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Plattformsorganisation av renoveringsprocesser

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Förord

Jag vill först och främst rikta ett tack till SBUF och NCC som har finansierat projektet tillsammans med Formas. Ett stort tack även till alla de som tagit sig tid för att bli intervjuade och alla de som har låtit sig bli observerade.

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Rapporten är skriven på engelska med en populärvetenskaplig sammanfattning på svenska.

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Abstract

There is a need to refurbish the Million Homes programme in Sweden. Many of the housing complexes belonging to the Million Homes programme consist of a numerous of similar apartments. To learn from previous refurbishment projects a method for knowledge management to facilitate organizational learning would be useful. In new build, one method for managing knowledge is to use a platform concept. Applying a platform concept is understood as organising a container of methods and information that can be reused between building projects. The platform consists of information about the components, the production processes, the supply chain, and the know-how. In refurbishment projects, the reuse of components is difficult due to the large variety of building solutions in the existing housing stock. Therefore, a platform for refurbishment needs to be built on reuse of production processes, supply chain and know-how. The platform thus represents a container for re-use of knowledge between building projects.

The aim of this research is to contribute to the understanding and use of a platform as an effective mean to increase knowledge sharing and experience feedback, i.e. achieve increased learning between different refurbishment projects, and the permanent organization, for the benefit of organizational learning within a construction company.

The introduction of a platform does not necessarily mean that people will share knowledge more than before, which raise a RQ I: What are some of the possible ways to increase knowledge sharing using a platform? RQ I was addressed by performing four semi-structured interviews with platform managers with the purpose to test and discuss Javernick-Will´s(2011) theory of the importance of social motivations for increased knowledge sharing. Further, the project-based focus in the construction industry and the mere fact that large proportions of the work carried out on a construction site is inherently action-oriented, practical, experience-based and performed according to rules of thumb, thus encompassing tacit knowledge, are complicating factors for the construction of a platform for refurbishment.

This lead to the formulation of research question RQ II: What is important to consider when managing knowledge by the use of a platform to enhance learning in construction projects? RQ II was addressed in the second study and a proposition for a knowledge management method was tested and discussed by attending meetings in five on-going refurbishment projects acting as an observer. Insights from the second study indicate that applying a knowing in practice perspective and developing methods for communicating and collecting knowledge related to tacit knowledge is crucial for successful knowledge management.

Hence, the purpose in study III: To identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge. A systematic literature review addressed RQ III.

Findings indicate that applying a knowing in practice perspective and adopting methods for communicating and collecting tacit knowledge and focusing on the individuals who actually will be sharing their knowledge and especially on their social motivations are important for successful knowledge management in construction projects. Also, managers and leaders should demonstrate knowledge sharing behaviours as this will facilitate the establishment of a culture where knowledge sharing is the norm. It is further suggested to use a combination of technical and social methods for managing knowledge in construction projects. In addition, methods such as e.g. formal processes, revisions, different kinds of face- to-face meetings, workshops, mentorships, and site visits involving different actors in a construction project are recognized as being especially useful for knowledge sharing and knowledge transfer where both tacit and explicit knowledge to some extent are embraced.

In conclusion, applying an interorganizational focus regarding knowledge management, i.e. focus on communication, knowledge sharing and knowledge transfer also across organizational boundaries, including the tenants and sub-contractors, should be considered when refurbishing the Million Homes programme. Also, the adopted knowledge management methods should embrace tacit knowledge. Formal processes, revisions, different kinds of face-to-face meetings, workshops, mentorships, and site visits are recognized as especially useful per se. The adopted methods for knowledge sharing and knowledge transfer should acknowledge social motivations on the individual level to facilitate knowledge sharing. To constantly build the platform, the results from the knowledge management methods need to be captured while moving along through building projects. This is a task that needs allocation of resources and adequate methods for information capture. Considering the above, a platform concept for refurbishment of the Million Homes programme has the potential to function both as a vehicle for transfer of information and as a means for knowledge-driven development in an organization, i.e. a means for organizational learning within a construction company.

