

Master Degree Project in Knowledge-Based Entrepreneurship



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A case study of a small architecture start-up:
Strategic considerations to aid innovation in the construction industry

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Abstract

This paper examines innovation within the Swedish construction industry with the purpose of identifying key factors for small and/or newly founded firms to increase their innovative capacity and long-term competitiveness. The paper presents a theoretical framework of driving and hindering factors raised by the literature along with an introduction to the Swedish market and important segments on the market. An analysis is performed through the lens of a case firm operating within this market, where their approach to construction innovation is compared and contrasted with the findings of the literature and complementary interviews, in order to find factors most critical to innovation, that are still within the impactable sphere of a small firm. Our paper holds that five factors are key for small firms ability to innovate: Network Development, Build Dynamic Organizational Capabilities, Scale Knowledge-flows, Procurement Partnering, Impact through Knowledge Brokerage. Findings are related to a small firm operating in the more innovative side of the construction industry with a high skill base and high level of education compared to other firms operating within the industry. Further investigations based on small firms with lower academic skill-base is needed to complement the findings and to create a more holistic view of small firm construction innovation within the Swedish market.

Keywords: construction innovation, project-based innovation, small and newly founded firms

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Background and Personal Connections

The interest in the topic of this thesis comes partly from personal interests and preferences of the authors. However, interest was also sparked through our personal connection with the case firm. In a master course taken prior to our thesis process and through personal connections, the authors had basic knowledge and insight into the case firm. Primarily the interest was focused on the development of a specific innovation researched by the case firm. The thesis later developed to take a wider scope at construction innovation. Our time vested with the company prior to the study has therefore impacted our focus and interest within the study. The effects of this is not easy to derive, yet in our methodology section we attempt to describe the path that has led us to the consideration we have made and which has led to the final result.

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1. Introduction

This chapter is aimed to introduce the reader to the underlying foundation of this thesis, by problematizing around the research topic. Further, the chapter presents the reader with the purpose and the research question of the thesis.

1.1 Problem Definition

Urbanization is a clear trend in countries and cities all over the world, Sweden is no exception, and this has affected the Swedish housing market. The metropolitan areas are increasingly attracting new businesses and thereby offering a growing number of job opportunities at the expense of smaller cities, towns, boroughs and rural areas of the country (Boverket 2012). This development has led to the growth of the larger metropolitan areas in Sweden, yet the density of cities remains largely unaffected which means commuting distances as well as central land values are increasing. The current use of existing land is in many ways poor and land is in an increasingly short supply (Boverket 2012). The poor use of existing land and infrastructure is a problem recognized by the state and accordingly included as one of the five superordinate goals in the Swedish planning and building act (Brandén et al. 2016).

The clear trend of urbanization, combined with the low building rate over the last twenty years have led to a palpable housing shortage in 240 out of 290 Swedish municipalities (Brandén et al. 2016)). The magnitude of the situation can be highlighted by the fact that, in order to meet the demand for housing, 71 000 new dwellings per year is needed, which represents a doubled construction pace compared to the last decade (Brandén et al. 2016). The challenges of doubling the pace of housing construction and simultaneously improve resource utilization, decrease environmental impact and improve standards are huge. Taken together, the industry needs to improve in all aspects in order to maneuver through the existing challenges of providing the housing market with an increased housing production.

The Swedish construction industry contributes to Sweden's growth, development and wealth through the built environment of housing, commercial real estate, industrial facilities and infrastructure. The industry employs more than 300 000 people and it contributes to 10 % of the GDP (Sveriges byggindustrier 2015), thus the built environment impacts all parts of society on a daily basis. Its impact and size makes every citizen a stakeholder, one way or another. (Gann and Salter 2000; Egan 2002; Sveriges Byggindustrier 2015)

Although being vital and important, issues exist within the industry and these need to be addressed by the industry itself and by the society as a whole. Common opinions about the industry are that it is conservative and lagging behind other industries in terms of its level and capacity for innovation (Egan 1998; Blayse & Manley 2004; Hardie 2010; Lassen et al. 2010;). Low R&D investments characterize the industry, and the industry is argued to be rather low-tech (OECD 2000; Seaden & Manseau 2001; Reichstein et al. 2005). Furthermore, the industry is heavily regulated and partially politicized, and many of the stakeholders surrounding the industry are also very conservative and unwilling to take risks in order to innovate as needed (Simu 2009). The conservatism and unwillingness to take risks might

hinder innovation, and so does the industry structure. The industry is fragmented and the project-oriented structure creates strong interdependence between stakeholders, which means that intense cooperation between stakeholders is needed in order to innovate (Gann & Salter 2000).

On a national level, there are just a few large actors that dominate the market and that have the ability to conduct and operate large scale housing development (Simu 2009). This is the result of a consolidation trend going back to the 1970's when the Swedish construction market had around twenty national construction companies. The nature of the industry, with long and resource consuming processes guided by tradition and characterized by long-term established relationships makes it especially difficult to compete on the national level. The scale of the financial commitments, the regulatory environment, the long time frames as well as the lack of contacts, network and legitimacy are all problems that needs to be addressed and are all factors that create high barriers for firms trying to enter the commercial real estate and large scale housing development market.

The regional markets, in this context meaning smaller scale construction, primarily smaller multi-family dwellings, small commercial buildings, single family and duplex housing, additions and housing extensions, are on the other hand characterized by a large number of small and medium sized actors and close corporations. The level of innovation within this part of the industry is, often, even more limited (Fairclough 2002; Blayse & Manley 2004) and even more characterized by conservatism, network dependency and tacit knowledge (Johansson 2017, personal communication, 25 Jan; Simu 2009). Nevertheless, smaller firms active on the regional markets have a clear potential for new innovation (Fairclough 2002). Here, barriers to entry are less cumbersome, yet this simultaneously makes for a more competitive market with less stability for each individual actor (Simu 2009). The market is characterized by fragmentation and segmentation into different specialist areas, where construction projects almost inevitably requires coordination and collaboration between many different actors, firms and stakeholders. The process of overall planning and organizing thereby often creates challenges (Simu 2009). Through the nature of this market structure, and confirmed by the partners at Cream Architects; networks, contacts, reputation and need for legitimacy between actors are critical factors for firms to successfully enter the market or to innovate within it. To build legitimacy and networks is particularly crucial for newly formed firms since few, if any, new actors are able to handle the entire process of new housing development in-house. The constant need for collaboration and project organization also makes process innovation more difficult and new processes and technologies are hard to implement since it requires several actors to adapt and agree to new practices (Johansson 2017, personal communication, 25 Jan).

In essence, both structural and attitudinal problems to innovation exist within the industry. At the same time, if the industry reach higher levels of innovation, the likelihood of increased contribution to economic growth rises (Blayse & Manley 2004). A contribution that is needed in order to maintain economic growth and to be able to build higher quality, resource efficient and affordable houses in attractive areas which is what is demanded. A massively increased building rate alone will most likely not lead to a built environment that can support this. Firms need to overcome the challenges to innovation in order for the industry to increase its

contribution, and Fairclough (2002) holds that small firms within the industry have a high potential for innovation given the right tools and methods. Due to the characteristics of the industry, with a majority of small and medium sized firms, an increase in the innovative capacity in this segment could have large impact on the innovative capacity of the industry as a whole. Therefore, a probing investigation of the existing challenges and how to overcome them as a small and newly formed firm, makes up for an interesting research topic.

1.2 Purpose

In this thesis, we will look closer at the workings of the Swedish construction industry and innovation theory and attempt to use a case company and industry participants in order to reach important considerations of relevance to small firms' ability to be innovative in the Swedish construction industry.

Through the lens of Cream Architects, a small and newly formed architectural firm profiled as innovative and environmentally friendly, we attempt to analyze and discuss strategic considerations for a newly formed venture in the Swedish construction industry. We believe that their journey of championing innovation can both serve as contrast and tell us more about the existing problems, as well as give insights and potential tools to alleviate the challenges of innovating within the Swedish construction industry.

1.3 Research Question

Our purpose of finding important consideration for small and/or newly formed firms ability to innovate leads us to the following research question.

How can strategic considerations aid small and newly founded entrepreneurial firms' ability to innovate in the Swedish construction industry?

2. Methodology

This section is aimed at serving as a roadmap for “getting here to there” as described by Yin (1994). It outlines and motivates how the research has been conducted and to which academic standards it adheres to (Bryman & Bell, 2011). It shall thereby create a red line for readers to follow and guide the research in the journey towards an answer of the research question.

2.1 Research Focus

The idea was to study how strategic considerations can aid small and newly formed entrepreneurial firms to innovate in the Swedish construction industry. We did this through the lens of a newly formed architecture firm focusing on adaptation and innovation of new technologies and new concepts in the industry. Cream Architects, the case firm of this study, fulfills the selection criteria corresponding to the research topic by being a small and newly formed firm with a clear focus on innovative solutions and greener construction, acting in the Swedish construction industry. Thereby the firm has faced and is currently facing the existing challenges for firms when entering as well as innovating in the Swedish construction market.

2.3 Research Strategy

The characteristics of the innovation climate in the Swedish construction industry are not easily and objectively concretized. Conversely, they are subjective in nature. Therefore, the research conducted in this thesis was predominantly performed using a qualitative approach. Bryman and Bell (2011) defines qualitative research as a research strategy that emphasizes words rather than quantification in the collection and analysis of data. The strategy allowed for a pursuit of the factors specific to the workings of the construction industry, not immediately apparent to outsiders. We deemed that these factors were best explored through the access to a network of key actors within the industry who possess the tacit knowledge, experiences and insights needed to answer the research question.

The research strategy was iterative in the sense that it was performed in close relation to both internal sources of the case subject and with external sources, so that data collection and analyzing were performed in an ongoing process. An initial scan and literature review carried characteristics of a deductive process. Simultaneously, interviews were conducted and analyzed in order to identify categories and concepts relevant to our research. This in contrast followed an inductive approach. This iterative approach enabled the research to comprehend with the complex and interactive process of innovation, which cannot be seen as having a clear and one-fit-all answer. When viewed as a whole, the chosen path of a continuous iterative process of moving between empirical observations and existing theory thereby makes our research strategy, abductive. A research approach that we found suitable for the task of applying theory and empirical findings from other actors to a tangible setting.

What characterizes the challenges for market entry and innovation is that all of them are socially constructed. They can be seen as social phenomenon, which are subjectively understood. To acknowledge our field of study as being socially constructed led us to an

epistemological consideration towards interpretivism. Interpretivism is predicated upon the view that a strategy is required that respects the differences between people and the objects of natural sciences and therefore requires the social scientist to grasp the subjective meaning of social action. This is an epistemological consideration that tackles the question of whether the social world can and should be studied according to the same principles, procedures, and ethos as the natural sciences (Bryman & Bell 2011).

Further, the research strategy followed an ontological consideration towards a position of constructionism, meaning that the research strategy acknowledged the case firm and the culture within the field of study as being in constant flux and therefore dependent on individual action of subjects within. Social phenomenon such as organization and culture are not only produced through social interaction but they are also in a constant stage of revision, meaning that they are socially constructed (Bryman & Bell 2011). This ontological consideration enabled the research strategy to account for the complex process of commercialization and innovation in an emerging start-up, which is a process characterized by constant change.

2.4 Research Design

To fully understand the existing challenges that firms face when innovating in the Swedish construction industry, we felt we needed to stay in close proximity to an environment where the challenges to innovation could be identified and studied. The choice to perform a case study was taken out of this reasoning, since the selected case allowed us as researchers to intensively investigate how strategic considerations help a small and newly formed entrepreneurial firm to innovate. Lee, Collier, and Cullen (2007) suggest that particularization rather than generalization constitutes the main strength of case studies. The goal of a case study analysis should, therefore, be to concentrate on the uniqueness of the case and to develop a deep understanding of its complexity from the standpoint of effectuation.

2.5 Research Method

2.5.1 Research Process

Knowledge within the construction industry is often tacit (Johansson 2017, personal communication, 25 Jan), which means that to answer our research question, we needed access to tacit knowledge and practices possessed by key actors with experiences and insights in the Swedish construction industry. The tacit knowledge needed to answer our research question is hard to access on an aggregated level, but possible to access through the network of the case firm. Therefore, access was primarily sought through unstructured and semi structured interviews to allow for the pursuit of and give room to unique experiences of each interviewee. The specific nature of a case study creates demand for specific knowledge and interviews allows for the perception of different perspectives, tacit knowledge and phenomenon that can serve to create a deeper understanding of the subject and capture nuances (Bryman & Bell 2011). The semi structured interview allows for a flexibility to explore interesting unique aspects, yet it also creates elements of commonalities that can serve

as a bridge to connect with the existing literature (Bryman & Bell 2011). The unstructured interviews allow for even deeper exploration of the interview subjects specific knowledge and ability to pursue their unique experiences and context to capture new aspects and angles to further the theoretical knowledge (Bryman & Bell 2011).

The selection of literature and interviewees was focused on subjects with relevant experiences, knowledge and expertise within new new venture creation and innovation in the Swedish construction industry. The interviewees were selected through the lens of Cream architecture and through findings from the literature regarding strategic considerations and organizational structure for innovation.

The research plan consisted of an initial scan and compilation of relevant research within the fields of strategy and innovation theory, all within the field of construction. A first round of interviews with the case company was conducted to form a reference for the literature review and analysis. This was followed by a second round of interviews which were broadened to look more closely into the world of strategies and innovation in the construction industry. The idea was to examine potential key considerations and factors affecting the ability to be innovative in the Swedish construction industry and thereby find recommendations for action plans that small and newly formed entrepreneurial firms might get support from. In the third round of interviews, an interviewee within the identified stakeholder framework was targeted, in an attempt to capture aspects and perspectives from different stakeholders of the industry.

2.5.2 Data Collection

The data collection stemmed from both internal and external sources, where data gathered from Cream architecture and stakeholders related to them was regarded as internal and other sources of data and observations were categorized as external.

Interviews were analyzed through initial categorization of relevant findings and reviewed and contrasted with the literature in order to find connections as well as unique findings. All interviews were recorded to allow for immediate interpretation as well as post reactions and interpretations of both interviews and initial reactions to the data. Complementary data was collected through secondary sources, such as statistical databases.

2.6 Research Contribution

Our research was intended as a contribution to the development and application of a more dynamic and innovative construction sector where the study examined strategic considerations for innovation and mechanisms in the construction industry from the standpoint of effectuation rather than causation. Meaning that we aimed to look at how a small venture in constant flux could utilize strategic considerations and organizational structure to create and develop a set of possible effects from a given set of means rather than looking at a set outcome and finding and applying the means to achieve the intended outcome.

The case has brought insights into Cream's experiences of innovating within a conservative and highly regulated industry during a time of rapid production increase and rise in venture

formation. The research was aimed as an exploratory case, and it provided an opportunity to look into the dynamics of innovation as it unfolded. Learnings can potentially be applied to supports small firm innovation within the Swedish construction industry.

2.7 Research Quality

2.7.1 Credibility

Credibility was enhanced by using each interviewee as a check against each other, which is to confirm the social reality from different perspectives. This is a tool explained as triangulation (Bryman & Bell 2011). The social reality was thus understood from different perspectives within the industry framework, where actors both on the supplier side and on the contractor side of the industry, except from the case firm positioned as a technical consultancy firm, gave their view on the research topic.

2.7.2 Transferability

Readers have to judge for themselves if the research in our thesis is transferable to other environments, which was enabled by providing a thick description of the research performed. The thick description of industry characteristics, hindering factors to innovation, together with a stakeholder analysis, provides readers with a broad context to allow transferability.

2.7.3 Dependability

An auditing approach supports reliability, or dependability as a criterion of trustworthiness (Bryman & Bell 2011). Recorded interviews and field notes has been our main approach to enhance the level of dependability.

2.7.4 Confirmability

To maintain a high degree of confirmability, we have focused on being objective, thus not letting personal values affect the research more than necessary. Personal values are hard to extract completely, but our focus was to act in good faith during the research.

