innovation, which does not yet have a clear definition. Although, researchers generally agree that it can be expressed as the change in technology (Cabello-Medina, C., *et al*, 2006). The term is also strongly related to the market and organisational capabilities and that is why Gina C. O'Connor and Alan D. Ayers (2005) define radical innovation as “*the commercialization of products and technologies that have strong impact on 1) the market, in terms of offering wholly new benefits, and 2) the firm, in terms of its ability to create new businesses*” (O'Connor, C. G., Ayers, D. A., 2005, pg. 24). Moreover, they argue that radical innovation is strongly related to uncertainties and risks due to that the new areas often require establishment of new capabilities. The major uncertainties are related to technology, market, organisation and resources. (Gassmann, O., *et al*, 2012) The accumulation of those uncertainties often results in that radical innovation gets a lower priority than the daily operational business. (Gassmann, O., *et al*, 2012) Technical uncertainty refers to knowledge related to, for example, feasibility and maintainability meanwhile market related uncertainty addresses the requirement of understanding- and translating needs. Organisational uncertainty refers to managements' lack of support in favour for day-to-day business and resource uncertainties considers the importance of using required internal as well as external resources. (Gassmann O., *et al*, 2012) Another perspective of radical innovation can be described by requiring *exploration capabilities* and also the potential to change relations, create new portfolios and disrupt markets. Such transformations can lead to the fall of the companies that decide to remain in the current technology. (Leifer, R., *et al*, 2000)

Richard Leifer *et al* (2000) describe how radical innovation can be segmented into different categories depending on its relation to existing business. The categories are as follows; *Innovation within existing*

business, Innovation between existing businesses (so called “white spaces”) and *Innovation outside current business* (see Table 1). (Leifer, R., et al, 2000) Radical innovations that refer to *Innovation within existing business* are those that target existing markets and customers but challenge current technology. As the customer is often well known it results in that the market acceptance often is high, which results in low market risk. Consequently, these innovations are commonly cannibalising on existing products and tend to have high technology uncertainty. The category of *Innovation between existing businesses* refers to those that are in line with existing company strategy but still requiring a new place in the organisation. These markets are therefore new for the company. (Leifer, R., et al, 2000) This could therefore be interpreted as having a higher market risk, but lower cannibalisation compared to the previous category. The last category *Innovation outside current business* refers to the creation of complete new markets. (Leifer, R., et al, 2000) These target new customers and put high pressure on the organisational change. The major transformation also requires strategic redirections. (Leifer, R., et al, 2000)

Table 1 - A classification of radical innovations and their structural differences and risks. [The author’s own illustration] (Leifer, R., et al, 2000)

Structure	Type of Innovation		
	Within Existing Business	Between Existing Business	Outside Existing Business
Customer/Market	<i>Existing</i>	<i>New</i>	<i>New</i>
Strategy	<i>Existing</i>	<i>Existing</i>	<i>Require Change</i>
Organisational	<i>Existing</i>	<i>Require Change</i>	<i>Require Change</i>

2.1.1 Success Factors in Radical Innovation

Radical innovation tends to lead to varying results and this chapter describes what factors that could have a positive impact on radical innovation. Boston Consulting Group has defined five key domains that are critical for success (see Figure 1). The first element, *the process*, is recommended to take a non-linear approach and to consist of multiple solutions. It should also be flexible and enable taking different paths (Küpper, D., et al, 2013) while also supporting innovation in an efficient way. (Desai, J., 2013) *Methods and tools* for identifying and foreseeing latent needs are also necessary for successful innovation. (Küpper, D., et al, 2013) In relation to this, Jatin Desai (2013) explains how all type of innovation require a systematic approach that uses and establishes a common language, which is familiar to everybody in the organisation. Regarding *KPIs and decision making* it is proven to be successful to apply action and control rather than passive monitoring and prediction making. The relation between radical innovation and risks is earlier described and that enhances the significance of

considering risks in decision-making. It is also important to enable fast decision-making. (Küpper. D., *et al*, 2013) As radical innovations have different requirements than incremental ones, the company should also distinguish two different processes. The *organisational structure* should have an open structure that supports both internal and external collaboration. (Küpper. D., *et al*, 2013) Open *collaboration* is related to employee engagement, which is required throughout the whole organisation. This allows involvement of all types of individuals and enables to capture their different knowledge and experiences. (Desai, J., 2013) Innovation should also be considered as critical by the management who should engage in and lead all kind of innovation initiatives in the company (Desai, J., 2013) by for example ensuring requested resources. (Küpper. D., *et al*, 2013) The company culture also needs to be focused on gathering insights and generating ideas. (Desai, J., 2013)

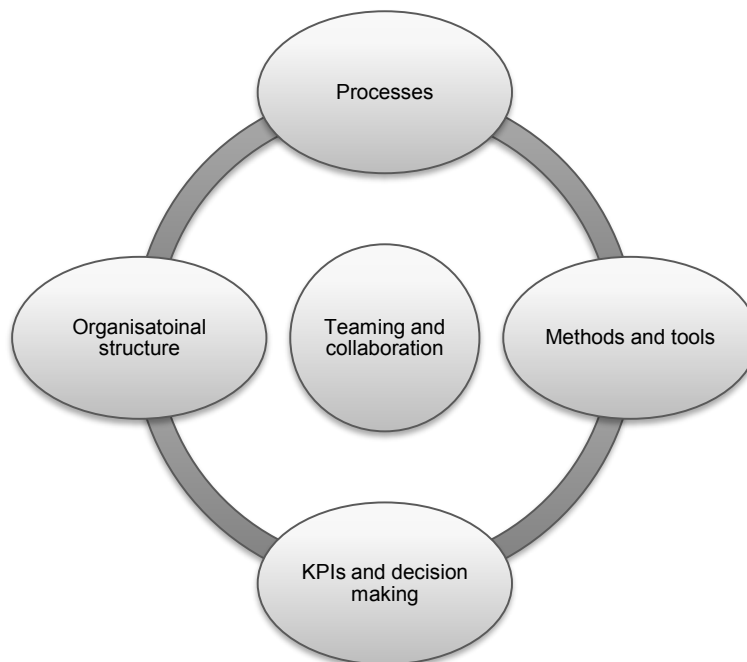


Figure 1 - The five key components of successful system for radical innovation. [The author's own illustration] (Küpper, D., *et al*, 2013)

2.1.2 Challenges in Radical Innovation

A part from the identified success factors, there are also barriers that prevent expected results in radical innovations. Birgitta Sandberg and Leena Aarikka-Stenroos (2014) have in their study listed the key challenges for both large companies and for companies with a business-to-business relation (see Table 2). The study shows how large companies tend to apply a too narrow mind-set, lack the

competency for discovering opportunities and have an unsupportive organisational structure. A too narrow mind-set is often caused by established routines that prevent new initiatives and the insufficient competency for discovering opportunities refers to the lack of an appropriate methodology to evaluate opportunities in the market. Meanwhile, the unsupportive organisational structure is explained to be the internal conflict between the current business and the attempts in radical innovation. Externally, larger organisations face barriers in terms of customer resistance, insufficient networks and ecosystems and instability in technology. Customer resistance refers to the customers' inability to articulate their needs and the insufficient network and ecosystem address the lack of support in adapting innovations. The instability in technology refers to rapid development and changes in technology. In line with large companies, companies with Business-to-business relations are also characterised by a restrictive mind-set and an insufficient network and ecosystem. Additionally, they challenge lacking incubation capabilities and governmental support where the former refers to the ability to link technology and market, meanwhile the latter refers to the alignment of business and regulation. (Sandberg, B., Aarikka-Stenroos, L., 2014)

Table 2 - Radical Innovation barriers. [The author's own illustration] (Sandberg, B., Aarikka-Stenroos, L., 2014)

Barriers	Large Companies	Business-to-Business
Internal	<ul style="list-style-type: none"> - Restrictive mind-set - Lack of discovery competences - Unsupportive organisational structure 	<ul style="list-style-type: none"> - Restrictive mind-set - Lack of incubation competences
External	<ul style="list-style-type: none"> - Customer resistance - Insufficient network and ecosystem - Technological instability 	<ul style="list-style-type: none"> - Insufficient network and ecosystem - Unsupportive government

In line with the previous authors, Keith Goffin *et al* (2010) express the inability of customers to express their needs and the organisational capabilities to find and evaluate opportunities to be key challenges in successful radical innovation. Moreover, they point out the dynamic characteristics of customer needs and their tendency to change over time. (Goffin, K., *et al*, 2010) Today's easy access to information enables customers to rapidly evaluate and switch among suppliers (Anne, R., *et al*, 2015), which require the companies to absorb and respond to those needs in short time. (Goffin, K., *et al*, 2010)

2.2 Innovation Strategy and Process

A product or service needs to go in line with the values of the customers as well as the company to become successful, and that is why having an *Innovation Strategy* is so important. (Dodgson, M., *et al*, 2008) Many companies are shown to lack an innovation strategy and act as if innovation is the outcome of an accident or ad-hoc occurrence. Instead, it is recommended to prioritise innovation to prevent it from being a short-term hype and instead including it in long-term success. (O'Connor, C. G., *et al*, 2008) It should therefore be built on the company's long run objectives and support in conducting efficient innovation. The innovation strategy derives from the company's overall strategy and decides which areas that should be focused on in the future. (Gaubinger, K., Rabl, M., 2014) An innovation strategy is either one out of two lead innovation strategies or otherwise a fast follower strategy. The lead innovation strategy is either primarily technology driven or need seeking. The former aims to deliver solutions for unarticulated needs by investing in- and developing new technologies meanwhile the latter is focused on a well-developed end-user understanding. It is rare that the strategies are applied alone and are instead mainly used in combination. (Jaruzelski, B., *et al*, 2011) The strategies have in common that they combine customer needs and problems with suitable offers, and that is what results in value, both for the customer as well as for the company. (Gaubinger, K., Rabl, M., 2014) The existence of different types of radical innovations reveals the importance of establishing a strategy that allows reaching the targeted type of radical innovation, which is confirmed by Gina C. O'Connor and Richard DeMartino (2006) who argue that missed opportunities could be the result of applying too narrow strategies.

The innovation strategy is fulfilled by the innovation process, which can be illustrated in several ways, both as loops and as sequences. Peter Koen *et al* (2001) explain it to consist of three sub-processes; Front End of Innovation (FEI) (also known as the Fuzzy Front End), New Product- and Process Development (NPPD) and Commercialisation. The innovation process has lately gained a major focus in larger firms at the same time as managers tend to focus on the later parts of the process. (Gassman, O., Schweitzer, F., 2014) The later parts refer in this case to the NPPD and Commercialisation. Therefore, these parts are more structured and have, for example, established processes and roles compared to the FEI that is often more uncontrolled. (Gassman, O., Schweitzer, F., 2014) The tendency is widely spread even though the outcomes of innovation activities are strongly dependent on the Front End of Innovation, (Gassman, O., Schweitzer, F., 2014) as it decides the initial level of the research and development attempts. (Eling, K., *et al*, 2013)

Peter Koen *et al* (2001) explain the FEI in their *New Concept Development Model*, see Figure 2, which aims to establish a common language for the otherwise misleading term Fuzzy Front End. They argue that the term gives strong association to that early stages of the innovation process have to be unstructured and chaotic by nature. Instead, employees can be guided by a process, which enables putting full attention on creativity and leads to a more deterministic approach. (Gaubinger, K., Rabl, M., 2014)

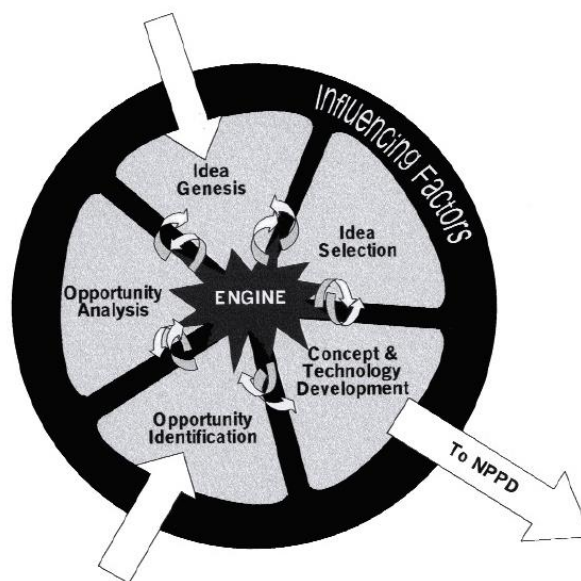


Figure 2 - The New Concept Development Model illustrates the components of the Fuzzy Front End. (Koen, P., *et al*, 2001)

The NCD contains three key components: the Engine, the Influencing Factors and the Five Front-End Elements. The circular design illustrates a flow of ideas that use the relevant elements as well as combination of elements. *Engine* refers to leadership and culture and *influencing factors* intends the environment in which the organisation operates. The environment can be further described in the terms business strategy, competitiveness, organisational capabilities and maturity of technologies. The five *front end elements* are the activities in the FEI process; Opportunity Identification, Opportunity Analysis, Idea Genesis, Idea Selection, Concept and Technology Development. It has been avoided to illustrate these as a process since that could lead to forcing an inappropriate structure. In *Opportunity Identification* the company identifies new potential opportunities that might be interesting for the company, and this phase is driven by the business strategy. The content of this element is mainly the

applied technologies and methodologies and can both be of a formal- and informal character. The accomplishment of those can result in everything from a smaller upgrade or a new product to a new manufacturing technology. (Koen, P., *et al*, 2001) The opportunities often require deeper analysis to assure the foreseen potential, which is conducted in *Opportunity Analysis*. Execution of this element aim to gather more information about the potential opportunity with the purpose to reduce technology- and market risks. Depending on several factors as, for example, the relevance of the idea, different level of effort is dedicated for this activity. *Idea Genesis* refers to the birth, development and maturation of an idea. The activity is iteratively evolving and ideas often reshape over time. In this phase it is common to include external partners as well as clients to increase the leverage. (Koen, P., *et al*, 2001) Richard Leifer *et al* (2000) explain the idea generation to be derived from two different sources; the technical and the market need. Technical ideation is often driven by curious engineers and can be derived from the discovery of either new technologies or new insights of existing challenges. Radical ideas tend to come from non-obvious information that in combination with other information becomes a new insight. The market drives instead ideas that are mainly related to the company strategy or unsolved problem in the market. So either of these sources can lead to a recognised opportunity, but it can be difficult to use both types since, for example, a researcher in technology might lack the natural ability to identify market potential. (Leifer, R., *et al*, 2000) New ideas are often described as suddenly appeared without any progress time, but Steven Johnson (2010) expresses ideas as a network that often needs time to mature. The phenomenon of combined ideas is called collision, and reforms the initial idea. This requires an environment where ideas can meet and develop. Another factor that drives this development is the connectivity and access to larger networks so that new perspectives become available. (Johnson, S., 2010) The ideas are often adding up to a great number and it is therefore essential to select and prioritise among ideas, this is conducted in *Idea Selection*. The selection can be based on a formal process but it can also be influenced by the individual's own selection among own ideas. At this point, the financial impact is often difficult to estimate and thereof other factors such as business relevance, risks, capabilities and uniqueness might be more suitable parameters for evaluation. The last element considers *Concept and Technology Development*, which is the creation of a business case based on market- and technology estimates, among others. Technology uncertainties can be treated in a particular technology development process, this process can either be included or not included in the NCD process. (Koen, P., *et al*, 2001)

The importance of FEI is shown in a study with 23 companies to identify what elements of the NCD that was most important for innovative success whereof it became clear that successful companies in innovation showed better performance in FEI than less successful companies. The same study shows that the most difference is derived from the elements *Engine*, *Opportunity Identification*, *Idea Selection* and *Technology Development Process*, see Figure 3. In contrary, *Idea Generation* and *Concept and Technology Development* show a smaller difference and can therefore be assumed to have lower impact in the innovation performance. (Koen, P., et al, 2001)

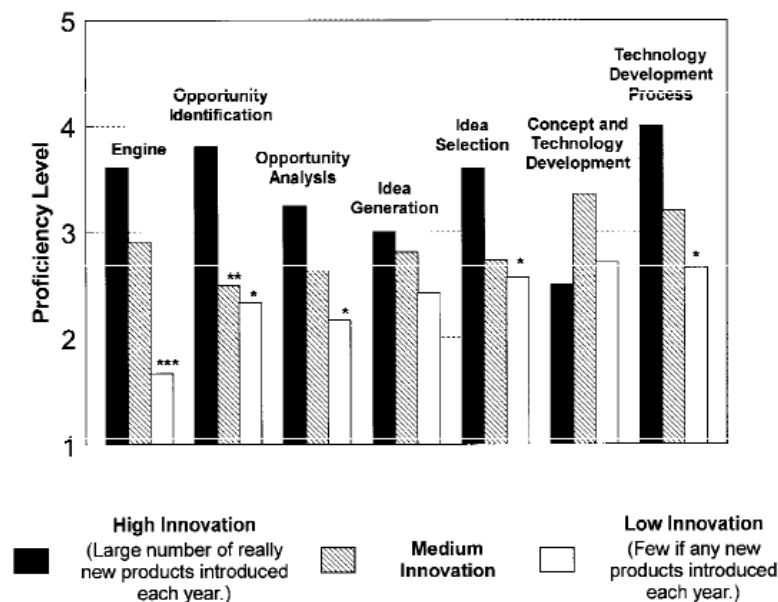


Figure 3 - The proficiency levels of the different NCD components in relation to innovation capacity. (Koen, P., et al, 2001)

2.3 Customer Integration in FEI

A common trend is the increased involvement of external partners to absorb knowledge and insight outside the company and a potential partner is the company’s own customer. (Schweitzer, F., 2014) One of the reasons behind this trend is that it is not longer sufficient to achieve competitive advantage by providing the lowest prices, technology breakthroughs or incremental development. (Anne, R., et al, 2015)

Customer involvement is a broad term but can be explained as two different types of integration; need- or solutions based. (Schweitzer, F., 2014) The former aims to gather current and future needs by

applying customer insight methodologies (Goffin, K., *et al*, 2010) meanwhile the latter approach requires the customers to support in creativity and with technical expertise. Gathering customer insight is a commonly accepted source for data collection but the quality of the data is vividly discussed since the customers' ability to contribute is highly requested. It is frequently argued that the customers are too biased of the current environment that experts are more likely to come up with innovative solutions. At the same time, there are studies that show on the opposite, that the results from customer input tend to lead to outcome with higher level of novelty than ideas from professionals. (Schweitzer, F., 2014)

The key purpose of involving the customers is to reduce technical- and market uncertainties, but it can have other benefits as well. It can for example strengthen the relation to the customer and build trust between the parties. Furthermore, it can be used for increased sales as the involvement of customers with similar profiles as the customer can result in a lower buy-in. (Schweitzer, F., 2014)

There are different methodologies to apply when selecting the type of customer to involve. For mainly discovering current needs the key focus is to find a sample that represents the whole group of customers. (Goffin, K., *et al*, 2010) For discovering latent needs it is often more suitable to target lead users as these users often develop needs before others. The fact that lead users themselves often are aware about the need make them often willing to participate in the study. Important when analysing customers with business-to-business relation to the companies is not to mix the definition of lead-users and important customers, as those considered important customers are often very involved in the company already and will not contribute with the critical information that is required. (Schweitzer, F., 2014)

2.4 Customer Needs and Customer Insight Methodologies

This chapter explains what customer need is and how that could be understood by applying so called Deep Customer Insight methodologies. The benefits and challenges from using the methodologies are then described, and also a suitable way of how they can be implemented in the organisation.