Populärvetenskaplig sammanfattning

Det finns ett stort behov av att renovera Miljonprogrammets bostäder i Sverige. För att lära sig från tidigare renoveringar vore det användbart att ha en metod för kunskapsöverföring mellan byggprojekt. Vid nybyggnation av bostäder används plattformskonceptet som en bärare av information mellan byggprojekt. Att arbeta med plattformar innebär att organisera en behållare för information som kan återanvändas vid nästa byggprojekt. I det här projektet har plattformskonceptet utvärderats för att se om det kan användas även för renoveringsprojekt. Först undersökte vi om kunskap delas lättare om man arbetar med plattformar. Svaret på den frågan var positivt, men vi upptäckte också att den personliga motivationen var viktig för de som arbetar med plattformen för att få kunskapsdelningen att fungera.

Sedan tittade vi på det projektbaserade arbetssättet inom byggande och karakteriserade det som aktionsorienterat, praktiskt, erfarenhetsbaserat och fullt av tumregler. Karakteristiken gör att plattformskonceptet blir svårare att tillämpa, då mycket av kunskapen är personlig och svår att beskriva. För att få veta mera spenderade vi tid på fem byggplatser och undersökte hur arbetet med renovering går till rent praktiskt och vilka faktorer som är viktiga. Särskilt funderade vi kring lärandet mellan olika byggprojekt, eftersom våra studier skedde på ett och samma byggföretag. En viktig lärdom var hyresgästernas involvering för ett bra renoveringsprojekt. Att ha hantverkare som är vana att arbeta inne i människors privata sfär var en framgångsfaktor och information till de boende om vad och när saker händer på byggplatsen är helt avgörande för ett framgångsrikt projekt. På entreprenörssidan lärde vi oss att det var viktigt att ha ett praktiskt kunskapsperspektiv där kommunikation och insamlande av praktiskt kunnande är avgörande för framgångsrik kunskapsutveckling. Ledarskapet måste innebära att man föregår med gott exempel kring kunskapsdelning.

Därför formulerades den sista delen av studien så att vi tittade på metoder för organisatoriskt lärande, kunskapsdelning och kunskapsöverföring i löpande arbete i byggprojekt. En litteraturstudie genomfördes som visade att kunskapen kring det här ämnet är begränsad. Det finns mycket forskning gjort på strukturer och metoder för erfarenhetsåterföring, men området kring praktisk kunskap och hur den överförs via en plattform är litet. Resultaten pekar på att det är lämpligt att använda en blandning av tekniska och sociala metoder för att hantera kunskap inom och mellan byggprojekt. Workshops, enskilda möten, genomgångar, mentorskap och platsbesök är alla metoder som identifierades som särskilt viktiga eftersom både tyst och dokumenterad kunskap kan överföras via dem. Att anlägga ett interorganisatoriskt fokus för kunskapsdelning, kommunikation och kunskapsöverföring är att rekommendera då Miljonprogrammet renoveras. Det tekniska kunskapsinnehållet är enklare att arbeta med och

behöver inte lika stort fokus då metoder redan existerar för att dokumentera och överföra kunskap för tekniska frågor. Den personliga motivationen för att dela kunskap måste stöttas. Den kunskap som flödar i projekten behöver fortlöpande dokumenteras t.ex. i en plattform, vilket kommer att kräva resurser. Med ovan i åtanke har en plattform potential att fungera som stöd vid renovering av Miljonprogrammet både som en bärare av information mellan projekt, men också som ett stöd för kunskapsdriven utveckling i ett byggföretag.

Content

Appendicies

Background

In 1964 a political initiative was taken to solve the lack of accommodation in the Swedish cities and during a ten year period about one million new homes were built. The Million Homes programme consisted of different types of dwellings, about an equal amount of single homes, two to three store apartment buildings and high rises. Before and during the Million Homes programme the building technology was under rapid development resulting in a large variety of technical solutions (Formas, 2012). Today, these buildings do not in all cases live up to the standards that are currently requested. To refurbish the building stock from the Million Homes programme with its different types of dwellings and vast number of technical solutions means to understand the building technology that was used, and to develop solutions and processes to upgrade the building stock to current standards. Methods to share, transfer and reuse knowledge and information about the former built and solutions for the refurbishment of these buildings are needed.