2.7.5 Authenticity

Fairness has been intended throughout our research, by interviewing not only the case firm but also other actors within the field, thus different perspectives have been captured. Further, our research has been performed with clearly specified methods, aimed to provide transparency.

3. Theoretical Framework

This chapter is aimed at providing an understanding of driving and hindering factors to innovation as well as strategy tools with the aim to provide the reader with a theoretical background of important aspects for firms trying to innovate within the industry.

3.1 Innovation in the Construction Industry

The Swedish construction industry is far from unique when it comes to being criticized for being conservative and produce low levels of innovation (Engström & Levander 2011;), the same goes for the construction industry worldwide (Egan 1998; Blayse & Manley 2004; Hardie 2010; KPMG 2015). In a survey performed by KPMG (2015) 69 percent was considered followers or “behind the curve when it comes to technology innovation. As an industry of massive economic importance, perceived to be lagging other industries in its development, it could be argued to have a need to change in order to maintain that status (Hardie 2010).

While some actors are unwilling to leave the comfort of familiar territory and others perceive that the cost and risk of developing and implementing new methods and technologies outweighs the benefits (KPMG 2015), there are certain universal factors, that are in the nature of the industry, that can impact innovation. One such potential problem for innovation within the industry can be that the industry considers itself as being poorly structured for innovation which, like a self-fulfilling prophecy hampers the innovation (Lind 2011). Hardie (2010) reference the importance of owners’ attitudes and the need for the industry to be incrementally exposed to new technologies and systems often times from other industries.

3.2 Driving or Hindering Factors to Construction Innovation

3.2.1 Structure of Production

A feature of the construction industry seen as a hindering factor, is the structure of production (Blayse & Manley 2004). The products constructed by the industry (buildings, bridges, roads, etc.) can be clearly distinguished. They are location bounded, generally have a very long life span, high costs and a great influence on the quality of life. One of the most problematic aspects is the one-off nature of construction projects, because it leads to discontinuities in knowledge development and in transfer knowledge within and between organizations (Dubois & Gadde 2002). Another problematic issue is the large number of actors involved in any given construction project, since each firm or individual involved controls only a specific element in the overall process. Complex and sizeable projects comes with challenges to communicate and collaboration, thus they lead to disparate and discordant outcomes, which is hindering innovation (Blayse & Manley 2004).

3.2.2 Industry Relationships

Industry relationships is a driving or hindering factor with significant influence on construction innovation (Anderson and Manseau 1999; Dubois and Gadde 2002; Miozzo and

Dewick 2002). It is of high importance due to the capacity to facilitate knowledge flows through interactions and transactions between both firms and individuals, that the industry relationships create (Blayse & Manley 2004). The interaction can come in many shapes, such as processes related to product integration between manufacturers and installers of construction products, processes related to coordination in project organizations, flow of labor, and flow of information from various sources. Within this factor, it is important to acknowledge how tight the couplings or the relationship are, because the tighter the couplings between individuals and firms, the more supportive of innovation they become (Blayse & Manley 2004).

3.2.3 Conservatism

Many, including industry insiders, holds the construction industry as being conservative (Styhre 2010). Dubois and Gadde 2002, describe how conservatism manifests itself in the industry, making it unwilling to change, poorly performing and a strongly preferring old and tried methods. The industry uses too few new management techniques, tools and new media (Bresnen et al. 2005), and Gann (2000) claims that the industry produces too little innovation. Further, conservatism manifests itself through a lack of equality, which is seen in a lack of women in the industry together with a conspicuous sexism (Watts 2009). KPMG (2016) describes how the industry's traditional conservatism restrains the industry's ability to tackle the complexity of today's projects, thus making conservatism into a hindering factor to innovation.

Nam and Tatum (1988) holds that traditional conservatism results from various sources, where the general costliness of the constructed product together with a high degree of social responsibility are the two factors most affecting conservatism. The costliness of constructed products often times makes it very costly to test technological inventions, thus innovation is constrained. For instance, it is not possible to destroy a skyscraper to test its seismic design. The cost from doing so is too high. The result is that trying new methods and materials, without sufficient tests, on costly constructed products, leads to high risk. In addition, the long life span compels customers to stick to proven methods (and avoid radical changes); they have to live with it for many years, thus triability (as introduced by Rogers (1982); a buyer can try a product and easily replace it if it is unsatisfactory) is low. Therefore, less trial and error is used in construction, and instead conservative well-proven methods and designs dominate.

Nam & Tatum (1988) further argues how constructed products carry a high degree of social responsibility. The high degree of social responsibility breeds conservatism and stems from the concern for public safety and health, but also from environmental awareness. Historically, when cities began to form, constructed products became a target of governmental regulation in order to protect citizens and counteract the construction firms' lack of concern for public safety. The potential effects of a construction disaster are often huge, thus regulation is needed to ensure public safety and health. Further, such construction disasters might have a great impact on the environment, which cause a social responsibility to protect the environment as well.

3.2.4 Clients

Many authors raise clients as an important driver of innovation (Egan 1998, Blayse & Manley 2004; Engström & Levander 2011; Ekeskär 2016). Yet clients vary greatly in their knowledge and thereby their ability to drive innovation. An inexperienced (or novice) client generally does not possess the knowledge to structure the procurement or specify demand that stimulate innovation (Engström & Levander 2011). Hardie (2010) raises low competence levels of the project initiator and future owners, in terms of making qualified choices between competing offers, as a hindering factor to innovation. The one-off relationship between private customers and contractors also tends to attract shortsighted actors to profit maximize (Lind 2011). In this combination of low demand and little reward the incentives to take the risks associated with innovation are relatively low.

Nevertheless, irrespective of clients' experience levels, an important source of innovation, especially for SME's, are changing client needs or unanticipated project conditions (Hardie 2010). This often forces new methods and solutions, which can drive development of new products, methods and processes.

3.2.5 Cognitive Bias

A significant deterrent for innovation is also that decision-makers suffers from a type of regret bias where one is generally more concerned with potential losses and associated regret rather than with wins from positive outcomes (Engström & Levander 2011). Regret will be even more prominent in situations where decisions cannot be reversed. Added to this is also a tendency for decision makers to stick to what is familiar and repeat previous decisions, the so-called status-quo bias. Applying decision theory to such an environment suggests that this type of biases will lead to the election of common practice methods over innovation, even when the innovative solution is considered to provide a more desirable result (Engström & Levander 2011). A bias which also have a large impact on innovation is that outcomes that are distant in time tend to largely be discounted in favor of events and results closer to the present (Engström & Levander 2011). This is reflected in the way the industry reflects on price in procurement which is further discussed later.

In order to mitigate or overcome these biases, equivocality and uncertainty needs to be addressed. When affected by equivocality and uncertainty, the reliance on heuristics and biases increase. The fastest way to alleviate uncertainty and equivocality can be to stay with what you know, the status-quo, which thereby hampers new development and innovation. Engström and Levander (2011) argue that these factors should instead primarily and more efficiently be managed through the gathering of rich information. They show that clients that are more capable of adopting innovation used more functions and information than less innovative clients. However, often times the clients lacks both efficient processes and the ability to process rich information as well as the ability to ask the relevant questions.

3.2.6 Procurement

3.2.6.1 Form

The construction contract can have a number of different structures which can have a large impact on the incentives for innovation. Traditional lump-sum contracts are most detrimental to innovation since it transfers high levels of risk to the contractor and it is unfavorable for options for supply chain integration (Blayse & Manley 2004).

In addition, contracts that place incentives for speed or price-based competition deter from innovative solutions and cooperation and promote self-protective behavior (Blayse & Manley 2004) and leads to increased risk-taking in the build process (Hardie 2010). The industry also has a strong tendency to shift risk, through contractual structuring, to those who are least able to bear the cost (Hardie 2010). The challenges of the industry with fragmentation and low levels of trust can be furthered by contractual designs which does not encourage collaboration. A strong reliance upon contractual specifications where focus is put on escaping blame rather than solving problems is common. A system that is detrimental to trust which limits cooperation and ability to innovate and is especially damaging for small businesses.

Procurement methods that encourage integration and team or partner building are generally considered to be positive for innovation. A function-based contract or turn-key contract, allow for a higher flexibility and utilization of strengths of the contractor as well as building teams with mutual goals (Widén 2004). Functional based contracts also allow for competition on a wider basis than on price alone, since the builder is free to use materials and techniques at their discretion provided that they fulfill the functionality stated in the contract. (Nyström, Wandel & Bröschner 2016).

Furthermore, the law of public procurement is structured in a way that does not allow for long-term relationship building (Lind 2011). A procurement process where “a job well done” or providing strong value for money does not lead to increased chances of receiving future contracts does not create incentives for long-term sustainable innovations. In addition, often times, the winner of the contract is the actor best able to utilize weaknesses in the structure of the procurement or the provider of the lowest initial price alone, which further decreases innovative incentives and guidance for new innovative solutions (Lind 2011).

3.2.6.2 Partnering.

Along the same lines partnering, defined by Blayse and Manley (2004) as “*a commitment between the client and the contractor(s) to actively co-operate in order to meet separate but complementary objectives*” can help facilitate innovation through reduced project cost and times, higher levels of quality and client satisfaction as well as boosted productivity. Partnering does not rely on a strict legal contract, but rather on trust and integrity (Blayse & Manley 2004). In a fragmented industry with short-term project oriented commitments like the construction industry, such trust can be hard to build. Therefore, actions that can help facilitate trust between actors can be inducing to increased innovation. Konkurrensverket (2015) holds that partnering can be utilized within most contract form, yet turn-key contracts

are generally viewed as the form of contract where partnering is most applicable. They also argue that increased cooperation by the public housing companies in the procurement and development process for housing can improve procurement competition and stimulate industrialized building as well as lower prices.

3.2.6.3 Price

One of the greatest problems for innovation is the clear focus on initial costs and price rather than highest value (Johansson 2017, personal communication, 20 April; Lind 2011; Engström & Levander 2011; Hardie 2010; Blayse & Manley 2004). In addition to the large upfront cost and often long timeframes for returns, Hardie (2010) reference the nature of contractor - subcontractor relationship that is dominating the industry as a cause for the dominating focus on cost. A more mutually beneficial approach is suggested which should strive for improved resource allocation and focus on maintenance and improvement of the skills base.

Lind (2011) also discusses the difficulty of determining the actual price and costs of the industry. Price is often given with a reference to some type of estimated base case with various conditions for added orders or complications, or the deals are structured with a set pricelist and where volumes are calculated, but variable. Thereby, deals can often be about putting the right price on certain materials that will allow for higher margins on products that is not correctly estimated. The builder that wins the procurement may therefore not be the one offering the best value, nor the one with the lowest final price, but the actor that is the most proficient at utilizing weaknesses in the procurement details from the client. Lind (2011) goes on discussing the problem of costs, in a market where the price paid by the market is high, each actor in the value chain has incentive to raise their prices and thereby increasing the perceived costs of building. The problem is expatiated by the focus on initial costs rather than life-cycle cost which is detrimental to new solutions in general, but in particular for long-term sustainable and qualitative solutions that provide increased value over the life-cycle of the building (Engström & Levander 2011).

3.2.6.4 Quality

What constitutes quality within the construction industry and how to evaluate it on an upfront basis is not easy. The definition of quality is often closely related to durability and long-term performance (Lind 2011). For innovation, this has the negative consequence of creating preferences for tried and tested techniques (Blayse & Manley 2004). The difficulty of determining what constitutes quality is also a very complex matter and the durability is not easily estimated, especially for private individuals. The builder therefore has little incentive to choose more expensive materials and drive up the price since it is not likely to be corresponding with a perceived increase in value by the client. Nor does it incentivize using new innovations that increase the risks of problems in the long-term (Lind 2011).

3.2.7 Size and Resources

The construction industry is dominated by small firms in most countries. Hardie (2010) raise the problem of small firms and innovation, stating that most small companies have a hard time just surviving and even more so, with growing. Companies with very limited resources therefore cannot be expected to drive innovation (Fairclough 2002, Hardie 2010; Kadefors & Femenías 2011; KPMG 2016). Nevertheless, these companies have a great potential to innovate through learning from other industries (Fairclough 2002) and from industry best practices (Widén 2004; Hardie 2010).

The firms most prevalent in the construction innovation realm internationally, are medium sized companies, with around 1 to 5 billion dollars in turnover (KPMG 2016). These companies are large enough to allocate sufficient resources towards innovation, yet small and agile enough to be able to implement and change structure, within reasonable time, to allow for innovation. Large companies, however, have an important role to play in order to facilitate innovation, through initiatives and engagement in constructing a road map for the longer term (Fairclough 2002).

3.2.8 Appeals

A factor that is also detrimental to especially small companies and that impacts competition and innovation, are the appeal processes. Long appeal processes increase risks and costs of construction projects and therefore excludes smaller companies without the resources to maintain a large project portfolio and the costs of the legal process (Andersson & Andersson 2014). Appeals are more common in high profile or large scale projects (Davidsson 2016) and therefore innovative designs can be more prone to appeals as well as threatening to partnering and alliances that are more common in larger projects (Blayse & Manley 2004). The introduction of appeal fees can therefore be a way of diminishing unwarranted appeal claims and thereby decrease risks for small firms and innovation in general (Andersson & Andersson 2014).

3.3 Strategic Considerations

3.3.1 Motivation

Regardless of which strategic consideration a firm chooses to take when innovating in any industry, three basic factors are necessary to succeed with innovation: time, money and motivation (Widén 2002). Both money and time are rather straight forward, either a firm has it, or not. The motivation is a more complex factor, since it might stem from different sources. Tidd et al (2001) describes how motivation when innovating either is created out of a market push perspective where the firm itself identifies a market gap or a demand that the customer does not know the existence of, which means that the firm gather all the knowledge needed in order to push innovation to the market. Or it can be created out of a market pull perspective where the customer demands something specific so that the firm has to understand the requirements and innovate in-line with them. Widén (2002) emphasizes that neither market push nor market pull effects explain the true complexity of innovating within an industry but

the motivation behind innovating is of importance, since it directs firms towards specific strategic considerations.

3.3.2 Firm Emergence and Growth

Organizational survival is the firm's main strategic goal during emergence (Hite & Hesterly 2001). However, the newly formed firm, which commonly suffers from liabilities of both newness and smallness, often lacks critical internal resources and capabilities to ensure successful survival of the firm. Helfat and Lieberman (2002) hold pre-entry resources and capabilities of the newly formed firm, or the lack thereof, as heavily impacting the firm's choice of market, mode of entry, entry timing and its success of entry. Specifically, they conclude that the better the fit between the firm's pre-entry resources and capabilities and the resource profile of the industry of entry, the more likely the firm is to enter the market and the more likely the firm is to reach long-term success. The newly formed firm's timing of entry is also linked with the fit between the industry's required resource profile and the firm's pre-entry resources and capabilities, thus meaning that the firm enter the market when they perceive their pre-entry resources and capabilities to be matched with the required resource profile of the market. Further, Hite and Hesterly (2001) describe how firm emergence is characterized by equivocality and uncertainty regarding resources, routines, products, and the environment as the emerging firm attempts to do something it has never before accomplished. Moreover, the newly formed emergent firm initially faces low degrees of legitimacy and reputation. Thus, access to external resources and knowledge needs to be secured, which cannot be produced internally. Given the lack of necessary capital or legitimacy to exchange using traditional market transactions, the emergent firm is dependent upon its external network to provide resources and capabilities on exchange terms other than traditional market transactions. (Hite & Hesterly 2001)

With the given background, a broad consensus has emerged, stating that networks play a central role in successful firm emergence and growth (Hite & Hesterly 2001). But network development can also be tightly coupled to knowledge-transfer, which is another topic raised as detrimental to firm emergence and growth, which serve as a field of interest in order to guide strategy formulation. Sveiby (2001) develops a knowledge-based theory in order to guide strategy formulation, where not only external network development and knowledge transfer externally are highlighted as successful to firm emergence and growth, but also knowledge-transfer internally in the firm as well as on an individual level.

