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Insights on Knowledge Transfer in a Medium-Sized Construction Company: Barriers and Enablers

Master's thesis in the Master's Programme Design and Construction Project Management

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Examensarbete ACEX30
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Cover:
Employees at the case company studied, interacting on the construction site (Tommy Byggare, n.d)
Department of Architecture and Civil Engineering
Göteborg, Sweden, 2021

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ABSTRACT

Knowledge is a vital resource for an organisation and knowledge transfer within project-based organisations is an important process of knowledge management. This topic is considered difficult to perceive and even harder to implement. The study took place in Gothenburg and was conducted together with Tommy Byggare, a medium-sized construction company located in the southwest of Sweden. Tommy Byggare had experienced inefficiency regarding their work with knowledge transfer and wishes to improve this process, with hope that it would facilitate the overall quality within the company. The aim with this thesis is to investigate and determine what the current barriers with knowledge transfer are in a medium-sized construction company and to see what enablers there are to improve the work with this process.

The foundation of the thesis is built on previous literature on this subject and on an interview study. There was one explorative interview in the beginning of the thesis followed by ten interviews, where the participants were white collar workers with various working roles. The interviews were semi-structured, which helped to map the current barriers. The results from the interview were then analysed and compared to the literature, which led to suggestions for possible enablers for improvements in this area. Several issues were found in the interview study, which were assembled into six main barriers: inconveniency, lack of time, imperceptibility, lack of responsibility, lack of transparency and incoherency. These key barriers are presumed to hinder the progress of knowledge transfer, which led to possible enablers. The study indicated that governance, organisational culture, communication, and user-friendly knowledge transfer systems were factors that could facilitate improvements of knowledge transfer processes. These results aim to provide medium-sized construction companies with insights on what to focus on when improving the work with knowledge transfer.

Keywords: Knowledge transfer, medium-sized construction company, project-based organisations, barriers, enablers

Insikter om kunskapsåterföring i ett medelstort byggföretag: barriärer och möjligheter

Examensarbete inom mastersprogrammet Design and Construction Project Management

JACOB EDWIJN

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Institutionen för arkitektur och samhällsbyggnadsteknik
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SAMMANFATTNING

Kunskap i en organisation är en vital del och likaså är det viktigt att föra kunskap vidare. Kunskapsåterföring är en process inom kunskapshantering och är ett komplext ämne, men det är en viktig del för ett företag att behålla användbar kunskap inom företaget. I denna studie har ett medelstort byggföretag undersökts, Tommy Byggare, vilka är etablerade i Västra Götaland och studien är genomförd i Göteborg. Företaget har upplevt att processen med kunskapsåterföringen är ineffektiv och vill bli bättre på detta, då det anses främja det övergripande utfallet av kvalitén i företaget. Syftet med denna studie är att undersöka samt fastställa vilka barriärer ett medelstort byggföretag kan ha med kunskapsåterföring samt se vad ett förbättrat arbete med detta kan generera. Arbetet bygger på tidigare litteratur inom ämnet, som sedan analyserats och jämförts med data insamlad från en explorativ intervju i början av arbetet samt en huvudsaklig intervju med tio anställda på företaget. Intervjuerna var semistrukturerade och hölls med tjänstemän, så som platschefer och projektchefer. Flertalet problem med kunskapsåterföring inom företaget kunde genom detta lokaliseras och möjligheter till förbättring genererades genom att analysera resultaten.

Problemen som framkom under studien hade kopplingar både till kunskapsåterföring samt kunskapshantering, som sedan slogs ihop till sex olika barriärer; besvärligt att arbeta med, tidsbrist, svårbegripligt, avsaknad av ansvarig, bristande öppenhet och brist på sammanhang. Studien påvisade att verksamhetsledning, kultur inom organisationen, kommunikation samt att användarvänliga system för kunskapsåterföring var möjliga förslag att fokusera på för ett fungerande sätt att arbeta med kunskapsåterföring. Resultatet ger ett perspektiv på vad företaget bör fokusera på för att förbättra sitt arbete med kunskapsåterföring samt få en inblick i hur det ser ut i dagsläget.

Nyckelord: Kunskapsåterföring, medelstora byggföretag, barriärer, möjligheter

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Acknowledgements

It has been a long time since we began our journey at Chalmers and we have now reached the end of our student life. New adventures and challenges are around the corner and finishing this thesis have helped us feel prepared for whatever the future holds for us. We are therefore eternally grateful for the help we got from our supervisors': Christina Claesson-Johnsson from Chalmers and Martin Skarhall from Tommy Byggare. We would also like to thank every single participant who made this thesis possible.

Thank you!

Jacob & Linnea

Abbreviations

DB Contract	Design-Build Contract
DBB Contract	Design-Bid-Build Contract
ICT	Information and Communication Technology
KM	Knowledge Management
PBO	Project-Based Organisations
QHES Manager	Quality, Health, Environmental and Sustainability Manager
VLS	Governance system (Verksamhetslednings-system)

Figures and tables

1. INTRODUCTION

This chapter provides a comprehensive view of the thesis topic, knowledge transfer and why it is an important process within organisations. This chapter explains how knowledge transfer, which is a process of knowledge management, could be beneficial for medium sized construction companies in Sweden. In this case the company studied is Tommy Byggare. The introduction includes a background of the topic, aim, research questions, delimitations, and a description of how the report is constructed.

1.1 Background

The construction industry is project-oriented and could be viewed as a combination of different disciplines designed for executing unique projects (Camara, Augenbroe, Anumba, & Carrillo, 2002). The project is the main mechanism for project-based organisations according to Hobday (2000), which is any type of organisation that works with projects having certain limitations as time, resources, and specified objectives. Camara et.al. (2002) state that the construction industry needs to be dynamic, as construction companies ought to fulfil requirements from clients with certain quality demands. Further explained is that knowledge management is a useful tool to implement in this industry to reach the requirements in an effective way by learning from past experiences. It is important both to transfer knowledge between various stages within a project but also between projects (Camara et.al., 2002). The processes may vary between different projects and depart from one another in economical scale. This has led to a belief that the industry could standardize processes to become more productive (Styhre & Gluch, 2010). Furthermore, consistent processes are derived from good knowledge transfer and makes it easier to systemize (Meiling, Lundkvist & Magnusson, 2011). Knowledge transfer is a process within Knowledge Management (KM) which could enable the industry to improve in quality, cut costs and reduce the construction time (Alavi & Leidner, 1999).

This thesis has been conducted together with Tommy Byggare which is a medium-sized construction company located in the southwest part of Sweden. The company primarily focus on dwellings and commercial real estates and has approximately 200 employees. The company has steadily exhibited growth since the start in 1970. As a result of the increased number of employees, the company has experienced inefficiency, on an organisational level, regarding knowledge transfer and they expect this to become even more apparent as the company grows even further. Therefore, Tommy Byggare wished to understand what type of tools and methods that could be beneficial for their way of working with knowledge management. This is an ambition as they strive to become more competitive on the market.

1.2 Aim

The aim of the thesis is to investigate what barriers and enablers exist related to knowledge transfer in a medium sized construction company. By outlining Tommy Byggare's current way of working with knowledge transfer, possible barriers can be identified. Further, the study

intends to present possible enablers by analysing the barriers and compare these findings to those which are portrayed in literature. The goal is that this thesis may facilitate the company's way of working with knowledge transfer and can hopefully be applicable for similar construction companies as well.

1.3 Research questions

Following research questions have been formed based on the aim of this study:

Research question one
What effects could better knowledge transfer generate for a medium sized construction company and what enablers could facilitate this process?

Research question two
What issues regarding knowledge transfer do the employees experience at Tommy Byggare and how would they like these to be addressed? Are their experiences coherent with those portrayed in the literature?

1.4 Delimitations

This thesis is limited to investigate a medium-sized construction company with a certain geographical location in the southwest part of Sweden. The study undertaken is not project specific, but it is bound to the case company Tommy Byggare. In the interview study, ten employees from the case company were interviewed, and it consisted of white-collar workers only.

1.5 Thesis structure

This thesis consists of six main chapters: an introduction, the methodology, the theory, the empirical research, the analysis, and the conclusion. The six chapters are illustrated in *Figure 1*, and the figure shows how one chapter leads to another. The introduction aims to put the thesis in its context. It includes a background which determines its relevance. It also contains the problem formulation. The second chapter is the methodology chapter. It describes how and why the study was conducted in this way. Next, the theory chapter presents what previous is known on the subject. The empirical research chapter displays what was established from the interview study. The data from the interview study is then compared with findings from the literature study which is analysed in the analysis chapter. The last chapter is a conclusion which binds the thesis together.

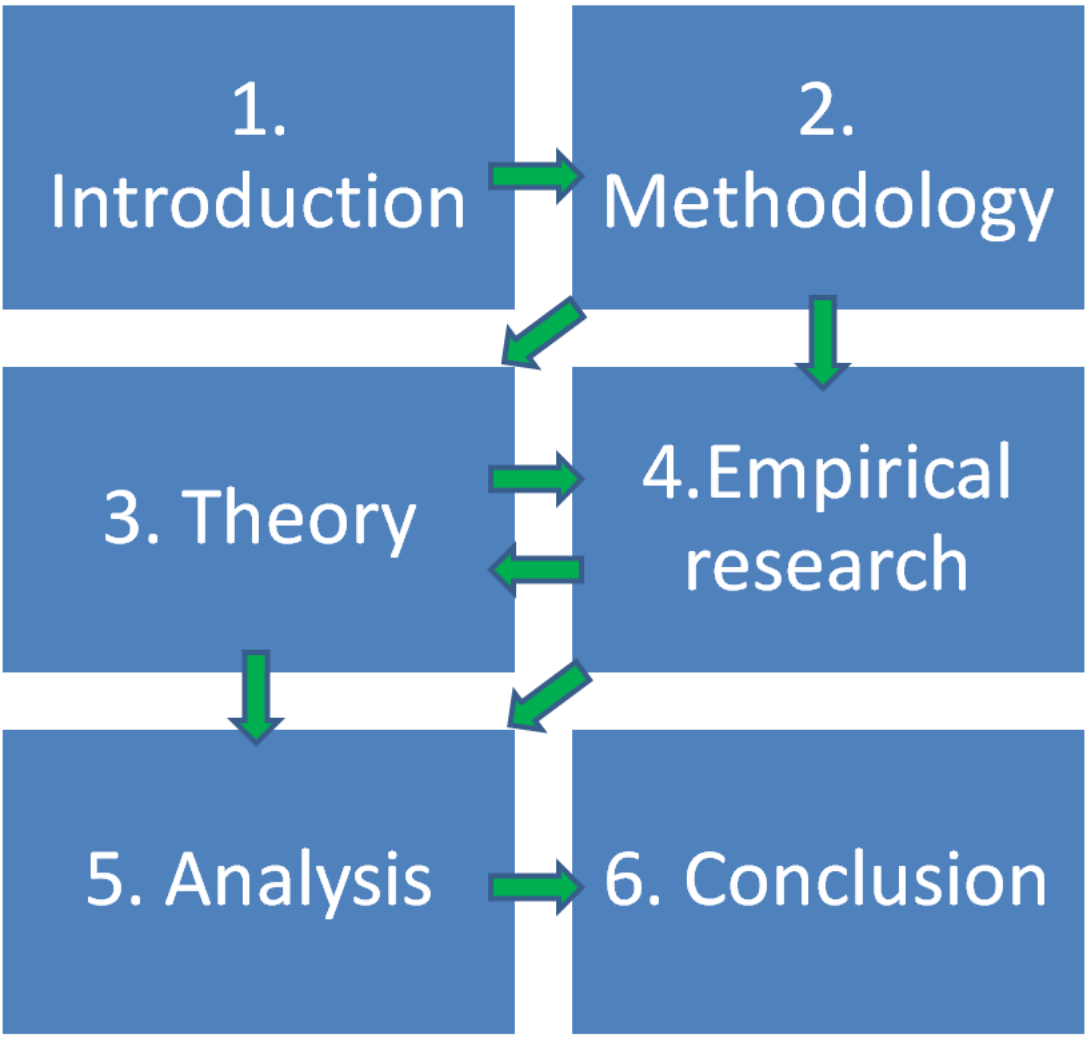

Figure 1. An illustration of the workflow between the six chapters in the thesis.