The use of a platform concept for refurbishment processes is proposed here in to be one such method and it could thus be regarded as a type of knowledge management system.

Various authors have addressed the management of knowledge in new-build projects in companies using a platform concept (Meiling, 2010; Styhre & Gluch, 2010; Thuesen & Hvam, 2011, Jansson et al., 2014; Lessing et al., 2015) and at large, the technical aspects of a platform concept have been in focus whereas in platforms for the refurbishment of buildings the focus should be on processes, knowledge and relationships. Though, the management of knowledge during and between refurbishment projects, the focus of this study, has received little research attention.

Aim and research questions

The aim of this research is to contribute to the understanding and use of a platform as an effective mean to increase knowledge sharing and experience feedback, i.e. achieve increased learning between different refurbishment projects for the benefit of organizational learning within a construction company.

To answer the overall research aim three studies have been performed.

The introduction of a platform does not necessarily mean that people will share knowledge more than before, which gave rise to research question I (RQ I).

> *RQ I: What are some of the possible ways to increase knowledge sharing using a platform?*

In Paper I Javernick-Will´s (2011) theory of the importance of social motivations for increased knowledge sharing is tested and discussed.

Further, the project-based focus in the construction industry and the mere fact that large proportions of the work carried out on a construction site is inherently action-oriented, practical, experience-based and performed according to rules of thumb, i.e. encompassing tacit knowledge, are complicating factors for the construction of a platform for refurbishment, which leads to the formulation of research question II (RQ II).

> *RQ II: What is important to consider when managing knowledge by the use of a platform to enhance learning in construction projects?*

In Paper II a proposition for a knowledge management platform is tested and discussed.

Though platform-use is acknowledged as one method for managing knowledge there are other methods potentially in use by construction companies to support and enable knowledge sharing and knowledge transfer and possibly organizational learning, which lead to the formulation of RQ III.

> *RQ III: What are the methods used in the everyday practice of construction projects for the sharing and transfer of tacit knowledge.*

Thus in Paper III, methods used in the everyday practice in construction projects for the sharing and transfer of knowledge, particularly tacit knowledge, was identified by conducting a systematic literature review. Then, the identified methods from the systematic literature review was analysed using theory about knowledge, knowledge management and organizational learning.

Theory

The platform concept

Platforms were developed in industries where competitiveness depends on offering several defined variants of a product to their potential customers (Meyer & Utterback, 1993). Creating new variants of a product from the very beginning is costly so companies focused on finding those parts that were common to all variants of a product. By combining the common parts with distinctive parts new variants of the product were created to a reasonable cost.

For a platform to be successful the interfaces between the common and distinctive parts must be optimal and managed over time (Sundgren, 1999). Platforms do not only consist of common and distinctive parts. According to Robertson and Ulrich (1998) a platform is the collection of assets that are shared by a set of products. These assets can be divided into four categories:

Components: the part designs of a product, the fixtures and tools needed to make them, the circuit designs, and the programs burned into programmable chips or stored on disks.

Processes: the equipment used to make components or to assemble components into products and the design of the associated production process and supply chain.

Knowledge: design know-how, technology applications and limitations, production techniques, mathematical models, and testing methods.

People and relationships: teams, relationships among team members, relationships between the team and the larger organization, and relations with a network of suppliers.

Robertson & Ulrich (1998) further argue, in a platform, knowledge about processes and technical solutions is stored and circulated effectively, i.e. circulated within an organization for the benefit of organizational learning.

The platform concept in the construction industry

In the process of implementing industrialised house building (IHB) in Sweden, contractors have recognized the use of the platform concept as one method to become more efficient and reduce costs. For instance, Thuesen and Hvam (2011) presented quality and lead time improvement as well as a reduction of project cost in a study of a Germen Housing platform. Also, Bonev et al. (2015) have studied the precast sector and the findings suggest that utilising platforms involves the creation of an optimum cost – value relation for the target market segment.