Sveiby (2001) argues that strategy formulation should start with the competence of people, because he sees people as the true agents in business, meaning that all tangible physical products, assets as well as the intangible relationships, are results of human action and depend ultimately on people for their continued existence. He further argues the competence of people to be an emerging firm's primary intangible resource, and that value in the firm can be created in two directions, either by transferring and converting knowledge externally or internally in the firm. The external transfer of knowledge involves intangible relationships with customers and suppliers, which forms the basis for the firm's reputation. Some of these relationships can be converted into legal property such as trademarks and brand names. The

value of such intangible resources is primarily driven by the firm's ability to solve its customers' problems. The internal transfer relates to distinct administrative processes, internal networks, organizational culture and the competences of individuals. The third area Sveiby (2001) brings forth, is the individual competence of the professional/technical staff, the experts, the R&D people, the factory workers, sales and marketing – in short, all those that have a direct contact with customers and whose work are within the business idea. To conclude, Sveiby (2001) highlights that the key to value creation, to support firm emergence and growth, lies in effective communication and conversion of knowledge within and between the three areas related to the firm, as seen in figure (1). Network development is key to successful firm emergence and growth, and Sveiby (2001) adds to this notion by using a perspective more focused on knowledge-transfer within the network of the firm, both externally and internally.

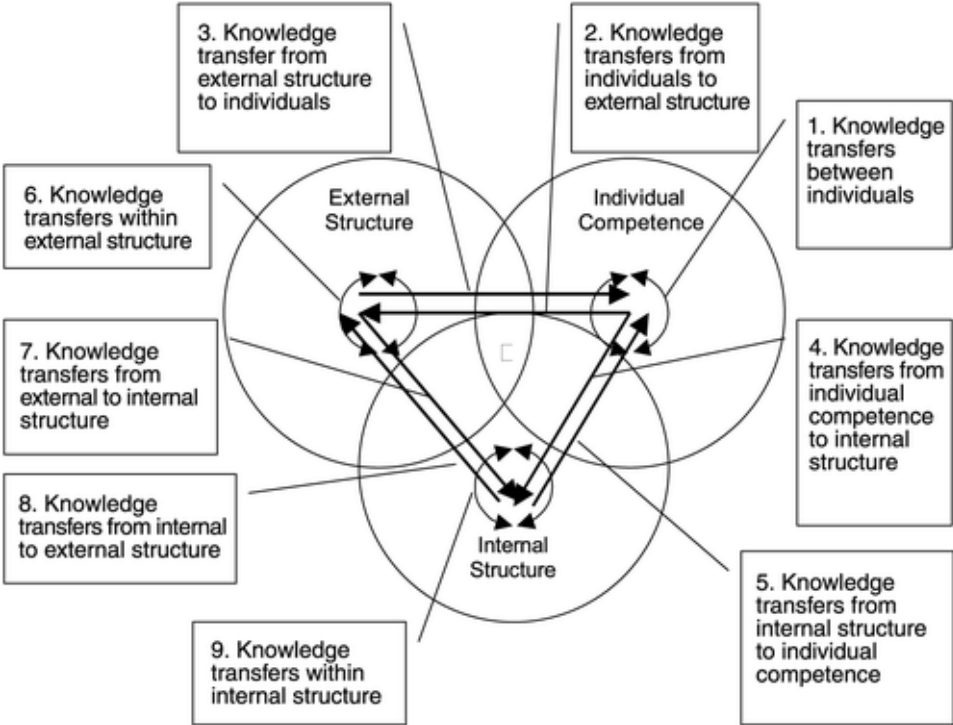


Figure 1. Nine areas of knowledge-transfer (Sveiby 2001).

3.3.3 Business Environment

As acknowledged by Teece et al. (2016) the business environment of firms has changed drastically during recent decades. The authors describe how the degree of uncertainty has increased dramatically for firms, since the global economy has become more advanced and more integrated, leading to the transmission of shocks and the opening of opportunities to businesses anywhere and everywhere. To provide understanding of the change in the general business environment even further, they use an analogy by comparing the level of uncertainty in the industrial economy to that in the innovation economy of today as being represented by chess versus mixed martial arts. In chess, almost every move is knowable. There are a large but finite number of moves and countermoves, which are possible to perform within the well-

defined rules of the game. In chess, the best player wins almost every time, but it is played in a closed world where the rules are fixed and so also the solutions (Teece et al, 2016).

In mixed martial arts, a broader repertoire of techniques is available to the fighters. MMA can be said to represent the uncertainty and the dynamism of the business environment generally present to firms of today, where both striking and grappling, both standing and on the ground fighting, are permitted. Boxing, kickboxing, Brazilian jiu-jitsu, judo and wrestling are all widely used and mixed by the fighters, in their attempts to outperform their opponents. The lack of predictability and deep uncertainty for the combatants in MMA symbolizes the new business environment, where existing rules are being changed and new ones invented. (Teece et al, 2016)

Firms with the aim to increase their innovative ability need to consider their business environment, and the business environment of small and newly founded firms within the Swedish construction industry is somewhat different from the new general business environment described by Teece et al (2016). The Swedish construction industry is not subject to intense global competition (Sveriges Byggindustrier 2015a) and the characteristic of producing costly products with long time-frames associated with high risks which creates preferences for tried and tested methods, makes the business environment somewhat slower and more certain than the general business environment for small firms today. Nevertheless, the business environment has clear implications on innovation and for what strategic considerations to take.

3.3.4 Dynamic Capabilities & Agility

In a business environment as described above, small and newly formed entrepreneurial firms can find support from elements in their strategy and organizational structure that enables them to cope with uncertainty and risks that are presented to them. How a firm integrates, builds, and reconfigures internal and external competences to address changing business environment, is related to the firm's dynamic capabilities (Teece et al. 2016). Teece et al (2016) further describe how dynamic capabilities are created out of organizational and managerial competences for both reading and shaping the environment and developing business models that address new opportunities and threats. Thus, dynamic capabilities define the small and newly formed entrepreneurial firm's ability to innovate, adapt to change, and to proactively create change that is favorable to customers. Factors that all describe and impact the firm's level of agility. Dynamic capabilities can be divided into three distinct clusters, which are sensing, seizing, and transforming.

Sensing

A firm's sensing capabilities govern how well it identifies, develops or co-develops, and assesses technological opportunities in relationship to customer needs. To have strong sensing capabilities is to be good at sensing the unknown future. Generative-sensing capabilities involve performing actions to create hypotheses, proactively, about future implications of observations such as trends or events and to test these hypotheses in order to pave the way for new products, services, and business models. The capability to sense opportunities before they

materialize, thereby ahead of opponents, is a crucial part of dynamic capabilities (Teece et al, 2016).

Another tool to aid generative sensing is scenario planning. It can act as an important internal tool for managing uncertainty and to make a rapid response to external events possible. The aim of scenario planning might not be to get the future right, but instead to be able to shape the focus of decision making around areas that otherwise might have been overlooked.

Yet another tool to build sensing a capability is the usage of real option purchasing (Teece et al. 2016). Firms that purchase real options often do this through research and development, and by doing so they get the option to exercise them at a lower cost than what would otherwise be possible. Keeping such options comes at a cost, but if matched with strategy it is a purposeful way of increasing the dynamic capabilities, which leads to an increased agility.

Seizing

The second distinct cluster of dynamic capabilities is the seizing capabilities. Teece et al. (2016) describes how these help firms to mobilize resources to address needs and opportunities and to capture value from doing so. Seizing is about implementation and getting things done. The concrete tools to build seizing capabilities are to use flexible sourcing arrangements, to build slack into the organization, to reorganize rule-bound hierarchies, and to adopt open innovation processes (Teece et al. 2016).

The industrial age was characterized by stable business environments where firms utilized the concept of economies of scale, by implementing vertical integration of the value chain so that optimization both up and down the value chain was facilitated. As previously stated, the business environment of today is different, which means that different tools might be better suited. Teece et al. (2016) holds that to use vertical integration, results in capital-intensive facilities and in organizational inflexibility. Instead, by using sourcing arrangements, e.g. by outsourcing the firm's production, it becomes easier for a firm to "walk away" since the firm is no longer locked by invested capital and the contractual agreements, thus flexibility is created, making the firm more agile and able to change (Teece et al. 2016).

The second tool to create seizing dynamic capabilities, described by Teece et al (2016), i.e. to build in slack into the organization, is doubtless costly, but it assists agility. To build in slack could be to maintain excess resources and capacity, with the purpose of increasing the firm's flexibility to act on opportunities or to meet demand spikes.

Organizational structures and hierarchies also has strong impact on a firm's dynamic capabilities and agility. Rule-bound hierarchies are characterized by high levels of specialization within the organization, thereby minimizing the requirements for individuals at the bottom of the pyramid. Knowledge is only shared on a need-to-know basis. This can be highly efficient when performing defined tasks in high volumes, but it also creates rigidity due to the structural ramifications. Rule-bound hierarchy often constrains information flows, where information from the bottom seldom reach top management. In fast-moving and dynamic environments, this rigidity is especially problematic. Reorganizing the organizational structure to become flatter to reduce hierarchy increases dynamic capabilities and agility by

increasing information flows and allowing for decentralized decision making. Thus, it creates increased responsiveness and flexibility which allow the firm to better cope with its changing business environment (Teece et al 2016).

Transforming

The third cluster of dynamic capabilities is about the firm's capabilities to continuously renew or *transform* the firm. A popular methodology to build agility as a newly formed entrepreneurial firm within this third cluster, is the "build-measure-learn" method. The ideas behind this method is that you best manage uncertainty by building a minimum viable product, launch it, learn quickly, adjust accordingly, and improve continuously. The "lean startup", as it is phrased by Blank and Dorf (2012), favors experimentation and it emphasizes learning instead of extensive planning in order to succeed with innovation. The key aspects are to fail fast and regroup towards new directions, and to incrementally improve the firm's offering by being agile and iterative. The method is best suited in highly uncertain business environments. Blank and Dorf (2012) states that not only new firms might use the method, but also incumbent firms.

Opportunity costs

To build dynamic capabilities in the form of sensing, seizing, and transforming, supports firms' agility and their ability to tap into new opportunities. At the same time, Teece et al. (2016) explains that, it is important for entrepreneurial firms to understand the fact that agility comes with an opportunity cost. Therefore, agility should only be built and increased if its purposeful for the specific firm and its business environment. This is the point where strategy gets affected, because even strong dynamic capabilities and increased agility can be compromised by bad strategy and bad strategic leadership. The greater the uncertainty and dynamism in the business environment for firms, the greater use firms get from organizational agility. In this sense, strategy and agility work in tandem, because agility always have to be matched with a good strategy in order to push the firm towards growth and financial performance. A need for balance between agility, the business environment and the firm's strategy will always exist, and in some cases agility will be sacrificed in order to support the firm's strategy, as in the case of commitments to production capacity. So, there are ways to build dynamic capabilities and increase the agility, yet, entrepreneurial firms always have to bear in mind the opportunity costs from doing so, and the purpose of building agility has to be clear (Teece et al, 2016).

3.3.5 Network Development

McKelvey and Lassen (2013) bring forward evidence that the process of managing a knowledge-intensive firm is strongly affected by the network activities undertaken by the firm. Aldrich and Zimmer (1986) also states the importance of network activities, by emphasizing the entrepreneur as embedded in a social network that plays a critical role in the entrepreneurial process. Brass (1992) defines social networks as composed of a set of actors,

individuals or organizations, and the links between these actors. There are three distinct aspects of networks that researchers historically have been focusing on, which are the nature of the content exchanged between actors, governing mechanisms of networks, and the network structure created by the linkages and relationships between actors (McKelvey & Lassen, 2013).

Network Content

Hoang and Antoncic (1999) states that network activities are important in order to help a firm to access knowledge and resources held by other actors, not only in the start-up phase, but also in the firm's ongoing efforts of managing the firm and its growth. Furthermore, network development allow firms to access a broad variety of resources, such as financial resources, key talent, business information, advice, market information and problem solving. Network activities can also aid firms by providing legitimacy and reputation, thus working as signaling content. When firms seek legitimacy and reputation, the purpose is to reduce the perceived risk by associating with well-regarded individuals and organizations who signal positive perceptions. These positive perceptions, stemming out of the network linkages, may lead to further beneficial resource exchanges (Hoang and Antoncic 1999).

Governing Mechanisms of Networks

The second aspect of network development is the governing mechanisms that coordinate the exchange of knowledge and resources between actors within the network. McKelvey and Lassen (2013) explain how governing mechanisms as a concept can be defined as, how things are decided and distributed between different actors and how the developed linkages within the network are affected. Governing mechanisms can be identified within networks, and the coordination of the network exchanges is important to discuss for firms in order to maximize the benefits of their network.

Researchers stress the fact that networks are governed by open-ended contracts supported by social mechanisms, such as power, influence and trust, rather than by legal mechanisms (McKelvey & Lassen 2013; Hoang & Antoncic 1999). Trust is highlighted as the main key to successfully form exchange with other organizations, and it also serves as a critical element to be able to increase the quality of resource flows between actors on a long-term basis (Jacobsen & Lassen 2012). Small and newly formed entrepreneurial firms especially benefit from networks if they manage to build trust, since they have little other reputation and branding to fall back upon (McKelvey & Lassen 2013). Pruitt (1981) describes mutual trust as a governing mechanism based on the belief between the two actors to trust one another to fulfill the exchange in a reliable manner, and Das and Teng (1998) continue to build on this notion by describing how trust is the key that allows the parties in a network to assume actions taken by other actors to be predictable and performed in a mutually acceptable way. Trust mediates expectations of predictability and mutually accepted actions, and these expectations reduce transaction costs such as monitoring and renegotiating the exchange in reaction to environmental changes, especially when time constraints are existing and the task

are of a complex nature (Jones et al. 1997). It is further shown that trust also affects the depth of the information exchanged (Lorenzoni & Lipparini 1999), and that trust between actors in purchase and supply exchange actions allowed the actors to exchange information with a nature far beyond simply price and quantity (Uzzi 1997). Instead, the actors exchanged information with a more holistic nature such as continuously incremental improvements hard to articulate. Thus, trusting behavior is to be seen as a critical factor in enhancing innovation through interfirm collaboration (Hausler et al. 1999).

Network Structure

A third aspect of network development to consider, is how networks are structured and especially how a firm relates to the overall structure of the network (McKelvey & Lassen 2013). To examine the network structure aspect allows understanding of how actors and linkages within a network affect the dynamics of social structures of the entrepreneurial firm and its external environment. When examining this aspect, both direct and indirect linkages between actors are of interest. The linkages are important since what defines the quality and quantity of resources exchanged between actors, is the firm's position within its social network, which in turn impact the performance of the firm. The emphasis is not on the actors themselves, but rather on the specific position of the actors relative to one another in the network structure and their ability to use the network (McKelvey & Lassen 2013).

The first important measure is the size of the network, simply defined as the amount of direct links between a focal actor and other actors. Analysis on network size are focused both on what resources available to access for the individual entrepreneur and for the organization (Freeman 1999). A second measure, raised by McKelvey and Lassen (2013), is the centrality, which is focused on the specific position of the firm in relation to other actors within the network structure. The idea is that high centrality leads to a better position to access resources through direct and indirect links. If a firm holds a central position in the network structure the ability to access other actors within the network is high, thus increasing the firm's absorptive capacity. The two measures together impact the amount of resources the firm can access, but other measures are also of importance to a firm in its effort to use network development to improve their business (McKelvey & Lassen 2013).

The diversity of knowledge is another topic discussed by McKelvey and Lassen (2013) in order to understand the relationship between knowledge, innovation and. Firms need to access a diversity of resources in order to succeed and the phase of the firm affect what type of knowledge and resources the firm needs to access. In the start-up phase patterns show that firms use network development primarily to access financial capital, but also to engage in exchange with universities to build credibility and reputation in the scientific and business environment. As time pass, the firm instead leans toward developing resource exchange through interfirm collaboration and with customers in order to enhance product development and commercialization, which is at that stage of greater importance (McKelvey & Lassen 2013).