2. METHODOLOGY

This section aims to display how the study has been conducted and what different methods have been used. It also shows in detail how all distinct stages has been performed from the initial phase to the results. Furthermore, this chapter aims to present the transparency of the work, evaluate the results and delimitations chosen and why it was conducted in such way.

2.1 Research process

The data which is presented in the theory section was gathered through a literature study. Multiple search engines such as Chalmers Library, Google Scholar, ResearchGate and ScienceDirect (Elsevier) were used to collect relevant information on the subject. The key words which were used in these search engines were: *Knowledge transfer in construction companies, Knowledge Management in Construction, Knowledge management strategies, Barriers with knowledge transfer in construction, Barriers with knowledge management, Improvements of knowledge transfer*. The literature study was carried out to get a deeper understanding of the subject before entering the interview phase.

The study process was mostly made from the students' home due to the Covid-19 pandemic. However, some of the days the students were fortune to get a workstation at Tommy Byggare's office in downtown Göteborg. The communication in the office was informal and vigorous which itself was beneficial to the learning process. The employees at Tommy Byggare clarified and confirmed certain data from formal meetings. Most of the formal meetings were held digital using Zoom, Skype and Microsoft Teams.

2.2 Approach

There are plenty of approaches to consider when writing an academic report. The three major approaches which were considered in this study were the inductive, deductive, and abductive approaches. The inductive approach is when an observation is made to produce a theory and then test it. For example, an empirical observation is that birds can fly. Testing this theory would be to observe how birds are capable to fly and then produce the theory that birds can fly because of their wings. Compared to the inductive approach, the deductive approach first conceives an idea or theory and then test it empirically to draw a conclusion. To illustrate, a theory is that all birds can fly because they have wings which enables them to fly. Testing this theory would then be to observe all birds and then to conclude that all birds are not able to fly, as the study showed that ostriches are too heavy to fly (Kovács & Spens, 2005).

The third approach is the abductive approach which is less linear than the other two approaches. A study could improve by constantly revising the empirical data collected in the study process. Unexpected findings can arise and by not locking the mindset the study can evolve and take new turns which will be beneficial for the study (Dubois & Gadde, 2002). The abductive

approach has similarities to the other approaches. It also makes logical inferences and conclusions to explain theories and phenomena of the world (Bell & Bryman, 2015).

This study used the abductive approach because there was no clear hypothesis from the start. By reviewing literature and making empirical findings this study started off in one direction and then changed course simultaneously as the study process went on. Gadde and Dubois (2002) resemble this with a jigsaw puzzle, in the start of the process there is no clear vision of the end goal. Nonetheless, piece by piece the puzzle becomes comprehensive as the process continues. According to Bell and Bryman (2015) is it crucial to be open minded when doing research because it will enable surprises which can be valuable for the study.

2.3 Research strategy

There are two main research strategies, quantitative and qualitative research. The chosen strategy for this thesis is the qualitative research. The most obvious difference between qualitative and quantitative research is that qualitative research deal with words rather than empirical data such as numbers (Bell & Bryman, 2015). Bell and Bryman (2015) suggest six steps that outline qualitative research which are illustrated below in *Figure 2.*

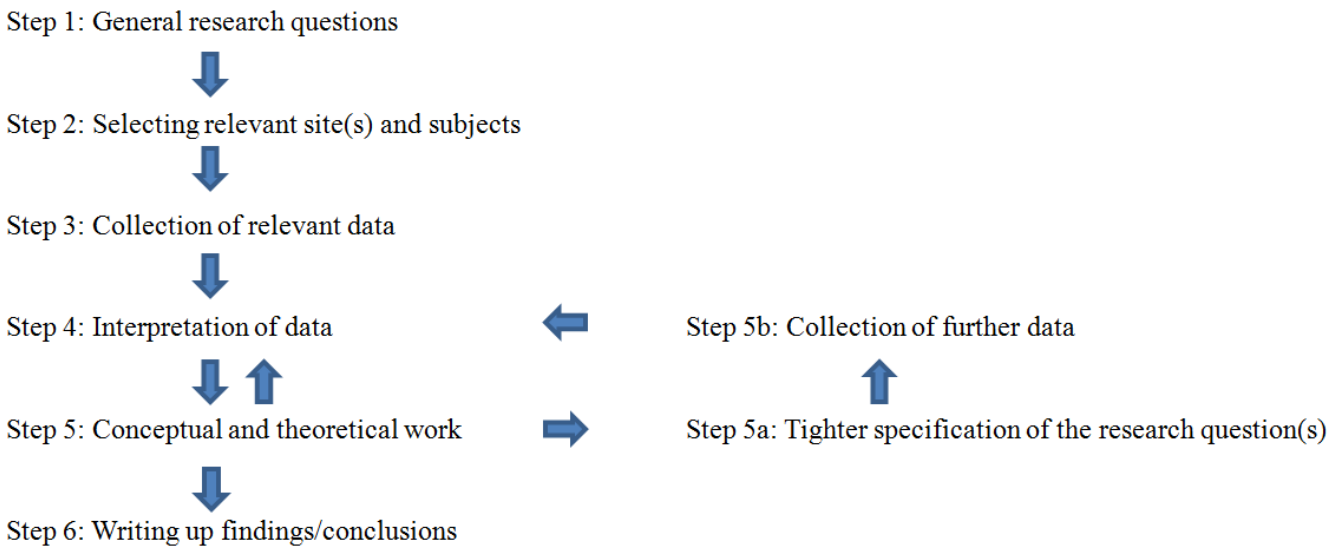

Figure 2. The 6 steps of qualitative research (reproduced from Bell and Bryman, 2015)

According to Libarkin and Kurdziel (2002) qualitative research can enable projects to develop theories during the research, which is applicable to this study. An intermediate goal is to understand what benefits knowledge transfer generate for a construction company and how the process could be made more efficient. There is no clear theory from the beginning which indicates that qualitative research is a suitable method. The study is anecdotical which means it is based on interviews rather than institutional data. Interviews is one of the key characteristics of qualitative research (Libarkin & Kurdziel, 2002).

Moreover, together with the interviews a literature study conducted. Walle (2014) claims that existing literature will guide the research in the early stages of the project. A literature review creates an overview of a subject which will be valuable for the research. It builds a foundation which will authorize the justification of the study. It also demonstrates the importance of the research and put it into context (Walle, 2014). Bell and Bryman (2015) confirm that a literature review will give the researchers an overview of what has already been studied on the topic. They also state that it is a good way to find controversies which could be interesting for the study. The choice of literature is made under the precondition that it should widen the authors' perspectives, and an extensive range of literature from various sources will ensure a deeper understanding of the topic.

The literature in this thesis was chosen depending on the publication date and how relevant it was to the topic. Literature which recently had been published was therefore prioritized to make the information as relevant as possible. Literature that had been cited many times was also chosen as it increases the credibility of the source.

2.4 Interview strategy

In qualitative research it is more common to use semi-structured and unstructured interviews, rather than structured interviews. In semi-structured interviews the interviewer has prepared a set of questions and topics as a guideline for the interview but has considerable leeway to change course during the interview. In contrast, structured interviews have little room for flexibility, and flexibility is a cornerstone for qualitative research (Bell & Bryman 2015).

In this study there are one explorative interview with our supervisor before the main interview study with nine participants. The explorative interview was semi-structured and was conducted to preliminary determine the issues that the company experienced regarding knowledge transfer. The interview was explorative which was valuable to determine the direction of the study. By evaluating the supervisor's point of view and revising what was already known on the subject it helped acuminate the study. This phase helped characterize the issue and was useful for specifying the research questions even further, which is comparable to step 5a shown in *Figure 2*.

With the insights from the first interview, the second phase started. The first thing of phase two was the selection of participants, also known as sampling. According to Bell and Bryman (2015), there are two main sampling methods in qualitative research called probability and purposive sampling. Probability sampling rely on collecting random data from larger groups or even a population, however, it can be difficult to collect such a sample and, therefore, purposive sampling was used in this study. In contrast to probability sampling, the purposive sampling method enables the researchers to choose participants deliberately. The idea is that this would generate relevant data, and this is more likely to happen by selecting participants that presumably have knowledge on the subject (Etikan, Musa & Alkassim, 2016).

The sampling process was made under advisement from the supervisor at Chalmers and Tommy Byggare. Their judgement was useful to find relevant interviewees for collecting the empirical data. Also, by interviewing a diverse sample group, it minimized the risk of missing data that could have high significance to the study. Therefore, it was important to interview people from various backgrounds, position, gender, age, geographical location, and professions. The interviewees' positions at the company are presented in *Table 1* and a mix between people who are working on site and in offices is clear. The purpose of this mix was to get a more holistic view and, thereby, to meet the intermediate goal of describing the employees' experiences at the company.

Table 1.
A list of the interviewees, date, and length of the interview

Interviewee	**Date**	**Length of interview**
Calculation Engineer	March 4, 2021	31 min
Construction Engineer 1	February 25, 2021	33 min
Construction Engineer 2	March 5, 2021	45 min
Project Manager 1	March 4, 2021	39 min
Project Manager 2	March 5, 2021	19 min
Purchasing Manager	February 23, 2021	30 min
Site Manager 1	March 5, 2021	35 min
Site Manager 2	March 10, 2021	29 min
Top Manager	March 17, 2021	25 min
QEHS Manager	February 12, 2021	46 min

The second step of phase two was to formulate questions. In contrast to the questions which were used in the early phase, these questions were more specific regarding knowledge transfer. The questions were formulated in such a way that they would scrutinize the topic and help to answer the aim of the study. The interview questions can be found in appendix A and B.

2.5 Research quality

Research quality could be optimized by three cornerstones: reliability, validity, and replicability. It is more common to used them in quantitative research, but they are applicable in qualitative research too. According to Bell and Bryman (2015), these cornerstones can be rephrased to trustworthiness and authenticity, to better suit qualitative research. Trustworthiness can thereafter be divided into four pieces: credibility, transferability, dependability, and confirmability (Bell & Bryman, 2015).

2.5.1 Trustworthiness

To begin with, the authors can achieve credibility by showing engagement, methods of observation and audit trails (Cope, 2014). It can be difficult to determine if credibility has been accomplished but it can be strengthened by triangulation. Triangulation is a method where the researcher uses more than one method to collect data or information on a specific topic (Carter, Bryant-Lukosius, DiCenso, Blythe & Neville, 2014). In this study, the interviews, and the selected literature study the same phenomenon, which is a form of triangulation and increases the credibility of the thesis.

The second is transferability which Korstjens and Moser (2018) describe as how well the result could be translated into other contexts. Cope (2014) states that this is achieved if the readers can identify themselves with the result, or if the study is meaningful for people outside the project. This study can be useful for other researchers that are interested in knowledge transfer, which can be applicable for medium-sized construction companies.

Thirdly, dependability could be accomplished by auditability. If the reader can follow the research, also known as audit trail, and understand how the study has been conducted it is auditable. The study should also be conducted in a way that it can be replicated (Koch, 2006). This thesis has a method section with the purpose of describing how, when and where the research has been done. This makes it uncomplicated and, therefore, increases the dependability of the study.

Confirmability is the fourth and last part of trustworthiness. Cope (2014) describes it as the ability of explaining the researchers' interpretations and conclusions. Further it is suggested that quotes can improve the confirmability by showing that the data is not swayed in any way. In this thesis there are quotes but arguably not enough to really establish confirmability. The topic is quite broad, and the interviewees sometimes convey an underlying message which only could be detected by listening to how the respondent emphasises certain words. By being aware of this problem the report still uses quotes which increases the confirmability to a certain degree.