2.4.1 Customer Needs

Related to the changing customer needs, there is a growing trend in using customer requirements as an indicator for satisfaction (Madzik, P., 2016) but all customers' needs are not always easy to grasp by the company or to express by the customer. The Kano model explains how different needs behave

related to Customer Satisfaction and Degree of Implementation, see Figure 4. The model divides customer needs into three different categories that all behave differently in correlation to these two variables. The categories are the following; *Basic Needs*, *Performance Needs* and *Excitement Needs*. Although, the categorisation of needs is not static and what is considered to be a basic need today can have been considered to be an excitement need a decade ago. (Goffin, K., *et al*, 2010)

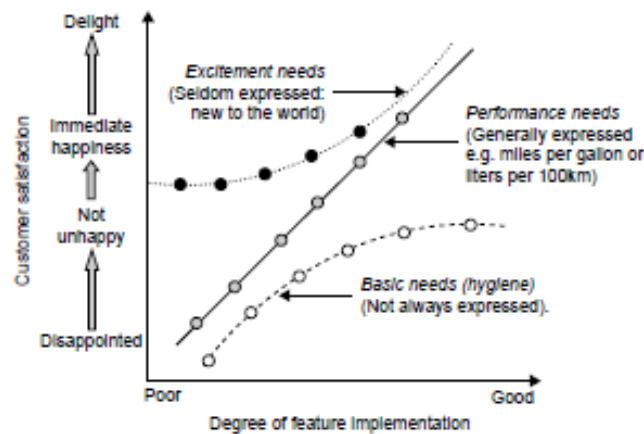


Figure 4 – An illustration of the Kano Model, showing customer need in terms of customer satisfaction and feature implementation. (Goffin, K., *et al*, 2010)

The *basic needs* are the minimum required needs to be fulfilled by the provider to even be considered by the customers. (Coleman, L. B., 2014) These needs are considered so obvious for the user that they will probably not mention them if being asked about important features. As the picture indicates there is no need for the company to try to excel above expectations regarding these needs, as it would not lead to any further satisfaction for the customer. (Goffin, K., *et al*, 2010) The *performance need* is instead referring to the functionalities that are continuously improved for a certain product (Coleman, L. B., 2014) and can, for example, consider battery time or power. It is also important to be aware of that even though the minimum requirement is static, the customer expectations increase in pace with the performance. (Coleman, L. B., 2014) The customer commonly expresses those needs when being asked about them, and the satisfaction increases in line with the level of fulfilment. (Goffin, K., *et al*, 2010) The *Excitements needs*, or *delighters*, are exceeding the customer’s expectations by predicting their current and future needs. (Coleman, L. B., 2014) As those factors are new to the market they bring high satisfaction by non-expected values. The customer rarely expresses the features that belong to this category but might be pleased and satisfied when they are being presented. (Goffin, K., *et al*, 2010)

Keith Goffin *et al* (2010) describe the importance to fulfil all these different needs to develop a successful product and at the same time, the model requires the innovation team to reason from the customer's perspective. But important to note is that satisfaction is not equal to loyalty, as the customer still have the potential to seek other opportunities. (Coleman, L. B., 2014) And since customer loyalty is what drives business the company should not only concentrate on the satisfaction but also aim for loyal customers. (Coleman, L. B., 2014)

2.4.2 New Market Research Methodologies for Gaining Deep Customer Insight

The previous chapter describes the different categories of customer needs and how some of these are more accessible than others. The accessibility is further impacted by the consequent underestimation of the required effort to gain deep customer insight and also, the increased market complexity and change rate. This makes proper understanding of the customer very challenging (Smith, B., Raspin, P., 2008) and it is therefore necessary to use suitable methods for this purpose. This chapter initiate to discuss what Customer Insight is and is then presenting useful techniques for revealing those.

The term *insight* does not yet have a common accepted definition in innovation and Paul Laughlin (2014) confirms that it is interpreted and used differently. According to him, the definition should be "*A non-obvious understanding of the customer, which if acted upon, has the potential to lead to change their behaviour for mutual benefit*". (Laughlin, P., 2014, pg. 76) This definition defines four key concepts where the first is *non-obvious* and refers to that many insights do not derive from a single source and instead require several accumulated studies. The insights need to be *actionable* which means being able to test, and not remain as a theoretical hypothesis. The insights should also be powerful enough so that when acting upon them, it will make people *change behaviour*. And lastly, it should be of the earlier described *mutual benefit* in the meaning of creating value for the customer as well as for the company for long-term success. The term is commonly misused (Laughlin, P., 2014) and terms as data, information and knowledge should not be used as synonyms even though they are strongly related. These terms can instead be described as stages under the transformation to value. (Smith, B., Raspin, P, 2008)

Market Research is used to gather information about the customers and the used methodologies are divided into two types; traditional- and Deep Customer Insight methodologies (DCI). (Price, A., *et al*, 2015) The former one considers methodologies such as Focus Group Interviews, Surveys and Traditional Interviews but do rarely lead to any radical outcome. (Goffin, K., *et al*, 2010) One of the reasons is that the captured knowledge is not explained on an individual level. (Price, R., Wrigley, C., 2016) Instead, the traditional ones are more useful when the users are able to express their needs but which also make them rely on self-reflection. (Price, A., *et al*, 2015) Suitable purposes could therefore be when trying to identify trends and for evaluating performance, (Price, R., Wrigley, C., 2016) which can take place in the concept development phase. They can also serve as a good complement to the DCIs when used for verification of the result. (Goffin, K., *et al*, 2010) Deep Customer Insight methodologies aim to put the company in the customer's shoes to enable deep understanding and empathy of their values and culture. The methods are of a dynamic nature, meaning that they can be used for several purposes and are suggested to adjust for each case. This requires different skills and resources than traditional methodologies and can otherwise experience to be a very confusing approach. It is also to consider that all methodologies are not successful in all environments and situations, and the appropriateness should therefore be considered before application. (Goffin, K., *et al*, 2010) Furthermore, they are strongly dependent on close interaction with the customer, which is something that can be difficult to organise and sometimes even impossible (Price, A., *et al*, 2015) and does in general require a lot of time. (Jane, M., 2016)

Keith Goffin *et al* (2010) have identified successful DCI methodologies that are referred to as the *new methodologies* and those are used to capture better understanding about the customers' problems, issues and culture. (Goffin, K., *et al*, 2010) The methodologies are new in the sense that they have not been widely used in this context and two of those are; Ethnographic Market Research and Repertory Grids technique (Goffin, K., *et al*, 2010). Read more about the studies in Table 3.

Table 3 - Two new methodologies to gather Deep Customer Insight. [The author's own illustration] (Goffin, K., et al, 2010)

Method	Purpose	Description	Methodology for Analysis
Ethnographic Studies <i>Systematic Observation</i>	To achieve deep customer understanding. Enables comparison between actual and claimed behaviour.	Observational study of customer in the customer' environment. Systematic approach that should be targeting distinct areas, e.g. a process or the customers' feelings.	<ul style="list-style-type: none"> - Decoding - Thick descriptions
<i>Contextual Interviews</i>	To achieve deep customer understanding. Enables explanations of reasons and backgrounds.	Interview technique applied in the customer's environment that is conducted in parallel as the customer operates.	<ul style="list-style-type: none"> - Decoding - Thick descriptions
Repertory Grid Technique	To reveal personal constructs and their presence in current products.	Structured interview technique to reveal the operator's constructs, and how these constructs are present in the discussed items.	<ul style="list-style-type: none"> - Statistical analysis - The behaviour between variation and average reveals common constructs that is a potential latent need.

A study based on 160 American companies made by Robert Cooper (2008) shows the spread of the above-mentioned techniques according to their experienced effectiveness in idea generation (see Figure 5). (Goffin, K., et al, 2010) The study shows that Customer visit teams, Focus Groups and Ethnographic studies are efficient methodologies, whereof the first two are most commonly used. The study also shows that the least efficient methodologies and techniques are those related to open innovation and could for example be external product designers, external submission of ideas or external scientific community. (Goffin, K., et al, 2010)

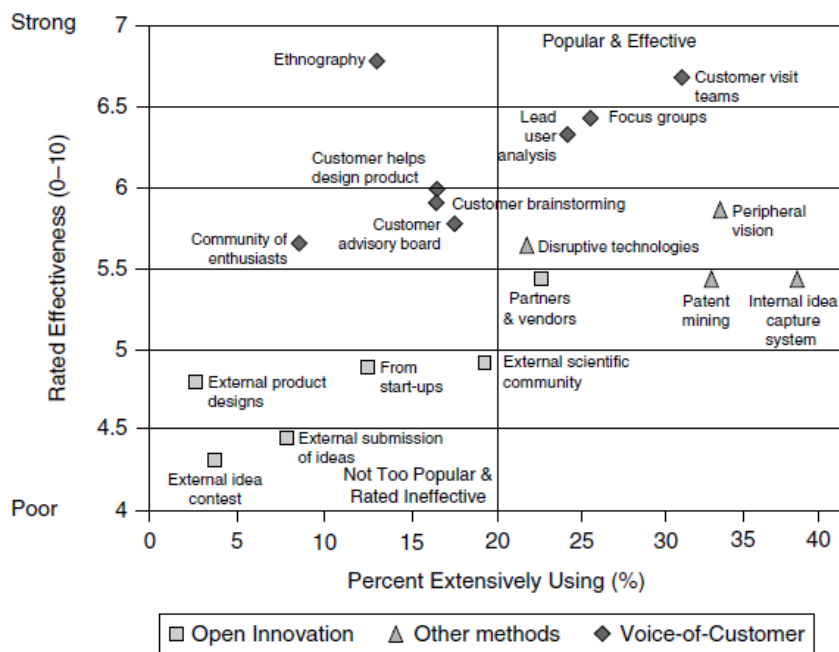


Figure 5 - Usage and Effectiveness of different market research methodologies for ideation. (Goffin, K., et al, 2010)

To properly understand the customers’ needs it is not sufficient to only use suitable methodologies. Instead, it should also be considered how the methodologies are applied (Weigel, T., Goffin, K., 2015) and how to handle that needs are changing over time. (Goffin, K., et al, 2010) The changes of needs require to continuously updating the outcome from the studies to consistently work with of accurate data.

2.4.2.1 Ethnographic Research

Ethnographic Research has developed and matured over many years and can be used to find opportunities for radical innovations, but the methodology has also shown to be efficient for understanding processes, habits and cultures. The methodology contains two main parts; *Systematic Observation* and *Contextual Interviews*. These two methods are complementing each other, as it is not always what the customer says that corresponds to the reality. Systematic observation is by many companies considered as casually watching the user but it is more complicated than that. (Goffin, K., et al, 2010) It should instead be applied systematically and be focused on a targeted area, which could for example contain the customer’s process, environment or feelings. To achieve the intended result, the methodology requires professional experience. (Goffin, K., et al, 2010) The observations can be proceeded in two ways; participatory or non-participatory. The former risks to influence the outcome

of the study as the presence of the observer might change the user's behaviour, which is called the Hawthorne Effect. The approach also requires a lot of from the observer that has to make observations and take fast decisions at the same time as being involved in the context. The non-participatory approach is less likely to be influenced by the Hawthorne Effect, as the users tend to forget that they are being observed when using video cameras instead of having the observer involved. The collected video material enables higher validation of the outcome since biases can be reduced if several persons analyse the same material. (Chapman, B. J., *et al*, 2013) Contextual Interviews is a semi-structured interview technique that is conducted in the user's environment. This methodology is carried out in the context of the user, meaning that the user should meanwhile performing daily activities answer to the interviewer's questions. (Ross, J., 2012) The questions enable the interviewer to get a background of the user, and encourage the users to explain their tasks (see Appendix 1). (Goffin, K., *et al*, 2010) This reveals the special nature of the interview, as the interviewee should take an active role and lead the discussion in comparison to the traditional way of waiting for questions from the interviewer. (Ross, J., 2012) This methodology is particularly gainful when trying to understand explanations behind behaviours such as for example feelings. (Goffin, K., *et al*, 2010) The format of the interview can sometimes be difficult for the customer to grasp, especially as the name invites for associations to traditional interviews. (Ross, J., 2012)

Nisaratana Sangasubana (2005) defines the first step in Ethnographical Research to be *Problem formulation*, which refers to the key focus of the study. Keith Goffin *et al* (2010) continue with the following process steps; *Understanding the field*, *Defining the study*, *Gaining access and introduction*, *Sampling strategy*, *Data collection and recording*, and *Data analysis*. By merging these steps we get a complete process illustration as in Figure 6.

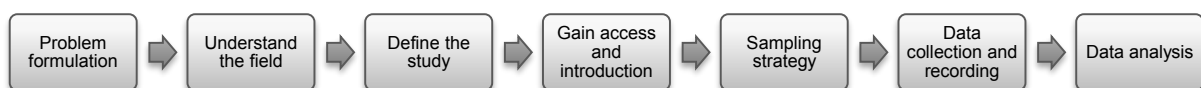


Figure 6 - The Ethnographic Research Process. [The author's own illustration] (Sangasubana, N., 2011) (Goffin, K., *et al*, 2010)

The first phase is to define the focus area of the study. In line with this scope, the ethnographer then needs to get a good understanding of the application field. One way to achieve this understanding is

to prepare a tour to meet customers that are operating in the targeted setting. This gives better understanding about the overall context of the customer and is useful for further design of the study. (Goffin, K., *et al*, 2010) Furthermore, the tour can support in other related decisions such as required competences, setup of teams and necessary preparation and training. The next process step, to define the study, means to clarify the type of study and could for example be to decide between applying a covert- or overt approach and/or between a participant- or non-participant approach. To enable execution of the study it is thereafter essential to get access to the necessary customer profile (Goffin, K., *et al*, 2010) and this is considered to be one of the most difficult parts of the study. (Bryman, A., 2012) Access means both in terms of time and privacy, and it could be worth making a major investment to get good access, as this factor can be critical for the whole study. (Goffin, K., *et al*, 2010) This often means to meet or communicate with the so-called gatekeepers that enable you to access the requested customer and setting. (Sangasubana, N., 2011) When access is confirmed, the ethnographer should present her-/himself and the purpose of the study for everyone involved, and it can be worth considering how the participants should be rewarded. The sampling strategy aims to go further into detail on when the study should be done, what activities to observe and whom to interview. All previous mention steps refer to the preparation and setup of the study, which is not to be underestimated. The study is applied iteratively and these steps do therefore continue to evolve over time as the study gets more targeted. (Goffin, K., *et al*, 2010)

The data collection is, as earlier mentioned carried out in the customer's field where the ethnographer should try to involve her-/himself in the user's environment. (Bryman, A., 2012) This could be achieved by for example using their language and following the jargon and all material should be collected in so called *Ethnographic records*. (Goffin, K., *et al*, 2010) The records can take different forms (video records, photos, tapes, field notes and copies of documents) and one of the major strengths of this methodology is that it enables both gathering quantitative and qualitative data. The records do necessarily not only consider the users perspective but should also contain the ethnographer's reflections. (Goffin, K., *et al*, 2010)

The analysis of the data should be carried out continuously during the execution as it enables to narrow down the scope and verify the different learning. To create a clear and unified structure, the data can be *coded* with help of a coding scheme (see Appendix 2), which enables to easier find repeated and conflicting data. (Goffin, K., *et al*, 2010) Coding is a process to review collected material

by labelling the content to find similarities and trends. (Bryman, A., 2012) This approach enables so called triangulation, which increases the validity of the outcome if the same result is derived from several sources. The scheme also supports the ethnographer to stay focused during the analysis, which is extra important, as latent needs are rarely expressed in words and therefore more difficult to note. The sorted data is then used to create *Thick Descriptions*, detailed summaries from the experience. The Thick Descriptions are used to express relations and contradictions, and could be written by two analysts in parallel to increase the validity of the outcome. The descriptions are then used for generating hypothesis from repeated events or behaviours, which thereafter should be verified by for example using traditional research methodologies. The ethnographer should during the study apply a reflective and critical mind-set as this allows finding contradictions and reflecting upon the observations. (Goffin, K., et al, 2010)

2.4.2.2 The Repertory Grids Technique

The other DCI methodology, *Repertory Grids Technique*, is built on the *theory of personal constructs* (Goffin, K., et al, 2010) and originates from psychology and anthropology. (Lemke, F., et al, 2010) The methodology bases on the assumption that people create constructs, or rules, to make sense of the world. The constructs are dynamic and change over time, and are influenced by external factors as for example the social context. This leads to variations among segments. The methodology enables to understand how people construct meaning, and when merging the result of individuals the similarities become the common construct for a larger group. (Goffin, K., et al, 2010) The methodology is particularly useful in cases when the topic is only known indirectly (Lemke, F., et al, 2010) but it is still not very well known as an innovation technique since it has been excluded from recent studies about insight methodologies. (Baxter, I., et al, 2014)

The process for this study is similar as the one described for ethnographic studies in Chapter 2.4.2.1. *Ethnographic Research* and this chapter covers therefore only the differences or other areas that need to be highlighted. Before starting the study it is essential to define the scope, which should include the elements: project aim, profile of interviewees and the targeted category of elements. (Goffin, K., et al 2010) The elements are the core of the methodology as it those that the interview is focused on; the term is further described later in this chapter. It is important to always adapt the study so that the participants and the elements are relevant for the scope. A descriptive example is that customers were

used as participants when comparing products in a business-to-costumer market meanwhile managers were used when evaluating suppliers in a business-to-business case. (Baxter, I., *et al*, 2014)

The interview is schematically illustrated in Figure 7 and starts with that six elements are either presented for the interviewee or asked to be defined by the same. The elements should be concentrated to a pre-defined topic and could for example consider products, services or processes. They should be explicit and definite to prevent confusion when starting to elaborate on the attributes. It is also important to assure that the interviewee has good knowledge of at least five of the elements since that is necessary in future steps of the process. The elements are then presented for the interviewee in randomised setups of triads from whereof the interviewee should define what is similar between two of the elements but different from the third. The result on this question becomes an attribute. The validation of each attribute is then rated on a scale from one to five for each of the earlier defined elements. This process is then repeated about 8-12 times and this is the reason why the user needs to have good knowledge in at least five elements, as the triads would otherwise not be sufficient. But good knowledge is also relevant to be able to conduct meaningful elaboration. Each interview takes about 45 minutes and previous attempts show that 20-30 interviews could be a number for indication to achieve a valid result. (Goffin, K., *et al*, 2010)

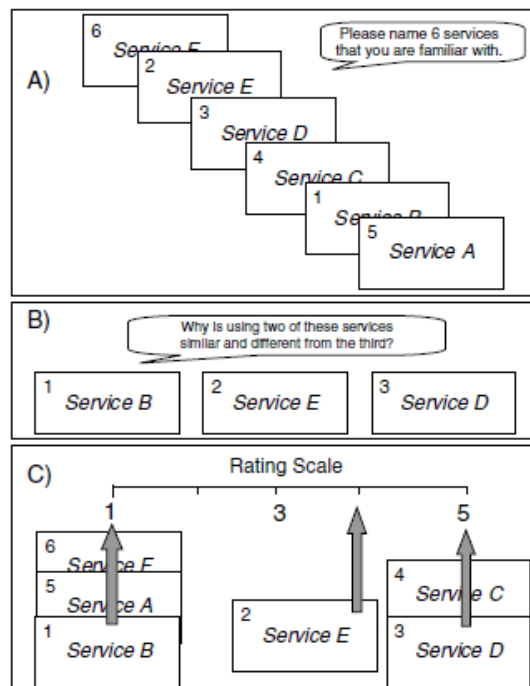


Figure 7 - An illustration of the execution process of the Repertory Grids Technique. (Goffin, K., et al, 2010)

The data from the interviews can be analysed in two ways; based on the attributes or the elements. This explores either how well an attribute is covered by the elements or how the user perceives the different elements. As the interviewees' earlier rated the elements it enables to apply statistical analysis for interpreting the data. When studying the attributes, the combination of variability and the average becomes an important indicator, as it enables to verify whether it is a commonly presented attribute or whether it is a potential latent need. It could be explained as seen in Table 4, that the combination of low variation and low average indicates that the elements are all clustered in the lower part on the scale and therefore, it could be a potential latent need as it is not yet covered by the elements. Meanwhile, low variation and high average is in contrary an attribute held by most of the elements. Even though it is present among most of the elements it might still be an attribute that is significant. (Goffin, K., et al, 2010) This can be explained by the earlier described basic needs, and therefore something that is considered a minimum requirement for the customer to even consider a product. The same logic applies also for the elements, but in this case it reveals the differentiation among the elements. (Goffin, K., et al, 2010) Other data that also can be used in the analysis is the participating interviewee's feelings and behaviour. It can for example be revealed whether a user is excited about a topic by the speed of how he/she talks or the body language. In the analysis there are

several ways to increase validity, one way is to use a suitable software and another is by analysing the data in parallel. (Goffin, K., *et al*, 2010)

Table 4 – How to interpret the data from statistical analysis of data collected from Repertory Grids Technique. [The author's own illustration] (Goffin, K., *et al*, 2010)

Variation	Average	Significant
Low	Low	Highly significant – a potential latent need.
Low	High	Low/Medium significant – a common need among all elements.

2.4.3 The Benefits and Challenges in Deep Customer Insight Methodologies

The collected needs from the Customer Insight Studies enable to identify opportunities for innovation, and those can in turn serve as input in the ideation activities to come up with new, creative ideas. This was explored by Mölnlycke, a provider of one-time use products in the healthcare industry, which used the methodologies in their attempt to establish innovation capabilities (read more about Mölnlycke in *Chapter 3.3 Data Collection*). They utilised their insights as a trigger for further innovation initiatives as, for example, innovation days. (Weigel, T., Goffin, K., 2015) This describes the essentialness to not only conduct the studies, but also to react upon the captured insights to transform them into value.