Small and newly formed entrepreneurial firms also face a trade-off between depth of knowledge and diversity of knowledge, which they have to consider when developing their network. Granovetter (1973) point out that weak ties are important to firms since it allows access to information and knowledge that initially lies outside firms' immediate contacts. Capaldo (2007) strengthen this notion, by stating that the ability of the firm to integrate a wide range of heterogenous weak ties and a number of core ties makes up for the firm's relational capability. This capability serves as a foundation for the firm in order to gain competitive advantages. The discussion of weak ties is also complemented in the literature by a discussion of structural holes. There are scholars who emphasize the benefits from bridging structural holes, i.e. holes where a firm can position itself in order to link otherwise unconnected actors. The opportunity to bridge such structural holes might provide the firm with access to novel information, which in turn might spur learning and development of internal capabilities to enhance performance (Baum et al., 2000).

The literature on network development shows how networks often become important sources of knowledge, resources and support to small and newly formed firms since these types of firms are often facing the premise of resource constraint. The ability of firms to benefit from network development is affected by the structure of their specific network in terms of size, centrality of the position within it, as well as by the diversity of resources possible to access. The most important mechanism for a firm in order to successfully build and benefit from its network, is according to the literature trusting behavior. Trust is the single most important mechanism governing a firm's network (McKelvey & Lassen 2013).

4. Empiricism

This chapter is aimed at providing a description of the current market conditions that our analysis is based on. This will be done through a presentation of the Swedish construction market followed by a stakeholder analysis to set the framework for the actors involved in the industry and that can impact the firm's ability to innovate. The chapter is concluded with a depiction of Cream Architects AB, the case firm, and a description of their interactions with and how they are affected by the sub categories defined in the stakeholder framework.

4.1 The Swedish Construction Industry

Simu (2009) concludes that the Swedish construction industry is, on a national level, dominated by a few major actors who have the ability to conduct and operate large scale building construction and major infrastructure projects. This situation evolved from a consolidation trend since the 1970's, where about twenty construction companies have been merged so that there are only a few major actors left. This development comes primarily from the structure of the industry, with long and resource consuming processes guided by tradition and overly bureaucratic processes. In addition, the industry is characterized by long-term established relationships and networks. Taken together, these conditions make it especially difficult for smaller firms to compete on a national level (Simu 2009).

The construction market is segmented in different product types where housing, commercial and industrial buildings, civil engineering structures and infrastructure and public works are types of new construction while repair, maintenance and improvement to existing facilities are additional segments related to the sector (Gann & Salter 2000). In 2014, Sweden's construction sector accounted for 10 percent of the national GDP or 13 percent, counting the value of maintenance and repairs, which puts the Swedish construction industry among the top contributors to national GDP within the European union, where the average contribution is 9 percent (Sveriges Byggindeindustrier 2015a). The industry has had a yearly turnover of 530 billion SEK or more in recent years and the value of the property stock is estimated at nearly 7.400 billion SEK. Further, in 2014, the industry directly employed over 300.000 people and out of 1.158.000 registered Swedish businesses in 2014, 96.700 or 8 percent of the total corporate population was tied to the construction sector (Sveriges Byggindeindustrier 2015a).

The Swedish market is characterized by a high degree of fragmentation (Simu 2009; Sveriges Byggindeindustrier 2015a) which is similar to most national construction markets (Egan 1998; Hardie 2010). 88 percent of companies had less than four employees and 21 percent of the

total number of the employees within the industry are self-employed. However, as previously stated, there are only a few number of large companies that compete on the national level.

The international competition within the industry is gradually rising, however it is still on a low level in absolute terms and compared to the one percent share of the overall Swedish market. In construction, the number of foreign controlled companies in the sector represents around 0,01 percent of the firm population. The most frequently represented foreign market corporations are German and Polish ventures (Sveriges Byggindeindustrier 2015a).

4.1.1 Dominant actors

As previously mentioned, the Swedish market are now dominated by three national giants. With a combined turnover of 95 billion SEK in 2014, Peab, NCC and Skanska represent a substantial share of the total Swedish construction market and together they employ 30'000 workers (Sveriges Byggindeindustrier 2015a). This can be contrasted to the fact that only 1 percent of the active firms within the industry employ more than 50 people. Following these giants are three other companies, each with a turnover of over 3 billion SEK, yet these companies are not active in the whole country, instead they are focused on regional areas, mainly around the larger urban areas (Sveriges Byggindeindustrier 2015a).

For large scale projects, these major actors are in a league of their own, yet the competition from international firms is increasing. However, at a regional level, Simu (2009) states the competition from local actors with lower overhead costs is massive. The giants therefore have a challenging environment to navigate when it comes to balancing the advantages of large scale production capabilities and superior resources and the advantages of close relationships and local knowledge (Simu 2009).

4.1.2 New Venture Formation

According to Sveriges byggindustrier (2015a), the amount of newly started construction firms compared to other Swedish business sectors, is relatively substantial. In 2014, roughly 7.000 businesses were launched which represents close to 10 percent of all new businesses in Sweden in the same year. Even in terms of newly formed businesses in relation to the sector population, the construction industry stands out in relation to the market average. In 2013, 7,8 percent of the companies in the sector was newly formed compared to the national average of 7,3 percent. Even during the recession of 2009 the number of new construction firms kept rising. This is mainly attributed to the ROT-deduction that was introduced in July of 2009. One of the reason for the large number of newly formed companies is low demands for capital when it comes to forming a construction company. This means that barriers to entry in that sense is relatively low. In a fragmented industry with many small players, it is also easier for new small companies to compete on level terms from the start (Sveriges byggindustrier 2015a).

Yet, the relatively high numbers of new venture formation are also accompanied with high numbers of bankruptcies. High numbers of new venture formation naturally increase

competition which is fierce in the local markets (Simu 2009) along with a weak business cycle in 2012 and 2013 led to an increased number of bankruptcies in the sector. In 2014 1.260 construction firms filed for bankruptcy, numbers that are comparable to those of the Swedish economic crisis in the early 1990's (Sveriges Byggindustrier 2015a).

Through 2012 to 2014, the number of firms on the Swedish market grew by 1,414, and out of these, 1,265 companies had less than five employees. Yet in terms of percentage the number of large companies (here defined as 50 < employees) increased more. This is likely attributable to the diminishing effects of the ROT-deduction along with a rise in the national housing production (Sveriges Byggindustrier 2015a).

4.1.3 The Regional Market

The regional market is mainly focused around smaller scale construction (primarily smaller multi-family dwellings, small commercial buildings, single family and duplex housing, additions and housing extensions) and these market segments are characterized by a large number of small and medium sized actors and close corporations. The level of innovation within this part of the industry is also perceived as limited (Engström & Levander 2011) and even more characterized by conservatism, network dependency and tacit knowledge (Johansson 2017, personal communication, 25 Jan; Grufvisare 2017, personal communication, 15 April; Simu 2009).

Each of these actors and firms fill different roles in the ecosystem. In the smaller scale building projects, barriers to entry are lower than for large scale national projects, which makes for a more competitive market and with less stability for each individual actor (Simu 2009). The market is characterized by fragmentation and segmentation where construction projects almost inevitably requires coordination and collaboration between different actors, firms and stakeholders (Gann & Salter 2000). The process of overall planning and organizing thereby often creates challenges (Simu 2009). Due to the nature of this market structure, and confirmed by the partners at Cream architects (Johansson 2017, personal communication, 25 Jan); networks, contacts, reputation and need for legitimacy between actors is critical within the industry. This is particularly applicable to incumbent firms since few new actors are able to handle the entire process of new housing development in-house. Furthermore, many firms collaborate continuously on projects (Grufvisare 2017, personal communication, 22 April), and therefore, getting one's foot inside these networks of contacts and mutual value creation cycles is critical for the survival of the firm (Johansson 2017, personal communication, 25 Jan; Grufvisare 2017, personal communication, 22 April). The constant need for collaboration and project organization also makes process innovation more difficult and new processes and technologies are hard to implement since it requires several actors to adapt and agree to new practices (Egan 1998; Blayse & Manley 2004). This is something that is supported from several of our interviews and the case study (Johansson 2017, personal communication, 25 Jan; Pettersson 2017, personal communication, 15 Feb)

The investments in housing is closely tied to employment, rent levels and household disposable income (Sveriges Byggindustrier 2016). The mortgage cap on private housing loan that was legislated in October of 2010 has primarily had a negative impact on single family

households which contributed to the continuous decrease in investments from 2008 until 2014 where it once again turned positive. However, multifamily housing investment had risen to an all-time high since the separation of the two statistics in 1985 (Sveriges byggindustrier 2015). The single family and duplex housing stock in Sweden is primarily built before the 1930's or in the 1970's, with roughly 20 percent of the houses stemming from each of these periods. In 2014, 36.500 new housing units was commenced, 8.400 units out of these units were single dwellings.

4.2 Stakeholder Analysis

As we have described, the Swedish construction industry as a large and important industry contributing to Sweden's growth, development and wealth. The industry provides the society with the physical conditions of housing, transportation, industrial production and infrastructure. The built environment impacts all of society. In that sense, we are all stakeholders of the construction industry, which adds to the unique characteristics of the industry. Due to this powerful impact on society, stakeholders should be considered in every construction project, since construction projects, regardless of size, are subject to potential controversy and conflict with stakeholders (Olander 2006).

The large impact on society and scattered structure of the industry, together with the project oriented nature of the industry is what mainly separates the industry from most others (Blayse & Manley 2004). These special characteristics of the industry naturally have a large impact on the innovation process of individual companies and the industry as a whole. Therefore, in order to be able to investigate a phenomenon within it, thorough understanding of its size, structure, driving forces and key players is a prerequisite. To map out the participants and the structure of the industry can be an important step to better understand the nature of the industry and to identify structural barriers and weaknesses and opportunities for improvement and innovation.

Olander and Widén in Bröschner (2012) also emphasize that a single project or innovation champion is not enough to build engagement and to build enough support. They argue that key stakeholders need to be identified as early as possible in the process and every innovation project should have a clearly defined plan to manage and involve stakeholders through all phases of the project.

The complicated structure of the industry with many interconnecting participants, products and designs, intricate hierarchies and substantial participation of users and clients throughout the whole process also puts the industry in a category of its own compared to other industries (Hardie 2010). Some authors even view construction as a system, rather than an industry (Gann & Salter 2000; Blayse & Manley 2004). This complicated web of participants makes mapping and analyzing stakeholders, their impact and interests, on the industry as a whole as well as for every specific construction and innovation project, highly relevant and useful (Olander 2006).

4.2.1 Definition

According to Olander (2006) the most commonly used definition of a stakeholder is the one expressed by Freeman (1984), which states that “stakeholders are any group or individual who can affect, or is affected by, the achievements of a corporation”. Although this definition is commonly used, it is sometimes criticized of being too wide. By introducing Mitchell et al. (1997) definition of what constitutes a “stake”, namely "the possession of one or several attributes of power, legitimacy and urgency", Olander (2006) arrives at a definition of a stakeholder as:

“A person or a group of people who have a vested interest in the success of a project and the environment within which the project operates. Vested interest is defined as having possession of one or more of the stakeholder attributes of power, legitimacy and urgency.”

According to Olander (2006) there are basically two types of stakeholders; internal, which can be defined as actors that has a formal connection with the project or the industry and external; which are actors upon whom the project has an impact. Figure 2. is revised from Cleland by Olander (2006) and depicts prospective internal and external stakeholders around construction projects.

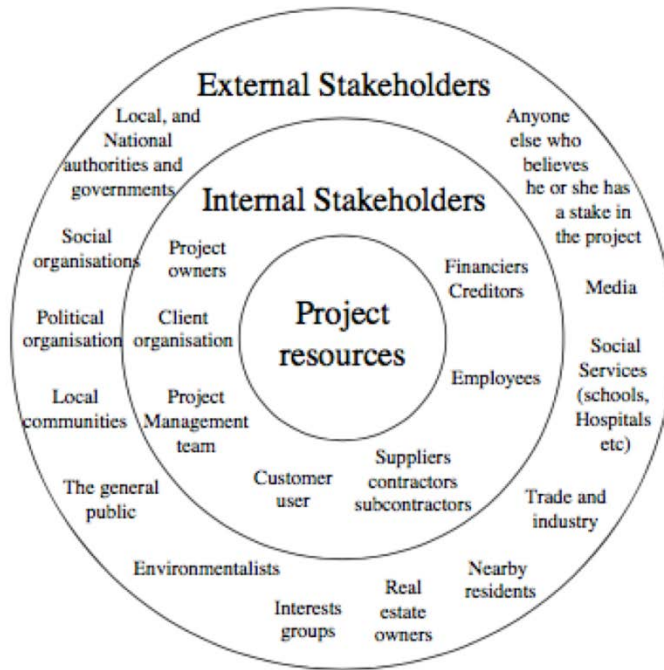


Figure 2. Potential stakeholders for construction projects. Adapted by Olander (2006) from Cleland.

4.2.2 Framework

In an effort to categorize and sort the various stakeholders of the construction industry, Blayse and Manley (2004) utilized a framework built on the work of Gann and Salter (2000). The framework (fig. 3) specifies five different categories of participants in the building and construction project system. Using these categories, a stakeholder analysis of the Swedish building and construction market will be presented.

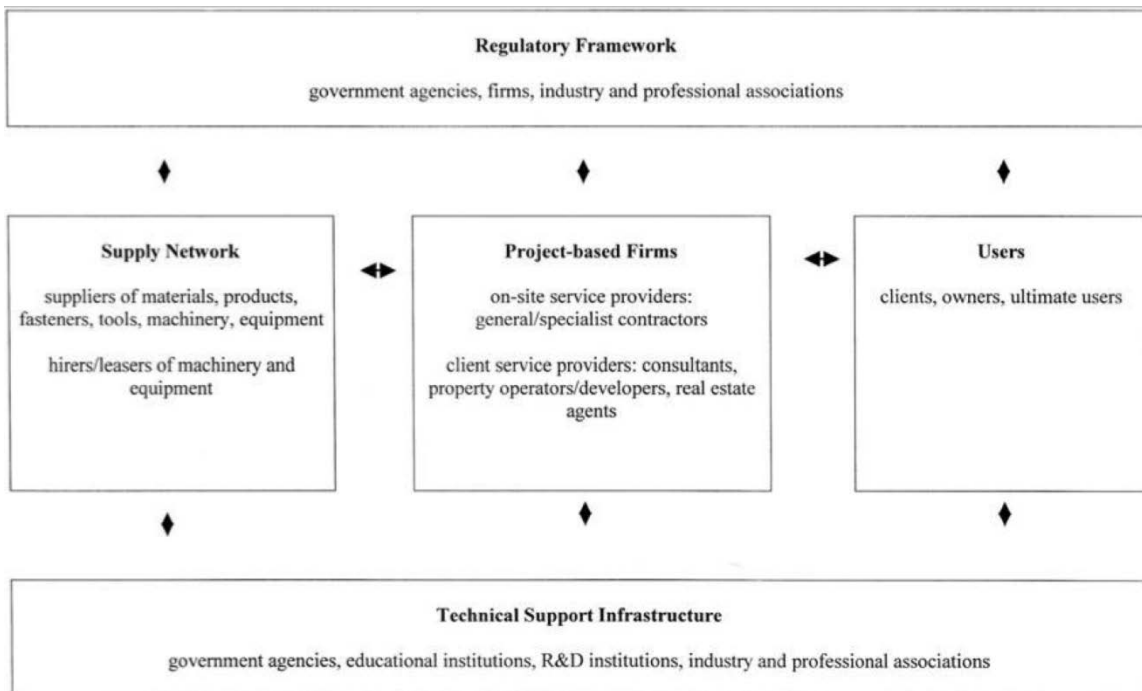


Figure 3. Participants in the building and construction project system (based on Gann and Salter, 2000) (Blayse & Manley 2004)

According to Blayse and Manley (2004), the building and construction industry is made up of two main parts, manufacturing (supplies and materials, components and equipment) and services (engineering, design, surveying, consulting, hiring, leasing and management). At the same time, it is also a system of actors that coordinates products and services to create the buildings and infrastructure that society depends upon. These two categories of actors within the system influences and are influenced by the *users*, clients and owners in terms of procurement structuring, demand and requirements. Surrounding this core chain are the *regulatory frameworks*, standards and best-practices set by government agencies and industry associations as well as the *technical support infrastructure* which includes academic and educational institutions, government agencies and R&D institutions.