2.5.2 Authenticity

Overall, there are some issues regarding the quality of this thesis. One problem is that qualitative research itself tend to be subjective because it is based on what a smaller group of respondents believe to be true. Even if countless of interviews are conducted it can be impossible to distinguish their intensions. The interviewees can be untruthful or unwilling to cooperate which can lead to an unreliable result. In this study, only one company is investigated and there is a possibility that there is a bias. Crucial information on the topic could therefore be withhold due to lack of transparency and people might not dare to state their opinion. The sample size also hinders the replication of the topic, as it is a small group in comparison to the total amount of employees. The result could be vastly different if ten other interviewees were chosen and therefore is it difficult to generalize the results.

2.6 Ethical and sustainable aspects

Interviews are key elements in quality research and make a large part of the empirical data. The data will be published electronically for the public, for this reason could it be sensitive for the investigated company or the participants. The data was therefore handled in a delicate way and no names were published. The respondents were also informed before the interview that they would be anonymous which created a form of trust, which increased the credibility of the study.

From a sustainability perspective, improved knowledge management and knowledge transfer within a company could decrease the number of mistakes and faults. By preventing the number of mistakes, the amount of material and financial costs would diminish which is an improvement in both economic and environmental sustainability. Improved knowledge transfer allows individuals to share past experiences within the company and prevent the same mistakes from happening several times. Social sustainability is also something that would become better with knowledge transfer. Sharing former experiences of accidents makes people aware of risks in the production and through this a safer work environment could be established for the safety of the workers.

3. THEORY

In this chapter different theories are gathered about knowledge transfer, which should constitute a foundation for the analysis. It will include general theories about knowledge management that are applicable in the construction industry and possible barriers. It will also present the benefits of knowledge transfer and why it is a relevant process of knowledge management.

3.1 Knowledge management

Data, information, and knowledge have different meanings of one another, but they go hand in hand. Data provides information and this in turn generates knowledge. Knowledge is used for decision making and is based of individuals thoughts and past experiences and it involves judgement. Knowledge from individuals within organisations has always been valuable, as experienced people is something that is acknowledgeable both when hiring or asking for advice (Davenport & Prusak, 1998).

Information and knowledge have been discussed in literature of KM, as the distinction between them is hard to define. In the Swedish National Encyclopaedia information is described as meaningful content, that through various communication forms are transferred. As previously mentioned, it is hard to distinguish information and knowledge from one another clearly. Information provides somewhat of acknowledgement but might not be sufficient for deeper understanding, that step would instead be considered knowledge (NE.se, retrieved 2021-02-22). According to Alavi and Leidner (2001) knowledge must be interpretable for others to be useful, as it is based on information that is processed through the mind of an individual, by other means, information is not valuable if it is not used in the process that generates knowledge.

There are different approaches in KM due to distinct types of knowledge, where the most critical type is tacit knowledge, as it is considered the most difficult one to explain and describe (Bouthillier & Shearer, 2002). Accordingly, Kazi and Wolf (2006) explain that tacit knowledge is transferred through practices' and learning from other people, thus difficult to collect and transfer further. Nonaka (1994) believes that the starting point for knowledge within an organisation is based on the individual's knowledge. Therefore, the diversity and the physical insight of the individual's experience is important, as it characterizes the quality of the knowledge. This in combination with rationality and individual beliefs leads to divergent interpretations of the shared knowledge. One basis for spreading tacit knowledge from individuals is the organisation itself. Nonaka calls this a spiral of knowledge, which aims to create internal and external socialization for knowledge to permeate the organisational processes (Nonaka, 1994). Knowledge is a vital resource for a company's competitive advantage, and this has led to an increased interest in KM (Choi, Poon & Davis, 2008). Accordingly, Alavi and Leidner (2001) believe that knowledge could be managed to generate beneficial advantages for an organisation, and that strategic advantages could be created by allocate and collect knowledge within an organisation.

Based on previous studies it has shown that knowledge needed often exists within the organisation, but the difficult part is to extract that knowledge and how it should be implemented (Alavi & Leidner, 2001). Within organisations today it is becoming increasingly common to use KM. It is a crucial factor for the competitive advantage, but, according to Dalkir (2017), much of the knowledge within organisations is not gathered and utilized as efficient as it could. Davenport & Prusak (1998) mention that the trend of lean organisations has increased the interest of knowledge in the essence of realizing that when something is gone, one might realize the importance of it.

Bell, van Waveren and Steyn (2016) believe that the focus of KM should be on how to implement knowledge in the workflow and that efficient KM should be part of the organisational routines and should rewarded, promoted, and driven by management. Factors such as validity, how to use the knowledge, responsible parties and whom to receive the knowledge and the channels of communication, they are all important to confirm and clearly set up within the organisation (Bell et.al., 2016).

3.2 Knowledge transfer process

Knowledge transfer is a process within KM, and according to Dalkir (2017) it is one of the most valuable advantages, both to share with co-workers and future ones so that the company can benefit from the knowledge created within the organisation itself. Knowledge can be transferred on diverse levels from an individual to a group level and further to an organisational level (Alavi & Leidner, 2001). It is a tiring process, but necessary, to get the knowledge transferred to the right place and where it is useful and necessary within the organisation. Nonaka and Ichijo (2006) agree with this, as an organisation improves its ability to share and transfer knowledge, it would generate increased efficiency.

Boh (2007) describes two dimensions of knowledge transfer mechanisms; personalization versus codification and individualization versus institutionalization. Knowledge transfer mechanisms are the ways individuals retrieve knowledge and enables the process of knowledge transfer to be more efficient. The mechanisms are described as the formal and informal ways to share, clarify, and integrate knowledge and constitutes as tools in the execution of project tasks (Boh, 2007). There are mechanisms in knowledge transfer which is presented in the *Table 2* down below.

Table 2. Sharing mechanisms for knowledge transfer (based on Boh, 2007)

Nature of problems	Small and collocated	Large and geographically dispersed
Unique	Most suitable for individualized-personalization mechanisms	Most suitable for individualized-personalization mechanisms
Standardized	Most suitable for individualized-codification mechanisms	Most suitable for individualized-codification mechanisms

As organisations grow, it becomes harder to rely on individualized sharing mechanisms, Boh (2007) explains. Institutionalized mechanisms are therefore better suited for larger companies with a wide geographical spread. Dispersion reduces the chances of interaction with people in possession of the needed knowledge and accordingly knowing whom to ask for help gets more difficult. Hence, individualized knowledge transfer mechanisms are better for smaller and more compiled organisations where the employees have a small network as it is easier to allocate whom to approach. Codification, however, is more suited for standardized working tasks and solutions, whereas personalization is relevant for unique problems and enables customized solutions (Boh, 2007).

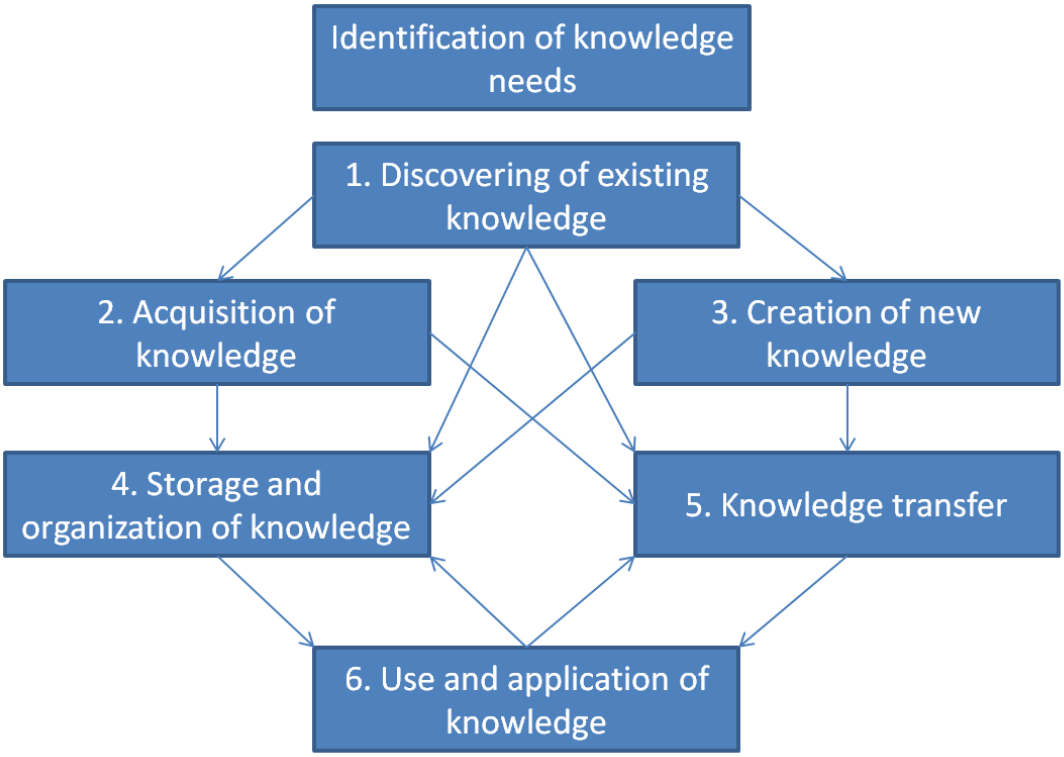

Figure 3. This figure illustrates a conceptual framework of knowledge management processes (reproduced from Bouthillier and Shearer, 2002).

In *Figure 3*, Bouthillier and Shearer (2002) aim to visualise how the different processes of knowledge management are connected. They argue that the focus in KM is not the distribution of knowledge but rather the knowledge transfer. The sharing of knowledge is vastly important to preserve knowledge within the company, and this is particularly important when considering staff turnover. The knowledge transfer is a crucial step to go beyond the step of dissemination of information. Bouthillier and Shearer (2002) further explain that KM programs are not successful if the knowledge stored or shared is not used. In comparison to information management, the retrieval and storage of it determines the success, whereas the success of knowledge management solely depend on the sharing of knowledge.

Boh (2007) believes that knowledge shared within a company should penetrate the organisation, and not merely be bound to databases and technology. Organisations should explore and investigate other working methods of how to ensure that the knowledge transfer becomes systematic and reaches out to the employees. Having a KM program might not even be necessary Boh explains, stating that the best procedure might be through individualized and personalized instead, based on the organisational needs. According to Bell et.al (2016), the type of mechanisms to use depends on the formality of the knowledge transferred, but the organisational KM system should enable both formal and informal knowledge transfer-mechanisms. Organisations need to be able to receive and implement knowledge from former projects by keeping repositories and intangible resources up to date, to learn from earlier experiences (Bell et.al., 2016).

To share and retain knowledge, Boh (2007) believes that the knowledge should be distributed between employees, both in groups and from person-to-person. By implementing personalized knowledge transfer and institutionalize the mechanisms, it facilitates knowledge transfer between employees, and, in turn, the knowledge transfer becomes more systematic (Boh, 2007). Bell et.al. (2016) found in their study that knowledge should be transferred to people rather than directly to a database. Consequently, the knowledge should be transferred to the people responsible for the KM functions of the company to evaluate the usefulness and value of the knowledge. Responsible parties should also decide relevant actions for how to utilize the retained knowledge, if the outcome shows that it is useful and valuable. Additionally, this group of people should identify trends and gaps of knowledge within the organisation. Thus, such documents should be further communicated to allow improvements of encountered problems, finding the initial cause that has led to the lessons learned (Bell et.al., 2016).

In a study performed by Koch and Thuesen (2013), it is explained how knowledge transfer and its governance, is used to coordinate knowledge in a partnering project. They indicate that three elements are involved for knowledge transfer between practices involved in a construction projects: *boundary objects, brokers* and *arenas.* The *arena* constitutes as meetings between engineers, contractors and architects and they all act as *brokers* for their own practice. The *boundary objects* are the exchange of objects, either concrete or abstract, and that this could be viewed as a bridge between the different communities of practices.

3.3 Barriers with knowledge transfer in the construction industry

Construction projects are unique, and they include various types of practices depending on the type of project (Kazi & Wolf, 2006). This is something that Almeida and Soares (2014) see as an obstacle, as each project generate certain information that is project specific, which has a definite meaning and structure bound to the context of that project. Due to the loss of context, valuable information and knowledge becomes impractical and gets dissolved as the project ends. Still, it is a necessity for project-based organisations to profit from past experiences, as knowledge constitutes as a main asset to increase the overall performance of the organisation (Almeida & Soares, 2014). Hobday (2000) state that the project is the core of the business to which all functions are to be integrated and could either include several companies or be performed by one company on its own. Further explained is that project-based organisations are flexible, as the hierarchy is specialized for one certain project at a time and not strictly bound.