A part from the direct value, the applied techniques can also lead to a more extended innovation culture, which was also experienced at Mölnlycke. They established a customer centric approach for seeking new opportunities and it became a standard to work in interdisciplinary teams. (Weigel, T., Goffin, K., 2015) If the methods are practised properly, they can also lead to reduced uncertainties and risks, (Goffin, K., *et al*, 2010) which are both earlier described to be correlated to radical innovations. The benefit of those reductions can follow by reductions in costs and time in innovation. The dynamic nature of the methodologies enables application in different stages and also in different departments in the company, which can unify and create stronger bonds within the organisation. (Goffin, K., *et al*, 2010) This can have positive effect on the general collaboration as a result from achieving better understanding of other colleagues.

The benefits are not only related to the internal organisation but can also have positive impact on customers. It can for example develop deeper trust and closer relationship. (Schweitzer, F., 2014) The

involvement of the customer in the research and development can also inspire and convince other customers about the outcome derived from that collaboration. (Goffin, K., *et al*, 2010)

Even though the applied methodologies provide several benefits for the organisation, they also tend to require major effort. It is described that a weak attempt can lead to high cost and an unjustified bad experience. It has been identified two common difficulties in implementing the techniques properly and those are related to the company's *intention to use* the methodologies and *the effectiveness of using* them. The former one is often related to that the company persist to rely on the internal capabilities and does therefore not have the need of collaborate with the customer, the lack of full understanding of the concept of latent needs or having an organisational structure and/or strategy that does not allow integration of the new techniques. The second topic is more related to those that try to implement the methodologies, but still not embrace the potential value. These companies tend to not have supporting leadership in making the change from a current system or not having enough champions that adapt the methodologies, they do not invest the requested time in learning the techniques, they do not succeed in building the innovation culture over borders or are applying an insufficient communication process. (Goffin, K., *et al*, 2010)

2.4.4 Successful Application and Implementation of the Deep Customer Insight

Methodologies

The innovation capability is essential for large companies and as earlier described, there are many companies that struggle to find the right structure that support sustainable radical innovation. Therefore, Rebecca Price and Cara Wrigley (2016) have defined an innovation framework that summarises how the innovation process and the Deep Customer Insight methodologies can be applied in a systematic and successful way. The model is illustrated in Figure 8 and describes an approach that uses existing market research and development to form a system that supports exploration of customer needs as well as ideation. (Price, R., Wrigley, C., 2016)

The model takes a cyclic approach and starts with a problem statement, which can be derived from several sources as for example a gut feeling, identified trends or previously known opportunities. The problem is thereafter further analysed to get a better understanding of the problem in relation to the business activities of the company, and can be achieved by for example market trend analysis or demographical studies. This phase should answer the questions; "*who, what, when, where and how?*"

(Price, R., Wrigley, C., 2016, pg. 96) The next phase of the study is when the deep customer insight methodologies are applied, and can for example be any of those used in this study. Commonly, a combination of methodologies is used, and is also required, for capturing different perspectives (Price, R., Wrigley, C., 2016) and also for enabling verification of the outcome (Goffin, K., *et al*, 2010). This phase aims to capture the knowledge about the customers' behaviour and should cover the question "Why do our customers behave as they do?" (Price, R., Wrigley, C., 2016, pg. 96) It is earlier described how these insights can be used for idea generation, as efficient idea generation requires a targeted approach with a clearly defined problem to solve. The ideas enable the organisation to become more tangible in the solution phase and new value propositions can be developed. This phase aims to resolve how the stakeholders' and customers' lives can be improved. It is also essential to keep the offer in line with the own company's business, whereby the linkage of the offer to the company strategy is evolved in the business development phase. This enables to make use of several insights, and introduces the next process cycle considering implementation. The process is continuously concentrating on the customer and is targeting to apply a futuristic approach. (Price, R., Wrigley, C., 2016)

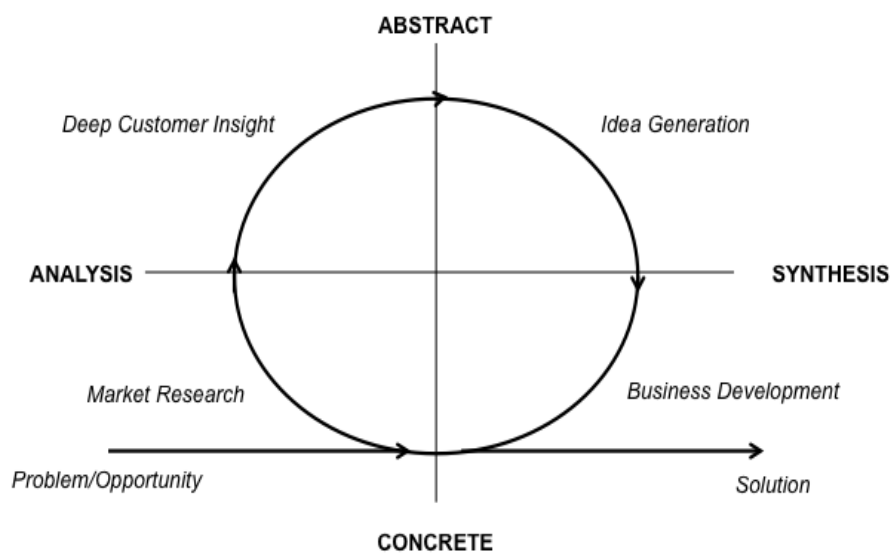


Figure 8 - A framework for Deep Customer Insight (Price, R., Wrigley, C., 2016)

Another requirement for successful implementation of the methodologies is a company's organisation, as the methodologies require organisational support. In the earlier described case of Mölnlycke, the initiative was driven by collaboration between R&D and Marketing, whereby those two departments

developed a suitable approach for the company. The studies were executed in small, exploration teams that were each assigned a unique topic to explore. There were five teams working in parallel and with a total pool of 40 employees, that all have different backgrounds in the company. In execution of the studies, the teams were reporting to both of R&D and marketing, which was a strategic solution for achieving high commitment by all team members. The employees at Mölnlycke confirm the advantage of interdisciplinary teams since different people pay attention to different things. This was considered to be a key requirement to achieve the intended result of the study. (Weigel, T., Goffin, K., 2015)

It is also described how the methodologies require education and training whereby Mölnlycke designed an introducing 3-day course that each participating employee needed to follow. Thereafter, each employee was partly engaged in the project meanwhile, in parallel, continuing with daily business activities. (Weigel, T., Goffin, K., 2015) To have this kind of internal team that works partly with innovation is expressed by Gina C. O'Connor and Richard DeMartino (2006) to be particularly successful for attempts in radical innovation, compared to if having full-time employees. Although, it is important to keep the insight generation separated from the normal activities, as it otherwise can result in that daily activities overrun the insight activities. (Weigel, T., Goffin, K., 2015)

The critical requirements of training in combination with high effort arises the question whether outsourcing could be a suitable option. One risk of using external sources is that the companies do not always share their applied processes, which are essential for the outcome of the study. It is therefore of relevance to assure this before agreeing upon a collaboration. Furthermore, this kind of collaboration, at early stage of the innovation process has affect the potential protection regarding Intellectual Property. (Goffin, K., *et al*, 2010)

The implementation of customer centric innovation is not costly itself and should instead be considered as a redirection. At the same time it takes a lot of time to establish the new approach and therefore it requires patience before seeing any results. Keith Goffin *et al* (2010) highlight the importance of the organisational culture to succeed with the insight study. The insight transformation can either be hindered or helped by the organisational culture but Brian Smith and Paul Raspin (2008) highlight those organisations that focus on services and products will face failures meanwhile those that get the importance of understanding the customers and their needs will succeed.

3. Method

This chapter explains the applied method for fulfilling the purpose of the study, which responds to the initially stated research questions. The following content is included in the chapter; *Research Strategy, Research Process, Data Collection, Data Analysis and Research Quality*.

3.1 Research Strategy

The purpose of this project is to verify how the previously defined innovation techniques can be applied in the industry of tool- and equipment for the construction industry to enhance radical innovation. Thereafter the project also intends to evaluate how the application of these methodologies can facilitate radical innovation and the benefits and challenges in doing so. The research is based on already existing theory and has in line with Alan Bryman (2012) been decided to mainly take a deductive approach since the theory is what guides the research. This approach is mainly based on quantitative research as it serves for verification of hypotheses derived from theory (Bryman, A., 2012) but that is not the case for this study. Instead, the study takes a mixed approach where the major focus is placed on the qualitative part. The focus on the qualitative part goes in line with the process design as qualitative research is not uniquely used for discovering new areas but can also be used for capturing new perspectives or deeper research in a particular area. (Hoepfl, M., 1997) The quantitative approach is also described as to be used for generalisation and determination (Hoepfl, M., 1997), which further justifies the choice to apply a qualitative approach in order to gather a deeper understanding and the quantitative one for verifying those results. Even though only one data collection source in the project was quantitatively verified. It is also argued that a combined approach results in a broader picture than using the two approaches isolated would have done and that it also enables synergies of data. (Wisdom, J., Creswell, J.W., 2013)

3.2 Research Process

The project is built on an action research process, meaning that the problem and solution is derived and developed in collaboration between the company and the researcher. (Bryman, A., 2012) As the main focus is not only to understand, but also to test and reflect upon change in the organisation, (Bradbury Huang, B., 2010) this approach is considered suitable. The approach contains the key steps; planning, data collection, interpretation of data, action based on data and reflect (Ferrance, E., 2000) which were applied in a cyclic manner both in terms of the activities within a cycle and also in the series of cycles. (Davis, J., 2004) An example was that the customer insight studies were conducted in a

series of two cycles and each cycle contained several smaller ones, as the data were iteratively analysed and evaluated. This enabled to continuously test and adjust the study in different ways to find a more suitable approach as the outcome from one iteration served as input in the next iteration. The researcher took an active role in the company when applying the different methodologies for a research purpose in the execution phase. But the researcher was taking a non-participant role in the customers' context. This means that the researcher was not involved in the customers' field of application and was only focusing on understanding their culture and values through applying the different methodologies. Any other setup could have been both illegal and dangerous. (Bryman, A., 2012) The impact of taking an insider role in this project is further discussed in chapter 3.5 *Research Quality*.

In order to solve the research questions the project is built upon four key blocks, see Figure 9. It is important to highlight that the blocks are not investigated in sequential order but should instead be considered as parallel evolving topics.

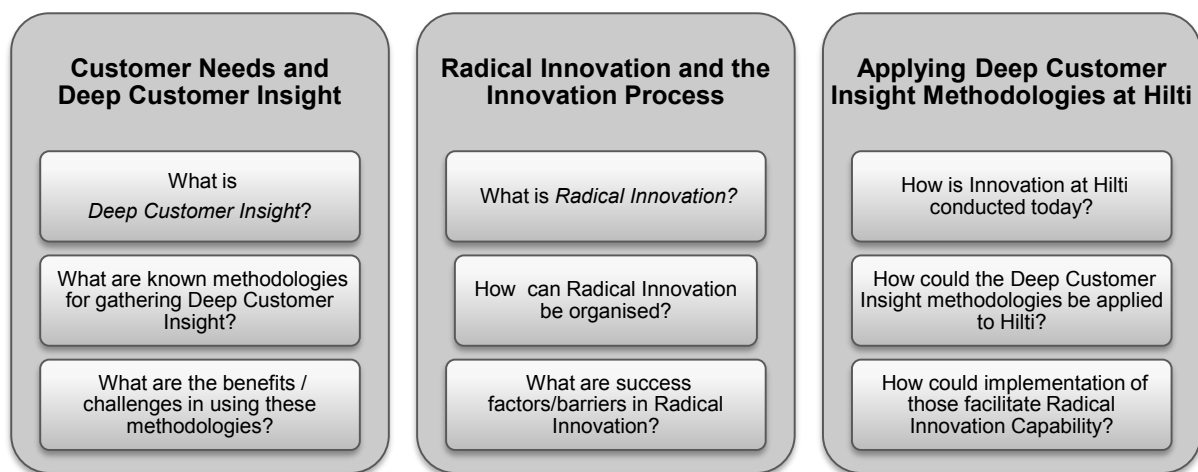


Figure 9 - A visualisation of the key parts of the research project.

3.2.1 Customer Needs and Deep Customer Insight

This first topic aims to get a better understanding of need driven innovation by clarifying what customer insight is and how it is related to customer needs. Moreover, it is investigating what could be suitable methodologies to capture these insights and is also describing how these should be applied to

reach the intended outcome. It is also investigated what potential benefits that can derive from applying these methodologies and the faced challenges in doing so.

3.2.2 Radical Innovation and the Innovation Process

As radical innovation is a very broad term it is explored what the term really means and what elements that are relevant to achieve radical innovations. It is also elaborating on what are expressed as success factors and requirements for success in term of radical innovation but also what is considered barriers. This enables to understand how the customer insight methodologies can contribute to this purpose.

3.2.3 Applying Deep Customer Insight methodologies to Hilti

This part of the process aims to initially explore how Hilti is currently working with innovation. This is a prerequisite for later explore the potential of application in the certain context. This part focuses on the research department but describes also other related departments to give a complete picture of how the system is linked together. Moreover, it explores Hilti relations to customers in today's organisation, which is necessary for evaluating and exploring the potential influence of the methodologies. Lastly, it will be analysed how the implementation and usage could affect the overall capability of radical innovation.

3.3 Data Collection

The project process is as earlier described to apply an iterative approach, which is in line with the continuous data collection. To fulfil the research questions there are four key sources of data; *Literature Study*, *Interviews*, *Survey* and *Deep Customer Insight Methodologies*. Each source is explained separately later in this chapter. Since the researcher was taking an active role at Hilti it also enabled collection of data from daily work, and that could for example be from informal discussions or meetings. This knowledge has also had impact on the study but was not intentionally captured in any formal way.

3.3.1 Literature Review

The main purpose of the literature review is to get further understanding of the previous research in this field, and due to the action based approach the literature was studied continuously throughout the whole project. This approach is described by Julie Davis (2004) to be typical for the chosen research design. Since the study contains several non-defined concepts and new methodologies, the literature study became an important part of the project. One key target was to gather better

understanding of the Deep Customer Insights methodologies and to define which of those that could be suitable for the project. That was also relevant for assessing best practise in application and evaluation of the methodologies. Furthermore, it was investigated how they could be implemented and what earlier identified success factors and barriers in radical innovation to discover how those methodologies could facilitate better capability in this field. The literature review was mainly conducted by using research engines such as Google Scholar and Chalmers Library with keywords such as *radical innovation, success factors for radical innovations, fuzzy-front-end, deep customer insight, customer need*. The outcome of the study is mainly presented in the empirical- and analysis chapters, but has also had impact on the rest of the report.

3.3.2 Interviews

Another methodology for data collection was interviews, and this chapter considers all type of interviews with exception of those that are integrated in the Deep Customer Insight methodologies, those are covered separately in Chapter 3.3.4 *Customer Insight Methodologies*. The conducted interviews were of semi-structured character, which is a qualitative data collection approach, to get a better insight about the current situation and future desires. According to Alan Bryman (2012) this approach is suitable when aiming for deeper understanding of the certain topic in its context rather than achieving statistical significance. The semi-structured approach enabled the researcher to stay in line with the topic by following an interview guide but at the same time remaining flexible for digging deeper in to topics that were revealed during the interview. (Bryman, A., 2012) There were different interviews for different purposes (see Table 5). Further details about each of them is described below.

Table 5 - Used empirical data collection methodologies.

Phase	Type	Participants	Outcome	Amount (Average time)
Planning/Execution	Semi-structured interviews	Research department	Gain understanding of current innovation approach	13 (45 minutes)
		Other departments; Business Units, Market Research, Sales Organisation,	Gain understanding of current innovation approach.	8 (45 minutes)
Planning/Analysis	Expert interviews	Tove Weigel	Gain understanding of the techniques	2 (45 minutes)
Analysis/Evaluation	Semi-structured interviews	Project Managers participating in the study	Evaluating the approach from their perspective	2 (45 minutes)

The first interviews aimed to gain a better understanding about Innovation at Hilti in terms of current process, culture, organisation and interaction with externals. These were initially conducted with the representatives from the research department and were based on a predefined guideline, see Appendix 3. The data was collected over a longer period of time and was continuously analysed during the process. This enabled the researcher to steer the interviews towards interesting areas. Each interview took about 45 minutes and was conducted individually, and the researcher was taking notes during the interviews. As the primary purpose of the interviews was to capture an overall understanding, the objective was therefore to meet people from all the five teams in the research department and therefore a Theoretical sample was used. The main idea of this strategy is that representatives from several categories are selected and the interviews are repeated until no new knowledge is discovered from the interview. (Bryman, A., 2012) The first candidates were identified together with the Innovation Manager to find people from the different teams that could be potential candidates. The interviews contained a kind of Snowball sampling as those that were participating in the interviews also could suggest others that they considered having good knowledge or being interested in a certain topic. This strategy was considered essential for this purpose as it is often used when searching for a particular experience or characteristic relevant for the study that might be hard to reach. (Bryman, A., 2012)

As the first interviews revealed a lot of interactions and links to other departments, it was decided to make a similar study with those mentioned in previous interviews. The selection was, as earlier described, based on Snowball sampling and for complementary reasons also Theoretical sampling, e.g. the interviewee recommended to contact a department but could not give a name or position. The Theoretical sample was chosen from the organisational chart. The Snowball sampling increased the likelihood of getting in touch with candidates that had good knowledge of the topic and it also gave a slightly better response rate as the interviewer could refer to one of their contacts in the organisation. Candidates from the interviews came from the following departments: Business Units, Market Research, Marketing- and Sales and Process Managers. The key focus of the interviews was the same focus as the previous ones, to investigate how the company works with innovation and to understand their connection to the research department. Therefore, these interviews were also based on the previously mentioned guideline. The duration time was about 45 minutes and was conducted individually, and the researcher was taking notes during the interviews.

To gain more insight about the Deep Customer Insight methodologies and to capture understanding on how they can be applied in a company, it was decided to conduct expert interviews with Tove Weigel. She has more than 12 years of experience within the field of Product Development and has a background in Industrial Design. One of her previous successes was when leading the establishment project of a customer insight process at Mölnlycke, which is strongly related to this project as it was based on the same methodologies. The fact that Mölnlycke provides products for surgery and wound-care globally, made the translation of Tove's experience very easily applicable to the context of Hilti. Two phone interviews were conducted, one before and one after the field studies at Hilti and they each lasted about 45 minutes. The first interview focused mainly on gaining more insight about the application of the methodologies meanwhile the second was more a validation on the outcome of the studies, and how they had experienced those factors at Mölnlycke.

Another approach to evaluate the applicability of the methodologies was to conduct interviews with the participants from the market organisation. They were very much involved in the process and were responsible for all of the contact and scheduling with the customer. The main goal was to understand how this was experienced and also, the reactions from the market organisation that became involved in a new approach for innovation. Their presence during the studies made them aware of the methodologies, and they could therefore contribute with their opinion in the methodologies' applicability to Hilti. These interviews were semi-structured phone interviews that lasted about 45 minutes.

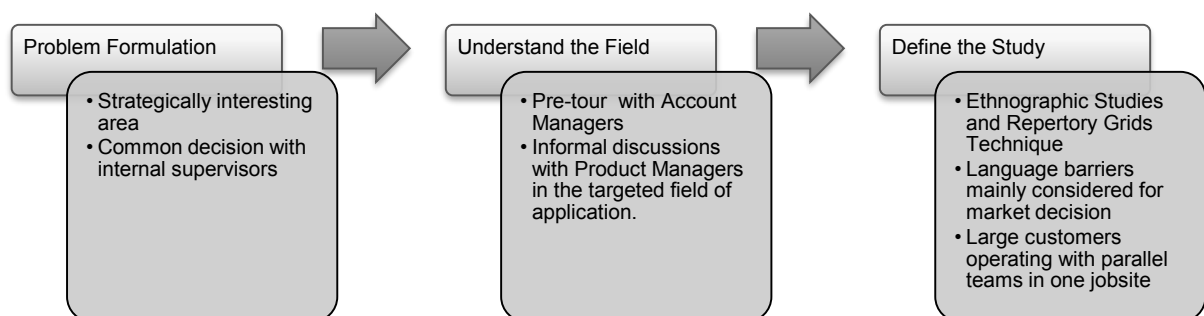
3.3.3 Survey

As earlier described, the qualitative research is mainly used for capturing understanding meanwhile the quantitative approach enables generalisation and determination. (Hoepfl, M., 1997) Therefore, it was decided to confirm the outcome from Hilti's innovation approach by conducting a survey within the research department. The survey was based on close-ended statements where three or five answers were provided, see Appendix 4. The participants in the survey were all full-time employees in technology research. The survey was distributed to 45 persons, whereof 20 answers were collected. The survey was embedded in an e-mail that allowed fast response (Bryman, A., 2012) and anonymity, as the form could be printed and delivered anonymously.