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According to Lessing (2006), IHB means the integration of several constructs including four main parts; a technical-, a process-, a supplier-, and a knowledge platform, an IHB framework. Each main part is divided into subareas and Lessing et al. (2015) emphasize that all areas of the IHB framework need to be integrated and reinforced by continuous improvement with a strategic focus beyond the singular project to establish IHB. This view is shared by various authors in contemporary studies on platform concepts in IHB; for the improvement and development of the platform the importance of integrating experiences gained from earlier projects into the platform are highlighted by e.g. (Meiling, 2010; Styhre & Gluch, 2010; Thuesen & Hvam, 2011; Jansson et al. 2014). For example, to bridge gaps between project requirements and platform parameters in an engineer-to-order sector as construction, Jansson et al. (2014) argue that support methods for daily engineering and improvement of the platform are needed. They further state the choice of support methods is an area that needs further study and development. Hence, applying a platform concept in the project based construction industry is understood as organizing a container of methods, knowledge and information that can be reused between building projects.

However, as argued by Meiling (2010), incorporation of experience feedback commonly fails and there is a need to regard experience feedback as an evolving skill related to standardised processes (ibid.). Similarly, Jansson (2013) argues that development of the platform demand a continuous flow of knowledge between the platform and the day-to-day work and methods to support the knowledge flow become necessary.

Hence, if experiences are going to benefit coming construction projects conducted by a construction company using a platform concept, experiences need to be acquired from activities performed in earlier construction projects. Then, reflected on in the construction company with the purpose to develop knowledge and the platform, and then recontextualize and integrate the developed knowledge in new construction projects. Based on this, a platform concept is therefore regarded as both a vehicle for transfer of information and a potential mean for knowledge-driven development in an organization, i.e. organizational learning. Additionally, functioning methods to support the knowledge flow between the organization and the projects conducted by the organization are needed.

Hence, cooperative capabilities, e.g. competencies relevant to information processing, communication, knowledge sharing and knowledge transfer, and intra- and inter organizational coordination (Tyler, 2001), are important per se.

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The Million Homes programme coincided with developments in building technology, which underwent rapid change in the period between 1950 and 1975, and resulted in a number of important technical advances (Formas, 2012). Hence, there are large variations in the building technology that was used (ibid.). Lind et al. (2016) further empathize that both municipal housing companies and some long-term private owners are looking for a more sustainable refurbishment policy, taking into account environmental, social and economic sustainability. Hence, making a more holistic evaluation of various refurbishment options (ibid.). Therefore, instead of components, platforms for the refurbishment of buildings would largely consist of processes with associated knowledge and relationships. In a platform for house refurbishment the common parts are substituted with common processes, meaning the processes that are always present in a job. The distinctive parts are substituted with distinctive processes, meaning the processes that are needed to complete a particular job. As stated earlier, for a platform to be successful the interfaces between the different parts in the platform must be optimal and managed over time (Sundgren, 1999). Interfaces in a platform for refurbishing buildings would mean that appropriate knowledge and information about the job are widely shared at every step of the refurbishment process. However, according to Styhre and Gluch (2010), so far a platform concept in the construction industry mainly concerns new build and functions mainly as a technical platform prescribing technical solutions. This view is supported by Lessing et al. (2015) which indicate that research concerning platforms with a large focus on processes with associated knowledge and relationship is limited.

Knowing in practice and tacit knowledge

In the 1990ies, the knowledge-based view of the firm emerged (Easterby-Smith & Lyles 2011). Furter, Gheraldi (2009) argues that discussions in the scholarly debate rotated around the discovery that knowledge is one of the most significant resources of contemporary society. However, the main difficulty was the definition of knowledge as if it is an object (ibid.). Nonaka and Takeuchi (1995) argue that knowledge takes various forms; one form of knowledge is explicit knowledge, which can be expressed in words and numbers and thus can be transferred as information between individuals formally and systematically. Hislop (2009) refers to such knowledge as "know-what". Another form of knowledge is tacit knowledge, which is highly personal and deeply rooted in individual´s actions, experiences, ideas, values and emotions (ibid.). Hence, tacit knowledge is often difficult to verbalize and communicate to others. Hislop (2009) refers to such knowledge as "know-how". Haldin-Herrgård (2003) argues that a great variety of expressions and epitomes are commonly used in literature for tacit

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knowledge. Accordingly, the most frequently used epitomes are; intuition, skills or practical knowledge, insight, know-how, beliefs, mental-models and practical intelligence (ibid.). Further, Backman et al. (2012) mean that all human beings by our very existence and our actions, already carries with us an implicit and contextual knowledge and understanding of the world when we try to consciously interpret our surroundings. Here, this is understood as; explicit and tacit knowledge is intertwined in peoples´ daily lives and work ethics. This view is supported by Polanyi (1983) who inter alia is known for formulating the phrase "we can know more than we can tell".