4.2.3 Project-based Firms

The project-based firms, mainly construction contractors, are the firms that works with the actual building process. The Swedish market is, like most construction markets, characterized by a considerable fragmentation (Egan 1998; Blayse & Manley 2004; Hardie 2010; Sveriges byggindustrier 2015). Most actors are small, have limited resources and operate on a local level (Simu 2009; Sveriges Byggindustrier 2015). Project based firms can be divided into main contractors and subcontractors, where the main contractors are the ones attained by the user or the client to lead the project and to facilitate and structure the activities to fulfill the project specifications (Ekeskär 2016). Sometimes that responsibility also includes designing the structure.

The contractor side of the industry contains many different competence areas where construction is one, installation (ventilation, electricity etc), finishing works (Painting, floors etc.), special contractors (roofers, concrete sawyer etc.) and demolition are other examples (Sveriges byggindustrier 2015; Ekeskär 2016). In most cases, the main contractor does not have all the competencies for the construction project in-house. Various subcontractors are therefore incorporated during the building process. All types of contractors involved in a construction project that is not the main contractor are referred to as subcontractors (Ekeskär. 2016). In many projects, most of the work is performed by subcontractors.

Most subcontractors have a focus on some specialties which creates a need for many different subcontractors at different stages of the project. This creates an irregular flow of the workload within a project and contributes to the inefficient use of resources that the industry is sometimes criticized for (Ekeskär 2016).

Sweden

According to Sveriges Byggindustrier (2015a), the Swedish contractor market is made up of roughly 96.700 companies. The largest sub category is finishing works with 28.700 firms, after that is the construction category with 24.400 registered companies, followed by 19.500 installation firms, 13.100 demolition and ground works enterprises and 11.000 special contractors. The majority of these firms are small local actors and only 12 percent have more than four employees and 58 percent have no employees. Of the total workforce, 21 percent are

self-employed. Out of the firms that have employees, only one percent employ more than 50 people. However, these companies employ a majority of the workforce active within the sector (Sveriges byggindustrier 2015).

Innovation

The temporary nature and fragmented process of the construction project means that coordinating the work is critical for the success of the project. Most innovation within construction are therefore tied to processes and logistics (Lind 2011; Grufvisare 2017, personal communication, 22 april). The networks of the industry are strong and often times firms' have a network of actors that one has worked with before (Johansson. 2017, personal communication, 25 Jan). Yet the temporary nature of professional relationships is not favorable for innovation since it does not facilitate trust between actors and therefore hampers information dissemination and cooperation and thereby learning, development and implementation of new ideas (Hardie 2010).

4.2.4 Supply Network

The supply side of the industry share many of the characteristics of traditional industries with fewer, yet larger actors with bigger resources and with more stable long term cycles. Although there is still considerable fragmentation within the supply side as well (Hådel & Uveborn. 2004; Andersson & Ohlsson. 2007). The more stable characteristics of this side of the industry better allows for classic R&D development (Blayse & Manley 2004; Brege et al. 2013) and thereby traditional innovation literature and theories are more applicable to these firms.

According to Ekeskär (2016), the cost of materials in a construction project is the single largest source of costs. The supply network is therefore critical for the development of the industry and how it functions. Due to the project-oriented nature of the construction industry, with several actors involved on a short-term contractual basis, each responsible for one small part of the project and with limited resources, traditional R&D activities within the project-oriented firms are rare (Blayse & Manley 2004). Therefore, an important source of innovation are the suppliers, since they operate in a more stable environment. This side of the industry can operate on a more long-term basis, with a large ability to affect the smaller actors on the contractor side of the industry (Brege et al. 2013).

The supply network can be divided into two segments; manufacturers and wholesalers. The main difference being that wholesalers rarely have any own production or products, instead they focus on bringing in a variety of products and materials from various producers and manufacturers and then supply them to the builders, while manufacturers produce their own line for delivery (Ekeskär 2016). Another sub-category of the supply market is the division of the material after its characteristics. Two such categories are light and heavy materials where heavy materials are concrete, bricks, timber etc. while light materials are used for structure completion and mainly decorative purposes (Ekeskär 2016). It is also relevant to make a distinction between standard and project specific materials (Ekeskär 2016). The nature of the

industry and its project-oriented structure makes for a clear need for project specific or somewhat customized products and solutions such as ventilation systems and concrete elements. At the same time, there are many standardized elements in each project such as kitchen cabinets, doors, plasterboards etc. The innovation in standardized parts are therefore better suited to come from the manufacturers through a more classical R&D approach while the project-specific solutions demands a more field based approach. Here, implementation of follow-ups and structured evaluations are key to make sure value is captured from these solutions.

The level of complexity in a construction project is steadily increasing and the number of different materials and components utilized in a project is growing, and thereby the number of involved material suppliers are steadily growing as well. This adds to the complexity as well as the importance of supply and supplier management (Blayse & Manley, 2004). Grufvisare (Grufvisare 2017, personal communication, 22 April), the CEO and owner of a woodworking firm specialized in kitchen and bathroom furniture, thereby positioned as a supplier within the stakeholder framework of the Swedish construction industry, stress that one of the keys for success as a supplier is therefore logistics management. The construction industry therefore has a strong need and potential for innovation in the space between suppliers and project-based firms.

Connected to the integration and facilitation of efficient flows and processes, Fairclough (2002) views standards to define interfaces between prefabricated modules and components as a powerful way to raise productivity in the industry through its facilitation of economies of scale, increased efficiency and institutional learning. This requires cooperation between competing firms, yet Fairclough (2002) argues that such an approach would be beneficial to all parts of the industry and therefore in the best interest of suppliers.

Furthermore, the supply side is sometimes said to be held back by the long timeframes of the industry. A building that is meant to last for a long time needs to be maintained and the supply of spare parts for service and replacement along with the preference of clients and contractors for stable and proven solutions, means that incentives for R&D and new product and solutions are low (Blayse & Manley 2004).

Sweden

The Swedish construction supply market is in many ways similar to that of most other countries and the supply market is categorized by fragmentation. Unlike the contractor side, where international competition is still relatively low (Sveriges Bygginndustrier 2015a), an increasing amount of international, primarily European suppliers are used in the Swedish construction sector. This means that the number of suppliers available tends to be very large, and an actor like JM on the Swedish market can have as many as 10.000 suppliers (Hådell & Uveborn 2004). To have a professional purchasing department is therefore also important both in terms of efficiency, cost control and from an innovation perspective. Small contractors or less experienced clients will have difficulties in information gathering and maintaining sufficient market knowledge which decreases dissemination of innovation and increases the

likelihood of using proven and tried methods and products that is already known to the firm. A way that companies sometimes deals with this problem is to structure framework agreements with certain suppliers. This can help reduce prices and increase efficiency (Hådem & Uveborn 2004). Partnerships are also a proposed way of facilitating more innovation in the construction industry, since it could decrease the risks associated with costly R&D processes (Blayse & Manley 2004). Yet, simultaneously this could make it more difficult for newly formed firms to introduce new innovation since it increases the dependence on network and favors larger actors with a wider product portfolio (Grufvisare 2017, personal communication, 22 April).

4.2.5 Clients & Users

The Swedish planning and building act (PBL) describes a construction client as:

“The one who for its own account performs or assigns others to perform design, construction, demolition or ground works.”

Through this formulation the construction client is held as a legal entity and thereby become subject to the statues, responsibilities and the frameworks stated in PBL (Ekeskär 2016). The definition holds that anyone or any organization that builds a building is a construction client. This in turn, have lengthy implications for the industry through the client’s impact on the industry performance as they assume the role of participators and stakeholders, even though often times the clients does not view themselves as being involved in the construction business as such (Ekeskär 2016). Some professional organizations from other industries, such as Tesco and ASDA, department stores in England, become hugely influential clients through their expansion of new stores, although they and few outsiders would connect them as key influencers on the construction industry (Ekeskär 2016).

The wide definition of a client as “anyone who builds a building” means that the level of knowledge and professionalism varies greatly. Within the Swedish market there are the *end-users*, such as homeowners and business owners, private individuals, cooperatives and real estate professionals. This wide range of knowledge level for clients warrants a division of different categories for clients ranging from *well-informed (or sophisticated)* clients who are from the industry, or at least have extensive experiences from construction procurement on a consistent basis, to *uninformed (or naïve) clients* who very rarely are involved in construction project procurement. In between these categories are the *partially informed clients* who have experiences from a few projects and are involved in the process on a more irregular and infrequent basis (Ekeskär 2016).

The clients do not only diverge when it comes to experience level, their main purpose for each project is also a divide of clients. Organizations such as IKEA build to serve their own needs and business and can be described as a *using client*, while a *maintaining client* realizes projects intended for leasing to end-users and these clients are also operating and maintaining the property during their ownership. The *selling client* only builds to sell at the price of maximum return. This of course, determines the scope and incentives of the client which

create variations in the type of solutions and characteristics that is demanded. For a long-term owner, the life-cycle costs are clearly more relevant than for a client that builds to sell.

Public and private

An important distinction is also whether the client is public or private. The separation can be useful since the two groups can be guided by different objectives where private clients generally looks to maximize profits or self-interest while public actors can act with other goals and objectives in mind (Ekeskär. 2016). A public client can build for public utility, for special interest groups, socioeconomically weak groups, with an objective to promote innovation or to overcome market failures to provide benefits for the good of many, which is highly difficult to capture value from. The role of governmental entities as clients in the innovation process is a vital one. Governments can stimulate innovation through procurement specifications regarding the usefulness and aptness for purpose from public buildings to account for the interest of the users of the building (Fairclough. 2002).

Sweden

Total investments in housing in Sweden amounted to 388 billion in 2014 (Sveriges byggindustrier 2015a). The Swedish market is divided into different categories, where the government and municipalities play a large role as an investor. As owners of Sweden's approximately 300 public housing companies, the combined investments by the state in housing represented 13 percent of the total investments in the market between 2009-2013. For multifamily dwellings, their share of total investments reached 20 percent (Konkurrensverket 2015). The public housing companies are permitted to choose between building through public procurement, or to manage projects in-house. In reality, the limited resources for in-house project-development means that they build through procurement contracts, guided by the law of public procurement (Konkurrensverket 2015).

The average project comprises 51 dwellings at a cost of 66 MSEK, which means the average construction cost per dwelling lies at 1,3 MSEK. Each project averages 4,1 offers from contractors and the majority of contracts are turnkey-projects (80 percent) where more than 70 percent of the contracts are awarded to "the economically most sound tender" (Konkurrensverket 2015).

Another important actor on the market are pension funds. Pension funds provide capital through indirect and direct investments in real estate. Investments by pension funds in real estate are growing, mainly due to its relatively low correlation to the stock market. 50 percent of the pension funds in Europe have exposure to the real estate market through stock market investments in real estate companies.

The single largest real estate company in Sweden is Vasakronan. The company is mutually owned by four of the Swedish pension buffer funds (AP1, AP2, AP3 and AP4). The company holds a property portfolio of 179 real estates, with a combined space of 2.4 million square meters, valued at 117 billion SEK (31 mars 2017). In 2016, investments of 2.2 billion SEK were made, which is in-line with the average of 2 billion of the last 5-year period (Vasakronan

2017a). During the upcoming 6-year period, the company plans to invest 10 billion SEK (Vasakronan 2017b).

Other large actors in terms of property values are Akademiska hus (73.0 B.SEK), Castellum (66.2 B.SEK), Balder (60.0 B.SEK) and AMF Fastigheter (55.0 B.SEK) (Fastighetsägarna 2017a). Of the top 5, only Balder has a significant share of housing within their property portfolio. The five largest all have a majority of their property portfolios exposed to the 3 largest metropolitan areas, as well as the major regional cities.

When listing the largest private housing owners, excluding dwellings under development, Rikshem (28.000 dwellings) is the largest operator followed by HSB (27.000), Willhem (22.800), Stena fastigheter (22.800) and Heimstaden (19.400) (Fastighetsägarna 2017b).

4.2.6 Regulatory Framework

The Swedish construction market is more heavily regulated than most construction markets (Andersson & Andersson. 2014). It is regulated by the planning and building act (PBL) which dictates planning of land, water and construction. Public land and the built environment is controlled by Sweden's 290 municipalities through the zoning monopoly which is governed by the detailed development plan (Boverket 2017). These regulations create the framework from within the industry can operate.

According to Andersson and Andersson (2014), the Swedish construction market is severely hampered by the regulatory frameworks currently in place. They argue that the low levels of housing construction in the larger metropolitan areas are due to extensive and tightly formed regulation and low levels of competition rather than conditions on the financial and credit markets. Meanwhile, Sveriges Byggindustrier (2015b) raise the financing situation as a potential cause of the low building rate. They argue that neither the rising costs of construction nor the absolute price levels can explain the lower rate of housing construction in Sweden compared to its neighboring Nordic countries. Instead they raise government incentivized or supported home savings programs, favorable conditions for younger first-time buyers and market rates for rental dwellings as potential, financially connected causes for the higher build rate in the neighboring countries.

According to Andersson and Andersson (2014), one of the main arguments for a poorly functioning construction market is that the governing framework is built on a double standard. The municipal zoning monopoly is said to be the guiding framework, yet the plan and building act severely limits its applicability through a number of low level detail management paragraphs. The situation is further complicated by a large number of court ruled praxis's which creates barriers to entry for small actors who cannot navigate the complexity as well as creating added workload and increased expertise knowledge for individual municipalities. Furthermore, the regulatory framework is too centralized which allows little room for local adaptation, experimentation and competition which in turn causes the housing and property market to allow for less optionality and diversity of supply than any other market. A centralized regulation also contributes to high prices on land as well as poor adaptations to local needs and conditions (Andersson & Andersson 2014). An example to accentuate the

problem, Anna Wersäll (Entreprenörskapsforum 2014) states that, when adding up all of the current restrictions, the areas of buildable land is virtually non-existent in the Stockholm area.

In a study performed in England, in an attempt to measure the cost of regulation in the heavily regulated English construction market, the researchers measured the price difference of the marginal building cost, which would be the theoretical price in a market without restrictions and in perfect competition (the authors assumes a “normal” profit is included in the marginal building cost) and the market price of offices. They found that Stockholm city have a regulatory tax of 379 percent, compared to that of 449 percent for London City, where London is Europe’s most regulatory taxed city (Cheshire & Hilber 2008).

In addition, notwithstanding if high prices of construction hamper the building rate or not, the Swedish construction prices are the highest within the European union, roughly 70 percent higher than the European average and among the highest of the world’s metropolitan areas in relation to the disposable income of local households (Andersson & Andersson 2014). A commonality among all the top countries are the tight regulatory constraints stated by their plan and building acts. Another way to look at costs and prices is that the price is determined by which price the builder can charge on the market and the costs therefore adjust accordingly and that the prices on the Swedish market are inelastic and when demand increase the prices increase rapidly, yet supply, or the building rate, does not (Lind 2011).

The nature of the PBL also creates an almost infinite amount of opportunities for appeals which causes increased costs and prolonged timeframes for new projects (Andersson & Andersson 2014). A study performed at KTH of appeals in the Stockholm area, states that 27 percent of all building permits were appealed. The study also showed that for larger projects involving a greater number of housing units or project of “special significance to society”, up towards half of the plans were appealed (Davidsson 2016). However, according to the study, the vast majority of the claims for appeal was found unsupported and that only one and a half per mille (1 of 689) of the claims was supported on the grounds upon which the appeal was based. From the appeal processes, an additional two percent of the cases were found to have grounds for revoked permissions due to other factors (Davidsson 2016). The low bar and risks associated with making an appeal in Sweden has led to increased risks and barriers for builders. The building process in Sweden can be held up over several business cycles which increases the risk for the builder (Entreprenörskapsforum 2015; Konkurrensverket 2016). This favors large builders and construction companies since they can afford to keep a portfolio of land ready for exploitation and maintain several projects at once, yet for a small company or private individuals, the building permit process can make the project impermeable (Andersson & Andersson 2014; Konkurrensverket 2016).