3.3.4 Customer Insight Studies

The action research design implies that action is made in the setting of the company to reveal better understanding and potential of the different methodologies. Therefore, this chapter explain how the earlier defined techniques for capturing deep customer insight was conducted at Hilti. The setup of the applied methodologies is described in this chapter meanwhile all experiences are discussed in *Chapter 4. Empirical Data*.

The literature review suggests a suitable process for the customer insight studies, which was chosen to follow (see Figure 10). The *Problem formulation* was the first step in the process and aimed to clarify the direction of the project. This was defined together with the internal supervisors, that all had backgrounds in the company's research department. The selection was impacted by earlier innovation history and the selection landed on a field that has been rather slow in terms of radical innovation. Important to mention is that the first chosen problem formulation was changed in the beginning of the project due to lack of organisational support, more about the background of the redirection can be found in *Chapter 4.2 Experiences from Conducting Deep Customer Insight Studies*. The decision to redirect the study was easily handled as it was prioritised to use the methodologies in the certain environment rather than staying with first problem formulation.



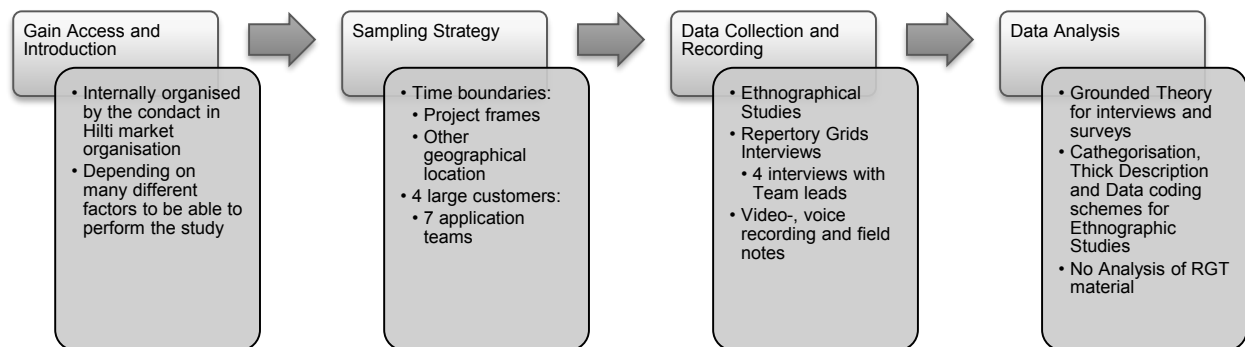


Figure 10 - The methodology description of gathering deep customer insight.

The pre-tour aimed to get a better understanding of the customer and the market organisation, which would be essential knowledge in the planning phase of the real study. The tour was conducted in one of the major markets in Europe where the researcher followed two Account Managers during two days to see and experience their daily work together with customers. The intended value to get to know more about the field of application was not possible to achieve in this case as the scope of the project changed after the tour. Instead, this knowledge was achieved from informal discussions with Product Managers that were working with products used in that field. The aim of these discussions was for the researcher to get a basic understanding of, for example, the customer, frequently used tools and equipment and their industry.

Based on the comprehension from the pre-tour the study was defined in terms of methodologies, geographical market, market accessibility and sample strategy. Earlier in the literature review it is discussed about two successful methodologies and techniques for gathering deep customer insights, which were used in this study; *Ethnographic Studies* and *Repertory Grids Technique*. These two techniques were chosen due to their promising result in radical innovation, their success in other high-technology industries and their potential fit to the time frames of the project. It was also proposed by the literature that traditional market research methodologies could be used for confirming the outcome of the study (Goffin, K., *et al*, 2010) but due to the limited period of time this was excluded from this project. The required time for organising the customer studies led to a poor sample, and it would have required more studies for being relevant to verify the direct result regarding customer insights. Regarding the decision of the geographical market it was one key factor that was strongly considered; the researcher's knowledge in the local language. Most parts of the methodologies included different forms of interviews and justified to minimise potential language barriers. Another

constraint was geographical distance due to cost reasons. In the same way as the problem formulation was redirected, the chosen geographical market also changed. This was explained by organisational reasons and timing, more about this can be found in the *Chapter 4.2 Experiences from Conducting Deep Customer Insight Studies*. The sample mainly targeted large customers, meaning that they were operating on large job sites and often had more than one team operating in parallel. This would enable the researcher to capture several parts of the process in one visit. The studies were conducted in another geographical location than the researcher's base which did cause restrictions as the data needed to be collected during a certain period of time. The length of each study was decided individually with each customer.

The studies were conducted with four large customers and as expected, there were several teams working in parallel, which enabled to apply the methods in seven different application teams, consisting of 14 operators in total. The iterative process can be illustrated as in Figure 11 and describes how the process was organised in two cycles, which enabled to analyse the data also between the phases. The methodologies were also refined according to the experience from the already conducted studies, which goes in line with the key characteristics of the action research design. Both methodologies were used during all customer visits and each visit varied between 3-7 hours, depending on the customers' availability. Before the studies were conducted, a scheme for observation and contextual interviews were prepared to assure that all essential material was captured. These templates were designed based after the previously described theory and examples can be found in Appendix 1-2.

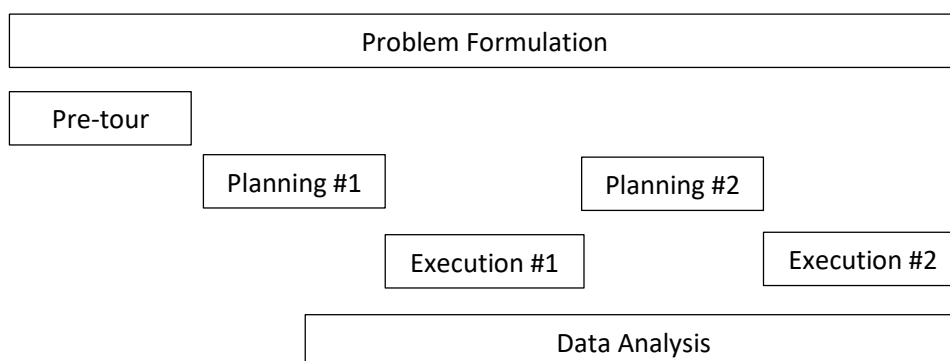


Figure 11 - The layout of the customer insight study.

The initial part of the study was often focused on contextual interviews to get a better understanding of the user's behaviour and the reasons behind them. (Goffin, K., *et al*, 2010) When enough data was collected from the interviews the focus was transferred to observational studies and the researcher took a more passive role when just observing the operator. The researcher carried out all the observational studies, meaning that she was practically shadowing the operators in their dynamic working environment. In line with Nisarata Sangasubana (2011) it was experienced very difficult to capture field notes at the same time as recording, whereby the researcher aimed to use video recording whenever that was possible. However, it was not allowed at one place whereby all the material was collected through field notes.

The Repertory Grids Interviews were only allowed to conduct with team leads of the company. This resulted in four Repertory Grids Interviews. Additionally, the team lead was only available for about 15-20 minutes and the interviews were conducted on an available location jobsite on or on adjacent location. The interviews closely followed the process that is earlier described in the literature. The topic was to elaborate on necessary activities that were necessary for that application field and the interviewee defined the elements.

The purpose of the study was not only the gathered data related to customers' needs but also to gain deeper understanding and reflections from using the methodologies in the particular context. Therefore, it was essential to also capture those insights throughout the process. This type of data was collected in memos, shorter notes, which were successively evolving over time. The memos helped the researcher to stay in line with the project scope and also to concretise the thoughts. (Bryman, A., 2012) As the project run over six months, it also enabled the researcher to recall the background of different decisions and to get an overview of the project's evolvement over time.

3.4 Data Analysis

The data analysis was conducted iteratively during the process, which goes in line with Alan Bryman's (2012) statement that the human memory is very short, and that the data should therefore be taken care of as soon as possible. All analysis was conducted by the researcher herself but with some occasional support due to poor technical understanding. In these cases internal employees with relevant background were giving their support. Different practices were applied for each method and they are all further described below.

3.4.1 Interviews

For the analysis of the interviews an approach based on Grounded Theory was taken, which is considered the most common analysis methodologies in qualitative research. (Bryman, A., 2010) Compared to quantitative research that explains how well the data is fitting in already existing schemes, this methodology enabled the researcher to create categories based on its own experiences. The material was therefore labelled so that data of the same context could be linked together. The Expert interviews was compared to own experience and existing literature for verification.

3.4.2 Survey

The survey was analysed numerically as the questions were of a close end character. The analysis was mainly done on group level without taking any considerations to the individual profile as for example background or gender. Any other option would have risked revealing anonymity due to the small population. The outcome of the survey is presented and discussed in the *Chapter 4. Empirical Study*, where additional explanations about the data are presented. For all results, see Appendix 5.

3.4.3 Customer Insight Studies

The Customer Insight Methodologies mainly followed the recommendation in the literature on how to analyse the collected data, whereby the Ethnographic studies used a systematic approach containing coding and thick descriptions. The Repertory Grid technique is earlier described to have resulted in a very restricted sample, whereby it was decided to not do any further analysis on this material. However, the experience from conducting the methods are still of relevance and considered in this chapter.

The data collection of Contextual Interviews and Systematic Observations were conducted in parallel whereby the two methodologies were analysed in the same way. The analysis followed the earlier described literature and was concentrated on decoding and thick descriptions. The analysis conducted in three steps whereof two of the elements was related to coding, and they are therefore respectively described as Categorisation and Decoding. The first step in the process was *categorisation* and aimed to categorise the recorded material and the field notes in a predefined content scheme. The scheme had a field with examples that the analyst should look for. As qualitative methods often generate a large set of data (Bryman, A., 2012) it supported the researcher to stay in line with the problem formulation when summarising the data from the videos. The content in the schemes served then as input for the *thick descriptions*, which were detailed descriptions from the application area. Each

description resulted in about 3-4 pages. Thereafter, the data in the thick descriptions was *decoded* and inserted in a data-coding scheme. The headers in the data coding scheme was the same as in the categorisation, but in this phase the data is further divided into a more detailed level. For example, if the category Tools and Equipment was used in the initial phase of the analysis, then the decoding also segmented the content in the thick descriptions into, for example, hammer drill, nippers and saw.

The researcher's reflections were analysed continuously during the project. This analysis was, like for the earlier described interviews, based on Grounded Theory, meaning that related material was labelled and categorised to find linkages within the data. The analysed data was then used as input for future design of the process as the insights could be confirmed or rejected by making smaller changes in the studies.

3.5 Research Quality

The research quality is discussed in terms of validity, reliability and generalisability. Validity refers to how appropriate the chosen tools, processes and data are for the desired outcome. (Leung, L., 2015) In this research the applied tools were considered relevant for the study, as they have proven success in previous cases. It is earlier described that the sample for the customer insight studies resulted to be very limited, but the main target for applying the methodologies was primarily to evaluate the feasibility in the particular context, rather than assuring a valid outcome of customer needs. Therefore, the sample is considered to be sufficient for giving initial indication even though a larger sample would have had positive effects on the validity of the result. The researcher conducted all the research alone, which could have negative impact on the validation. According to Alan Bryman (2012) the involvement of several persons in the process does enable triangulation, which would have resulted in higher validity. It could also have had impact on the outcome as the researcher did not have any previous experience in the industry. In this case, any other options were not possible due to limitations in time and resources. The decision to use a participant role, meaning that the researcher took a part in the organisation could have both positive and negative effects. The positive aspect is that it enabled the researcher to get very deep insight from being involved in the context of the company. The negative effect is that the researcher might have gone native; meaning that the researcher's ability to reason from an outsider's perspective is reduced when being too involved in the environment. (Bryman, A., 2012) This phenomenon was reduced by keeping weekly contact with the supervising professor from the university.

The reliability refers to the possibility to repeat the study, (Leung, L., 2015) which is considered to be limited. Even though the methodologies are very well described and could easily be followed in a similar project, the action-based approach enhanced forming the methodologies according to the particular environment. Furthermore, the used setting is not very easily accessible as both the company and the customer are strictly protected. Lastly, the generalisability is in line with other qualitative research also restricted (Leung, L., 2015) since the topic is, as earlier described, focused on a particular setting.

The ethical aspect places an important role as research is closely linked to integrity. (Bryman, A., 2012). To prevent from eventual ethical implications the study took this into consideration already in the planning and design phase of the data collection. The main data collections were based on interviews where the participants were given an introduction to the topic before the interview started. The introduction included the background, the purpose, the methodology and the impact of participation so that the interviewee could make an informed decision whether to participate or not. This goes in line with what Alan Bryman (2012) explains as ethically correct, to have an informed contender and to avoid invasion of privacy since the person can actively refuse to participate or give answers that are considered private. Regarding the observations, they were all conducted in a planned and controlled setting, meaning that the participants could be informed before the study and requested whether they would like to participate or not. It was also communicated that all collected material are treated as confidential and are only used for internal research- and development purposes.

4. Empirical Study

This chapter presents the empirical material from the study and considers; the innovation at Hilti and the experience of applying Deep Customer Insight methodologies.

4.1 The Innovation at Hilti

Hilti clearly communicates its strong strategic focus on the three elements; innovation-, differentiation- and the customer. This chapter therefore explains how these elements are reflected in the company in terms of organisation, innovation strategy and process and customer integration.

4.1.1 Organisation

To achieve a better understanding of the innovation at Hilti, it is essential to explain how the company is organised. The chapter focuses on the research and development departments and does thereafter explain their connection to other departments that are relevant for this study.

Regarding the earlier described strategic focus there are two of the elements, innovation and differentiation, which have strong associations to the company's research- and development departments. The research department, also called technology research, is a corporate organisation and has the responsibility to drive innovation in terms of product- and production technology. The research department also provides technical support to other functions whenever requested, as for example to the development units. The department has five core teams dedicated to technology research in different areas relevant to Hilti products. Product development itself is done with the development departments consisting of eight different business units. The main responsibility of a business unit is to serve the customers with products that fulfil their need. Expressed in terms of innovation, this means that they are responsible to embed the developed technologies into the product and also to continuously make incremental upgrades and face-lifts. Each unit has its own setup of functional roles such as project managers, developers, marketers and supply chain managers, which indicate the decentralised structure. The units vary in size depending on their market potential and size and complexity in their product portfolio. Each business unit, in addition to products, also delivers related services and software. Hilti market organisation commercialises the products and services in their respective markets.

As earlier described, Hilti also provides services for their clients and the responsibility for those can either be centrally placed or decentralised in the business units depending on their character. There are three main categories of services; enablers, door openers and profit drivers. The first one, *enablers*, refers to services that are expected by the customer and that are included in the price of a product, e.g. user instructions. The second type, *door openers*, is about services that the customer considers valuable to pay for, but that rarely stand alone. Lastly, the *profit drivers* contains services that stand alone and are therefore not necessarily related to a certain product. A new service is often triggered by two internal forces; pull from the market organisations or push from management. The services that derive from market pull are often already provided, but they are not yet globally standardised. Therefore, those cause redundancy, as several employees in the organisation have to create and prepare the same content, which gives varying outcome. The second type is triggered by management and is based on two reasons: changes in national regulations or changes in the business perspective. It is later in this report described that the customers' industry is characterised by strict regulations due to its many accidents (see *Chapter 4.2.1 The key characteristics of the Construction- and Energy Industry*), whereby new regulations are continuously established in the local markets. It can, for example, consider a new required training for an application and these changes become an opportunity for Hilti. Apart from services, the company also provides software, which can, for example, support the customer in making calculations and designing construction systems.

Responsible for capturing market knowledge and -trends is the corporate department *Market Research*. It consists of three teams: *Voice of Customer*, *Product and Innovation Research* and *Market and Competitive Intelligence*. The first team focuses on customer evaluation and gathers data about customer experience and feeling. The second team serves as a support function for the business units and guides and facilitates customer studies for the development projects, which often considers what the theory explain as traditional methodologies as for example surveys or focus group interviews. For execution of such studies Hilti often uses the support from external providers to make optimum use of their methodological know-how and experience. The third team in market research, *Market and Competitive Intelligence*, occupies by keeping track of- and monitoring the market movements.

The commercialisation is carried out by the local market organisation, which focuses on sales, marketing and providing technical service. The company is unique in the industry with its internal market organisation that generates more than 200 000 touch points with customers every day. To

structure the responsibilities in the company, it is clearly defined that the Account Manager (AM) is responsible for each of his customer's product portfolio and is also the internal owner of that customer. This means that if any other employee needs to get in contact with one particular customer, an agreement with that customer's AM is required before doing so. The AM is working on the field and regularly visits his customers to review the current portfolio, show new products or in any other way support them. These face-to-face meetings are particularly important in the business-to-business relations that Hilti has with its customers and leads to strong and close relationship with the customers. Furthermore, each meeting is important for the AM, who is strongly driven by highly set sales targets. Another central role in the market organisation for this project is the Project Manager (PM), who is responsible for managing and providing services for larger construction projects. Projects are often staffed of several companies and some of those might already be Hilti customers and are therefore already facilitated by an AM from Hilti. Therefore, the PM only follows a customer during a specific project and then gets new customers as the project is completed. A project can last a few years and the PM often manages 5-10 projects in parallel, depending on their size and work pace.

4.1.2 Innovation Strategy and Process

The innovation attempts in technology research are strategically guided by selected technology concepts that are considered interesting for the future. The innovation strategy is according to the survey fully understood by the employees as all participants responded either that they were *agreeing* or *strongly agreeing* with that statement. In contrast to this result, it was experienced in the interviews that the question about what guided innovation caused uncertainty and confusion among the participants. It was only a few of the participants that made the connection between this question and the company's innovation- and technology strategy. The innovation strategy also includes a distribution target of different types of ideas. This target aims to short-, mid- and long term ideas. The idea pool considers all active ideas that are potential for future development but which have not yet become a project. The interviewed employees are well aware about this target but the management expresses the need to create more long-term ideas, and therefore is looking at new methods to steer ideation in this direction.

The literature explains how the innovation process can be described as three sub-processes; the front end innovation, the NPPD and the commercialisation. (Koen, P., *et al*, 2001) This part focuses on the first two of them, with the processes initially described from a higher perspective and thereafter more

in detail. Following the standard logic of innovation processes, Hilti starts out with technology research responsible for and including Front End Innovation and Feasibility- and Research projects (see Figure 12). From there on, those projects are transferred to the development teams in the business units. The development projects are based on the strategic product portfolio management, aiming at fulfilling existing and future needs in the market. These needs can thereafter be satisfied or solved by the earlier described technical solutions that are derived from the technology research. A completed development project is then transferred to the market organisation for commercialisation.

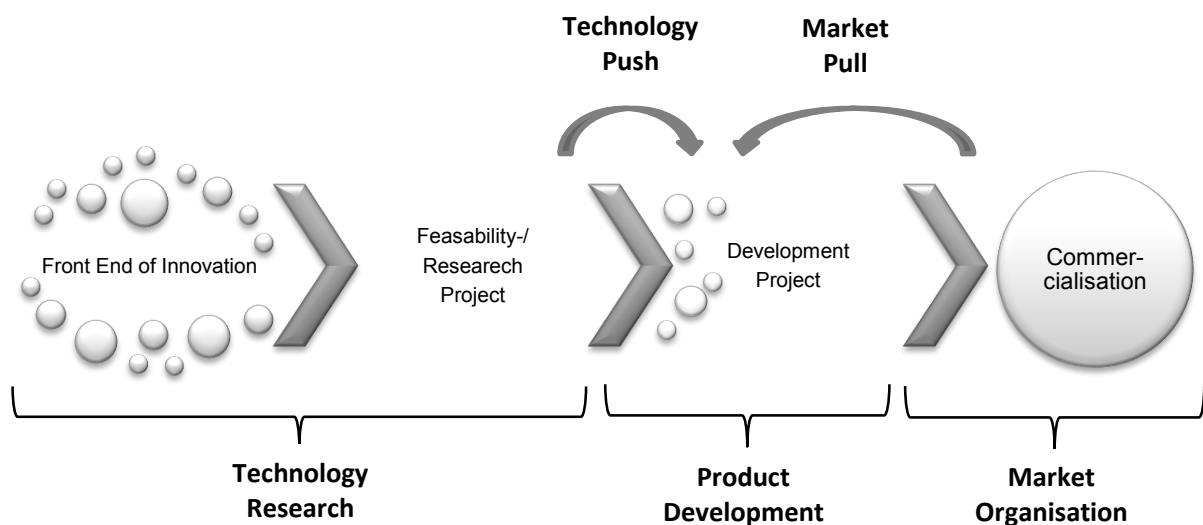


Figure 12 - An illustration of the innovation process at Hilti.