Large parts of human knowledge are tacit, particularly operational skills and know-how acquired through practical experience (Lam, 2000). Consequently, knowledge should be defined as an activity situated in time and space, and therefore taking place in work practices, i.e. knowing in practice (Gheraldi 2009). Similarly, according to Jonsson (2012), knowledge is a process and the use of knowledge is expressed as an individual's ability to mobilize it in action, i.e. in the everyday practice. This view is shared by Orlikowski (2006), who further emphasizes that knowledge is a dynamic and on-going social accomplishment. Also, Nonaka and Takeuchi (1995) propose that the knowledge-creation process takes place at the group level, where individuals share their experiences and participate in meaningful dialogue, i.e. knowledge is a capability produced and reproduced in social practices.

As argued by Tan et al. (2012), construction is a project-based industry and therefore, most of the knowledge in the construction industry is generated in projects during the construction process. After the completion of a project, the project team either splits up or moves to another project and thus much knowledge is lost (ibid). Therefore, an important prerequisite for e.g. continuous improvement and learning in construction is an organization´s ability to manage knowledge, especially manage the experiences gained during the execution phase of a construction project. Dubois and Gadde (2002) argue that in a specific construction project collective knowledge is created and forms a shared understanding of what is done and how it is done. Further, there are tight couplings in individual projects and loose couplings in the permanent networks, i.e. learning both between different projects and learning from projects to the permanent organization in a construction company is a challenge (ibid.). Also, the organizational conditions characterising the construction industry seem to provide little incentive to invest in long-term relationships, thus affecting what can be learned from others (Håkansson & Ingemansson, 2011). However, as later described by Håkansson and Ingemansson (2013) larger companies can use the internal network of other company units to

learn what has happened in similar projects. Also, by using existing interfaces with other actors in this network, i.e. an extended knowledge base, creates opportunities for learning (ibid.), (cf. Tyler (2001) and the importance of intra- and inter organizational coordination). Further, as emphasized by Styhre et al. (2004), in construction projects know-how primarily is shared through informal and personal contacts, and new arenas are needed where various professional groups can share knowledge and information, i.e. where experience feedback can occur, for the beneficial joint learning.

As large proportions of the work carried out on a construction site is inherently action-oriented, practical, experience-based, and performed according to rules of thumb, much of it is arguably tacit knowledge. This may be a complicating factor for the construction of a platform for refurbishment, particularly according to the knowing in practise perspective, which according to Jonsson (2015) holds that not all knowledge can be objectified, and "focuses on experiences and knowing how to do something, or how to perform a task, rather than on how to store and transform information and knowledge" (Jonsson, 2015, p. 49).

Technical and social elements for knowledge sharing and knowledge transfer

Many organizations have invested in various solutions for managing knowledge (Easterby-Smith & Lyles, 2011). Most organizations seem to be stuck with solutions intended to improve the accessibility of information by using information technology (IT) (Jonsson, 2015). In addition, studies by Al-Qdah and Salim (2013) and Johannessen et al. (2001) show that IT is limited to the transfer of mainly explicit knowledge.

Nevertheless, Newell et al. (2009) summarize knowledge management as a collection of strategies, tools, and methods that management can use to turn knowledge into a resource for the company. Also, as emphasized by Jonsson (2015), a key step towards effective knowledge management is to understand how knowledge is shared in practice in the daily work. Javernick-Will (2011) argues that knowledge management scholars mostly have focused on macro-level constructs and relationships, i.e. at the organizational level, when managing knowledge. Thus, the importance of technology, communication strategies and resources for sharing knowledge has been recognized (ibid.). However, as argued by Javernick-Will (2011), it is actually on the microlevel, that of the individual employees, that the processes of locating, providing and reusing knowledge within an organization actually takes place. More specifically, Javernick-Will (2011) recognized the importance of the social motivations employees have for sharing knowledge and offered insights into organizational strategies that may help to increase knowledge sharing by individuals. Also Nonaka and Takeuchi (1995) propose that it is the