It is common that errors reoccur in new projects and the solution must be reinvented, even if that same problem was solved in a former project. Consequently, existing knowledge is not used due to poor knowledge transfer (Kazi & Wolf, 2006). Dave and Koskela (2009) explain the construction industry as rather complex, as it undertakes many different processes with a high number of involved parties. Due to the many communication sources and stakeholders, managing information and knowledge gets difficult, as this also needs to reach throughout the whole project and between the various stages of the project (Dave & Koskela, 2009). In

alignment, Ren et.al. (2018) found in their study that IT solutions aids to make knowledge transfer more efficient and that it could constitute as help to overcome geographical dispersion.

3.4 Knowledge transfer within organisations

Meiling et al. (2011) state that the system of knowledge transfer is not stronger than its weakest link, and that the whole integration process and improvements need to become a strategy, as simple improvements that are not optimized for the construction industry should be avoided. To achieve stable processes within an organisation, a prerequisite is to have proper knowledge transfer, as it gets easier to systemize it in that way. It is also important to be thorough with reporting deviations to assess the root cause of the problems that occur. The foundation lies within commitment amongst all involved parties, but the knowledge transfer must be established.

Although KM is proven to be efficient, there are two main struggles with implementing it according to Ichijo and Nonaka (2006). Disciplines of management within organisations need to be revised to collect the knowledge each one of them possesses. Furthermore, there is the lack of analysing how KM contributes to current management issues and how KM could be used to solve these issues within the organisation. Dave and Koskela (2009) mean that there is a need for KM systems to collect and make knowledge accessible, as it apt to enable the reuse of knowledge during a project and in new projects. Some of the barriers they mention are the lack of standard platforms to collect knowledge, lack of motivation, and personnel in teams being separated.

Sun and Scott (2005) investigated barriers to knowledge transfer with focus on the different learning levels within organisations, which are individual, team, organisational and inter-organisational levels. The organisational barriers are for instance working climate, relationships, systems and structures and these are formed by the organisational culture. Information is transferred through the organisation to the teams, depending on the relationships.

Table 3. Sources of barriers between learning levels in organisations (based on Sun and Scott, 2005).

Resourse of barriers:	Individual to team	Team to individual	Team to organization	Organization to the team	Orrganization to inter-organization
Competence	✓	✓		✓	
Team climate	✓	✓	✓		
Team relationships	✓	✓			
Team structure					
Organizational climate	✓	✓	✓	✓	✓
Organizational relationships				✓	
Organizational structure		✓	✓	✓	
Inter-organizational climate					✓
Inter-organizational					✓

In *Table 3*, certain barriers that were found on different learning levels within the organisation are displayed, where they aimed to visualise the impact of sources to barriers on relevant learning levels and the different paths of information transfer. According to Sun and Scott (2005) these results entails valuable insights on what effect these sources of barriers have on all operational learning levels within organisations. Further stating that these insights could aid as a guideline to make knowledge transfer more effective within an organisation.

In a study conducted by Akhavan et.al. (2014), several barriers were found when implementing knowledge management in project-based organisations, where they considered the organisational barrier to be the most important, followed by culture, structure, and the organisational strategy. Regarding knowledge transfer in specific, Wiewiora et.al. (2009) conducted a study regarding barriers in project-based organisations, which emphasized lack of time as being one of the major ones. Further explaining that activities of sharing knowledge are not prioritized as the current work is already pressured and gets favoured. Ren et.al. (2018) accordingly believe that the urgency in projects is a barrier for communication between projects, as the time is not prioritized for that, hence the knowledge transfer gets disrupted.

Wiewiora et.al. (2009) explain that knowledge tends to stay in people's mind and that the knowledge remains merely as thoughts, which in turn prevents the knowledge transfer. This is due to unclear procedures of how to share and collect knowledge in the production of project-based organisations. Hence, Wiewiora et.al (2009) explain that a database could be a solution to preserve certain knowledge that is possible to collect.

Ren et.al. (2018) state that shared culture within organisations generates a unified work environment. Through this, knowledge is willingly made transparent and in turn utilized to realize the objectives of the company. This in turn would have a positive effect on shared attitudes between project teams and thus favour the knowledge transfer. Further stated is that one should not assume that project teams would make knowledge available without any promoters. To encourage transparency, incentive systems could be utilized as a motivation to keep up a shared culture. Ren et.al. (2018) believe that having a shared culture would lead to project teams organizing regular meetings and forums to enable discussions of problems and solutions and documenting the lessons learned, to favour the knowledge shared and enable the experiences and knowledge to be reused.

3.5 Enablers for improved work with knowledge transfer

One of the current problems in the industry is to keep valuable knowledge accessible. Dave and Koskela (2009) suggests that a knowledge management system could be used as a database for knowledge. Such system would also facilitate the communication within the different stages of projects and between involved parties, such as suppliers, subcontractors, and clients (Dave & Koskela, 2009).

The way to document and share knowledge should be integrated in the organisation, and the governing structure is vital to enable regulations of knowledge transfer. It must be clearly stated who the responsible person is and to whom the knowledge should reach. (Wiewiora et.al., 2009). Hence, support of the Board of Directors is a crucial factor to succeed, where it is advised that the commitment and attention from the Board of Directors should be ensured before executing a KM program. The board should also know what enablers KM allows and what learning activities are expected to be implemented to achieve competitive advantages (Akhavan et.al., 2014).

Social communication is also a vital part of knowledge transfer, where workshops, seminars and meetings are some techniques that facilitate this. When geographical dispersion hinders face-to-face communication, the use of other communication tools ought to be utilized (Wiewiora et.al., 2009). Styhre and Gluch (2010) present platforms as a possibility for knowledge management. The platform investigated was developed and structured to help with technical solutions, purchasing and production methods for better efficiency. They believe that a platform could constitute as a bridge for knowledge transfer and return experience back into the organisation, but also state that it could be difficult to put into practice as the construction industry apt to avoid standardisations. When projects are similar, it enables knowledge to be transferred between projects according to Ren et.al. (2018). Furthermore, the teamwork gets easier between projects as the exchanged knowledge is relevant for both parts.

3.6 Technology to facilitate knowledge transfer

The construction industry is not known for innovations regarding KM according to Styhre and Gluch (2010), and it is a complicated process to develop and implement within an organisation. Today most construction firms use intranet systems and other social communications within the organisation. Nevertheless, the knowledge is still not sufficiently accessible. It seems to get stuck in a local area and depends on oral and personal communication.

Information and Communication Technology (ICT) has developed over the years, and it is quite common that companies utilize different digital tools for knowledge transfer (Dave & Koskela, 2009). Ren, Deng, and Liang (2018) state that IT is a prerequisite for effective communication and to enable knowledge transfer, as projects in construction companies is geographically dispersed and makes the personal communication difficult. However, the innovation of IT for various sources of communication have reduced this barrier, thus Ren et.al (2018) suggest that project-based organisations should embrace the benefits of IT to improve communication and thereby improve the flow of knowledge transfer. Dave and Koskela (2009) explain that the pressure from clients wanting increased quality and the use of less recourses demands a higher efficiency. They further state that it has been proven that implementing solutions from the ICT industry generates an increased efficiency, thus suggesting KM in combination with digitalisation to be a good strategy.

Certain information is difficult to collect, such as tacit knowledge, but some knowledge can be documented. In a study performed by Aghimien et.al. (2018) it was shown that digitalisation has a favourable effect on most processes within a construction project. In this study, digital tools were used mostly for cost control, cost planning and cost estimations but it also had an overall positive effect. The conclusion was that digitalisation would improve productivity, efficiency, quality and it would save time and generate methods that would ease different work tasks (Aghimien et.al., 2018). This is in accordance with what Ordieres-Meré, Remón and Rubio (2020) say, stating that digitalization is beneficial in several ways and that studies has shown that it could contribute to organisational structure, sustainability, and economic performance, in combination with knowledge management. Schniederjans, Curado and Khalajhedayati (2020) on the other hand state that digitalisation in combination with KM is mainly for the supply chain management, as there are vast amounts of data that needs to be structured an analysed in this industry. The area of digitisation in combination with KM has although been proven efficient for the performance of such companies, but that it has not yet been fully explored.

Okere (2017) believes that effective knowledge management is not just by having KM tools and systems, but it must be integrated in the organisation to reach certain objectives. Accordingly, Davenport and Prusak (2018) state that technology constitutes as a tool to implement and ease the work with knowledge management, but it cannot replace knowledge itself. However, technology is still considered a good attribute to KM, as it enables easier

communication (Davenport & Prusak, 1998). Strong Information Technology (IT) infrastructure is according to Akhavan et.al. (2014) a good tool to reach certain knowledge-based objectives, and it is considered a necessity for PBOs to succeed with KM. Further it is important to use a software system that is customized for the organisation and its specific needs.

4. EMPIRICAL RESEARCH

This chapter presents the data from the case study, which will be used in the next chapter, providing a foundation for the analysis. The chapter portrays how the company works with knowledge transfer to create an insight on how it is handled today.

4.1 Introduction of the case study

The case company studied, Tommy Byggare AB, is a medium-sized, Swedish construction company established in the southwest of Sweden. The company has around 200 employees and the company works with both projects for dwellings and commercial real estate, mainly with Design-Build contracts (DB) but also Design-Bid-Build contracts (DBB).

Through meetings with a supervisor provided by Tommy Byggare, discussions regarding what issues the companies had eventually landed in their difficulties regarding knowledge transfer. The company has allegedly faced obstacles with implementation of this and there exits an ongoing improvement activity. Tommy Byggare wishes to improve in this area to increase productivity and through that gain market shares, this to increase the quality of their projects. As stated by the Supervisory from Tommy Byggare:

"Fewer errors would increase the profitability, and, in that sense, it would also strengthen the company brand."
- Supervisor, Tommy Byggare

Our industry supervisor further stated that the company have certain goals regarding knowledge transfer and experience feedback. They wish to decrease the number of faults during the warranty time and reduce the number of faults at inspections, this is to make the measures more efficient when warranty faults arise. Furthermore, a particular goal is to prevent occupational injuries, this by removing dangerous suboperations. Handling errors in an efficient way would also generate more satisfied customers and accordingly strengthen the brand.

"Prevention of occupational injuries has a purely human side, as we do not want our employees to get injured, but it is also profitable and good for the brand"
- Supervisor, Tommy Byggare

As of today, Tommy Byggare has certain routines for knowledge transfer and experience feedback. In this routine it is also stated that experience feedback is a big challenge for the organisation. It is also challenging to spread experiences between different disciplines and the distinct phases of a project, and the routine should help make improvements based on former

results. The person responsible for this area should validate former experiences that are collected in the governance system, and that relevant information is presented on start-up meetings or update documents in the project portal. When it is time to evaluate the results, it is the task of the Quality, Environmental, Health and Safety-manager (QHES-manager) to collect the results and store them in the knowledge management system.

There also exists a routine for deviation management to support the work of improvements more efficiently, which should generate lower costs and a higher quality of delivery. Deviations are brought up on all meetings, but only certain deviations are chosen by the responsible party to be further investigated, and prevention for these deviations are suggested based on an investigation made together with the business manager. The deviations of most importance are published in the governance system, short VLS, and presented on meetings with white-collar workers such as site managers, project managers and business managers. Further investigated deviations, with subsequent measures as a result, are to be presented at the Board of Directors' review.

4.2 Organisational work of knowledge transfer

When asking the interviewees how the organisation currently work with knowledge transfer, many respondents felt that there is no organized structure of how to work with it. It was also expressed that they do not really know if there exist any guidelines to follow. The company does send out information letters every month where significant issues might be brought up, but this is hard to remember later according to one interviewee. See *Table 1.* for participants.