The structure of the Front End Innovation gives a mixed impression as the first parts from opportunity identification to idea generation are perceived as open and dynamic, meanwhile the later parts, idea selection and concept development, are in contrary structured and controlled. The employees describe the first part of the process to be vaguely supported by common processes, methodologies or tools. The diffuseness goes well in line with some of the interviewees' general understanding of the early phase of the innovation process. It was, for example, mentioned a few times in the interviews that ideation should not be steered and controlled, as ideas often appear in unexpected situations and contexts, e.g. when having a shower.

In the first phases of the process, *opportunity identification* and *opportunity analysis*, the researchers in the company are responsible for continuously monitoring relevant technologies. This can be conducted by universities visits, participation in industry fairs or taking part in external science

networks. The knowledge is shared within the company, e.g. in regular technical meetings. The researchers are allowed, and also encouraged, to use about 10% of their working time for opportunity identification, ideation and testing of new ideas. These activities are free in the sense that they don't require any reporting and the employees are allowed to use the resources of the company. During the interview one of the employees mentioned that even though they were allowed to use the time, it still didn't feel as that it was completely accepted as *"you got the feeling of not doing anything"*.

Regarding *idea generation* in research, there was during the interviews revealed that there are no general processes, methods or centrally organised activities that enhance ideation and it is therefore each employee's own responsibility to organise them. Although, one of the teams has lately taken an initiative to organise monthly team meetings for discussing new ideas and sometimes also ideate upon new topics. The meeting is also used for discussions about already running projects. But even though there is no centrally organised way for conducting ideation, the survey reveals that the employees experience to systematically collaboration with colleagues for coming up ideas (see Figure 13). Apart from those that refer to the previously described initiative of organised team meetings for ideation, the result indicates that there are other initiatives for collaboration that are not revealed in the interviews. Since they were not revealed in the interviews, they are interpreted to consider a few people.

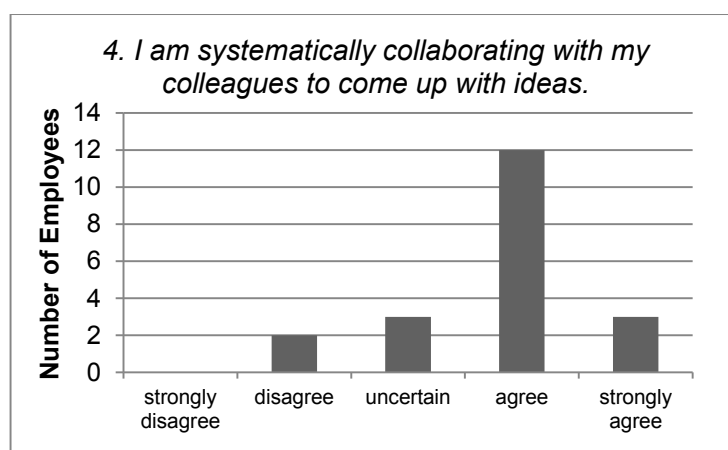


Figure 13 – The result on the statement “I am systematically collaborating with my colleagues to come up with ideas” when being asked in the internal research team.

A small majority of the participants assures that they are continuously practising ideation, but there are almost as many that are uncertain about this question, see Figure 14. At the same time, there are 35% that estimated their time spent on ideation to be <5% of their time, 50% between 5-10% and the last 15% to be >10%. That would mean that 65% of the participants really take advantage of the time that is provided for those activities meanwhile 35% uses less than 5% of their time.

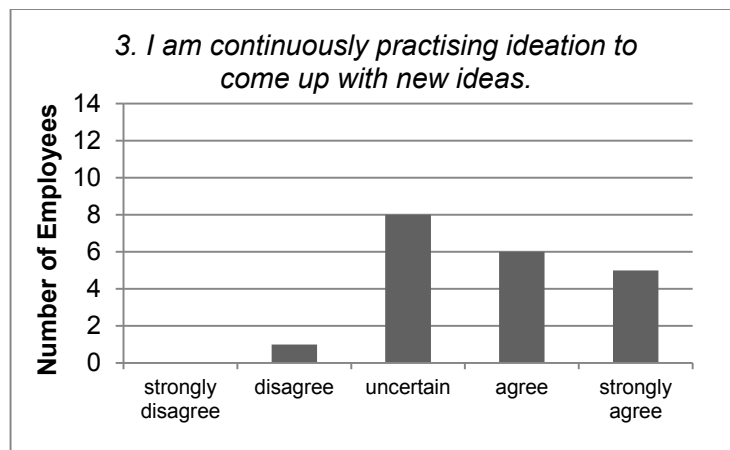


Figure 14 - The result on the statement “I am continuously practicing ideation to come up with new ideas” when being asked in the internal research team.

The lack of standardised innovation processes at early stage of innovation in is confirmed by the result from the question whether the employees consider themselves to have an established approach for coming up with ideas. This outcome of this question is almost equally distributed among the three answers: *disagree*, *uncertain* and *agree*. In this context it is notable that the majority of those that have an established approach are those that have been in the company for more than 5 years, which could be derived from that they have gained sufficient experience to establish their own way of working. At the same time, the employees express a need of this kind of support as the majority consider it beneficial to support the idea generation with suitable processes. However, it is also remarkable that there are many that are uncertain about this question (see Figure 15).

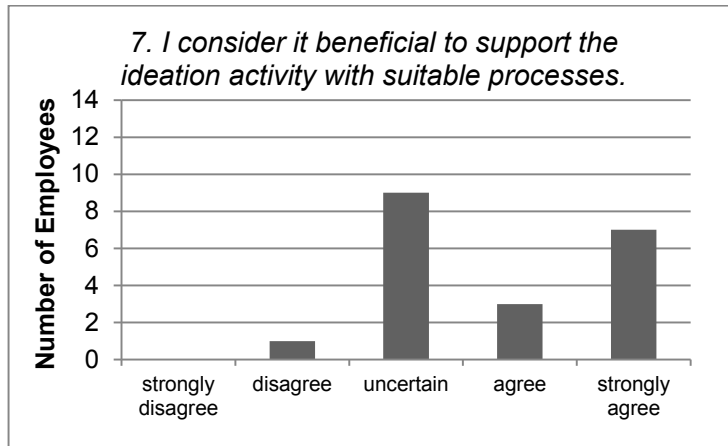


Figure 15 - The result on the statement “I consider it beneficial to support the ideation with suitable processes” when being asked in the internal research team.

Furthermore, a majority of 75% are motivated to come up with new ideas but at the same time there are a notable number of employees who feel pressured to do so. The wide distribution regarding this question can be shown in Figure 16.

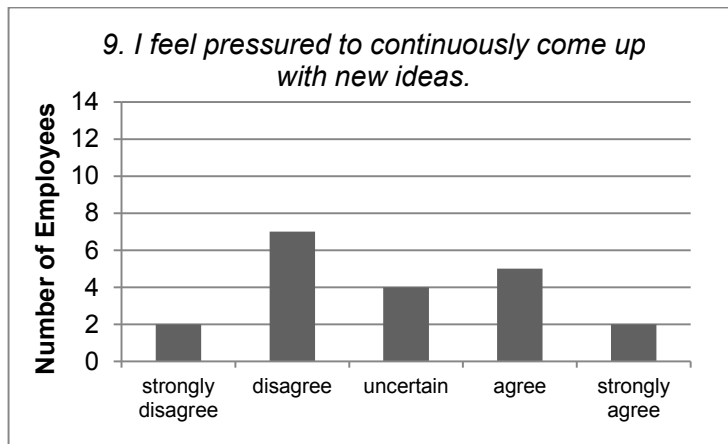


Figure 16 - The result of the questions "I feel pressured to continuously come up with new ideas" when asked in the internal research team.

The element *selection of ideas* in the Front end of Innovation is more structured at Hilti than the previous two elements. This goes in line with the employees’ general experience to apply a systematic evaluation together with other colleagues. Potential ideas are discussed with colleagues and management in an evaluation meeting. The idea is presented on a standardised one pager that mainly considers technical and organisational aspects, but there is at this early stage no major focus on

market potential. Within a defined period of time the idea is then further developed and matured with the goal of proving its feasibility. Ideas with relevant potential are moved to the idea pool, other ideas are documented and then stopped. From the idea pool the ideas are developed into research projects or transferred directly to relevant development departments. Interviewees highlighted the importance to evaluate the potential success of an idea with key persons in the organisation. These are typically persons with particular experience in relevant technical or marketing areas. This statement was in the interviews shown to not be fully shared among the participants and resulted in a wide spread over the scale, see Figure 17.

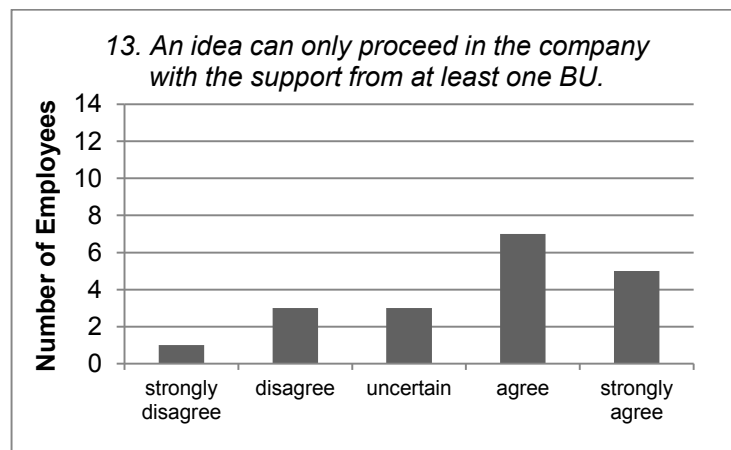


Figure 17 - The result on the question "An idea can only proceed in the company with the support from at least one BU".

The process for development projects starts by verifying and/or gathering deeper understanding about the experienced market need, which can be supported and organised by the corporate organisation *Market Research*. Based on the findings, the development team suggest potential solutions whereof some of the technology can initially be derived from technology research. This part of the process is identified with the small circles in the process description in Figure 12 and illustrates the ideation session in the development process, similar to the one in the Front End Innovation. The difference is a more narrow focus on the triggered market need and the boundaries within a business unit. In line with the employees from supply, the business unit makes a decision of a suitable solution and starts the development. In this phase it is common with customer acceptance test to verify the different solutions. Ideas in the Business Units are explained to come from everywhere, both internally and externally, but there are no systematic activities created for exploring market needs and instead this awareness comes from other directions.

4.1.3 Customer Integration

The last key element of the company strategy is the customer focus and the customers' role in the organisation, whereby the customer impact and –integration have been investigated. The employees' general picture of the company is that they practise a quite solid customer centric approach, and this is in several contexts considered to be proven by the company's organisational structure, which includes a market organisation that has daily contact with the customer. Focusing on the customer integration in R&D, it is noticed that the company encourages some contact with the customers. It is, for example, arranged customer field tours for new employees in the research department. These tours aim to provide the employee with a basic understanding of the customer and its environment, and are organised in one or two days with an Account Manager or a Field Engineer from the Market Organisation. The researcher takes during the tour part of their daily business. Therefore, these tours often contain many short and intense stops, which represent the busy and dynamic workday of a fieldworker. These characteristics also go in line with the customers' high focus on operations whereby longer stops would be neither necessary nor appreciated by the customer. Depending on the type of customer and the commissions of the fieldworker that organises the tour, the field tour can mean visiting the customers' offices or their jobsites. For the particular occasion there may sometimes be organised a longer stop for about 30-45 minutes in which the researcher is able to have a shorter discussion with the customer. A part from the field tour, the researchers rarely have contact with the customers. Even though customer visits are organised in certain cases to collect information about a specific topic or for validation of an idea or a solution from the customer point of view.

In the interviews it is revealed that customer integration in the early stage of innovation is directly interpreted as the customer ability to express their needs, which is according to theory explained to be something very difficult reveal directly from asking the customers, as they are very often not aware about it. The survey reveals that the majority of the participants have had direct contact with the customer between 1-5 times during the past 12 months, whereas 25% of the participants says that they never had contact with the customer during the same time period. Even though the researchers have very few touch points with customers, 50% of the interviewees either *agreed* or *strongly agreed* with the statement, that they have good knowledge about the customer needs (see Figure 18).

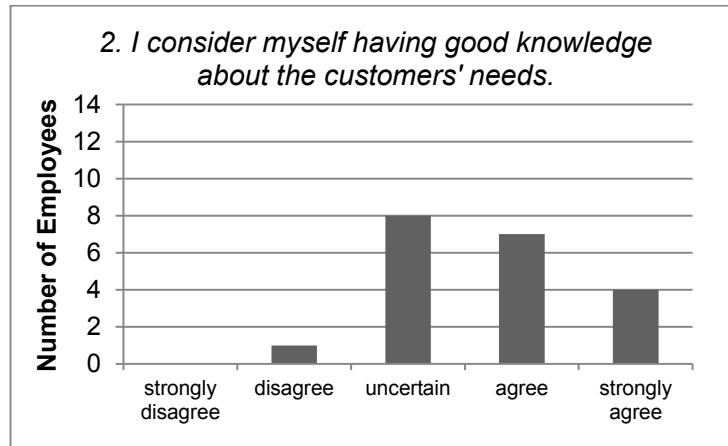


Figure 18 - The result on the statement “I consider myself having good knowledge about the customers’ needs” when being asked in the internal research team.

In general it can be stated that customer contacts occur more often in the later phases of the innovation process, mainly in development projects. The primary focus of these customer contacts is to verify ideas and solutions. Although these customer contacts can also trigger new ideas, but the generation of new ideas is not the main focus of the current setup of customer contacts.

4.2 Experiences from Conducting Deep Customer Insight Studies

The applied methodology for the Deep Customer Insight study is earlier described in *Chapter 3.3.4 Customer Insight Studies*, and this chapter focuses on the captured knowledge and gained experience from applying those at Hilti. Initially, a background of the customers’ industry is given for better understanding of the rest of the chapter. Thereafter, the key phases of the study are covered sequentially: *the preparation, the data collection and the analysis*.

4.2.1 The Key Characteristics of the Construction and Energy Industry

It is earlier explained that Hilti provides tools and equipment for the Construction- and Energy Industry. This industry is known for having the most accidents among industries (Choudhry, R., Fang, D., 2008) and is consequently strictly regulated and controlled. Notable is that most of the accidents derive from unsafe practise rather than the working conditions. (Choudhry, R., Fang, D., 2008) The industry is described to be complex in several perspectives and that has to do with the particular environment, the scientific knowledge required for practise and the complex workflow. The issue with these factors derives from uncertainty. A relevant example is that each construction site is unique (Dubois, A., Gadde, L-E., 2002) which require the worker to easily adapt to new environments and

settings. Furthermore, it is described to correlate with the particular interdependency among tasks. The complexity is not isolated to one single project as there can be many projects running in parallel, over which the company has to distribute its resources. (Dubois, A., Gadde, L-E., 2002) The interdependency among projects can clearly be shown when a delay in one project follows by a delay in others. (Dubois, A., Gadde, L-E., 2002) This effect is one reason why the companies have a strong focus on the operational business, as it is the operational activities that create value for the company. The interlinked tasks also create interdependency among companies, as there might be several companies and teams working in parallel on one jobsite, and often within many different fields. Regarding technological adaptability and innovation, the industry is characterised to be conservative. (Burger, R., 2014) Even though innovation might give associations to revolutionary high-tech solutions, it is in construction more about applying organisational best practice for increasing efficiency. This goes in line with the tendency among companies in the industry to focus on cost reductions and efficiency. (FMI, 2016)

4.2.2 The Preparation of the Studies

The preparation is not to be underestimated and has a major impact on the outcome of the study, and the iterative process makes planning and refinements essential during the whole process. (Goffin, K., *et al*, 2010) In line with the process description, the initial step of the study was to define the problem statement. The importance of having a clear and targeted statement became obvious in short time, as it guided further decisions in the study as well as supported communication. The scope was of a dynamic nature, as it was both reshaped and narrowed down as more information and comprehension were achieved from the studies.

Based on the problem formulation, a tour was organised to get a better understanding of the customers and the market organisation. The literature review explains how this type of tour can be pursued to capture knowledge within the targeted field of application. (Goffin, K., *et al*, 2010) But this was not the key target in this case since the application field was not defined at that point of time. Instead, it enabled the researcher to get better comprehension about the market organisation, the customers' environment and the relation to the customer. This awareness resulted in more informed and accurate decisions in the further preparation of the study. For example, the standard way for the research department to get in contact with the customer was through this kind of organised tours, whereby it was at first planned to also be used for this study. Then, when understanding the setup of

the tours, that contained plenty of short stops and were mainly in office-environments, it became obvious that another approach was required for these methodologies.

Apart from the targeted field of application, there are several other factors to consider in the choice of market. As verbal communication is a key component of the major part of the study, the selection might aim to minimise potential *language barriers*. Therefore, the first targeted market resulted in the researcher's native country. Another essential factor was the *maturity of the organisation*. This was revealed when a contact person from the market organisation explained that the targeted application field was newly established, which meant that they didn't have the required resources and structures to support the project in an efficient way. Another revealed factor was *the customers' occupancy level*, which was described to be lower in the aimed field of application compared to others. Based on those factors, it was recommended by the market organisation to redirect the problem formulation into another application field as it was experienced to be difficult to organise enough studies within the available time. The recommendation was followed but the problem with the study period remained, this time related to long lead times. The customers' strictly controlled industry requires externals to have permission to enter a jobsite, and this is authorised by higher management in the construction site and not by the customers themselves. As the study was conducted during the summer holiday period, the permissions would have taken long time to obtain and the arrangement of the studies was therefore estimated to be about 3 months. This led to another redirection, but this time regarding the geographical market. The new market was not yet in the peak of the national holiday period and it was therefore easier for them to support the project, even though the time was very limited also in this case. All the discovered factors that were revealed when contacting the market organisation were correlated to the time frame of the project, which was dedicated to be between 2-3 months from taking the initial contact with the market organisation until having completed the studies. In this project it was possible to redirect the problem formulation, but in a real case it should instead be focused on dedicating the required amount of time. Nevertheless, it is important to understand that there are many factors that impact the preparation of the study and that they might vary between markets.

When contacting the market organisations, it was experienced to be difficult to reach a suitable contact person as several loops and touch points were required. Since there were no obvious communication channels, a top-down approach was applied. This resulted in a rather complex and

time requiring communication path. One of the time drivers was long-term absent employees, e.g. on paternity leave, as their substitutes did not know how to handle this request. Along this chain it was verified that the most suitable contact person in the market organisation was the Project Manager (PM), who had the responsibility for the targeted customer profile: customers operating in larger construction sites. As the PMs only support the customer in questions related to a certain project, they were required to get permission from the Account Managers (AM) for conducting the studies. This derives from that they are the internal owners of the customers. The required process for setting up the study with the customer is therefore illustrated in Figure 19 and considers two main steps; alignment between Researcher and PM and alignment between PM and Customer. This illustrates how the preparations of the studies were handed over when the necessary PM was reached. During this process it was experienced to be some factors that had influence on the efficiency and the outcome of the preparation and these are also listed in Figure 19.

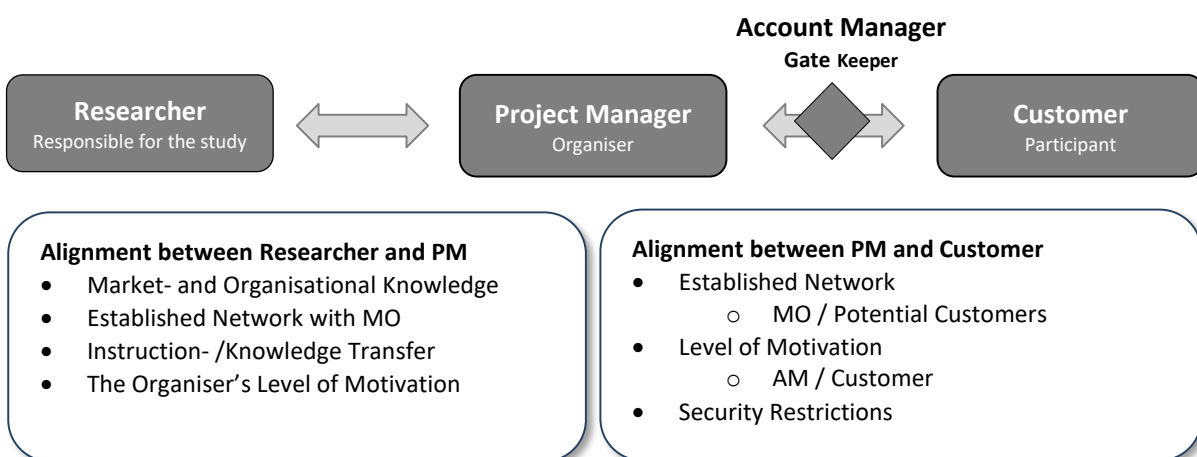


Figure 19 – Identified factors that influences the planning phase of the Deep Customer Insight studies.