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organization which provides the organizational contexts or devices that facilitate the group activities, as well as the creation and accumulation of knowledge at the individual level. Accordingly, two main approaches to knowledge management can be discerned in the literature: one focus on technical elements and the other on social elements (Newell, 2015). Some authors treat knowledge as a resource that can be managed like any other tangible resource and the focus is on how to free knowledge from the individual and make it widely available as an organizational resource by technical elements such as IT-systems or written guidelines (Newell et al. 2009; Newell, 2015). Others focus on managing knowledge work rather than knowledge itself because knowledge is about what people do and say, i.e. knowing in practice, and the focus is to provide an enabling context, a social element, that allows people to do and say things differently (ibid.). However, as argued by Easterby-Smith and Lyles (2011) "Effective knowledge management in organizations involves a combination of technological and social elements" (p.106).

Recognizing the individual in organizational learning

Cyert and March (1963) were among the first to connect research on economics and organizations and they argue that the individual is the key to organizational learning because it is individuals´ thinking and acting that result in learning. Argyris (1995) claims that actions that individuals have found to be useful and are accepted by the rest of the organization are key elements for organizational learning, and thus there is a high degree of causal interdependency between the individual and the organization. Fiol and Lyles (1985) describe organizational learning as the process of improving actions through better knowledge and understanding, i.e. learning is the development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions. Levitt and March (1988) have a similar view and argue that organizational learning is routine based, history dependent and target oriented. Further, individuals are functioning as agents for organizational actions and organizational learning (Fiol & Lyles, 1985).

However, Senge (1997) emphasizes that traditional organization structures restrict communications between departments and make the sharing of knowledge difficult, and in order to learn how to learn, an organization should be viewed as a fluid system with complex interrelationships. In addition, Holmkvist (2003) argues that organizations can learn from each other through interorganisational learning, which relates to collaboration between organisations.

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In the construction industry Winch (2010) argues that learning from the project process is vital for the resource base. The resource base is described as the human and equipment resources held by the firms on the supply side, including the contractor, that come together in a construction project (ibid.). Considering that large parts of the work in a construction project are conducted by subcontractors, it is recognized that much of the knowledge is created by subcontractors. This is an additional complexity to consider for a contractor who wants to manage knowledge to facilitate organizational learning between construction projects and the permanent organization. Also Chan et al. (2005) emphasize the interorganisational dynamics involved in both the process and outcomes of project-based organizations. Also, within the area of organizational learning, Chan et al. (2005) discovered that empirical foundation is lacking, especially in terms of viewing from an organizational learning perspective at a construction project level. More recently, Walker (2016) recognizes that there has been a significant growing focus on learning through collaboration and the value of being a reflective partner in the construction context.

Research design and methods

The research design in this project was not predefined but emerged during the research process. The aim of the research project is to contribute to the understanding and use of a platform as an effective mean to increase knowledge sharing and experience feedback, i.e. achieve increased learning between different refurbishment projects for the benefit of organizational learning. Hence, I find that the nature of the research is qualitative.

Research logic

Silverman (2016) describes qualitative research as theoretically driven and "complementing quantitative research in particular by entering into the `black box´ of how social phenomena are constituted in real time" (p. 3).

In qualitative research, interviews and observations are two common sources of gathering data (Merriam & Tisdell, 2016). Data from observations represents a firsthand encounter with the phenomena of interest whereas interviews represent a secondhand account of the world (ibid.). There are different kinds of interviews and any particular interview can be placed somewhere between unstructured and structured (Denscombe, 2007). In their extremes the unstructured interview is closer to observation while the structured interview with closed questions is closer to a questionnaire as a method (ibid.).

Data collection

<u>Study I</u>

In study I four semi- structured interviews were performed. The overall aim of the first study was to test if Javernick-Will´s (2011) theory of the importance of social motivations was applicable in companies using a platform concept. Semi-structured interviews were chosen as the method because I needed specific information from the respondents and it allows for additional questioning in the interview situation to create understanding. The purpose of the semi-structured interviews was to understand the knowledge sharing within organizations that use a platform concept.