Another aspect of government and regulation that can have a multisided effect on the construction industry and indirectly on innovation, is the regulatory framework around capital and taxes. According to Sveriges byggindustrier (2015b) taxes affect households’ ability to efficiently manage their capital. Through taxes, the incentives for moving and demand for new housing are affected. In Sweden, the costs of moving are high (WSP 2011), especially the capital gains taxes, which unlike the other countries in the Nordics as well as in Germany, apply in perpetuity (WSP 2011) which decreases the demand for new housing. This in turn,

leads to diminished opportunities for those outside of the market or with low financial resources through the effects of none-occurring property chains (Sveriges byggindustrier 2015b).

Public procurement act

The Swedish public procurement act regulates how public entities should handle the procurement process and is based on a EU directive (Konkurrensverket 2017). In 2014, the value of public procurement in Sweden was estimated at 634 billion Swedish crowns, roughly a fifth of GDP and over half of them was procured with price as the determining factor. Construction is the sector most frequently involved sector in public procurement (Konkurrensverket 2016).

There are four different procurement directives with different threshold values. The rules govern announcement, formulation of demands and criteria as well as contract proceedings. All public procurement that exceeds the higher threshold values are guided by EU law and each member state have limited possibilities to impact regulation that is ruled by EU procurement directives (Konkurrensverket 2016). The role of public entities as clients and their ability to promote and support innovation and set policies for the industry is therefore not entirely straightforward. Procurement policies and requirements are not rapidly or easily changed, yet potential room for improvement exist.

4.2.7 Technical Support Infrastructure

The construction industry is a complex system of actors (Blayse & Manley 2004) cooperating over long timeframes and operating within a highly regulated environment, yet in order to function the dependence on a functioning ecosystem around it, is undisputable. Together, governments, financial institutions, academic institutions and other stakeholders govern technology in construction through the framework that they create around the industry (Gann & Salter 2000).

Finance

The long timeframes and massive upfront costs demands a functioning financial system to provide access to capital (Sveriges Byggindustrier 2015b). The importance of capital is highlighted through five factors that Sveriges Byggindustrier (2015b) claim to have significant explanatory power for the variation in the production rate in construction sector:

- Households net financial assets i.e. assets minus debts.
- Changes in property and financial gains taxes
- The repo rate, or more direct, the mortgage rate
- Employment rate (Only significant in larger urban areas and in the Stockholm region)
- Building costs

Infrastructure

One of the most critical areas of the support structure for the building industry is the infrastructure (Andersson & Andersson 2014; Sveriges Byggindustrier 2015). New infrastructure can help to create access, decrease travel and commute times, open up connections to new labor markets and free up new land (Sveriges Byggindustrier 2015; Woetzel et al. 2016). The economic implications of infrastructure are primarily through increased societal efficiency and a dollar spent on infrastructure can often help increase GDP with 20 cents in the long run (Woetzel et al. 2016). It can often time be the driver of new built environments such as the Stockholm subway system in the 1950's and 60's when it opened up many new areas for the built environment to expand into (Sveriges Byggindustrier 2015a). Today, the infrastructure is often lagging new housing developments that rather forces the infrastructure to be built (Sveriges byggindustrier 2015a). The expansion and modernization of the infrastructure is critical to create new housing and to not hamper construction much needed for the Swedish economy and to solve the current housing shortage (Entreprenörskapsforum 2014; Andersson & Andersson 2014).

Swedish spending on infrastructure has been cut in half since the 1960's when around four percent of GDP was spent on the segment. A steady decrease has led to the current level of around one percent of GDP which has been stable over the last two decades (Sveriges Byggindustrier 2015a). According to Woetzel et al. (2016) the world needs to spend around 3,8 percent of GDP on infrastructure until 2030 to support the expected economic growth. 60 percent of the growth needs to be accounted for by the emerging economies, yet Sweden currently spends substantially less than the average of western European countries which is 2.5 percent (Wotzel et al. 2016). Long-term the value of the infrastructure needs to grow in line with the economy, yet since 1970's the value of Sweden's infrastructure has shrunk from 80 percent to 60 percent of GDP (Sveriges byggindustrier 2015a).

Education

A critical support function to the industry is of course education and training of new workers and talent to enter the workforce. In Great Britain, the number of engineers was declining rapidly in the late 1990s and early 2000's, a development which, according to Fairclough (2002) could have potentially devastating consequences for the industry and the society at large. The number of new recruits coming into the workforce and the skill level of these workers is of high importance both in terms of quality of work, cost of construction and the long-term development and ability to innovate the industry (Fairclough 2002). The Swedish construction industry is a male dominated one with only 8 percent women and the number of workers in the age category 65+ grew from 2.200 to 13.300 from 2001 to 2012 (Sveriges byggindustrier 2015b). The civil engineering works sector have an older demographic profile, where only 11 percent in the sector is under 24 while on the building and housing sector the same category have a 14,6 percent share (Sveriges Byggindustrier 2015b). The number of new applicants to the construction programs in Swedish secondary schools have gone up and down with a bottom in the late 1990's and a peak in 2011. Since then a redesign of the

program, with a more practical, apprentice-based approach, without automatic eligibility to post-secondary institutions, has meant that the numbers of applicants have declined.

For post-secondary education, the demand is high from the industry. According to SCB (2016b) 86 percent of the construction firms estimated that their need for personnel would increase in the coming years. Statistics from 2002-2012 show an average of 28 percent of the employers stating a perceived shortage of newly examined engineering competence, however the close ties to the business cycle means a heavy fluctuation in demand where the number ranges from 3 percent in 2005 to 60 percent in 2008 (SCB 2012). The average perceived shortage for experience engineers in the same period was 73 percent for civil engineering trained professional and 85 for experienced professionals with a bachelor degree in engineering (SCB 2016a). In essence, the construction needs talented people to drive innovation in the industry. A lack of high quality personnel trained to work in the construction industry is the most serious threat to the quality and the longevity of the future research base (Fairclough 2002).

Academia – Research and innovation

According to (Bröschner 2012) very few patents are registered as a result of Swedish research within the construction sector. He also states that a functioning cooperation between commercial actors and academia is lacking. An important role for the support system around the industry in general and academia in particular, is the function of ‘Innovation brokers’ or ‘knowledge-brokers’ which functions as repository and/or producer of knowledge and serve to facilitate dissemination of that knowledge to the industry (Blayse & Manley 2004). This way the information can flow from one company through intermediaries and out to other companies that otherwise would not be aware. This is argued by Blayse and Manley (2004) to be particularly important within the construction industry, even more so for SMEs, since the application of “technology watch” within the industry is very low. This in turn comes from a number of factors where the high-tech elements of the research are rare and little research and experimentation is carried out within the projects, since procurement is often based on price alone, heavily guided by contracts and the resource constraints of many of the companies working within the industry. The role of knowledge brokers can be assumed, not only by academic institutions, but also professional institutions, consultants, construction research bodies as well as individual academics and researchers (Blayse & Manley 2004).

Sveriges byggindustrier (BI) is a trade organization attempting to work as a “knowledge broker” through their regional R&D program. They have four regional branches trying to connect member firms with academia and other actors within the industry (Sveriges Byggindustrier. 2017). Widén (2004) acknowledges the role of "best practice centers" in the facilitation of innovation from small firms operating in the construction industry. These small firms often do not have access to resources that would allow them to innovate. The efforts of organizations such as BI's, with their regional R&D program, can therefore play a vital role to increase the innovative impact of small construction firms.

Government

Fairclough (2002) argues that “the industry and the public interest are inextricably linked and government policies should reflect this”. As a sponsor and supporter of the industry he argues that the role of government policies should “facilitate change but not impose or assume control”. The industry itself must be allowed to set the strategic vision and define the type of research and what kind of innovations to pursue. Government procurement policies is one such tool upon which to guide and encourage development and have a strong influence on demand that can play a vital role in shaping the future path of technological and process innovation (Gann & Salter 2000).

4.3 Cream Architects AB

This section is aimed to provide the reader with a greater familiarity with Cream Architects and their position within the construction ecosystem.

4.3.1 General Characteristics

Cream Architects AB is a small architecture firm founded by Gustav Johansson, Filip Karlén and Marcus Stark in the summer of 2014. Together, the three partners graduated from the architecture program at Chalmers and in the immediate aftermath, Cream was born. The firm is situated in Gothenburg, and they are primarily active within the local market of Gothenburg. The turnover of the firm was 1.8 million SEK during 2015, and the firm is positioned as a technical consultancy firm within the stakeholder framework. Currently, the firm is expanding, and so is their workforce. With the support of the current boom in the construction market, Cream has hired their first employee, and the future will prove if the growth continues (Johansson 2017, personal communication, 20 April).

Johansson (Johansson 2017, personal communication, 20 April) explains how that Cream holds a market position as a niche alternative within the industry through their chosen profile as an innovative and environmentally friendly firm. Cream utilizes an analytical and data driven approach when pursuing different stakeholders, and the competitive advantage of the firm lies in their ability to prove their solutions through quantitative and tangible measures rather than exclusively relying on soft values and design. The rational being that designs will always be subjective and therefore not really a long-term sustainable source of competitive advantage.

Cream is keen to build sustainable housing, where the use of wooden materials is often favored. Their designs are often constructed with pre-existing methods and processes, yet often applied in new innovative ways or using techniques not frequently applied in their market. Looking beyond the traditional approach, grabbing inspiration from other markets or industries and applying new methods they are not to be labeled inventors, yet they are most certainly innovators.

Since the beginning, the company has been working both towards companies (B2B) and towards private individuals (B2C). Currently, the focus of the company is shifted more towards the former, in order to form more long-term relationships and allow for a more

holistic view of value through increased client knowledge. Yet, the value of not specializing is recognized by the partners, since a diverse project portfolio allows them to maintain and develop a larger set of technical capabilities and thereby larger innovative capacity and flexibility.

To this point, Cream's main occupation has been a project of 63 villas situated on Lilla Fjellsholmen, an island 35 minutes away from Gothenburg. The project was initiated already when the team was studying at Chalmers. Their design captured the developers interest. Yet, the main contract was secured through their innovative and data driven approach, where they were able to capture the unique environment with their designs and to describe and support their unconventional and innovative proposal with hard data and rational argument for their methods, designs and materials.

4.3.2 Cream within the Industry Framework

Johansson (Johansson 2017, personal communication, 19th of May) describes how he perceives the industry as a whole, to be conservative. House production, and construction in general, is both risky and costly, which means that end users are conservative in order for things to be constructed with quality and trusted methods to provide long life spans. Therefore, Johansson argues that the industry is, to some degree, correct in its way of being conservative, since it protects the interests of the end users and society at large.

4.3.3 Project-based Firms

However, Johansson (Johansson 2017, personal communication, 19th of May) also recognizes that there are differences among different segments and sub-categories between the industry as well as a large variation among individual actors, as could be expected. As for Cream's environment, the project-based firms, both contractors and sub-contractors, are generally the most conservative compared to other stakeholders, such as suppliers and clients/users. The contractor generally holds a large role in project and is the one responsible for implementing the plan and the wishes of the client. Thus, project-based firms hold a filtering position where much innovation can get stuck due to conservatism.

Further, Johansson (Johansson 2017, personal communication, 19th of May) holds smaller project-based firms as more conservative than larger ones in their business environment. The conservatism is perceived by Cream to be partially driven from regulations, which requires them to construct with a minimum warranty period of ten years, and therefore they are conservative in what methods and solutions to use when constructing. On the other hand, they are less worried about factors such as life-cycle costs or life span of constructed products. Johansson describes an unsound mentality that exists among project-based firms, where they often prefer cheaper materials and quick solutions to cut costs, with a focus on managing the ten year warranty period rather than life-time or customer value. Cream also faces many project-based firms that prefer to build in the same ways, using the same processes, materials and suppliers as they have always used, which decreases the innovative ability of their environment. It also means that more environmentally friendly solutions are put aside in favor of cheaper solutions of construction. This notion holds true in general for project-based firms

that Cream has interacted with, but of course Cream acknowledges that firms less conservative and more prone to innovation also exist and their focus is to work closer with such actors.

The orchestrator position

Cream, has four civil engineers within their team, which, in comparison to the overall industry, and the project-based firms in particular, is an unusually high concentration of highly educated personal. Together with their innovative profile they are naturally more prone to innovation and less conservative than most firms. The high level of education within the firm, however, is not uncharacteristic for architectural firms and architects in general are more inclined to be visionary and more open to innovation than other categories within the larger industry.

Cream actively take part in construction projects, often with many actors involved. Cream often intend to act as an orchestrator between the many actors, and when they are able to capture the orchestrator position, the firm manages the exchange of ideas, contacts and blueprints between the many actors. Johansson (Johansson 2017, personal communication, 19th of May) stress the importance of the orchestrator position:

"If we do not put ourselves in this central orchestrator position within the project, we end up designing only our own specific detail, and then our ability to influence the project and all actors within, decreases a lot. Now, in the orchestrator position, we gain the possibility to overlook the project as a whole, which allows us to govern and direct other consultants, sub-contractors etc, in the direction we want. It also allows us to create and take part in a dialogue between all actors involved, so that we can discuss different solutions. It is fruitful for us, no doubt, but it also requires us to administrate protocols, excel sheets, contact surfaces and thereby spend a lot more time on the project than otherwise needed. So, the orchestrator position comes with an increased influence but also with increased time spent on each project. A balance exists between the benefits and the costs from acquiring the position."

Normally, according to Johansson (Johansson 2017, personal communication, 19th of May), contractors have a lot of influence, especially when projects are structured as a turnkey contract and when the main contractor is a larger firm. In these situations, the main contractor creates construction documents, sign sub-contractors, choose an architecture firm, decide what suppliers to use and so forth. Projects structured as a turnkey contract are negative to Cream, since this structure makes it harder for Cream to capture the orchestrator position. Instead, control is shifted to the main contractor, so that Cream loses influence and control which limits their ability to push through innovative solutions. Cream is striving to capture the orchestrator position in projects, because it helps them to build beneficial dynamics between all actors, so that the project vision can be aligned, and so that tight coupling between all actors can be ensured. By doing so, Cream is both ensuring successful projects as well as a more beneficial environment for innovation.

Many other consultancy firms, no matter if they are large or small, does not work or intend to hold this position to the same degree. Of course, there are specialized project leading-firms

which intend to capture this position and to manage projects, but firms similar to Cream does not have the intention to be the manager or orchestrator of projects. The role of project coordinator also plays to Cream's strengths according to themselves. When starting the firm, they saw the role that architectural firms have in the construction process in other parts of Europe and saw that their competencies, that lies somewhat in-between clear-cut architectural firms and the field of structural engineering, would be highly suited for such a role.

4.3.4 Supply Network

As an architecture firm, Cream has rather weak couplings to the supply network of the industry. The role of Cream in any given project, is to propose a design, where materials and quality levels are specified in detail. Often, a specific supplier is mentioned as the preferred choice, but with an addition of the possibility to substitute the specific materials or products for substitutes that fulfills the same requirements. Johansson (Johansson 2017, personal communication, 19th of May) emphasizes the importance of Cream's and the clients' role, because if materials are poorly specified in the design, contractors tend to substitute materials to cheaper ones, thus leading to a lowered quality of the project.

The role of Cream as an architecture firm, does not require them to build tight relationships with a supply network, instead Johansson (Johansson 2017, personal communication, 19th of May) holds that it is more common to find tight couplings between project-based firms and suppliers. He argues that tight relationships between project-based firms and suppliers can sometimes be a hindering factor for innovation. This comes from the fact that contractors can sometimes steer the build process and design to incorporate these suppliers' products, often times with little account of the specific characteristics of the project at hand. Johansson exemplifies by using their project of Lilla Fjellsholmen. Cream proposed an innovative roofing solution, with both cost and quality benefits over the standard solution. The main contractor stopped the proposed solution in favor of their standard solution, simply because the standard solution was to be delivered by a supplier tightly coupled with the main contractor. By doing so, the main contractor hindered innovation and thus acted as a filter between an innovative supplier and a client prone to innovation.