In the preparation with the market organisation there were four key factors that were influencing this phase; *Market- and Organisational Knowledge*, *Established Network with the Market Organisation*, *Instructions- and Knowledge Transfer* and *Level of Motivation of the Organiser*. Market- and Organisational Knowledge refers to having basic knowledge in the studied field of application and about the market organisation. This enables to make qualitative decisions, get in touch with the right roles in short time and pursue efficient communication. It is earlier explained how the restricted market- and organisational knowledge led to a top-down approach in the initial contact, which resulted in long lead-times and redundancy, as the details about the study had to be repeated for

several persons. The second factor, an established network, was experienced to have positive impact on the setup time and the engagement of the participants. The correlation was particularly evident when having established contacts in the management of the market organisation. Another important factor was the transfer of instructions and knowledge from the Researcher to the PM. This was crucial as the PM took over the responsibility for preparing the study and was thereby responsible for future decisions and to motivate the study, both internally and externally. Therefore, it was not adequate to only transfer the requirements about the interesting customer profile, as also the methodologies needed to be fully understood for taking informed decisions. The knowledge transfer was experienced to be challenging since all communication was conducted over phone and the meetings were often squeezed in to busy agendas. The PMs also confirmed to not have had full understanding about the methodologies before execution, but from their side it was not experienced as a problem since having more details about the techniques would not have had any notable impact on them or their actions. However, it was considered to have been beneficial to get better support in facilitating the methodologies to colleagues and customers. One mentioned example was that the researcher could have provided them with prepared video tutorials of the methodologies. Prepared material about the study and the methodologies simplified the PMs' contribution, which subsequently increased their motivation to support the project. The PMs' motivation was crucial for the study as it normally falls outside their responsibility. For the conducted studies in this report, the PMs explained their participation to be motivated by the fact that it is an interesting and relevant topic for Hilti.

The second part of the process focuses on the PMs' alignment with external customers and was mainly influenced by the following factors; *Established Network*, *Level of Motivation* and *Security Restrictions*. An established network enables to easier find and motivate participant and it considers both the internal as well as external network. The internal network refers to established relations with gatekeepers that can support in identifying and accessing customers; meanwhile the external network refers to the awareness of- and relations to potential customers. The importance of the established networks in the market organisations are also described by Tove Weigel, as the researchers and developers rarely have any established contacts in the market organisations. In the first contact with the market organisation it was immediately requested what the customers' benefits would be from participating, and contribution to future products was not considered to be a sufficient motivation. The question was initially understood to come from the customer, but it was later revealed to be of the same interest for the AM. The AMs' mind-sets are earlier described to be strongly focused on

establishing and maintaining close relationship with the customers. Furthermore, they can also have the attitude that the customer should only be visited when really needed or being requested by them. Therefore, this kind of study, that includes unknown people and that contains interviews, is perceived as something that can harm the relation with the customer. The main issue was therefore not only to motivate the customers to participate in the study, but also to motivate the AMs to give access to the customers. In relation to this, it was suggested from a PM to considering rewarding the participants with some smaller merchandise material. That would both have had positive impact on the customers' experience and also on the gatekeepers' willingness to cooperate. Tove Weigel describes to have had similar experiences and recommends that full support from higher management can have positive impact on collaboration. Another recommendation from her is to strategically place these roles in key positions in the project, which often lead to higher commitment. The last factor related to the preparation of the studies considers security restrictions. In the construction industry, these restrictions do not only regulate external access but also oblige permission for video recording, which was an element in one of the executed methodologies. The process for those requests can be time requiring, up to 4 weeks, and they are not always approved. The request was, for example, denied in one of studies in this project.

It can from this chapter be summarised that the preparations of the studies are in general time consuming whereby the dedicated time should not be underestimated. The strict organisational structure within Hilti increases the complexity further. However, the process tends to be more efficient when having good knowledge of the internal organisation and when being able to utilise established networks, and in particular including higher management. The customers' strictly regulated environment also means that access to the customers is not always obvious, even though many customers wants to support the project.

4.2.3 The Data Collection in the Studies

This chapter focuses on the experience from the data collection in the customers' environment and considers the achieved benefits from the studies as well as influencing factors on the outcome. In the end of the chapter the two methodologies are explained separately.

Conducting the studies in the customers' environment brought immediately increased understanding about the customers, which was perceived to further develop over time. Consequently, it became

much easier to reason like the customer. The studies also clearly distinguish the differences between the office environment of the researcher and the working environment of the customer, which should be considered when developing new products. However, it should also be noticed that the researcher had very poor previous experience from the field, whereby a more experienced employee might not witness the same obvious advantage. The close interaction with the customer established a new relationship, and in combination with the increased understanding of their physically challenging environment, it improved the motivation to support them through new solutions. Thus, this triggered the feeling of responsibility and encouraged to genuinely engage in the studies to bring material back to the office for further development.

The studies were at first experienced to be rather intense, which might be due to that both the methodologies and the environment were new to the researcher. The environment of the customer, which was very active and loud, forced the researcher to consistently pay attention to the surroundings meanwhile conducting the studies. The methodologies also had to be adapted to each location and required many fast decisions. Altogether, these factors were easier to handle when having good knowledge and experience of the methodologies. However, the learning curve was experienced to be very steep when conducting the studies practically. The same experience was exposed at another company that used Deep Customer Insight studies for research, wherein established guidelines were considered to be less efficient than practical training. (Goffin, K., *et al*, 2010)

The customers' particular environment, that requires permissions for access, places high pressure on the customer when inviting externals, since they become responsible for them. This leads to that the customers avoid to invite people they do not have a previous relationship with and therefore the AMs normally has to accompany visitors to the jobsite. Although, it is also in their interests since it enable them to control what is going on with their customers. This case was slightly different from others, as the time-required activities did not fit into the AMs' busy agendas and the already involved PM was therefore trusted to substitute them. This possibility was also communicated in the preparation of the study, as giving access to the customers would not influence their available time for sales. The PMs have different agendas and targets, and could therefore more easily take on longer meetings in certain cases, even though a full day was exceptional also for them.

Even if the PM had been earlier involved in the project it became clear upon arrival at the jobsite that the information about the methodologies had not reached through to the customers. This was revealed as the customer had poor understanding about the planned study, which required a shorter clarification on place. The lack of knowledge prevented the customer to make any preparations and to assure that the applications of interest were actually executed. Due to the circumstances, the researcher was shown the currently running activities whereof the most interesting one was chosen to be followed.

Having the local representative present during the study was initially beneficial as it enabled the researcher to acclimatise in short time. This was a result from the PMs' previous knowledge of the jobsite and the established relationship with the customer. The customer also appreciated the presence of a familiar representative as it contributed with trust and confidence in the otherwise new situation. As soon as the study started the PMs' role got less useful and they were mostly waiting out the time. Being aware of wasting other people's time worried the researcher. Furthermore, it caused reluctant feelings when having to ask or push for more customer visits. Instead of waiting out the time, one of the PM's tried to participate in the data collection and the study became immediately more efficient when working in parallel. However, the employee was not trained in the methodologies, which resulted in limited quality of the collected data. The execution of this kind of study is rather complex and requires training to achieve the intended result. (Goffin, K., *et al*, 2010)

Another revealed insight from the data collection was that the AMs' high protection of the customer were somewhat correlated to the large size of the jobsites. These jobsites tend to show greater attention to security compared to smaller ones, whereby the AM also might have acted accordingly. To reduce the complexity in the setup and execution of the studies, it was therefore investigated whether targeting smaller customers might be a better option. One of the PMs explained that it could be easier to organise unaccompanied visits on the smaller jobsites, but it would yet not be easy. If that were allowed, it would be because of a well-established relationship. A trial in this direction was the result of when the PM had to leave early during one of the studies. Therefore, the researcher remained a couple of hours alone for completing the data collection. This occurrence confirmed the importance of having an established relationship as it was only accepted since the researcher had previously conducted a few studies together with that PM. The PM also explained that the researcher's character

had impact on the decision, as it was important for him that the customer feels comfortable in that person's presence.

In summary, the studies were initially demanding to conduct in the customers' dynamic environment, but this experience was reduced in short time by practical training. Also, the rigidity of the organisation and the safety aspects limit the efficiency of the studies. Even so, working close to the customer results in more empathy and increased motivation to support them through new solutions.

4.2.3.1 Ethnographical Studies

The methodology of Ethnographical Studies was applicable to Hilti even though there were some identified factors that had impact on the outcome. As the two methodologies, Systematic Observation and Contextual Interviews, were conducted in parallel, the overall experience is described in this chapter.

The workers noticed immediately that something unusual occurred on the jobsite since the researcher's profile together with the video recording equipment was not commonplace in that environment. But after a short introduction and when the operators had accepted to participate in the study, they did not show any further signs of being affected.

As previously expected, the language came to play a central role in the Ethnographic Studies. The customers rarely spoke English and other influencing factors as the noisy environment and the technical vocabulary challenged the communication abilities. Therefore, some *language barriers* were experienced in the beginning of the study but those were continuously reduced as the researcher got used to the environment and the vocabulary. The present PM also supported whenever needed. The experienced language barriers had mainly impact on the Contextual Interviews. The methodology's particular nature containing a chain of questions, often led to that the answer of one question triggered the next question. Poor understanding from either of the parties tends to break this chain and therefore limit the outcome of the methodology. It was therefore not sufficient to only verify the researcher's knowledge in the local language but it should also be done for the operators. This is of particular relevance in this industry since many of the operators had foreign backgrounds. The video recordings from the interviews were helpful as they enabled to concentrate on the content rather than

the documentation. It was also a relieving to know that the interviews could be reviewed afterwards and that it was possible to both see and hear the content again.

The operators responded differently on the study as some were very engaged meanwhile others gave very brief answers. It was also acknowledged that some of the operators made comments about those that were more active, as their participation was interpreted as a way to escape from other duties. The engagement in the study was decreased over time, and those that initially wanted to participate did not show the same excitement later the same day. The engagement level was explained by the PM to vary depending on the customer's progress in the current project. High time pressure could for example reduce the operators' ability to contribute. It was also revealed from the PM that the studies were accepted since they only lasted for (maximum) a day. Longer studies than that would have been difficult to get approved. Another contributing factor for approval was the fact that it was a one-time occasion. Even though the customers wanted to support the project, it was still difficult for them as the operators got distracted from their work, which is earlier described, to be very costly for them. Therefore, the participating customers were very collaborative as long as the studies did not have any major impact on the operators' performances.

One of the key targets of the study was to capture the complete process for the particular application, but that was very difficult in the short studies and with few resources. So even when the customer had parallel teams operating, it would have required the researcher to be at several places at the same time or being there for a longer period for taking advantage of this opportunity. A similar situation appeared when an observed application team split up to continue with separated activities in parallel. This required the researcher to make a fast decision on where to continue, and the non-selected activities would be missed out. Another factor that made it difficult to capture all parts of the process was the general difficultness in foreseeing future activities. This is a characteristic of the whole industry. If not being able to foresee the activities, it makes it difficult to assure that the studies will cover the necessary content.

4.2.3.2 Repertory Grids Technique

The Repertory Grids Interviews were more difficult to conduct and that was both related to organisational- as well as methodological reasons, which are both discussed in this part of the chapter.

The interviews were initially planned to be carried out with the operators during the stay at the jobsite. However, it became clear that the agreement between the PM and the customer was not accordingly, as the interviews were only agreed to be conducted with the customer's Team Manager (TM). The reason behind this was the customers' earlier explained operational focus and that it would have been costly to give time from the operators. Compared to the operator, the TM is easier to take aside for a shorter time, as that role has not the same direct impact on the operational business. The researcher realised the changes in the sample while already being at the jobsites even though it was previously understood by the PM. The PMs' awareness also revealed that the internal organisers had not fully captured the importance of using the selected sample when conducting the interviews, as the change was not communicated to the researcher.

The first interview was conducted in a jobsite that was significantly delayed, which resulted in an overall high-paced atmosphere with more teams than usual operating in parallel. Even under the certain circumstances, the TM agreed upon participating in a short interview. The disposable time was about 15 minutes, which was similar also in the rest of the interviews. Even though this time was considered very restricted, especially compared to the theory that suggests about 45 minutes, it was anyway accepted for being able to practically test the methodologies. For the interviewee's convenience, the location was chosen to be in the entrance hall of the jobsite, which therefore not required the participant to change location and saved some time. The influence of the noisy and messy environment was identified in short time as the interviewee started to follow on-going activities in the surroundings. All future interviews were therefore conducted in an adjoining barrack, as there were usually no other available places close to the jobsite. The barrack had often a shared space with a small office, so conducting the interviews there did not grant to have found a calm space.

The interviews followed the previously described process closely and were focused on key activities in the particular field of application. These activities were to be defined by the interviewee. As the participants were Team Managers it led to that some participants interpreted the question from their own perspective and others from the perspective of the operator, but that was easy for the facilitator to correct. It was also experienced to be a bit difficult for the interviewee to understand on which level they should define the activities, and also to consistently keep to that level for all of them. This reveals that it might not have been clear in the instructions. When discussing this topic with Tove Weigel it was explained that the right level of the interview question can be challenging to find and that it often

requires to practically testing the interview. At the same time, it is a very fine balance as each trial with a customer is a used interview opportunity. If possible the interviews can also be tested internally.

Next phase of the process was perceived to be more difficult as the interviewee now had to define attributes related to the elements, and that was already from the beginning experienced to be challenging. Tove Weigel explains that having a too narrow scope can be a potential reason to this problem. Another discovered tendency was that the users' reasoning ability tended to become limited when they found an attribute. For example, if *requires human resources* was defined as an attribute they could only come up with the opposite of that in the second round, which in this case could have been *automated activity*. The researcher had to lead them out from this pattern by giving them other examples. To have difficulties already in the beginning of the process is the contrary to the experience of Tove Weigel. Instead, she explains the initial part of the study as relatively easy and that the later phases are more challenging when the attributed become less obvious. In order to simplify the process, the interviewer gave a concrete example in the beginning of the interview and also shared seven cards with different categories, which could be used for inspiration. The example did not have any notable effect on the interviewee's performance but might have led to slightly better confidence in the beginning of the process, meanwhile the categories caused a lock-in effect for the participants that used those more for verification rather than inspiration.

The rating of the elements went very smoothly and led to that many participants regained some lost confidence from the more difficult parts of the process. It was also experienced that the initial hinders made the interviewee to quickly loose interest for the interviews as they were observed to start checking the time, looking at the phone etc.

4.2.4 Data Analysis

This chapter discusses the experiences from analysing the data. The limited sample and the poor outcome from the Repertory Grids Interviews were not considered to be sufficient for analysis, and are therefore not covered in this chapter. Instead, the chapter focuses on the analysis of the Ethnographic Studies and includes the three steps: *data categorisation*, *writing thick descriptions* and *creation of data coding schemes*.

It is previously described how the analysis were conducted iteratively to enable taking advantage of the already captured insights in upcoming studies. The process for analysis was experienced to be rather time consuming but very structured and easy to follow, at the same time as it revealed unexpected insights and knowledge about the customers' culture among others.

The first phase of the analysis was to convert the recorded material into categorisation schemes. This was both a time consuming and a repetitive process, especially as the researcher conducted all the analysis alone. It was easy to lose focus, especially when analysing over long periods. In the beginning of the study, each of the parameters in the categorisation scheme were analysed separately but when gaining more experience it became easier to track multiple factors at the same time, which reduced the total time.

The quality of the collected material impacted the outcome of the analysis. As the environment in the construction site was very noisy, it could sometimes be difficult to follow the discussions in the video records. Another issue was the lightening. The operators did rarely organise with any supporting lights even though they were operating in dark environments, which resulted in very dark scenes. However, it was decided to not add any extra light during the data collection since that could have had impact on the workers behaviour. Furthermore, Alan Bryman (2012) highlights the importance of taking understandable notes to avoid later confusion when analysing the material. This was experienced to be valid also for this case and it was even more evident when it took longer time between the data collection and the analysis. This also arises the importance of treating the material immediately. But, it was also experienced as beneficial to let the analysed material mature after the process as some insights were occasionally revealed afterwards.

The analysis awoke questions that would have been beneficial to discuss with the operators and it would therefore have been useful to re-visit the same customer, which is also suggested by Keith Goffin *et al* (2010). Although, it might have been difficult in practice as the workers switch between projects and are not always working in the same teams. It was also revealed to be important to capture as much information as possible directly from the customer and to avoid trying to make own explanations. One example was when asking an operator for the reason behind an incident and then asking the same question to an internal Product Manager at Hilti. This revealed that the operator lacked the technical understanding of the problem and as a result, he applied a non-optimal solution.

This insight about the lack of technical knowledge would not have been understood by studying the video records and if asking the Product Manager.

The categorised material was then converted into *thick descriptions*. Before writing the description, all data in the categorisation scheme was overviewed to identify similarities and differences among the different parts of the study. The scheme enabled to get a good overview of the data, especially when comparing to the intangible format of video records. The thick descriptions can facilitate communication to non-participants and it provides a very complete picture of the experience. However, the material was experienced to provide an even better result when being complemented with snapshots or video clips.

Decoding then further segmented the thick descriptions. The coding scheme gave a very powerful view of the material in the thick descriptions as it filtered the different codes and gave a complete picture on everything related to a certain product, material or activity, depending on what codes that were used. The first time to conduct the study, it was not obvious how the codes could be varied in line with the scope, but that was something that became very clear after this study. The scheme was also used for internal communication and the structure was experienced to be easy to grasp for employees that had not participated in the study (see Appendix 6)

The analysis did not only provide useful deliverables, but also revealed several insights during the process, both related to customers' needs and their culture. The researcher also experienced to have a greater understanding about the customers after the analysis compared to before. Even though it has many potential benefits it should also be highlighted that the methodology was rather time consuming and sometimes very repetitive.

5. Analysis

The analysis discusses the ability of applying the Deep Customer Insight methodologies to Hilti, how they can facilitate radical innovation and also what opportunities and challenges there are in doing so.

5.1 Applying Deep Customer Insight Methodologies to Hilti

Looking at the overall picture of the Deep Customer Insight studies it is clear that the approach required a lot of effort and had long lead times, especially in the preparation phase. Furthermore they were difficult to conduct in the customers' dynamic environment. However, one of the methodologies showed high potential by bringing unexpected insights mainly due to the structural analysis. This chapter focuses on how these methodologies can be applied at Hilti whereby the discovered factors that had impact on the study will be discussed (see Table 6) and how to handle those.

Table 6 – Factors that impacted the Application of Deep Customer Insight Methodologies at Hilti.

Preparation	Execution	Analysis
<ul style="list-style-type: none"> • Market- and Organisational knowledge • Established Network • Motivation • Transfer of Information 	<ul style="list-style-type: none"> • Knowledge in Methodologies • Impact of the Environment • Accessibility • Available Resources <p>Ethnographic Studies</p> <ul style="list-style-type: none"> • Language barriers • <i>“Escaping from work”</i> <p>Repertory Grids Interviews</p> <ul style="list-style-type: none"> • Accessibility to Operator • Reasoning Abilities 	<ul style="list-style-type: none"> • Time Consumption • <i>“Try to understand, not Judge”</i>

One reason to the required effort and long lead-times is the rigid organisational structure, which increased the complexity of the project. This resulted in, for example, inefficient communication structures. However, the complexity and long lead times can somewhat be reduced by for example building up a contact network, gaining more knowledge about the organisation or steering the timing. The poor initial adaptability of the organisation to the new processes, might lead to that upcoming studies are easier to organise. But as Hilti operates in a global market it might not be possible for the company to fully take advantage of an established system in one single market, as the studies need to

be conducted in several markets. A potential solution can therefore be to target a few key markets and to establish those capabilities there.

The rigid organisation did not only impact the total time, but also affected the quality and efficiency of the project. One reason was the deeply established culture of the *ownership of the customer*. This prevented the researcher to find and access potential customers, and it was one of the main reasons to only be able to conduct a few studies. As earlier described by Tove Weigel, this effect can be reduced by assuring full support from management or strategically assigning key roles to gatekeepers within the project. The positive effect of having support from higher management was already experienced in executed studies, as it resulted in higher commitment and shorter lead times. Anyway, it should be considered what kind of management that needs to be involved in the project, as involvement of management from the head quarter might not have the intended effect in the market organisation. The solution of including the gatekeepers in the project goes in line with the recommended interdisciplinary approach of the studies, (Weigel, T., Goffin, K., 2015) and can therefore be a suitable solution. This would result in increased awareness of the project in the market organisation and would also enable to establish relations within the project team. These relations might enable to get easier access to customers. This tendency was shown during the execution of the studies when the researcher was allowed to remain in the construction site alone, which was the result of the previously established relationship. However, involving the AMs in the studies would be outside of their current responsibility and it might therefore be difficult to motivate for management. Important to highlight is therefore firstly, that all employees in the organisation can benefit from better customer understanding in their daily operations and secondly, which is maybe even more important, the necessity of using diverse employees in the opportunity identification. (Weigel, T., Goffin, K., 2015) Another issue for those involved in the studies might be to find the right balance between innovation attempts and operational business. It was for example discovered that the new attempts for collaborative idea generation meetings at Hilti were also used for discussing currently running projects, which shows how the operational business often overrun innovation attempts. (Gassmann, O., *et al*, 2012) Finding this balance might be even more difficult when having an active workday that involves a lot of customer contact. This tendency requires managerial guiding and clearly stated targets.