Recognizing that large part of human knowledge are tacit (cf. Lam, 2000) and when planning the interviews, a question arose; how to talk with people about knowledge, and especially tacit knowledge that is embedded within a person and embraces that persons´ experiences, values and emotions?

The chosen solution was to use a method described in Halldin-Herrgård (2003); as a help to trigger conversations about tacit knowledge, cards describing expressions of tacit knowledge were used in the interview situation. Haldin-Herrgård & Österåker (2002) have compiled close to one hundred expressions of tacit knowledge used in academic literature. However, going through all those with the respondents during the interview situation would have been time consuming with the increased risk to lose the respondents focus and interest. Hence, using my experience from the construction industry and the coauthors´ (in paper I) pre-understanding of a platform concept used in practice in the Swedish construction industry, 31 expressions of tacit knowledge was chosen as the base to form the interview.

All interviews were recorded and lasted between 1h and 1.5 h. The interviews were fully transcribed and then compared to the social motivations described by (Javernick-Will, 2011).

Study II

In study II a proposition based on inferences drawn from literature regarding knowledge management, organizational learning and knowledge in platforms is empirically tested. The proposition reads;

> *An appropriate knowledge management platform is a system that could tighten couplings between construction projects. For refurbishment projects, such a platform would include strong assets in processes, relationships and repetition of know-how. In addition, the effectiveness of a knowledge management system in project-oriented settings depends on individuals´ involvement in communication and discussion to foster learning during day-to-day work and having a knowing in practise perspective.*

The precondition in study II was that the parent organization in a major Scandinavian construction company wanted to collect experiences from temporary refurbishment projects undertaken by the organization regarding planning, logistics and handling of tenants.

A manager from the parent organization was responsible for the collection of these experiences. The manager selected and subsequently visited and attended meetings in five on-going temporary refurbishment projects in areas where the organization has continuity and an established operation.

To obtain information and understand how knowledge is shared in practice, I as a researcher also attended the meetings taking the role as an observer. The people attending the meetings were aware of the fact that I am a researcher and they watched me taking notes. To increase my understanding I had meetings with the manager short after each meeting at the refurbishment projects. Further reflections from the manager were also obtained 10 weeks after the last and fifth visit.

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The observations were coded and categorized in three themes; planning, logistics and handling of tenants. Findings from the coding were then compared with the proposition.

<u>Study III</u>

The purpose in study III was to identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge.

A systematic literature review was conducted, mainly because it has a prescribed methodology and a narrow focus. Then, the identified methods from the systematic literature review was analysed using theory about knowledge, knowledge management and organizational learning.

A prerequisite when conducting a systematic literature review is that I as a researcher need to have some working knowledge and understanding of the field.

Further, a systematic literature review is a question-driven methodology, and involves identifying and sifting through relevant literature and evaluating each according to predefined criteria (Jesson et al. 2011).

Compared to a traditional literature review, a systematic literature review is viewed as being a more neutral, technical process, which is standardised and thus demonstrates objectivity. However, I do agree with Jesson et al. (2011) who argue that a systematic literature review is not entirely free from bias, because I as a researcher have read and judged every article included through cognition, using my knowledge and earlier experience.

The first trial search was performed in May 2015, and was taken up again in February 2016 and continued through June 2016. To narrow the focus the review research question and inclusion criteria was changed from the ones used in the first trial search.

The period between the first trial search and when the search was taken up again was necessary, firstly because I needed to practice the key phases of a systematic literature review and secondly, to reflect on and refine the review research question and inclusion criteria.

Summary of appended papers

Paper I

Social Motivations for knowledge sharing in construction companies

Lundberg, M. & Lidelöw, H. (2015). *Procedia Economics and Finance,* 21, 224-230.

Purpose: The aim of this study is to discuss possible ways of increasing knowledge sharing from a platform concept; we apply these ideas in the setting of building refurbishment and test if Javernick-Will´s (2011) theory of the importance of social motivations is traceable.

Data collection: Semi-structured interviews with four managers from four different Swedish construction companies using a platform concept were carried out. The interviews were recorded and fully transcribed.