> *"Things you read three months earlier is not easy to remember when you need that knowledge for future work."*
> *- Construction Engineer, Tommy Byggare*

The way different departments and work roles work with knowledge transfer varies, but there also seems to be a variety in the perception on how the company works with knowledge transfer. There is also a dissimilarity between different regions in how they work with this matter. One interviewee stated that there exists a lot of knowledge in the calculation department that could be transferred to the design phase or to the production, on the other hand, the interviewee felt that projects tend to be quite different from one another so everything cannot be transferred from a previous project to a new one.

One interviewee mentioned that Tommy Byggare has identified knowledge transfer to be one of their biggest weaknesses. This was further explained by that the little that is documented regarding past experiences within the organisation is placed in the governance system, as word or excel files. There have been several attempts to use different data systems, but without

success. There was an application created, which allowed personnel to enter experiences and problems, but it seems to be little or no activity in this application. The general perception from the interviews is that there exits vague knowledge about this tool.

When asking the interviewees if they know who is responsible, if anybody, for knowledge transfer, most of them answered either that no one is responsible or that they do not know. One interviewee had the perception that at the present, there is no dedicated person that knows how to work with knowledge transfer. Currently, employees in positions with already heavy workload get several responsibilities handed out on top of that. Accordingly, this leads to that these positions, with several other responsibilities, tend to prioritize based on their individual perspective and some important tasks, such as knowledge transfer, is not considered to be an urgent matter and is, therefore, not prioritized.

It is further expressed that no one seems to be keen on taking on the task of knowledge management, probably because it is a difficult area. But the problem is also that there is no one that takes care of the knowledge shared and it is neither structured nor evaluated. This allows any type of knowledge to be shared without any verification of what is written. One interviewee explained that some data that was entered were more unnecessary than beneficial.

Furthermore, there seems to be a lack of transparency in the organisation and in the work between departments. One interviewee brought up an example that in the purchase department there exists knowledge about products not working, but this information is not available to everyone. Most interviewees perceive that people work separately, some departments have more connection than others, but this varies with the work roles. Additionally, there seems to be little interplay between the departments in how they work with knowledge transfer, and everyone works differently.

"I think the different departments have preconceptions about one another in how they work."
- Site Manager, Tommy Byggare

Knowledge transfer and connections between projects are not rooted in the way of working, whereas information is shared mostly internally within groups. The knowledge that is shared, tends to stay locally and not reach the whole organisation.
There are some frequent problems that were mentioned by many, regarding subcontractors and technical construction issues, in terms of knowledge not reaching out. There have been situations where knowledge about poor-performing subcontractors has not been reported in time, or not reported at all, which has led to using the same subcontractors for new projects. There have also been some problems with certain floor types and balcony doors, which are problems that have been detected by the aftermarket department, during the warranty time, but

have not been prevented in upcoming projects. This department is involved much later where deviations are detected, but then it might be too late to avoid these mistakes again as new projects have already begun. One interviewee stated that it would be good if the aftermarket department would teach people within the organisation, as they sit on a lot of information about deviations, and it would be beneficial as it could prevent the same things from happening again.

4.3 Knowledge from problems and audits

When asking more about documentation and protocols, most interviewees answered that there are different standards, routines, and templates accessible. Tommy Byggare's governance system, VLS, is a structure of folders that enables searching for specific documents such as standards, protocols, routines, and prepared templates. The VLS is mainly administrative and does not include any working methods. The QEHS Manager is responsible for the governance system to make sure that routines and describing documents are up to date and placed in the right folder. Most interviewees state that there is information in form of routines and templates, but it is rarely used as a source to knowledge.

A common opinion shared by the interviewees was that documentation takes a lot of time, in combination with not knowing exactly what to document and to where it should be reported. Most of the interviewees said that they prioritize work in the present, "extinguish fires" as they called problems that demanded immediate attention. That could be, for example, problems in the production that is considered more important than working with documentation for future preventions. As one interviewee states:

> *"You only call when you have encountered a problem, but never in prevention of problems"*
> *- Construction Engineer, Tommy Byggare*

4.4 Knowledge from meetings

The company's first action when starting a new project is to have a start meeting. However, when the project is uncomplicated and straightforward, the company avoids meetings to save time and money. A few participants witness that the starting meeting is a formality rather than something useful, and what is being said and agreed is rarely something they reflect upon. Tommy Byggare has a group of construction engineers that has weekly meetings where they discuss current work, if there are any encountered problems and this enables the sharing of experiences. This group is meant to spread the knowledge as all the participants from these meetings are connected to all projects, but it is mentioned that in general there is poor documentation from this type of meetings. It was also expressed that having meetings in real life works better than digital meetings, as the discussions are more rewarding when meeting in

person. As of now, virtual meetings have increased due to the corona pandemic, which is something that is considered efficient but still not preferred to meetings in person.

One participant stated that there was a construction site where they experienced a lack of security. There was a room which was locked because of an elevator shaft, but due to poor communication the workers unlocked the door and used it as a space to store their equipment. No one was harmed in this situation, but the interviewee stated that this shows the importance of knowledge transfer.

4.5 Individuals way of transfer and gain knowledge

It is a common trend among all the interviewees to search for knowledge and to gain knowledge through personal and oral communication. They either call someone they think could help with the problem encountered, talk to a co-worker or someone within the company from another department. The communication is mostly personal and local within city borders. Most of the participants stated that they try to communicate with people when encountering problems, which they consider suitable for that specific matter. The overall trend is to contact someone within the company for help. It was also mentioned that the size of a problem is primarily based of how high the costs are. If a problem is relatively easy to fix and cannot cause a significant damage, some individuals do not see it as urgent.

Several interviewees expressed that they don't really know how to implement knowledge transfer into the daily work. No matter what position, there is always a lot to do, and the prioritization of work is rather focused on current issues rather than future preventions. It was also stated that one must find information and knowledge from other persons by own means, and the work is very independent and time-consuming.

"You work a lot on your own, and you don't get anything handed to you."
- Project Manager, Tommy Byggare

4.6 Follow-up and supervisory control

Tommy Byggare uses several systems to follow-up the work and monitor their projects. The projects usually stretch over a long period of time and the employees experience that this makes it difficult to keep track of what has been agreed upon earlier in the project. The time frame also makes it challenging for the people who estimates cost because mistakes are not detected until later, or in worst case, until it is too late.

At the project end, there is a final meeting with room for evaluation to share what has worked and what has not. The final meeting is held at the end of project and is a platform where they address issues regarding the production. On final meetings in the production phase, there is also

involvements from the calculation department and the purchase department where knowledge is shared regarding the project outcome. This information will thereafter go to the financial department where they post calculate the project. This is followed by a comparison between the estimated cost and the actual cost. The final meeting works as a forum where Tommy Byggare try to find the reason if the expected result and the real result differs. A handful of the interviewees experienced that this knowledge stays at the financial department and never returns to people who are involved.

Furthermore, when the production is finished the projects usually get inspected. This leads to inspection notes showing any quality defects. This is summarized in protocols, which the participants claim is just used to fix the problems for that specific project. There are no wider analyses of the notes which could be used to prevent the same mistakes from happening again. A couple of years ago the company launched a project as a counteraction to this problem. They wanted to prevent mistakes rather than fix them after they already happened. This was an application where people were supposed to feed with data which could be beneficial for others. Most of the participants claimed that they used the folder in the beginning of the project but after a while stopped because they never really understood its usefulness.

Lastly, several participants state that they follow-up their own work but do not consider following-up others. For instance, someone was taking notes on how they experienced a specific subcontractor but only shared that knowledge to the nearest co-workers. This interviewee wished that this is something everyone should know, and that the company should share this type of knowledge. The company also used to have a person responsible for the warranty, but that is no longer the case, but then there were follow-up meetings directly which was appreciated, as this department sits on a lot of valuable knowledge.

4.7 Barriers and enablers with knowledge transfer today

Several interviewees mentioned that it would be good if there were a clear structure implemented in the organisation on how to work with knowledge transfer. It would be easier to know how to work with it and what type of knowledge to share. One interviewee expressed that it would be good to have compulsory system, integrated in the organisation, so that everyone works in the same way. A concern that several interviewees expressed was the lack of time for documentation, but also that improved knowledge transfer most likely would save time.

Another improvement that several participants mentioned was that it would be preferred if someone, independent from other working roles, were responsible for knowledge management, and work with this fulltime. One interviewee expressed that the QEHS Manager should be responsible for knowledge management. There were also some comments regarding the relevancy of the knowledge shared, that it needs to be collected and sorted, so that in the end there is not a ton of irrelevant data. But it is also very individual what is considered necessary knowledge, both to share and sort out, which was another issue expressed.

To improve the communication and interaction between different departments and projects a general opinion was to have more meetings. Meetings are good to acknowledge problems in the different departments. It should not be too often but still enough to allow knowledge to reach out. Workshops or different group activities were some suggested activities. Having workshops, where issues are discussed, makes it easier to later recall information, than from information distributed through emails or monthly letters. One interviewee stated that

> *"When you mix people with various experience and knowledge, that is when you learn a lot"*
> *- Site Manager, Tommy Byggare*

It was also mentioned that the project managers access and connect to many departments, and they are, therefore, considered to be a key for successful knowledge transfer within the organisation.

A common opinion collected in the interview study was that the system of working with knowledge transfer should be user-friendly. As of today, it is neither user-friendly nor commonly known to everyone of how to use it. The knowledge shared should also be understandable to be useful and generate something in the end. Several interviewees mentioned that it would be utilized to a larger extent if the system was easy to use and available within the organisation. One interviewee stated that it is probably good to start with more comprehensive issues and move on to detailed levels later, if necessary, as it appears easier to allocate. During the interview series, a portal called Homemaker was mentioned as a good programme to minimize faults when making orders, but expensive. Further expressed was that this could be something to look in to, but then it is an investment to make, so it needs to be useful.
Several participants considered documentation to be important, but the work of collecting knowledge should not be overwhelming. The current situation at the company is that there is a heavy workload with documentation as it is, and more would be hard as the time is not sufficient. It was also expressed that a possible improvement would be to become more niched within Tommy Byggare, choosing specific types of construction projects and become good at certain building techniques.

> *"Sort out 5 main aspects that we should focus on and become more niched. If you are niched it is easier to get better at specific things, as it all renders in money. It is easier to have knowledge if you work with the same thing repeatedly."*
> *- Site Manager, Tommy Byggare*

An example for improvement from the employees that was interviewed was that there could be a system where grades are entered from how the project worked in various aspects and enable

people to take photos of critical matters and send to responsible person. Another suggestion was a forum open for discussion, but one issue seems to be that to make this possible there needs to be a group responsible, and there are already many diverse groups in the company. A bank of methods was also something that was brought up, as one interviewee mentioned that this was a good tool used at a previous employer.

Several interviewees mentioned that if there were any way to visualize the benefits of improved knowledge transfer it would increase the understanding of its relevancy and importance. It is difficult to see the value of mistakes when it is not measured, or no results are shown. As one interviewee stated:

"People need to understand why they are typing in information in a system to be motivated."
- Project Manager, Tommy Byggare

This was a general opinion amongst the interviewees, as of now there is no clear way of measure the improvements. But if there were some sort of feedback on the work done e.g., lower costs or reduced project time, it would motivate the employees as it allows them to see value in their work.

5. ANALYSIS

In this chapter, data from the interview study is compared to the findings from the literature study. It also distinguishes the similarities and differences between the two studies, including a discussion which builds a foundation for final conclusions.

5.1 Six barriers to knowledge transfer

During the interviews, the interviewees were asked about what they believe are the obstacles when it comes to knowledge transfer. These barriers are summarized in *Figure 4* and aim to visualize what the interviewees claims to be the reason why knowledge transfer is not functioning as the company wants. The barriers are described one by one, in individual subsections.