Other essential impact on the study was derived from the particular environment and the characteristics of the industry. Contributing factors were the safety aspect, the dynamic nature and the strong operational focus. The safety aspect did both impede the access to the customer as well as the execution of the project. Looking at the industry today, it is still manageable to overcome these factors even though it can be time consuming due to slow processes. However, it is necessary to reflect about the future as the safety regulation in the industry can be further constrained over time. This can lead to that the studies become even more difficult, or in worst case almost impossible, to organise. The dynamic nature mainly refers to the experienced difficulties in planning in the industry, which makes it difficult to assure that the planned studies cover the essential content. This is necessary for identifying common needs in the data, and makes it essential to verify that the certain application is actually running during the intended study. Otherwise, longer travels can have been done for no use. A possible approach is to establish a direct contact between the project team and the customer, but that is not possible with the current organisational structure that instead applies the longer communication paths. The restricted planning abilities also require flexibility as awareness of changes in the plan can be achieved very close to the intended study.

A part from the previously mentioned difficulties, the execution of the Ethnographical Studies was experienced to be very useful as it enabled to enhance both insights about customers' needs and culture. The very structured approach encouraged the researcher to observe from different perspective, which can be of very high benefit for Hilti as it can reduce biases of previous knowledge. Regarding the language barriers it should be strived for using teams with different language knowledge that can be distributed over different markets. This is not considered to be a major problem as the organisation has a very diverse workforce. Furthermore, the methodology was experienced to require practical training, as the real potential and the flexibility of the methods were not fully understood until after a few iterations. The training should not only focus on the process but also on the approach that the team needs to apply. As for example, the information needs to be captured directly from the operators and should not to be explained by the observers, as that could lead to missed out knowledge. This can be perceived as something difficult when having very high previous technical knowledge about the products.

The customers' strong operational focus prevented to access the operator for the Repertory Grids Interviews, even though the operator was the key person in the sample of the study. Consequently,

this had major impact on the result. Even though many different roles and departments can apply the methodologies for different purposes, (Goffin, K., *et al*, 2010) they still become very limited if never being able to access the key user. For using the methodologies it is therefore essential to assure this access. There are two potential solutions to this problem; either motivating the customer to ensure access the operator or motivating the operator to participate outside work. One solution of the first case requires to align with higher management in the customers' organisation and to motivate them to support the project, which could for example be compensated by sharing the outcome of the studies with them. Another solution is to reward participating companies with for example discounts, products, consumables etc. This would lead to that the loss in time is repaid in another way. Otherwise, the operators need to be reached in their spare time and this could be achieved by organised events in relation to their normal workday, e.g. a free lunch. Operators could also be accessed through other channels as web-communities or at particular locations where the interesting profiles tends to be, e.g. material shop for construction. The potential of the different solutions are varying but is recommended to be evaluated.

Apart from the problems related to accessing the operator, the Repertory Grid Technique was also experienced to be difficult to conduct. The reason is difficult to define based on the few interviews, but two impacting factors can have been; again, the operational focus and also the reasoning ability. The stressful environment distracted the interviewee to properly engage in the interviews and it was almost immediately acknowledged how the participant wanted to return to daily business. This can have been one reason to the poor performance in the rather deep interview that required high focus. Another reason might be the interviewees' reasoning ability. Compared to the previously described cases in the literature (Baxter, I., *et al*, 2014), this study involved participants without academic backgrounds and consequently they might have had less previous experience from abstract reasoning, which the methodology requires. At the same time, the methodology is derived from psychology (Lemke, F., *et al*, 2010) whereby it can be considered to be applicable for a broader profile. These uncertainties motivate to further investigate the potential of the methodology in the context of Hilti. One way to reduce the abstractness is to use more tangible elements as for example products, which also could be brought to the interview.

This chapter reveals the many challenges in applying the methodologies at Hilti, which derive both from the internal rigidity and the customers' particular environment and business. However, the

Ethnographic Studies showed to have high potential in the execution as it revealed unexpected insights from the structural analysis. But for being able to conduct these studies, it requires organisational- and cultural transformations for making the administration of the studies more manageable. It also requires managerial support and clearly assigned expectations of the participants to enhance internal motivation and commitment. Based on this study, the Repertory Grids Technique is considered to be difficult to apply at Hilti as it is difficult to motivate participation of the customers and also challenging to conduct the interview in practise. Although, it is recommended to further investigate the potential solutions to motivate the customers and also, due to the poor sample, try to conduct some further interviews where the previously explained knowledge is considered.

5.2 How the Implementation of Customer Driven Insight Methodologies Can Facilitate Radical Innovation Capabilities

The Deep Customer Insight methodologies do not only provide the direct value from application, but can also serve as a component in the system of building radical innovation capabilities. (Weigel, T., Goffin, K., 2015) Therefore, this chapter discusses how the implementation of those methodologies can potentially support in fulfilling the identified success factors (see Table 7) and avoid the barriers related to radical innovations. As the methodologies were only tried for a short period of time with limited resources, this chapter is mainly based on previous studies in the field.

Table 7 – Potential benefits in the overall innovation from implementing Deep Customer Insight Methodologies for Increased Radical Innovation Capabilities.

Phase	Hilti Today	Potential Benefits by Implementing Deep Customer Insight Methodologies
Process	<p>Mixed approach</p> <ul style="list-style-type: none"> - Initially open and flexible - Later structured and controlled <p>Technology Research</p> <ul style="list-style-type: none"> - Technology Monitoring <p>Business Units</p> <ul style="list-style-type: none"> - Development Projects 	<ul style="list-style-type: none"> - Encourage innovation between/outside current business - A component in the complete innovation process - Reduce market risk - Apply a problem solving approach in research - Cultural acceptance of innovation activities - Clear approach for new employees - Keep track of changing customer needs
Methods&Tool	<p>Business Units</p> <ul style="list-style-type: none"> - Traditional Market Research 	<ul style="list-style-type: none"> - More empathy and understanding of customers - Increased motivation in innovation
KPI& Decision Making	<ul style="list-style-type: none"> - Established Decision Making Process - Long horizon hinders measurement 	<ul style="list-style-type: none"> - Enables measurement of investment - Enables to influence performance
Organisation	<ul style="list-style-type: none"> - Rigid functional organisation 	<ul style="list-style-type: none"> - Encourage internal and external collaboration - Establish discovery capability - Encourage innovation outside current business
Teamwork& Collaboration	<ul style="list-style-type: none"> - Ad-hoc collaboration across boundaries 	<ul style="list-style-type: none"> - Encourage collaboration across boundaries

The first mentioned success factor in the theory is related to the innovation process and describes the importance of having a guiding process that is of an open and flexible nature. (Küpper, D., *et al*, 2013) Currently, Hilti mixed approach goes from being open and dynamic in the beginning to be more controlled and structured from that an idea is defined. Therefore, the early stage of innovation does not have a very distinguished process but has instead more clear targets and responsibilities. The Business Units apply a structured approach for conducting development projects, and those projects also contain idea generation that may result in radical innovations. Even though these ideas often end to be limited to their area of business, e.g. an upgrade of a product. The early stage of innovation can therefore be summarised to have a diffuse process, and especially for radical innovation outside existing business areas. Not having an established approach can have negative impact on the efficiency as the time is not focused on the innovation per se but also used for finding the right approach. To establish a process in innovation, the literature describes how the Deep Customer Insight methodologies can be implemented as a part of a cyclic framework. (Price, R., Wrigley, C., 2016) This allows targeted innovation that can be steered by the company's strategy, and that triggers idea generation activities (Weigel, T., Goffin, K., 2015). Consequently, this would establish a natural way of

acting upon discovered opportunities, which is essential for gaining the full value out of the studies. Establishing an early focus on the market may also lead to reduced market risks (Schweitzer, F., 2014), in comparison with the current technologic approach. This derives from that the customer interaction is shifted from the developing phase to an early stage of innovation, whereby the opportunities arises from the market rather than being verified by the market. This can follow by reduced time and costs in innovation. (Goffin, K., *et al*, 2010) The structured approach can also impact the researchers' general experiences of innovation. It can, for example, be more challenging to transform a technology into a market opportunity rather than finding a technical solution for an identified opportunity. Furthermore, establishing a process with clear methodologies might also have positive impact on the innovation culture, as the employees explain it to not yet be cultural accepted to use the dedicated time for innovation activities. The clearly established processes might encourage using this time, which also can result in better outcome. However, not all employees at Hilti agree with that the initial part of ideation should be steered and controlled, whereby an initiative of implementing such a process could result in resistance. Hence, it is important to assure its flexibility in being open and allowing to take side-paths. (Küpper, D., *et al*, 2013) As those that have established approaches in the company are mainly having long-term experience, it can also be argued that it might be easier for them to take a side path in an existing process rather than for new employees to establish their own process. The implementation of a process would also go in line with the fact that customer needs changes over time (Goffin, K., *et al*, 2010), and that those methodologies therefore require to be applied systematically (Desai, J., 2013) for always being aware about the latest knowledge.

The theory continues with the advantage of using methodologies and tools for identifying customers' needs, (Küpper, D., *et al*, 2013) which are currently limited within the company. The on-going market research activities are mainly conducted in the Business Units and are therefore related to development projects. Those studies are often facilitated and supported by the market research department and do often consider traditional methodologies, which are according to the theory beneficial when the user can express their needs (Price, A., *et al*, 2015). This is more common for basic- or performance needs rather than the excitements needs that are relevant in radical innovation. (Goffin, K., *et al*, 2010) Even though some of the employees already consider themselves having good knowledge about the customer without any extensive customer contact, applying the methodologies aim to lead to deep customer understanding (Goffin, K., *et al*, 2010) and is therefore assumed to only have positive impact on this knowledge. That is also experienced when applying the studies as it

revealed both insights about the customers' needs as well as their culture. The increased customer awareness from established methodologies and tools will, again, most probably reduce market risk in later stages of innovation. (Schweitzer, F., 2014) More empathy for the customer can also lead to more accurate decisions in further development, for example, related to customers' preferences. Close interaction is also experienced to have positive impact on the motivation in innovation, which can both lead to higher prioritisation and better outcome.

Hilti has established a very clear decision-making process that is very well understood by the employees. At the same time, the company experiences it to be challenging to measure innovation due to long cycles. A contributing factor to the difficulties can be that the company not requires reporting of early innovation activities. Establishing Deep Customer Insight studies would therefore enable to track the investment in each project, and also the correlated outcome if the approach is implemented in the previously described cyclic manner. (Price, R., Wrigley, C., 2016) Tracking innovation also enables to impact the performance by reacting upon the results.

Hilti organisation has strictly separated functions and collaboration across boundaries is only conducted on ad-hoc basis, as for example when supporting with technical knowledge. The theory explains that a successful radical innovation approach should instead support internal as well as external collaboration. (Küpper, D., *et al*, 2013) The suggested solution of using interdisciplinary teams for the deep customer insight methodologies might therefore be an initial step towards that direction. The activities across boundaries can also establish stronger networks, which is also a common barrier (Sandberg, B., Aarikka-Stenroos, L., 2014). Using the interdisciplinary teams enables to reach more innovative solution by taking advantage of the different experiences and perspectives in the company. (Desai, J., 2013) A potential competitive advantage for Hilti can be if fully taking advantage of the internal market organisation by involving them in this system. As external providers mainly conduct the current studies, applying the methodologies internally would result in new discovering capabilities. Lacking discovering capabilities is one of the most common barriers in radical innovation (Sandberg, B., Aarikka-Stenroos, L., 2014) and can therefore also become an essential competitive advantage. However, this also requires a lot of training and practical experience. The interaction across functions can also encourage innovation between and outside current business areas, if that is supported by the innovation strategy.

The summary of this chapter is therefore that the methodologies do not only reveal customer insights but can also facilitate radical innovation capability by establishing a clear process that encourage internal as well as external collaboration.

6. Conclusion

This chapter aims to describe the conclusion from this study and covers initially how the Deep Customer Insight methodologies can be applied at Hilti. Furthermore, it considers how this approach can impact the overall radical innovation capability. The benefits and challenges in using the techniques is also integrated in the chapter.

Application of Deep Customer Insight methodologies goes theoretically very well in line with Hilti strategy that is concentrated on: innovation, differentiation and the customer. However, the execution of the methodologies reveals that they are more challenging to apply in practise. This derives from both internal as well as external factors. The rigid internal organisation prevents efficient preparation and execution, which therefore requires a lot of effort in organisation and tend to lead to long lead-times. At the same time, the customers' strictly regulated environment, that is also very unpredictable, makes it difficult to assure the quality of the studies as changes on the jobsite can appear very close to the planned execution. Additionally, the customers' strict operational focus prevented access to the operator, whereby the Repertory Grids Interviews became very limited. The poor outcome from the interviews was also related to the stressful environment and the restricted analytical experience of the interviewees. However, the Ethnographical studies showed a better fit into the Hilti organisation and also showed high potential in execution as it revealed several insights and understandings about the customers. This was mainly due to the very systematic approach of the analysis. Furthermore, the close interaction with the customer increased the motivation in innovation and established a feeling of responsibility of the researcher to provide useful solutions to the customer. The greater empathy of the customer enabled to reason like the customer, and could therefore be useful for other development decisions. To enable practise the methodology it still requires changes in the organisation and the culture, as today's situation creates many barriers and make the methodology difficult to organise and use.

Regarding the overall innovation system, the suggested implementation of the methodologies could be of great potential for enhancing radical innovation capabilities. The implementation enables to establish a complete innovation framework, which can lead to a more targeted approach in innovation that goes in line with the company strategy and enhances further innovation activities. A clearer process can also establish a more innovation centric culture where the employees know how to conduct innovation. Implementation of the methodologies and tools will give better empathy and

understanding about the customers and their needs, which can result in reduced market risks. Consequently, that could reduce time and costs in innovation. Using this approach also enables measurement of innovation, as the investments are very clear and traceable. In turn, this enable to react upon the results for further improvements. Also, the approach suggests taking advantage of interdisciplinary teams which enhances working across borders and utilising the overall competence in the company. This prevents the identified barrier of radical innovation of working in strictly organisational structures and enables to create networks across the organisation as well as with the customers. Conducting the methodologies internally does also require building up new market discovery capabilities that can be a competitive advantage. Even though the methodology has several different benefits in terms of radical innovation capabilities, it still requires a lot of effort to get there. As the current understanding of the customer integration at Hilti is to take a passive role and asking the customers what they want, this reveals the lacking understanding of customer insights. Therefore, it is fundamental to fully establish the concept within the organisation as this, in fact, would be to take a very active role and searching for understanding.

Based on this, the final conclusion is therefore that the methodologies for gathering deep customer insight makes a very well strategic fit and can also, in several ways, facilitates the overall radical innovation capability. However, the application is in practise more difficult to conduct in the rigid organisational structure of the company. The methodologies are also very strongly dependent on the customers' business and industry, which are factors that are more difficult to influence. The Ethnographical Studies shows potential, but need further trials for verifying the setup and access to the studies. It should also be noted that the safety regulation might also be restricted over time, whereby the potential limitations in the future should also be considered. Repertory Grids Technique shows worse results as it has a very bad fit in the industry of the customer, both regarding access as well as in execution. But due to the poor sample it is recommended to investigate this methodology further, when also taken in to account the experience from this study.

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Appendix 1 – Example Questions for Contextual Interviews

Following list of interview questions are presented by Keith Goffin *et al* (2010) and can be used in Contextual Interviews for getting better understanding about the customers and their needs.

Contextual Interviews : Questions

What?	This is a set of questions that could be used for gathering customer insights by Contextual Interviews. The content should be adjusted for the certain case. The questions are divided into what should be covered before/during/after the study.	
Before	Demographic questions (Understand the customer)	- Tell me about your role at [company] ? - How much time do you spend on [application area] ?
	Problem Discovery (Learn about problems)	- What is the hardest part of your day? - What tasks take up the most time of your workday? - What could be done to improve your experience with [activity/process/role] ? - What are the biggest / most important professional responsibilities / goals?
	Product Discovery (Generate and validate)	- What would your ideal solution on this problem be like? - If you could wave a magic wand and instantly have an imaginable solution to this problem, what would it be? - What's the hardest part about [process you're improving] ? - What are you currently doing to solve this problem/get this value?
During	Purpose of an activity	- When do you use this product / service ? - Why do you use this product / service ? - How does this product / service help you to do your work ? - Who else benefit from this product/service?
	Preparation	- Can you tell me what you need to prepare in advance?
	Procedures	- Can you explain to me how you use this product or service? - What makes the activity easier / harder to complete? - Are there different ways of doing this [activity/process] ? - Do you find it hard to [process / problem] ? - If you had a solution to this problem, what would it mean to you / how would it affect you? - How motivated are you to solve [problem / process] ? - How important is [delivered value] to you?
	Time and Space	- How long does this typically take? - Can you do this somewhere else?
Ending	Personnel Requirements	- Who do you need to help you to do this? - What skills do you require?
	Nature of Social Organisation	- Who else uses this product / service? - What is the relationship between these people?
	Trigger of the activity	- When do you need to do this? - How often do you do this?
	After the activity	- What happens after the activity? - What needs to be verified? - What concludes the activity?
Ending	Validation of data	- So based on the conversation, it sounds like [activity / process / problem] is really hard for you, but y is not. How accurate is that ? - [Summarize some of your key takeaways] – did I understand your situation correctly?
	Additional Comments	- Is there anything else you think I should know about that I didn't ask?
	Further Contact	- Can I follow up with you if I have more questions?

Appendix 2 – Decoding Scheme for Observations

Following template is presented by Keith Goffin *et al* (2010) for decoding collected material from observations. The data categories modified to each case, depending on the scope of the study.

Observations : Decoding Scheme

Data Categories	Points to look for	Observations	Timings	Personal Notes
Triggers for acquiring product or material	· Why, When, How?			
Trigger for product / service usage	· Who, what, when, where, why, how?			
The environment in which the product / service is used or consumed	· Physical Layout · Actors · Events / Activities · Time Sequence			
Interactions with user's environment	· Physical Interaction · Proxemic Distances · Social Interactions			
Product or Service Usage	· Doing things right/wrong · Non v alue-adding time · Misuse · Workarounds · Confusion (data)			
Intangible aspect and unarticulated needs	· Emotions · Frustration / Wasted time · Fears and Anxiety · Linguistic Signals · Extra-Linguistic Signals · Non-verbal Signals · Spatial Signals			
User Customisation	· User modifications of the product · User modifications of the process			

Appendix 3 - Interview Guide: The innovation process at Hilti for Employees in Research

Name:

Gender:

Date:

Department:

Title:

Introduction

I am writing my Master Thesis within the topic of Customer Driven Innovation for the Research department at Hilti. The purpose with this interview is to map the current Innovation process. I have signed a NDA (Non-Disclosure Agreement), which mean that all information will be internally reviewed before being presented or published. Furthermore, your name or role will never be presented or published.

The interview will mainly consider the Fuzzy Front End and Customer Integration in Innovation.

Interviewee Profile

1. What is your role at Hilti?
2. For how long have you been working with similar tasks?
3. For how long have you been working with similar tasks at Hilti?

Strategic Areas of Innovation

4. What steers in which areas that research is conducted:
 - a. What criteria are considered?
 - b. Why are these criteria considered?
 - c. Who is involved in this decision?
 - d. When are these decisions made: Continuously or at a certain point in time?
5. How are the areas of Opportunity transferred to the organisation:
 - a. How are areas of opportunity communicated to the organisation?
 - b. Who receives this information?

Ideation - The birth, enrichment and evolvement of innovative ideas.

6. What trigger Ideation at Hilti?
7. How is ideation at Hilti conducted:
 - a. What techniques and methodologies are used for ideation?
 - b. Who in the organisation is involved in ideation?
8. What motivates the team to come up with innovative ideas?

9. On what information / knowledge is the ideation based:

- a. What is important to have knowledge about when working with ideation?
- b. How are you considering customer needs in this early phase of innovation?
- c. Do you consider that the organisation has enough of customer insight for being able to generate sufficient outcome from the ideation?
- d. How do you achieve awareness about customer needs at Hilti?
- e. Is Hilti sales model influencing your knowledge about the customer?
 - i. *If yes, how is it influencing?*
- f. Is the customer knowledge shared or stored within the organisation?
 - i. *If yes, how is that knowledge shared?*
 - ii. *If yes, how is that knowledge stored?*
 - iii. *If yes, what is stored?*

10. How is the contact with customers in the research phase:

- a. When are you in contact with the customers?
- b. How often are you in contact with customers?
- c. What kind of customers are you in contact with?
- d. How do you select what customers to contact?