Findings: The findings show that the main purpose of a platform concept is to standardize components and processes. To increase the possibility that a platform concept for the refurbishment of buildings will be used for knowledge sharing the focus should be on the individuals who will actually be sharing their knowledge and especially on social motivations. It is important that managers and leaders demonstrate knowledge sharing behaviors as this will facilitate the establishment of a culture where knowledge sharing is the norm.

Paper II

Testing a Proposition for a Knowledge Management Method for Refurbishment

Lundberg, M. & Lidelöw, H. (2016). In the proceedings of the 32nd Annual ARCOM Conference, 5-7 September, 2016, Manchester, UK.

Purpose: The aim of the study is to test a proposition for a knowledge management method for managing knowledge during and between refurbishment projects.

Data collection: Data has been collected by a researcher acting as an observer and taking notes at meetings associated with five refurbishment projects, two in Denmark and three in Sweden. Additionally, to increase the understanding of the observations and validate the material, six interviews were conducted.

Findings: The findings indicate that applying a knowing in practice perspective and adopting methods for communicating and collecting tacit knowledge, and including a coordinating function is important for successful knowledge management in construction projects.

Paper III

Methods used for knowledge management and organizational learning in the practice of construction projects: a systematic literature review

Lundberg, M., Lidelöw, H. & Engström, S. (2017). In the proceedings of working papers from the ARCOM and BEAM Centre Early Career Researcher and Doctoral Workshop on Building Asset Management, Glasgow, 20 january 2017.

Purpose: To identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge.

Data collection: A systematic literature review of peer- reviewed journal papers written in English, describing methods for organizational learning or knowledge sharing or knowledge transfer, encompassing empirical data from practice, site level in construction projects and western world context has been conducted. Then, by using theory about knowledge, knowledge management and organizational learning the found methods have been analysed to identify methods related to tacit knowledge.

Findings

The findings show that methods such as e.g. formal processes, revisions, different kinds of face- to-face meetings, workshops, mentorships, and site visits involving different actors are recognized as being especially useful for knowledge sharing and knowledge transfer of tacit knowledge. The above methods embrace a live capture of knowledge, i.e. have a knowing in practice perspective (Orlikowsky, 2006).

In a majority of the papers a combination of technological and social elements for knowledge sharing and knowledge transfer are used.

Conclusions

When a construction company is developing a platform concept for the refurbishment of buildings from the Million Homes programme one should consider to apply an inter organizational focus regarding knowledge management, i.e. focus on communication, knowledge sharing and knowledge transfer across organizational boundaries involving different actors. When refurbishing the Million Homes programme it is recognized that the tenants often stay in their apartments during refurbishment and thus affect the refurbishment process. Therefore, a coordinating function taking care of everything related to the tenants is recognized as important. Lind et al. (2016) also underline the importance of involving the tenants in the refurbishment process. Also, considering that large parts of the work in a construction project are conducted by sub-contractors, it is recognized that much of the knowledge is created by subcontractors. Therefore, to learn from previous and on-going construction projects, also sub-contractors should be involved in the knowledge management process.

Further, a major portion of the overall knowledge generated in construction projects is related to tacit knowledge which could be a complicating factor for a platform concept used as a mean for knowledge management. Hence, identified methods for sharing and transfer of tacit knowledge are; formal processes including live capture and reuse of project knowledge, revisions, face-to-face meetings, mentoring, site visits, and workshops. Additionally, to facilitate knowledge sharing on the individual level which is a prerequisite for organizational learning (cf.Argyris, 1995; Fiol & Lyles, 1985), social motivations (cf. Javernick-Will, 2011) should be acknowledged.

Considering the above, a platform concept for refurbishment of the Million Homes programme has the potential to functioning both as a vehicle for transfer of information and as a mean for knowledge-driven development in an organization.

Future research should address the recognition that research concerning platforms with large process-, supplier-, and knowledge content is limited. If a platform concept is going to function as a mean for organizational learning by knowledge driven development in an organization, methods to support the knowledge flow between the organization and the projects conducted by the organization while moving along through projects become important. Future research should therefore investigate what actions construction companies using a platform concept are taking to support the aforementioned knowledge flow.

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