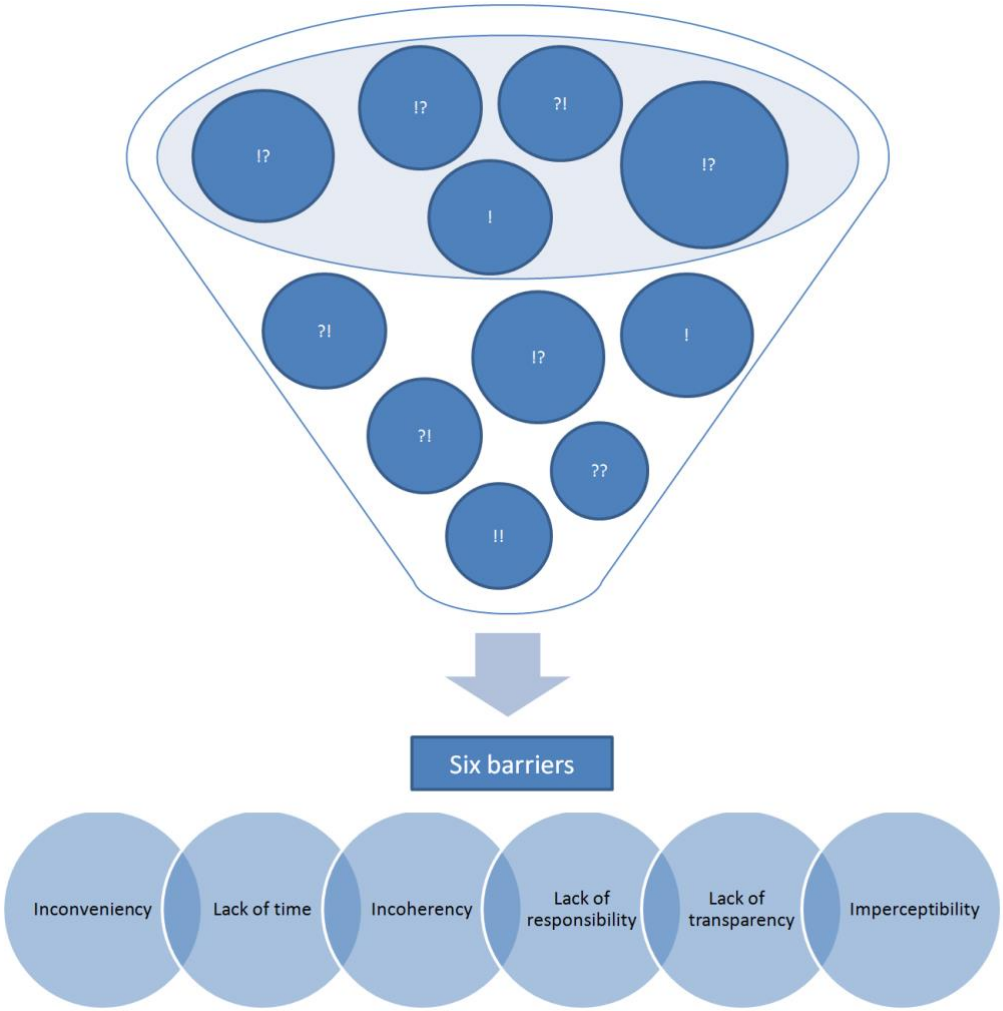

Figure 4. Issues the interviewees have experienced regarding knowledge transfer Note. The question- and exclamation marks represent the difficulties which the respondents experienced.

5.1.1 First barrier: Inconveniency

Choi et al. (2008) state that knowledge management is essential for a company's ability to compete on the market which has led to an increased interest on the subject. In accordance with this, all the interviewees point out this as an issue at Tommy Byggare and wish to develop the company's strategy and, thereby, extend its share of the market.

First, several participants state that the tools and systems that have been introduced are not user-friendly. The systems are inconvenient, and most interviewees agree that this is a barrier. According to Dave and Koskela (2009), a lack of standard platforms to collect knowledge is a barrier for companies, which is comparable to what the employees experience at Tommy Byggare. In the interview study, it was clear that most of the communication were either through emails or phone calls. This is something which works fine until the company becomes too massive. There is a barrier of calling people you do not know and when the company grows there will be an additional issue which is that you do not know who to call or email to retrieve certain knowledge. Even if someone else knows who to contact it will be time consuming to find out who that person is. As the company grows this is a relevant question to consider as this barrier grows with more employees.

Secondly, the interviewees claim that the current management system is insufficient. The major problem is that the system does not allow for free text search which frustrates the users. The current system is an excel document where the newest data goes on top of everything, and the document just kept on growing until no one wants to touch it anymore. Consequently, the employees do not work with the document anymore and some of interviewees are not even aware of this system. Choi et al. (2008) claim that companies become less competitive when employees do not use strategies and systems. In Tommy Byggare's case, the employees neglect the present strategy because of the inconvenient system. Choi et al. (2008) view on the subject is that a company can either select a comprehensive strategy or focus on areas of interest. Tommy Byggare could make the system accessible by changing their strategy which would make the system more convenient for the employees and the company would become more competitive.

Moreover, the perception during the interview study were that the participants opinion on knowledge management depended on their role in the company. For instance, a carpenter can experience difficulties using a smart phone in hostile work environments, in contrast to the CEO of the company that can carry out his or her tasks in a warm office. The strategy should perhaps be adapted for distinct roles at the company, and it should be comfortable for every single employee, regardless of working role. In the literature, there are many aspects which correlate to what the results of the interview study indicate, as described in the previous paragraphs. The literature outlines practices which could be applied to Tommy Byggare and it pinpoints what the benefits would be by doing so. The participants seem to be on the same page as what the literature proclaims. This is not surprising as inconvenient tools and methods are indisputably something nobody desires.

5.1.2 Second barrier: Lack of time

The construction industry is generally project oriented which some participants perceive as stressful. Several of the interviewee's state that they are mainly focused on present work, which results in little or no time to focus on future work. They claim that solving the current issues is so overwhelming that it consumes their full attention. Consequently, the participants overlook the upside of knowledge management, and the company will inevitably pay the price. According to Kamara et al. (2002) can a company reduce expenses, increase quality and become more sustainable by using knowledge management. Several participants witness that this is not functioning correctly at Tommy Byggare due to stress. Nevertheless, a few of the participants seem to like the stressful feeling, contrary to theory. There was one interviewee who was fond of solving the daily tasks. Even though this behaviour created a stressful situation, the interviewee did not experience this stress as a problem, it was rather seen as a trait of the industry which the interviewee admired. This interviewee illustrates the complexity of this barrier and indicates that there is no obvious solution.

In the interview study, plenty of the participants witness that their positions include several responsibilities. This has to do with the size of the company and sometimes there are not enough resources to hire staff for every activity. As a result, the employees need to prioritize what task is more important than the others. This has led to neglecting knowledge transfer, as they feel it has low priority for the company. At this point, the lack of time is making it burdensome for the employees, and the nail in the coffin is the documentation. All participants agree that the current system on documentation requires too much effort. One interviewee claims that even work injures are not reported and documented correctly, which the participant believed to be immoral.

5.1.3 Third barrier: Imperceptibility

In the interview study, the participants affirmed that knowledge transfer is complex and difficult to comprehend. Most interviewees believed that it is almost impossible to measure and calculate actual numbers on what knowledge transfer generates in terms of time or cost savings. In accordance with the interviewees, the literature describe knowledge as based on individuals' thoughts and past experiences and it involves judgement (Davenport & Prusak, 1998). Considering that the concept is based on subjective experiences, the participants perceive it as difficult to understand what knowledge the company values. For instance, one type of knowledge can be valuable for one person, and at the same time be useless for someone else.

The participants stated that even if the company improve their way of working with knowledge transfer, it does not bring clarity on how beneficial it is for the company. For example, Tommy Byggare experienced that they had problems with wooden floors a couple of years ago, so after a while, they decided to always hire subcontractors to reduce the risk. This is knowledge that the company's management saw as an opportunity to increase profit, but then again, it is difficult to estimate or calculate a precise number on how much the company saves. This phenomenon is what makes knowledge transfer imperceptible for most interviewees. Several of the

participants saw the wooden floors as a successful example and emphasised that there surely are many other hidden cases, where the company could benefit from using knowledge transfer to a higher degree than that of today.

Similar to the results of the interview study, the literature stresses on the fact that knowledge must be interpretable for others to be useful. The literature also identifies that knowledge is something that usually exists within the organisation, but it is difficult to extract and implement throughout the organisation (Alavi & Leidner, 2001). The two studies together show that knowledge must be imperceptible to be useful. The interviewees' statements confirm what the literature distinguish as a barrier.

5.1.4 Fourth barrier: Lack of responsibility

While Tommy Byggare has approximately 200 employees today, the company has the ambition to become more powerful on the market. This has led to high employee turnover rate as the company grown during the last decade. In the interview study, several participants explained that this has resulted in a structure where no one takes responsibility for how the company work with knowledge management. A majority claimed that it is up to each and every one to take their responsibility to collect and transfer knowledge within the company. As exemplified in the Empirical research chapter, a participant suggest that shared responsibility equals no responsibility. This statement demonstrates what most interviewees believe to be a major issue.

The lack of responsibility makes it diffuse and difficult to work with knowledge transfer, which results in additional difficulties for the employees. It is a struggle knowing what knowledge they are expected to collect and pass on to the company and co-workers. The interviewees believe that if Tommy Byggare assigns a person with a distinct roll as responsible for the company's knowledge management, it would help the employees understanding the subject better. This person could then formulate a structure for the employees, which makes the topic much more understandable and convenient to work with. It would also make the subject much more imperceptible as the structure of the topic would be clearer.

5.1.5 Fifth barrier: Lack of transparency

The construction industry is consisting of multiple actors such as contractors, subcontractors, architects, consultants, etc. This group is represented in the outward circle in *Figure 6*. In the interview study, several participants witness that there is a gap in communication between the actors which become a barrier for knowledge transfer. An interviewee conveyed that it is demanding to constantly work with new partners when entering new projects. The interviewee suggests that working permanently or long term with actors would increase trust and reliability between the actors. This would increase the opportunity to share and work with knowledge management in a way which would be beneficial for both parties. The interviewee further explained that low transparency entails in distrust and little insight in other actor's work which could be disruptive for Tommy Byggare as a company.

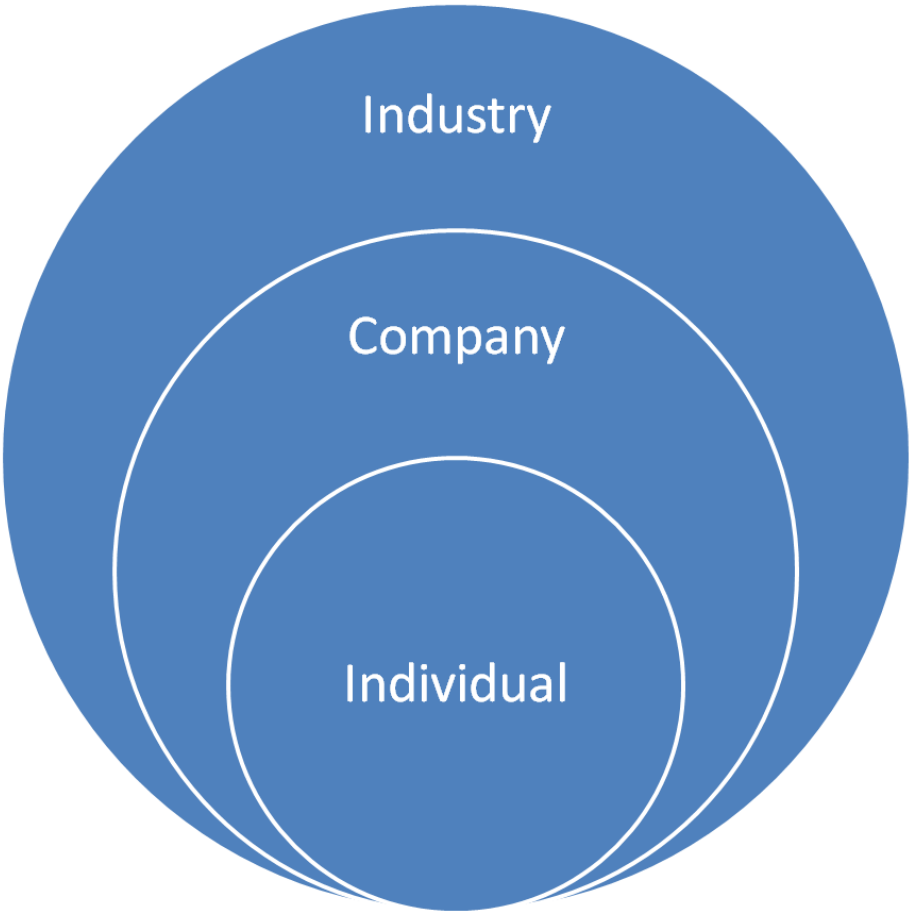

Figure 5. Venn diagram, showing how an individual is connected to the industry through their employment.