11. Do you collaborate with any external partners for ideation:

- a. With customers?
- b. With other companies?
- c. Others?

12. What are your personal experience and feelings about the ideation phase?

Evaluation and Selection: The review of ideas to define their potential value

13. How are the ideas evaluated at Hilti:

- a. What are the criteria for idea evaluation?
- b. How is the evaluation being conducted at Hilti?

Appendix 4 - Survey: Innovation in Technology Research at Hilti

Following survey was distributed internally to the Technology Research to verify the outcome of the earlier conducted interviews. The survey was sent out to the whole department consisting of 45 persons.

Survey : The Innovation Process in CR&T

Department:	<input type="text"/>			
Gender:	<input type="checkbox"/> Female	<input type="checkbox"/> Male		
Years in the Company:	<input type="checkbox"/> <3 years	<input type="checkbox"/> 3–5 years	<input type="checkbox"/> >5 years	

Please complete the following questionnaire with specific regard to the above enquiry, by placing a CROSS in the appropriate box.

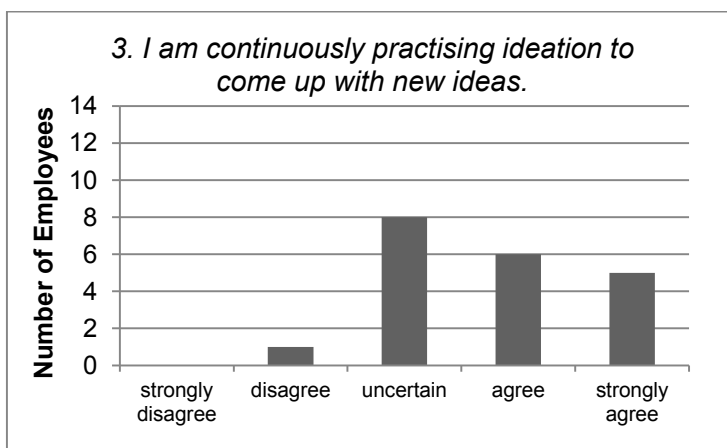
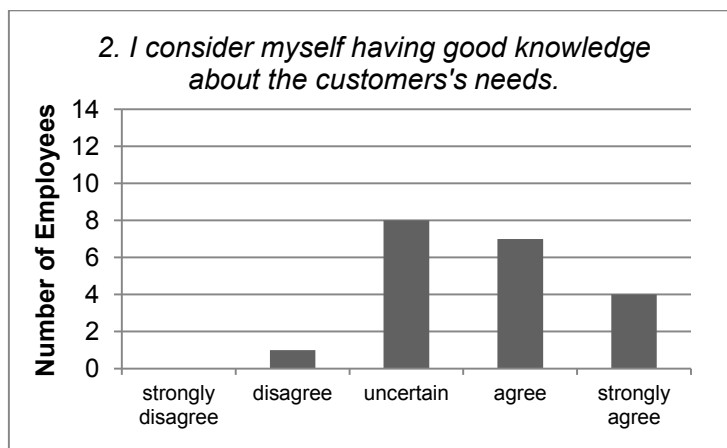
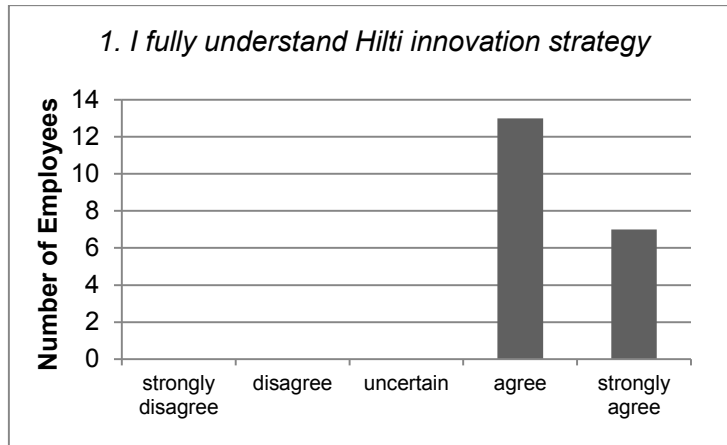
	strongly disagree	disagree	uncertain	agree	strongly agree
1. I fully understand Hilti innovation strategy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I consider myself having good knowledge about the customers' needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I am continuously practising ideation to come up with new ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I am systematically collaborating with my colleagues to come up with ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I am systematically collaborating with my colleagues to evaluate ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I have an established approach for coming up with new ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I consider it beneficial to support the ideation activity with suitable processes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I feel motivated to continuously come up with new ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I feel pressured to continuously come up with new ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I consider myself a creative person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I know how to access passed ideas within Hilti.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

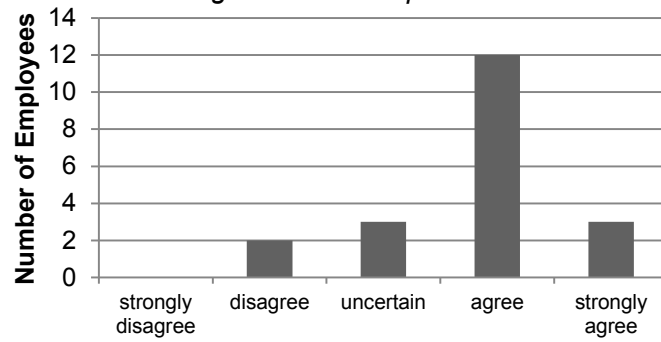
	strongly disagree	disagree	uncertain	agree	strongly agree
12. I feel that I have the organisational support that I need to be able to deliver new ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. An idea can only proceed in the company with the support from at least one BU.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I estimate my time spent on ideation to be about:	<input type="checkbox"/> <5%	<input type="checkbox"/> 5-10%	<input type="checkbox"/> >10%		
15. I estimate the number of times that I have had customer contact during the last 12 months to be:	<input type="checkbox"/> Never	<input type="checkbox"/> 1-5 times	<input type="checkbox"/> >5 times		
16. I estimate the number of times that I have visited customers during the last 12 months to be:	<input type="checkbox"/> Never	<input type="checkbox"/> 1-5 times	<input type="checkbox"/> >5 times		

Appendix 5 – Results from Survey: Innovation in Technology Research at Hilti

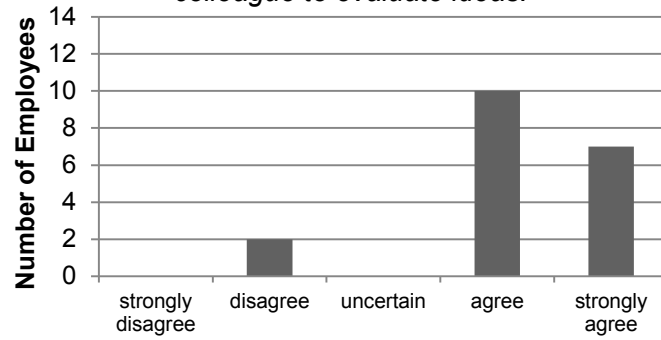
Following data is the outcome of an internal survey that was sent out to the Technology Research department. The survey was distributed to all actively register in the internal network in the department which responds to 45 persons and 20 answers were received.



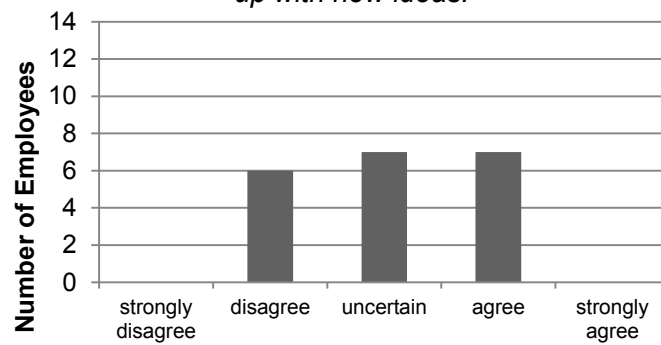
4. *I am systematically collaborating with my colleagues to come up with ideas.*



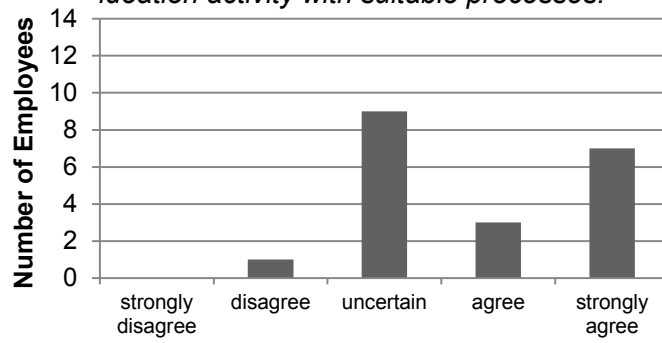
5. *I am systematically collaborating with my colleague to evaluate ideas.*



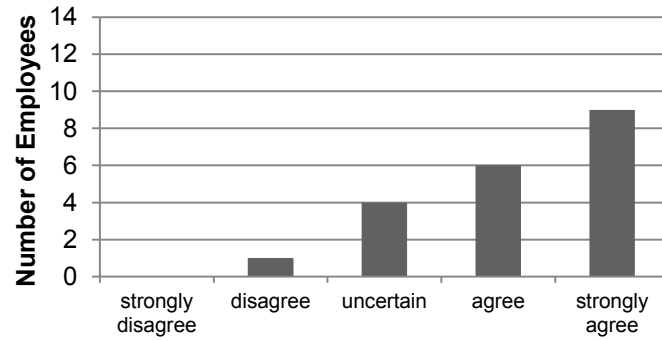
6. *I have an established approach for coming up with new ideas.*



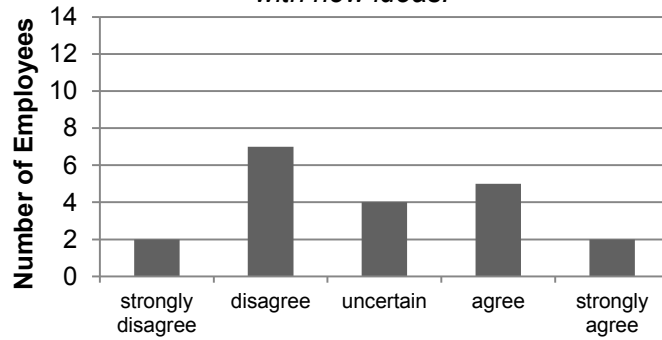
7. I consider it beneficial to support the ideation activity with suitable processes.



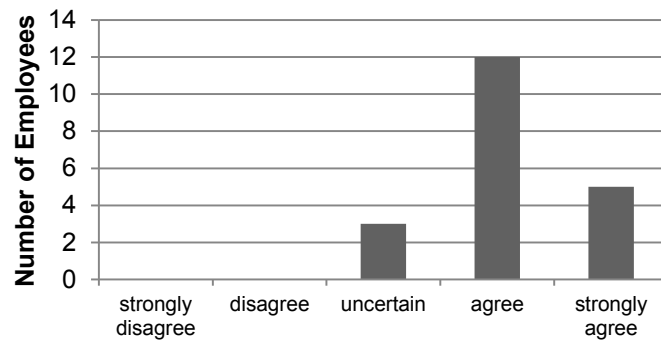
8. I feel motivated to continuously come up with new ideas.



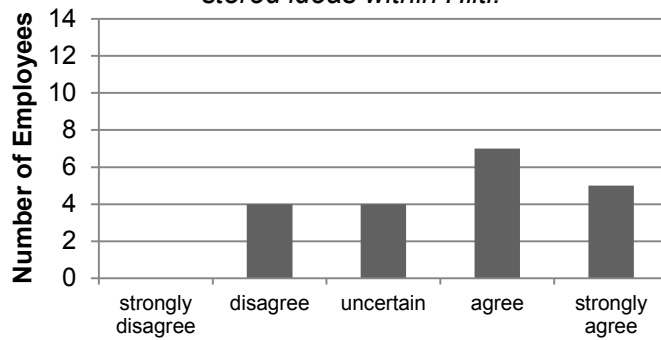
9. I feel pressured to continuously come up with new ideas.



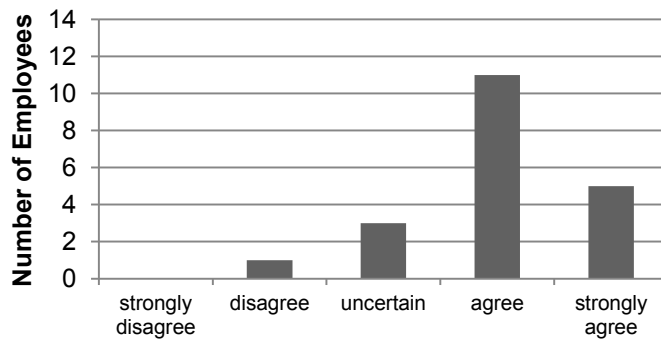
10. I consider myself a creative person.

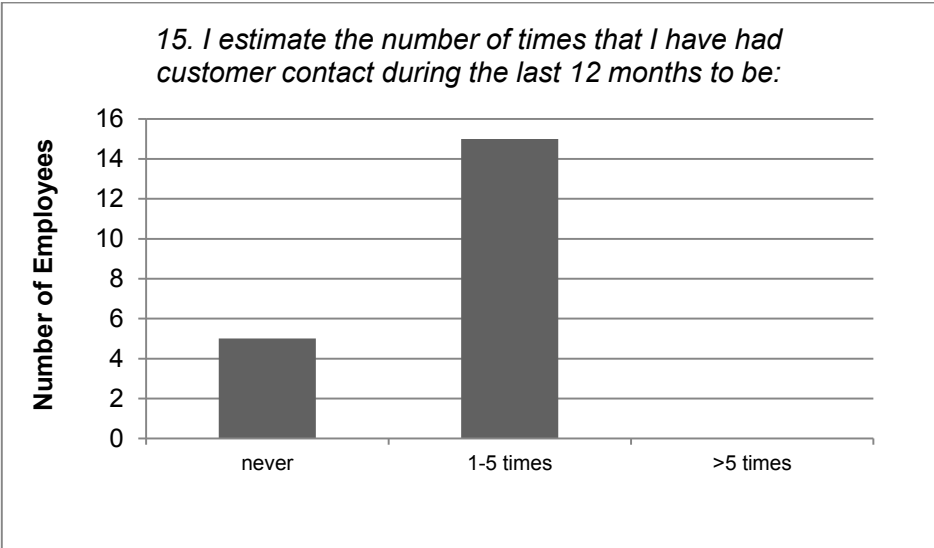
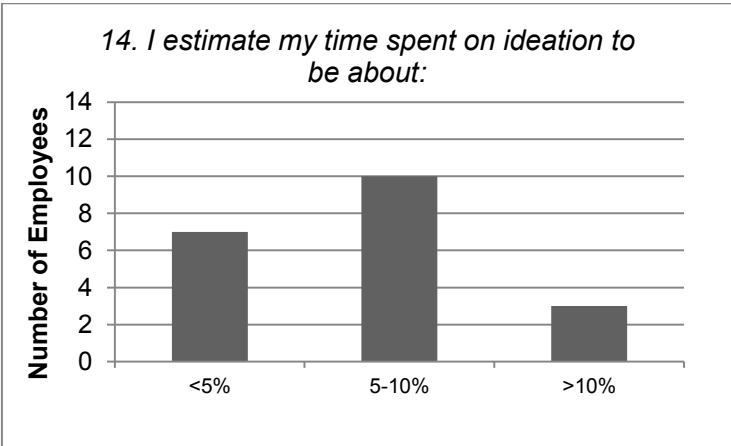
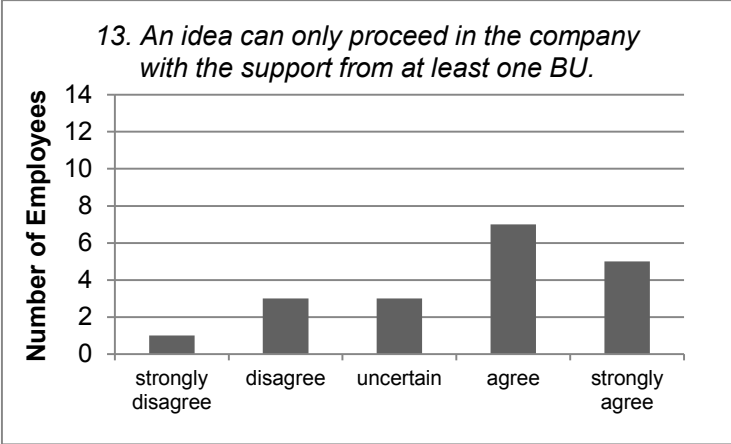


11. I know how to get access to earlier stored ideas within Hilti.

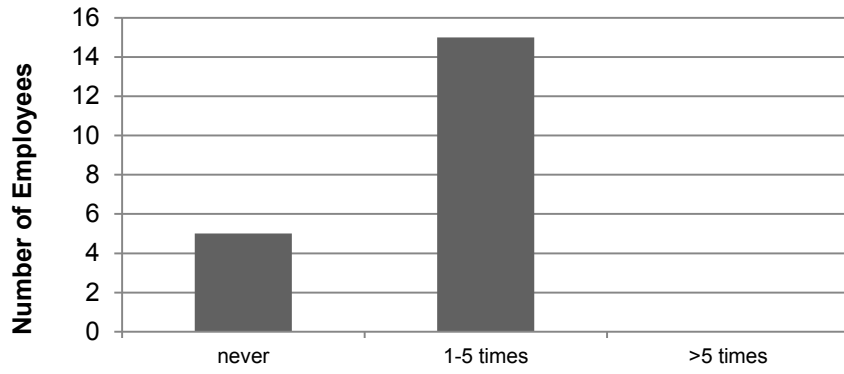


12. I feel that I have the organizational support that I need to be able to deliver new ideas.





16. I estimate the number of times that I have visited customers during the last 12 months to be:



Appendix 6 – An Excerpt of a Thick Description with Correlating Data Codes

Following text is an excerpt from a thick description. Each code within brackets is then correlated to a certain place in the data scheme. Therefore, every time a code is mentioned in the thick description the content is written in the description column.

[...]Larger materials and tools were kept on the floor of the lift meanwhile smaller components were stored in a cardboard box. **[STORAGE₂] [TOOL_AND_EQUIPMENT₁]** One of the workers on the floor gave instructions according to the map where the pipe should be installed, in this case 30 cm to the right from an already installed one. **[ACTIVITY₄]** The worker used that pipe as a reference point when measuring with a measuring tape **[TOOL_AND_EQUIPMENT₄]** and making a mark. Then he used the rod that were inserted in the pipe clamp to create a straight line and made the final mark where it should be fasten. **[ACTIVITY₅] [MATERIAL₂]** The worker drilled **[ACTIVITY₆] [TOOL_AND_EQUIPMENT₅]** a hole and hammered **[ACTIVITY₇] [TOOL_AND_EQUIPMENT₆]** in a threaded insert **[MATERIAL₃]** which enabled him to later screw in the rod. **[MATERIAL₂]** This was expressed by the manager to not be the best solution and that an electronic insert tool would have been a better choice. **[ACTIVITY₇] [TOOL_AND_EQUIPMENT₆]** Initially the rod was screwed in by hand but was later properly tightened with a polygrip pliers. **[ACTIVITY₈] [TOOL_AND_EQUIPMENT₇]**

Category	Code	Definition [code]	Description
Environment	[ENVIRONMENT ₁]		
	[ENVIRONMENT ₂]		
	[ENVIRONMENT ₃]		
Organization	[ORGANISATION ₁]		
	[ORGANISATION ₂]		
	[ORGANISATION ₃]		
	[ORGANISATION ₄]		
Activity	[ACTIVITY ₁]		
	[ACTIVITY ₂]		
	[ACTIVITY ₃]		
	[ACTIVITY ₄]		
Non-value added time	[NON-VALUE ADDING TIME ₁]		
Material	[MATERIAL ₁]		
	[MATERIAL ₂]		
	[MATERIAL ₃]		
	[MATERIAL ₄]		
Tools and Equipment	[TOOLS_AND_EQUIPMENT ₁]		
	[TOOLS_AND_EQUIPMENT ₂]		
	[TOOLS_AND_EQUIPMENT ₃]		
Emotions and Feelings	[EMOTION ₁]		

List of References

Goffin, K., Lemke, F., Koners, U., (2010) *Identifying Hidden Needs – Creating Break Through Products*. [Electronic]
New York: Palgrave Macmillan.