Supplier partnership

In general, Johansson (Johansson 2017, personal communication, 19th of May) perceives the supply network segment of the framework to be more progressive and prone to innovation, compared to other segments of the framework. To stay updated with the latest developments is vital, but a challenging mission due the gigantic supply of different actors and solutions. The specialization areas of the team is one way to deal with this, where each partner can go more into depth with the best alternatives for his areas. Johansson has also noticed how suppliers try to push innovation and market new solutions to the industry through briefings, breakfast meetings and similar actions, which he finds to be a good source of new information, although, challenging not to miss out on less well marketed solutions. Johansson (Johansson 2017, personal communication, 19th of May) discusses other ways for Cream to best utilize the innovative ability of suppliers, in order to increase their own innovative

ability. An approach that seems beneficial to Cream, is to create a partnership with a well-suited supplier. Architects seldom have relationships with suppliers, therefore this action will be rather unique, and Cream is passively seeking this type of partnership. A strong relationship could enable Cream to create more flexible solutions, better tailored to the individual projects, or to create standardized elements to solutions that they find to be lacking in the market.

4.3.5 Clients/Users

The literature describes the client as an important driver of innovation, something that Cream wholeheartedly confirms. The clients level of engagement, openness, flexibility, ambition and willingness to take a long-term perspective on costs is all important factors for Cream's ability to work with innovative solutions. As previously described, the project-based firms can often operate as a filter for innovation. The characteristics of the client is therefore critical to allow for more innovative solutions through that filter. Johansson (Johansson 2017, personal communication, 19th of May) describes how their natural approach is to try to present their company profile and their visions early on in the process with the client in order to discern if there is an alignment of interest and intention. As the firm grows and more projects come through their pipeline, the firm have gotten to a point where such a meeting can lead to a decision of not taking the job, if the clients interest does not allow for the firm to follow their profile. In the first years of the firm, more or less all projects and jobs was accepted. Yet, the firm now recognizes the value of doing inspiring projects as well as building a portfolio and a profile that is more consistent with how they want to position themselves.

The conservatism that is often claimed to characterize the industry is also present in the clients of Cream. The founders, although focused on new solutions and unique designs, view the conservatism as relatively reasonable and logic in many aspects, since risks and costs are high and time-frames are very long. Yet, they often feel that there is a clear bias towards the old and tried, even in the face of clearly less risky details or with solutions backed by verified data and arguments which creates proven benefits.

Different types of clients

Cream describes an environment where the type of client and the geographical market of the building or project often have a large impact on choices related to material, process and the general view on costs. The main divider is whether the client builds to operate or to sell. For long-term owners and users, the life-cycle cost is often more relevant which means that they allow for higher initial costs to ensure quality solutions. These clients can thereby be more open to some of Cream's ideas on sustainability and quality. Yet, this type of clients can also be relatively conservative when it comes to innovation, since they have a long-term view and therefore have a stronger tendency to demand proven methods. Cream also perceive the market of the project to also have an impact on client preferences. Clients on the larger markets, where demand and prices are high, are generally more open to spending extra on quality materials etc. since the margins are so high on the projects either way. As Johansson

views it, these clients can afford to spend a little extra on "building their brand" which is what he perceives is the largest driver behind these types of choices for clients that does not build for their own use.

Cream also sees a clear distinction between private and professional clients. A private customer does not have the same experience, yet, perhaps more importantly, they are often not willing to spend money on services not immediately connected to the build process. Johansson (Johansson 2017, personal communication, 19th of May) speculates that, although a small cost in the larger scope of the full project, the design process is often one of the first costs in the project and is therefore a huge cost in a psychological context. Private individuals are therefore less inclined to allow for extra costs on exploratory work where new solutions or several alternatives are tested. The professional clients are more accustomed to consultant fees and the upfront costs and are therefore, on an aggregated level, more willing to allow for a more extensive design process. Cream also sees a benefit in working with professional clients since it is more likely to lead to productive relationships and added network effects which increases incentives for the firm to create qualitative and value adding solutions. A longer-term relationship also gives the firm additional value from their efforts to educate their clients, since this knowledge-sharing facilitates a better process in future interactions.

Client Recruiting

In order to find new clients, Cream relies heavily on their network. Little to no resources are spent on marketing or sales meeting. The company keeps a list on potential clients and an associated log of contact status ('contact' or 'no contact'). Their efforts of 'cold selling' have been extremely unproductive and the reliance on 'warm introductions' through their network is therefore the primary source of new clients and customers. Once introduced, the firm relies on their profile and data driven customer process. The firm, although still relatively cheap, does not find themselves to attract clients on the basis of price, but rather on their branding as green and innovative and by presenting designs that is backed by visuals and data. The actual design is not an argument in itself according to the founders, since "beauty and design is always a matter of time and taste and therefore subjective" (Johansson 2017, personal communication, 19th of May).

Once in a project, Cream has adopted a strategy to try to describe and set the bar towards clients and project-based firms, already when initiating a project. When doing so, they intend to describe their vision, profile, and intentions with the project, in order to create a common ground for all actors and to initiate a sound relationship which fosters successful projects. This is an active strategy in order to gain a clearer and more central role in the projects and in the minds of clients. In a project managing or coordinator role, the firm increases their ability to impact the process and decisions and establish closer relationships with the clients.

To better cope with the new role and to be able to have a more constant flow of projects coming in, Cream have, during this study, changed their view on growth. From a mind-set of outsourcing and limited personal growth, only working with the founding team, to an expansion plan of new hiring and potential firm merger in order to grow the client base and to increase firm competence to allow for bigger projects and clients and a larger role in each

project.

4.3.6 Regulatory Framework

Johansson (Johansson 2017, personal communication, 19th of may) describes how Cream, as all other actors within the industry, is affected by the regulatory framework. Cream is a small actor and therefore they cannot take actions to change the regulatory environment, instead they have to adapt to it and find their path within it. Firms, no matter what size, have to follow the regulatory framework, but Johansson believes that bigger firms are better positioned in order to influence the regulatory framework surrounding them.

Cream has not been able to compete for contracts governed by the public procurement act yet, simply because they have been too small. Meanwhile, even if they are not able to compete for these contracts, Johansson (Johansson 2017, personal communication, 19th of May) argues that the public procurement act affects them in the sense that it directs who they are able to work with.

Furthermore, Johansson (Johansson 2017, personal communication, 19th of May) holds bigger firms as better suited to cope with the regulatory framework. Larger firms often possess more resources, which puts them in a situation where they can afford to appeal contract details. Larger firms do not suffer from stalled projects as small firms might, thus larger firms are less vulnerable than smaller firms. However, as Johansson says, even if Cream is a small firm, it rarely suffers from stalled projects or difficulties with the regulatory framework, since the risk rarely lies on Cream. Instead, the risk is often associated with the property owner or the project owner, while Cream only carries risk attributed to the number of hours they have put down on the project. Cream is often among the first ones to get paid, in any given project.

4.3.7 Technical Support Infrastructure

As an architectural firm, moving towards a more project-orientated role, Cream takes a role that lies somewhere between the supporting consultancy firms and those more project-based. The consultancy framework around Cream is important, since they are a small actor, that unlike giants such as Sweco, cannot maintain all competencies in-house. Much like the industry in general, a few giants dominate the market, but on the regional and local level, fragmentation and competition is extensive.

The consultants working within the construction eco-system often carries the role of niche experts and are those most likely to provide the link from academia and new developments from other parts of the industry or other industries. They are therefore highly important for the innovation within the industry. For Cream, the trick is navigating through this jungle of actors to find the one's that can add the most value and work in the same way, and build their network. Reaching out to these firms is according to Johansson (Johansson 2017, personal communication, 19th of May) similar to that when reaching out to customers, cold calling is very challenging, warm introduction through their network is a far more successful strategy. For Cream, it is also essential to be able to compete and be successful to form such network within the technical support infrastructure since it is through this network that they can access

the competencies that they cannot afford to have in-house, yet still is vital for successful innovation processes.

Interbranch Organizations

The organization that is most closely tied to Cream's competitive environment is Architects of Sweden (Sveriges arkitekter) which is an interbranch organization working to make a difference in society and to illustrate and highlight the implications and significance of architecture and to impact their terms and ability to operate (Sveriges Arkitekter 2017). For Cream, Johansson (Johansson 2017, personal communication, 19th of may) argues that they have a positive view on the work performed by the organization, that they provide important support for small firms through their dissemination of new developments as well as general terms and conditions on the market that allows Cream to access knowledge about market salaries and so forth. However, in wider terms, most of the work performed by them does not affect the daily work of Cream, since they find that most activities are on a policy level, yet they recognize the value of an organization working for their occupational category.

Academia

Construction is as previously described an industry with low levels of knowledge transfer and innovation stemming from academia. Cream, as an architectural firm, formed during the final stages of the founders' education, has a closer connection to academia, than most other companies within the construction industry, even when compared to other architectural firms. Their work with a new construction system for single family house production, with automated production of frame elements from plywood, printed from computer drawing to CNC wood carving machines, is an example of a contribution stemming from an academic environment and their natural inclination to learn and connect developments from within and outside of the industry. Early on, the founders also held classes as well as mentoring roles for students in certain areas of structural engineering, however, as the company grew its business, it was not deemed to provide enough value for the company. The firm is now moving away from the academic setting and finding a closer connection to the industry, which is in-line with the more general development of their surroundings.

Johansson (Johansson 2017, personal communication, 19th of may) also finds that suppliers tend to have a closer link to research and academia, than the more project-based firms, especially the "pure builder" he perceives to have little to no connection with a strict academic environment.

5. Discussion

The following discussion attempts to highlight and contrast findings and views from the existent literature with empiric observations from interviews with industry actors. The general concepts and factors of innovation and the Swedish industry is combined with the views and experiences of market participants and connected to the reality of the case firm.

5.1 Industry Characteristics

As previously described, the structure of the production within the industry, with project-oriented development and fragmented organizations within the projects, causes a number of potential hindrances to innovation. Yet, it is also true that other industries, such as the entertainment industry, have similar characteristics and is still not perceived as stale or slow to drive and adopt innovations. What could be argued to be more relevant as a cause for the construction conservatism are the risks in terms of financial and human capital and the attitudes towards new approaches within the industry.

The industry's inherent risks and great importance to society has led to a substantial regulatory framework around construction, which varies across the world. This serves to create more regional markets and thereby decreases advantages of scale, which is further reduced by the human resource intensive nature of production. This makes construction distinctly different from other industries, such as the it-industry where global giants such as Facebook, Google and Amazon are able to dominate the industry, almost worldwide. The exception being China, which, much like the case for national construction markets, has some distinct legal and political frameworks which limits these giants from applying the same models or structures, or even enter the market.

The need for safe and long-lasting solutions within the industry also makes radical innovation more problematic. Lind (2011) raises the problem of long time-frames when judging the quality of a project, which makes quality as a decision criteria for construction alternatives highly difficult, especially for inexperienced clients. The long time-frames and difficulty in evaluating different alternatives, as well as high costs of failure creates a bias towards proven methods. When contrasting with the tech industry an example could be when Samsung released a new phone model, which on several occasions caught fire, due to a battery malfunction. This caused minor burns on some of the owners and an incident on a flight which caused major publicity and bad press for the company, yet no people were badly hurt. A similar flaw in the electrical system of a building could cause massive material damages and human suffering in the event of a fire. The somewhat conservative attitude within the industry is therefore at least partially justifiable. Together with this factor, the great costs and lengthy processes of construction also makes a trial and error process and quick iterations championed in many popular management theories, highly difficult to implement.

It is also important to note that different segments or categories of actors within the industry are more or less prone to conservatism and to adopt innovation. Architectural firms can often be considered the visionaries of the industry, more prone to introduce and seek new expressions and methods and can serve as a driver of new solutions through new design which forces new materials, products or processes. On the other side are the small-scale project-oriented firms operating within the construction side, where educational levels are lower. Here, much work is done through the reliance of experience and tacit knowledge (Simu 2009) and resources for organizational development are limited. The reliance on experience and heuristics contributes to the creation of one of the most conservative subsectors of Cream's environment. For Cream, their ability to innovate is connected to all the project participants, yet, clients and main contractors are the most important actors. A knowledgeable and

progressive client with a long-term operating interest provides the optimal conditions for a more long-term sustainable and high quality project outcome with the use of a more progressive approach. The builder in many ways functions as a filter, according to Johansson (2017, personal communication, 19 May), where some builders are more conservative and rule bound than others. This means that often times, the firm have to convince the owners of their solution, and then also sell the builder on the idea, in order for them not to work against the suggested solution. Furthermore, builders can often have relationships and experiences from building with certain suppliers. In some cases, this connection can work as an additional hindering factor for new solutions championed by Cream.

Supplier relationships is thereby a two-edged sword in the sense that often times the suppliers are more progressive and innovative. A strong relationship with a company of that sort is often conducive to innovation and Cream is passively looking for a closer relationship with such actors, which is something that would be rather unique in a Swedish context, according to Johansson (Johansson 2017, personal communication, 19 May). However, strong industry relationship can also add to the stale nature of the eco-system. It risks reinforcing habitual building processes and limit competition as well as dissemination of new solutions and innovation. This is something that Cream has experienced on several occasions, where Johansson (Johansson 2017, personal communication, 19 May) mention a situation on the Lilla Fjellsholmen project, where they prescribed a ceiling solution produced by a Norwegian company which offered a lighter, yet more durable construction with a lower environmental impact from both manufacturing process as well as building process, at a lower cost. Nonetheless, the client chose a more conventional solution advocated by the builders on the count of them being more comfortable and experienced with the use of their partner supplier.

This combination of factors of client complacency, poor cooperation amongst project participants, stale structures and relationships and conservative mind-sets is a main contributor to the hardships and slow pace of innovation within the framework operated by Cream. A potential mediator that Cream is working on, is the formation of strong relationships, built on trust, that can serve as a lubricant when suggesting new solutions. When the firms involved are more able to trust the others' systems and methods this will make for a smoother implementation of new solutions, benefitting everyone involved and increasing their collective competitiveness.

5.1 Network Development

The structure of production in the construction industry involves hindering and driving factors that are impacted by network development. Building strong industry relationships can enhance knowledge flows (Blayse & Manley 2004). In any given project, numerous stakeholders are connected and cooperation between them is of great importance to the outcome of the project (Blayse & Manley 2004). Johansson (2017, personal communication, 20 April), one of the partners at Cream Architects, confirms this characteristic, and he

acknowledges the fragmented relationship as a hindering factor to be able to push through innovation.

Johansson (2017, personal communication, 20 April) also describes how the network characteristics and approach, as well as ability to innovate, differs depending if the firm aims at B2C or B2B- relationships. If they are working with a private individual, the project is often a one-time activity, which leads to a rather shallow relationship where neither the customer nor Cream can develop a long-term relationship. The added benefits of innovative solutions is limited through both the one-off nature of most building projects which limits the firm's ability to apply a given innovation to other situations (Blayse & Manley 2004) and the one-off nature in terms of relationship, that most often, does not bring the added benefit of increased opportunities for future projects or important network connections. Johansson (2017, personal communication, 20 April) describes their shifted strategical consideration of moving more towards B2B projects, because of the possibility it provides to create a deeper relationship on a long-term basis, something that he describes as more beneficial in several aspects. The main benefit being that of more stable, long-term relationships and an ability to factor in value in designs beyond the initial costs.