The inner circle in *Figure 5* symbolizes the individuals at Tommy Byggare. A few of the interviewees testify that there exists prestige among the employees. It was explained that some people do not want to share their issues with others at the company, as it might be considered as a failure to acknowledge faults. It is not easy to confess when something is difficult or when something has gone wrong. Project managers and site managers work independently and do not involve others unless it is necessary. A small portion of mistakes are detected by the calculation department but by then it is too late to adjust those mistakes. Even though some errors are located, the follow-up of these issues are poor in terms of reaching out to the whole organisation. The reconnection is merely between the involved parties and tends to stay at a local level.

All participants agreed upon that there is a geographical element in how people share and use knowledge from one another. The geographical dispersion in combination with the work way makes it difficult to create personal contact with all employees within the organisation. Some interviewees do not feel comfortable in calling someone they do not know or never have met. This corresponds to what Kazi and Wolf (2006) describe as tacit knowledge and they also believe it is difficult to transfer further.

During the current pandemic, some interviewees believe that the polarization between groups of employees has increased. There is no safe way for people, generally working in an office, to go out on site and meet people. This has resulted in a wider gap between the groups and lower transparency. The Venn diagram, *Figure 5,* demonstrates how Tommy Byggare as a company is connected to the construction industry and to the employees, and the company depend on these. Low transparency is therefore a barrier when it comes to knowledge transfer, which makes it difficult for the company to progress, as there seems to be a lack of transparency.

5.1.6 Sixth barrier: Incoherency

The interviewees indicated that the structure of knowledge management at Tommy Byggare is incoherent. This is due to the factor that knowledge is perceived as imperceptible, and together with lack of responsibility, it has made the structure inconsistent. Several interviewees believe that the Board of Directors should provide a distinct way of work which most people can relate to and follow. There seems to be variety within the company of how to work with knowledge management. Some interviewees believes that digitalization would improve the way of working with knowledge management, whereas some participants expressed that this is wishful thinking. The sceptical participants illustrate with the example of a carpenter working outside. It may be too cold or unsafe to use a phone or computer, and, therefore, digitalisation is just a tool that would be useful in theory. Nonetheless, they are open to new technology but not as it functions today. The different opinions of the employees at Tommy Byggare have resulted in an incoherent structure. According to Schniederjans et.al. (2020), knowledge management and digitalisation are superior in the supply chain industry rather than in the construction industry. This is similar to what several interviewees believe to be true, but as long as there is no clear structure this creates an uncertainty and becomes a barrier.

Digitalisation is one of opinions that divide the employees at Tommy Byggare. Many of the interviewee's stated that it is difficult to be objective when individuals have different opinions of the same topic. In the literature study, it is mentioned that the construction industry has a high variety of projects, as it is project oriented. This leads to a diverse workplace, with the result that many employees experience their job differently. Hence, this creates a divided opinion within the company, with the results of having an incoherent way of working with knowledge management.

5.2 Four enablers of knowledge transfer

Up until now, key barriers have been revealed that hinder the progress of Tommy Byggare. In this section, opportunities that literature and the interviewees identify as possibilities for improvement when it comes to knowledge management, and specifically knowledge transfer, are highlighted. The four main areas of opportunity, where the company can improve, are summarized in *Figure 6.* These areas include governance, organisational culture, communication and user-friendly systems. These enablers could solve the existing barriers and help Tommy Byggare, and similar companies that strive to expand their way of working with knowledge management.

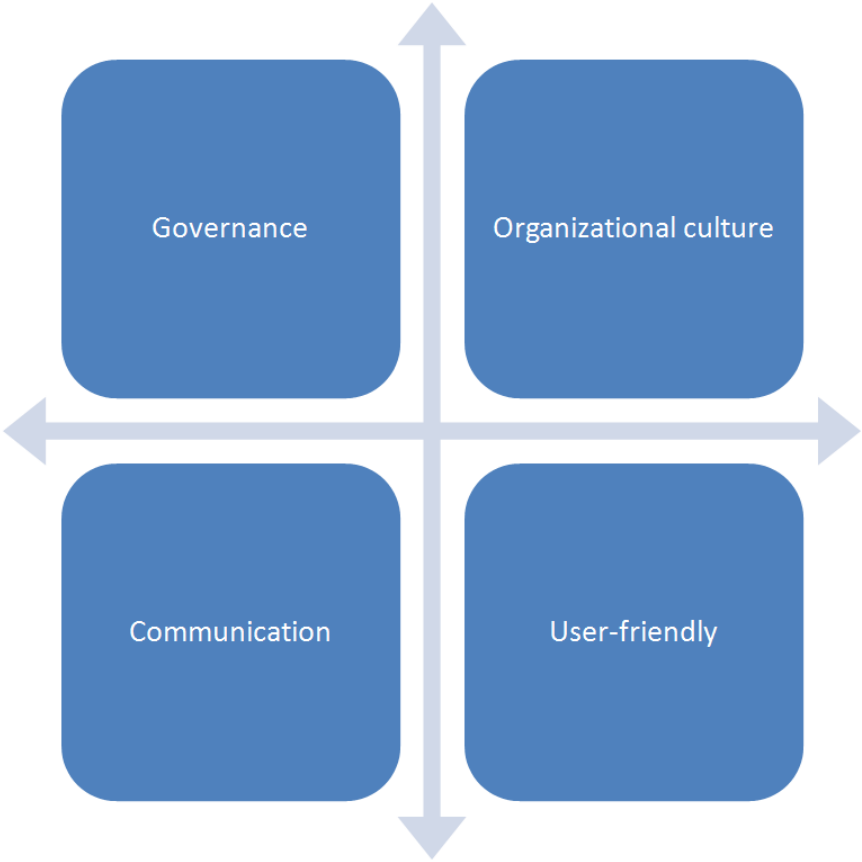

Figure 6. Identified enablers that could improve a companies' way of working with knowledge management.

5.2.1 First enabler: Governance

Several of the interviewees stated that the company has no clear structure when it comes to working with knowledge management. Okere (2017) suggests that knowledge management must be integrated in the organisation to create a comprehensive understanding of the topic. The organisation needs to establish a structure which can enable employees to set up goals that can be reached. The literature and the results from the interview study both propose that governance would enable companies to improve their way of working with knowledge management.

The current state at Tommy Byggare is that many of the interviewees do not know what they should do, how, and why they should work with knowledge transfer. This is something which is critical, where Choi et al. (2008) mention that knowledge management is vital for knowledge to be shared within an organisation. Meiling et al. (2011) agree with this and is also propose that to succeed with the implementation of knowledge transfer, it needs to be seen as a strategy and the company should really focus on adapting solutions that fits the construction industry. The construction industry is vastly different, both from other industries but also other project-based organisations, as it has unique projects, and, therefore, anything that works in other

industrys might not be applicable. A structured way of implementing knowledge transfer is important and the specific problems need to be located, this to find effective ways to implement it. Furthermore, Bell, van Waveren and Steyn (2016) believe that KM should be part of the everyday workflow, and this is something that the interviewees requested too.

The difficulties of implementing knowledge management in the construction industry is well described in the literature and it indicates that the issues Tommy Byggare struggle with KM is not uncommon. When no good structure for KM exists, the employees feel that it is hard to include it in their daily work. As Meiling et al. (2011) explain, the commitment of knowledge transfer lies within the commitment of everyone involved. Further explained is that it needs to be an established system to make it work and the entire process of integration needs to be seen as a strategy. Thus, it is important to know what the focus should be when implementing knowledge management, and to see what needs to be improved and what the best approach is for the company. It could vary depending on the size of the company, which Boh (2007) accordingly states in her theory. Currently it seems like Tommy Byggare lacks an established structure of KM. This can be seen as an opportunity to implement clear guidelines and frames, as it would make knowledge management coherent for the employees.

Furthermore, as mentioned earlier, most interviewees requested a department, or dedicated person who can be responsible and structure the company's way of working with knowledge management. This would ease the workload of others that have many separate roles to take on at the same time. The participants expressed that they want the Board of Directors to declare a plan and a clear structure how they should work. If the company can establish an urgency on why the topic is important, people would take their time to do what the company considers to be necessary. Lastly, Ichijo and Nonaka (2006) say that a good ability to transfer knowledge increases the company's efficiency. This aligns well with what the interviewees expressed, that with an improved way of working with knowledge transfer, it would most likely save time. Efficiency leads to saving time, cutting costs and problems might be easier to solve; this is something that knowledge management and the process of knowledge transfer could generate.

5.2.2 Second enabler: Organisational culture

Sun and Scott (2005) say that relations within an organisation could also have an impact on how the knowledge transfer works, as this is formed by the organisational culture. As already mentioned, most interviewees agreed that there is an organisational structure that creates an issue, and, therefore, propose that Tommy Byggare should restructure elements of the company. An example of a reorganisation is that the organisation should find partners where they can build long lasting relations with and together find a strategy which benefits them together. One participant stated that this would increase the transparency and therefore the exchange of knowledge. Some interviewees witness that the current culture at Tommy Byggare is based on a mindset which is short term. An example is that every subcontractor is replaceable, and this is not unique for Tommy Byggare.

In both studies it was established that the industry has a high staff turnover which itself can create some form of distrust. The high staff turnover rate creates an environment where it is difficult to establish long lasting relationships. However, it is an opportunity for Tommy Byggare to strengthen their relationships by setting an organisational structure which benefits longer relationships. As mentioned in the empirical study, one interviewee suggested that Tommy Byggare could find a more specific niche in the construction industry. That would enable longer relationships with other companies, clients, etc. Also, by building more standardized or become more niched at technical solutions, this could be a beneficial for the company's way of working with knowledge transfer. By doing so, the knowledge regarding certain "areas of expertise" would increase and the knowledge within the company would be more united. Further, this would also generate that the area of knowledge to transfer is narrowed down a bit and the concentration of valuable knowledge would increase and in turn generate better quality. It would therefore be easier to set clearer instructions as the company's strategy would not be that disperse.

Clearer instructions would make the subject more comprehensive, and it would make the work much effortless to work with. It has been mentioned in the interview study that other, larger construction companies have standardized ways of building, which has resulted in method banks. Although, one perception was also that if the standardization is too strict, there is no freedom or flexibility it could be quite boring to work. This is something which should be considered but in general the participants request a more direct and simple way to work with knowledge management. Meiling et al. (2011) state that improvements made must be considered to fit the construction industry. Stable processes come through good knowledge transfer and makes it easier to systemize, whereas a standardized way of working and building would then be possible. According to Ren et.al. (2018) can an open and transparent culture within organisations generates a unified work environment. Mistakes are often discovered too late today because of the low transparency. This could be considered as an enabler to open the work environment by preventing the shame-culture within the organisation.

5.2.3 Third enabler: Communication

Styhre and Gluch (2010) suggest that a communication platform could work as a foundation for better knowledge transfer. The construction industry is not known for either innovation regarding KM or standardizations, but this is something that is necessary for the KM process, knowledge transfer. According to Dave and Koskela (2009), a KM system as a database would help the organisation to maintain knowledge within the company and to have a better communication throughout the processes and with involved parties in projects. However, Tommy Byggare has already a KM system, but it is inadequate according to the interview study. In the interview study, a few people claim that they never had used the system and that indicates that it is failing and should therefore be exchanged or improved.

To improve the communication and interaction between different departments and projects a general opinion in this study was to increase the number of meetings. Meetings are a useful tool to acknowledge problems encountered in different departments of the company and to share

that knowledge. Koch & Thuesen (2013) stats that arenas, brokers and boundary objects are an essential part for knowledge transfer to function. The arena symbolize meetings between involved parties in projects and the boundary objects are considered as a bridge between practices. This indicates that meetings are a validate and important part of knowledge transfer, and the wish from most of the interviewees was to have more meetings. These meetings should not be too long or too often, but more frequently than they occur today. Then there is also the aspect of digitalisation, where virtual meetings could be a possibility. In the current Covid-19 pandemic, this has been a solution, perhaps a more temporarily one, but it could certainly constitute as a future development to enable meetings more frequently. However, there is also a somewhat negative attitude towards virtual meetings, as meeting colleagues gives another sense of commitment and unity. Furthermore, it appears that starting a conversation, develop discussions and to share knowledge are all easier when meeting people in real life, as virtual meetings are more organized and does not easily allow for such interactions.

Another idea that was expressed during the interview study was to have workshops, or group activities, which would allow for discussion. It might be easier to remember facts, insights and others' experiences, when interacting, rather than only listening. One aspect regarding developments are the costs of such measures, as frequent meetings between white-collar workers cost a lot of money, as do workshops. This is also where the visualisation and the ability to measure the actions taken for improvements are important. If there is a way to measure the work one puts into knowledge transfer, the motivation would probably increase as the work done feels necessary and important. For instance, if organizing meetings is a useful resource for knowledge transfer, this could be an investment that will generate more savings than the initial costs.

Furthermore, our interview study showed that there exists a gap between the various departments within the company. There exists no structured way of communicating apart from start-up meetings and final meetings. Several individuals possess a lot of knowledge, which seems to get stuck in specific clusters within the company. The example with wooden floors were a case where the problem was familiar within the company but did not reach people who are involved, so it kept on happening. The problem was that this knowledge did not reach out in time to the people who could solve the issue, which contributed to redundant costs. Alavi and Leidner (2001) mention knowledge transfer as a vital process within KM, as this assures knowledge to reach out to where it is necessary. If the communication and the knowledge management were better within the company and functioned as it should, the problem would probably have been detected sooner and the right persons would hopefully have been notified in time.

Learning from each other, known as tacit knowledge, emphasising that some knowledge is hard to retrieve and collect only on paper or in a database, as why meetings and interaction within the organisation are important. This was also found in the literature study (Alavi & Leidner, 2001), that specifies that knowledge within a company is hard to extract and implement, but the most required knowledge is likely to exist within the company already. Boh (2007) states that there are two dimensions of transfer knowledge, individualization and institutionalization,

also known as informal and formal. The interviewee expresses that both are important to enable knowledge transfer, and this corresponds to what several participants wished for. They want both informal meetings on site and formal meetings such as conferences to improve the exchange of knowledge. This is certainly something Tommy Byggare and similar companies could implement to improve knowledge transfer in their business.

In the interview study, one example was highlighted and displayed why communication is essential. The situation with the elevator shaft could in worst case scenario cost someone's life. Consequently, by increasing the formal and informal meetings this would probably decrease the number of errors such as this example. It is human to make mistakes but by communicating on a wider scale the numbers of lethal accidents can be reduced.

5.2.4 Fourth enabler: User-friendly systems

In the interview study, it was emphasised that the system to transfer and collect knowledge should be user-friendly and accessible. In the literature, as mentioned, for example, by Dave and Koskela (2009), it is stated that the construction industry is not good in adopting new information and communication technology (ICT) solutions. One reason may be due to the required flexibility of project-based organisations. Projects in the construction industry often need to find immediate solutions, hindering long-term gains based on adopting new digital ways of working, for example. This in turn might be a vicious circle regarding the adaptation of innovative technology, as there are old systems or barely any systems that are used but the projects float and manage anyway. That leads to not seeing the urgency of innovative technology, as construction companies seem to manage anyways, but having better tools might increase the improvements.

The need of improvements is a current issue as the system for knowledge transfer at Tommy Byggare today is inconvenient, but not an urgent issue, as the perception might be that any system would be just as bad as the current. If no one has utilized a better system before, they do not know what they loose and cannot relate to the benefits, as these have yet not been experienced. It is stated in the literature (Davenport & Prusak, 1998; Okere, 2017) that technology and improved systems cannot be the only solution, and these can never replace the knowledge. However, these could be useful tools supporting the implementation of knowledge management. This seems to be the case for Tommy Byggare, as the organisation wishes to work with knowledge transfer and sees new technology and improved systems as valuable tools for increased quality and efficiency.

5.2.5 Making knowledge transfer processes more effortless

Further suggestions from the literature study were also to use some sort of system for grading a project regarding the success of it. Finding certain processes or parts of a project to get a holistic view over every project. If there is to be found that certain topics have frequent struggles or low grades, then that could be an indication of improvements or changes needed and to be looked over. But the relevancy must still be there and not overwhelming work, as this was a

common meaning regarding knowledge transfer in general. The time is not there and the motivation is decreased with an increased amount of documentation. However, before a company introduce a grading system, the end goal should be considered. For instance, it the best result its focus or is it the amount of money saves. Sometimes these two counterstrike each other and setting the aim towards money can be successful in a short-term perspective but be negative in long term due to loss of future- and reoccurring clients. The grading system should be coinvent for the employees and could generate in a positive experience towards knowledge management.

6. CONCLUSION

There are employees at Tommy Byggare which experience inefficiency regarding their way of working with knowledge transfer due to the company growth in the past decades. This chapter presents the conclusions drawn from the research. It displays the tendencies which could explain why the company struggles and how they could improve their way of working with knowledge management.

6.1 Answers to research questions

What could better knowledge transfer generate for a medium sized construction company and what enablers could facilitate this process?

The construction industry is a highly competitive industry which means that every advantage is essential for a company's survival. One advantage is knowledge management as it can help medium-sized construction companies such as Tommy Byggare to become more successful compared to its competitors. Knowledge management, and more specifically knowledge transfer, can reduce the numbers of errors which decreases the building time, and thereby, increasing the profibility. Even though the interviewees and the literature mainly bring up economy as an incentive, one interviewee suggests also health and safety benefits should be seen as an encouragement as there can never be a price tag on human life.
There are several measurements that a company can initiate to assist the progress of knowledge management. The four categories which were identified in this research were governance, organisational culture, communication, and user-friendly tools and systems. These four groups are potential areas where Tommy Byggare is suggested to focus their resources. Firstly, clearer and explicit governance would make knowledge transfer more comprehendible for the employees. Secondly, by changing the organisational culture, increased transparency between employees, subcontractors and other parties involved would be gained as well as improved knowledge transfer. Thirdly, communication is a key element to make knowledge transfer work. Channels where knowledge can be exchanged is vital to make this process efficient. Finally, a user-friendly system would make the process convenient and less time consuming. The company should focus on fewer, more central elements, where they can collect knowledge and interweave it into the business model

What issues regarding knowledge transfer do the employees experience at Tommy Byggare and how would they like these to be addressed? Are their experiences coherent with those portrayed in the literature?

The employees at Tommy Byggare have experienced several barriers when it comes to knowledge management. Most of the interviewees experience a structural absence, and that nobody takes responsibility for how the company intend to work with the subject. This has led to incoherency and employees experience knowledge management as incomprehensible, and, therefore, unnecessary. Consequently, many employees see it as irrelevant and several of them

do not take the time which is required to make it work. The negative spiral could therefore be seen as a side effect from inadequate governance. However, the culture in the construction industry is also a barrier. In the interview study, several participants witness that there is an unwillingness to ask for help and admit when you are wrong. This creates an environment unsuitable for knowledge transfer. The solution to this issue is presumably larger than Tommy Byggare and the entire industry needs to change. However, the employees at Tommy Byggare could attempt to resolve this matter by highlighting the problem. Being aware of the issue is the first step to a solution and this is something further researchers could explore.

6.2 Suggestions for improved work with knowledge transfer in medium-sized construction companies

Based on literature and interviews have following recommendations for medium-sized construction companies been made.

- Online meetings cannot fully replace physical meetings
- People in production have a high workload, thus we do not recommend increasing their administrative responsibility without giving them extra time
- Focus on improving the connection between the calculation and the after-market department
- Revise the outline of starting meetings: who should participate, when, why and how?
- When introducing IT-systems it must be applicable for construction sites
- People want to know each other; companionship can improve more than knowledge transfer

6.3 Further research

The research has resulted in several questions which were not answered in this thesis. Many of them could be interesting for future research and be beneficial for companies such as Tommy Byggare. Firstly, one fascinating topic this thesis came across was that there exists a shaming culture within construction companies, and people tend to be too proud to admit when they are wrong. Several of the participants expressed a fear of admitting their own mistakes which is a barrier to the knowledge transfer process. It is provocative to not know why this is a part of the work-climate at construction companies and future researchers should investigate why this is happening and how to prevent it.

Secondly, future research should examine how user-friendly tools could be formed. What would make a knowledge transfer a topic which could be would be comprehensible by most people. Finally, this has led to a field which could be analysed further, knowledge transfer is a subject which most participants experienced as imperceptible. This created the idea that knowledge transfer should be measurable to make it logical. Future researchers could therefore examine the possibility to introduce a system which would grade knowledge transfer and how

successful it is. If people could recognize its value, it would make it more obvious why they should benefit from knowledge transfer. Seeing an economical advantage in knowledge transfer would presumably increase its interest and further research could develop a framework to make this clearer.

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APPENDIX A

The initial interview was explorative, directed to the supervisor provided from the case company. The interview was semi structured and were held in Swedish, but here translated to English.

Explorative interview

Q1 Can you give us a short introduction of yourself?

Q2 Can you tell us more about your working role?

Q3 Governance system (VLS), is that a computer system?

Q4 Do you work with compiling documents?

Q5 What connections do you have to knowledge transfer and experience feedback?

Q6 Could you describe how you and employees at Tommy Byggare work with actively sharing knowledge from one project to another?

Q7 Which persons participate in meetings with knowledge transfer?

Q8 How do you spread the knowledge from meetings further?

Q9 What type of knowledge do you consider the most vital to transfer further from project to project? Is it environmental, safety questions etc?

Q10 Weekly meetings that you mentioned, how could these be improved and how?

Q11As mentioned, quality is the most important to improve, but it all renders in that you wish to become more efficient, with help from knowledge transfer?

Q12 When mentioning that efficiency is important, is it mostly quality or reducing costs? Or what do you want to improve the most, if we were to narrow down the topic?

Q13 When you say that digitalization is something you wish to improve, should it go all the way out to the production and the workers there? What are your thoughts on digitization then, what are the prerequisites, considering tools such as phones, computers etc?

Q14 What is your perception of how Tommy Byggare works today with knowledge transfer? How does it work and are you satisfied with the current situation? What is the easiest part with knowledge transfer?

APPENDIX B

The second round of interviews were directed to the main research, directed to employees as the case company. These interviews were also held in Swedish, and semi structured as the initial explorative interview.

Main interview study: employees from Tommy Byggare

Part 1 – Knowledge transfer

Q1 Could you give a short introduction of yourself?

Q2 Du you have any previous experiences regarding knowledge transfer?

Q3 How do you make sure to transfer knowledge further?

Q4 How do you gain knowledge from others?

Q5 In what way does the company work with knowledge transfer?

Q6 How do you feel that the knowledge transfer works?

Q7 What functions bad/good?

Q8 What is the most difficult part?

Q9 What could be improved?

Q10 Who is responsible for the knowledge transfer?

Part 2 – How is the work with knowledge transfer in projects

Q11 Are there any reoccurring problems at inspections that you are aware off?

Q12 If yes: Why do you think they are reoccurring?

Q13 What could you do about it?

Q14 How do you make sure to learn from others and gain knowledge from other projects?

Q15 Do you use protocols from previous projects into new projects?

Q16 How do you use inspection protocols?

Q17 How do you work with evaluation and follow up?

Q18 How do you receive and take part of knowledge from other departments in the company?

Q19 In what way do you think that knowledge transfer affects a project?

Q20 What issues do you mainly emphasize in the knowledge sharing process?

Q21 Do you have any suggestions of how to improve the work with knowledge transfer?

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