5.1.1 Credibility, Reputation and Trust

To explain the implications of long-term relationships B2B, Johansson (2017, personal communication, 20 April) uses the example of their first major project. Cream Architects designed a project of 63 villas on Lilla Fjellsholmen, a project they began working on already when in university. After the initial proposal, other architect firms were brought on, partially due to previous relationships, and partially to the lack of trust and credibility on the count of Cream's lack of experience. However, as the project moved forward, Cream kept a close eye. Much like described by Teece (2016), they saw the potential opportunity and so they utilized a form of sensing capability in order to create continued shadow proposals in-line with their perception of the clients' needs. When the other firms' designs lacked in some aspects Cream was able to provide solutions, backed up by data and research to provide credibility rather than experience. Cream developed an improved design which solved the faults identified with the design by other architects, and thanks to this the trust and their credibility was further increased. Today, the project at Lilla Fjellsholmen is under construction and Cream is the lead architect firm involved. Johansson (2017, personal communication, 20 April) is keen to describe how this long-term relationship during the project has given them increased credibility within the industry, as a player who has the ability to deliver innovative solutions to a relatively sizeable project. Further, he emphasizes the value of trust, because the more their client trusted them, the easier it became to convince them of new solutions and small incremental innovation continuously. The words by Johansson (2017, personal communication, 20 April) is in line with the theory on network development, where trust between actors is argued to help enhance innovation outcomes (Hausler et al 1999), mainly through increased depth in exchanged information (Lorenzoni & Lipparini 1999) and a move beyond price and quantity to a more holistic perspective of value (Uzzi 1997). Network development also provides legitimacy and reputation, but it also works as signaling content

(Hoang & Antoncic 1999), which is seen in the example from Johansson (2017, personal communication, 20 April). McKelvey and Lassen (2013) also stress that trusting behavior is the single most important mechanism governing networks, and that small and newly formed entrepreneurial firms especially benefit from networks if they manage to build trust, since they have little other reputation and branding to fall back upon.

Grufvisare (Grufvisare 2017, personal communication, 22 April) also contributes on the topic of network development. He discusses the nature of the industry with many actors involved in any given project, as a major factor why network development is so important in order to be successful, and in order to create and maintain the ability to take an invention through the final stage of implementation and commercialization. He gives an example from an ongoing project they have together with one of their most important customers.

“Whenever you have a project within this industry, there are always many actors involved in the process, not only on the production site, but also in the planning and design phase of a project. Our customers are in housing production, and at the production site there are electricians, painters, floor-layers, all with a specific responsibility and time-slot, and at a specific time-slot during this process our products are meant to be installed. Therefore, it is incredibly important with planning and logistics, and that is why the contractor (our customer) must be able to trust all the actors in their ability to fulfill their specific responsibility, otherwise the project fails and both time and money are lost. Trust is the most central aspect in order to facilitate success from network development, and to be able to continue to do business with your B2B-customers”.

He continues,

“Our ability to succeed both with our overall economic performance goals and with driving innovation, is facilitated by our capability in network development. All of our major customers are relationships that we have developed during a long time-period, and this has provided us with a great amount of credibility and reputation within the industry. During these relationships, we have been driving innovation mostly through process innovation and incremental innovation, but the thing to remember is that before being able to successfully introduce innovation, one has to create trust and credibility to do so, which is facilitated by network development.”

Blayse and Manley (2004) describe how industry relationships have an extremely significant influence on construction innovation, which is identified in the example by Grufvisare (2017, personal communication, 22 April) where their long-term relationship with the contractor influenced their ability to drive innovation.

Trust mediates these expectations of predictability and mutually accepted actions, and these expectations reduce transaction costs such as monitoring and renegotiating the exchange in reaction to environmental changes, especially when time constraints are existing and the task are of a complex nature (Jones et al. 1997). Grufvisare (Grufvisare 2017, personal

communication, 22 April), highlights the advantages of a close and trusting relationship. However, the supplier context is somewhat different to that of Cream. As a supplier, these relationships are often similar in their characteristics, and the number of trusting relationships are generally not as large as for an architectural firm and the frequency of interactions over time are generally higher, which allows for better conditions to build trust. In the project process, the number of actors with shifting interest involved is a lot higher and the relationships are more episodic. Finding long-lasting partnerships and building trust through mutual interest alignment and learning of one's organizations is therefore more challenging and sometimes not as productive within the project-based context.

Nevertheless, we argue that the value provided by establishing long-term and trusting relationships makes it worth pursuing. The fragmented nature of projects and project participants does not allow for such relationships with all actors, yet finding partners and working to align interest with clients and project participants is crucial for small firms' competitiveness and ability to successfully introduce and drive innovation.

5.1.2 Proactive Network Development

Since network development is emphasized as extremely important by our interviewees to successfully innovate, the path of creating a beneficial network becomes interesting.

In an interview on the 20th of April, 2017, Johansson concludes that to establish a network as a small and newly formed entrepreneurial firm is hard, since you lack legitimacy, credibility and reputation. He argues that it is logical how the industry at first treated them with some skepticism, since they were three newly graduated architects when they entered the industry as a start-up. But Cream also understood the value of network development, thus they needed to take actions to create their network. To build a network, they bought into a business network located in Gothenburg, which contained actors from different parts of the stakeholder framework. The business network is a way for Cream to gain access to important information and knowledge from the industry. The network meet continuously, and Cream view it as important to access information on new technologies and the overall development in the industry, as well as providing them with potential opportunities for collaboration on projects in the future and access to relevant complementary knowledge and capabilities.

Grufvisare (2017, personal communication, 22 April) compares the situation of his venture to the one of Cream, and when doing so, he recognizes the fact that they are in different stages in their respective ventures. He describes that when a firm has created initial contacts and thereby started to develop its network, it is important to utilize the existing network to further develop it. To continuously search and pursue actors interlinked with your core relationships, so that the existing network is used in order to expand the network. By doing so, the firm creates weak ties that might or might not become core business contacts in the future. Weak ties are functioning as untapped opportunities for the future, and it is important to focus on creating these weak ties and not only focus on your core contacts. Capaldo (2007) holds that the ability of firms to integrate a wide range of weak ties and a number of core ties makes up

for the firm's relational capability, which in the long run helps the firm to gain competitive advantages.

The value in networks within the industry can be further highlighted by the fact that the supplier company in this study, operated and owned by Grufvisare, does not have a homepage or spend a single penny on marketing. They solely rely on the reputation and network that they built through their operations.

Innovation-broker

As previously described, to act as an innovation broker might provide several benefits to the firm (Blayse & Manley 2004). The content a firm can access, through network size, centrality and diversity of knowledge, all get affected positively if the firm develops its network through this kind of positioning. Cream architects have recognized this opportunity, and Johansson (Johansson 2017, personal communication, 20 April) talks about actions they are planning as a proactive approach to gain a central position within their network.

Initially, they had the intention to put themselves in this position from the start of the firm. Back then, they were supervisors to bachelor students on their thesis work, and therefore they held lectures and tight relationships with the university and connected actors, thus they established an important link to academia, which is relatively rare in construction (Hardie 2010). A benefit Johansson (Johansson 2017, personal communication, 20 April) noticed was that they were closer to new technologies and to innovation within the industry, However, the lack of resources in terms of available time for the value gained was not enough for the company at that point.

Currently, Johansson (Johansson & Stark 2017, personal communication, 28 April) explains that the strategy for reaching network centrality and harness the benefits of the knowledge broker position, is gathering key stakeholders within a specific segment of innovation, for instance wooden construction frame systems. By lecturing, performing workshops, inviting to network evenings etc., they see a way to proactively link themselves with key actors, where they become a central actor within this network. This way of developing their network might also lead to an increased influence and reputation as an innovative actor within the industry, thus it might spur their ability to engage in innovative projects. Stark (Johansson & Stark 2017, personal communication, 28 April), another founder at Cream Architects, further describes the positive benefits possible to gain from becoming an innovation broker;

“To put oneself in the position of an innovation broker is a good way to take part in the discussion, but at the same time it is extremely important to manage it properly and to perform it within a subject of our expertise. We have glanced at another, larger, architect firm that is undertaking this type of action to build influence and reputation through network development. They are inviting researchers, politicians, consultants, construction companies, and it provides their firm with great influence, thus they have become a central actor in the discussion of urban planning and how to tackle the existing housing shortage in Stockholm. They have succeeded in their efforts of becoming an innovation

broker, and their actions might affect how housing development evolves in Stockholm over the upcoming years. We clearly see how this architect firm has gained a higher value on their voice, and they can use this in order to influence key actors within the industry”

However, this strategy is not being implemented, due to the lack of resources and the firm's need to define itself, its strategy and profile more clearly before they could succeed in making themselves into an innovation broker of this sort.

5.2 Organizational Learning and Capabilities

Innovation is about introducing elements of novelty into an industry, market or an organization (Widén 2002). This, per definition requires change and elements of new learning. Engström and Levander (2011) state that those most able to introduce and utilize innovation are those best suited to collect and process new information. Several authors reference that the construction industry stands out as an industry that spends very little of formal R&D (Gann & Salter 1998; Widén 2004; Hardie 2010). It is also said that the project-driven nature of the industry is ill suited for R&D (Egan 1998). Yet it could also be argued that every new project is a research opportunity, that the unique aspect of each project provides unique solutions, like small experiments (Gann & Salter 1998; Widén 2004). A critical factor for innovation is therefore to capture new solutions, methods and products, concretize learnings and distribute through-out the organization.

An example of project-based learning in an organization is given by Gann and Salter (2000) where they reference the Danish architecture firm Ove Arup and Partners, who, among many other projects, designed the Sydney opera house. The firm utilize practitioner-research as a strategy to develop technical capabilities. When working on large projects, the firm strives to include a research project of some sort. Cream Architecture works with a similar motive where they prioritize projects that challenge their current capabilities and they focus on clients that are open to new solutions. Designing standardized "boxes" at lowest possible cost, is not part of their strategy since they view it as detrimental to both their brand as well as to their development as a company (Johansson & Stark 2017, personal communication, 28 April). This attitude is, at the same time, raised as somewhat of a problem for certain parts of the industry by Gann and Salter (2000) where they argue that the industry favors and promote a pattern of “reinventing the wheel” by frowning upon standardization and the re-use of designs and rewarding novelty through the design of incentive systems. Cream partially mitigates the focus on new development through their accumulation of a design database where they document their work in order to create a catalogue for learning and design re-use in the future (Johansson 2017, personal communication, 20 April). This could be argued to be an attempt to build a basis for standardization and increased absorptive capacity in the same strategy. The importance is maintenance of a sound balance between the two and that the knowledge bank is actually used for standardization of elements in future projects.

5.2.1 Tacit Knowledge

Furthermore, the industry, especially the small project-based contracting firms, are highly dependent on tacit knowledge (Johansson 2017, personal communication, 20 April; Grufvisare 2017, personal communication, 22 April; Pettersson 2017, personal communication, 15 Feb). Gann and Salter (2000) talks about the importance for firms within the construction industry to work on codifying knowledge that is accumulated through projects so it can be distributed through the organization and be used in parallel or future projects. They emphasize know-who and know-how are generally less formalized and documented than 'know-what' and 'know-why, which is supported by our interviews (Johansson 2017, personal communication, 20 April; Grufvisare 2017, personal communication, 22 April). Tacit knowledge is often accumulated during long time-periods and closely tied to experience. However, without codification of that knowledge, there are severe limits to the scalability of that knowledge and makes systematic innovation within construction firms more difficult since the knowledge is closely tied to the individual and therefore easily lost. The codification of tacit knowledge also ensures that the organization can become more coherent (Blayse & Manley. 2004) and mitigates problems in future projects where teams are likely to be shifted around. The ability to quickly and effectively form teams is something raised by Gann and Salter (2000) as a core capability for project-based firms if they are to maintain innovative capacity as they scale.

Currently, the partners at Cream collaborate on most projects and does not work in separate teams which by design facilitates team coherence, yet their growth has given more diverse tasks which increases experience and knowledge fragmentation. Weekly planning meetings and briefings as well as documentations of projects to a knowledge bank and case portfolio are attempts at disseminating new knowledge and codify learnings and experiences.

Building coherence and consistency within the firm also allows firms to mobilize their core resources to support projects and the feedback allows the firm to develop and maintain relevant resources (Gann & Salter 2000). It also helps lessen the tendencies of the often, semi-autonomous operating units and project managers to solve problems on an ad-hoc basis (Hardie 2010; Lind 2011) which cause ineffective use of the technical knowledge within the firm (Gann & Salter 2000). Such a lack of organizational learning and utilization of firm knowledge and resources hamper facilitation and dispersion of innovation.

Another problem with the tacit knowledge is that it can be difficult to separate relevant experiences and knowledge from biases and heuristics. As discussed by Engström and Levander (2011) biases are a limiting factor for innovation. Regret bias and status-quo bias are two factors that keep decision-makers from making rational and informed decision about new approaches. Biases and heuristics are more relied upon in situations of equivocality and uncertainty. Developing capabilities to deal with equivocality and uncertainty, to learn from experiences and projects as well as bringing in information from other sectors are therefore critical to increase firms and the industry's ability to innovate.

In the project on Lilla Fjellsholmen, Cream overcame adversity caused mainly by lack of credibility, experience and network, but, arguably also from bias. By gathering rich

information and the dissemination of their technical abilities and conveyance of strong rational argument for their design, they were able to convince their client of going with them as a new firm, as well as their more innovative solutions. An approach and process that is in line with Engström's and Levander's (2011) description of innovative firms.

5.2.2 Organizing for Innovation

Taken together, to develop relevant capabilities and to be innovative, is therefore in many aspects a strategic consideration or a result of company culture, attitude (Blayse & Manley 2004; Hardie 2010) and organizing for innovation. Blayse and Manley (2004) reference 'absorptive capacity' as being a function of prior knowledge and ongoing technical capability. To make sure that the firm hires good competence, and more importantly that the firm has clear ways of finding relevant and rich information (Engström & Levander 2011), seek knowledge from other industries (Fairclough 2002; Blayse & Manley 2004; Hardie 2010) have processes to codify knowledge and to bring in expertise knowledge through cooperation, network and services when needed (Gann & Salter 2000), is therefore key factors for the ability to innovate within the project-orientated construction industry.

Stark (Johansson & Stark 2017, personal communication, 28 April) describes how Cream understands the importance of finding rich information to be able to innovate within the industry.

“It is incredibly important for us to stay up-to-date with new knowledge and technologies and to focus on continuous learning. We try to not get stuck in a rut and only use what we learned in university, and instead we keep on our toes to grasp new knowledge and technologies. The future will bring change, which we have to be aware of, and we have to evolve together with it and thereby become better.”

Gann and Salter (2000) also reference the growing need of construction industry-related companies to extend their knowledge beyond the narrow boundaries of their guild in order to effectively manage innovation and technology as well as the rising complexity of their industry. Cream tackles the need for technical capability and diversity in competence through a conscious focus on specialization within the team. Certain tasks and areas are awarded to the team member that is responsible for that area. The specialist then in turn has the responsibility to update the team and to disperse knowledge, yet maintain domain culpability (Johansson 2017, personal communication, 20 April).

However, as a small company the ability to maintain knowledge and technical capabilities is limited (Widén 2004; Blayse & Manley 2004). Blayse and Manley (2004) maintain that absorptive capacity is dependent on a critical mass of qualified people that are able to interpret and implement new knowledge and research. In line with this, Fairclough (2002) holds that small companies cannot be expected to maintain the capacity for meaningful R&D development, yet that small companies within the construction industry maintain a high potential for innovation. The innovation capacity, however, needs to come from the outside. Cooperation and networking (Hardie 2010), centers of excellence (Widén 2004) “knowledge

brokers” (Blayse & Manley 2004), academia, a directional leadership set by the dominant actors of the industry and copying other industries (Fairclough 2002) are all suggested ways of helping small firms to find access to innovative practices.

In order to complement their areas of weakness and maintain a high level of absorptive capacity, Cream actively builds and maintains a network of complementary knowledge and skills, as well as hiring consultants and maintaining ties to the local university (Johansson 2017, personal communication, 20 April). This way they actively work to create an agility and readiness for new projects and solutions without the burden of a large and costly organization. This is a clear example of a development of the type of seizing capabilities that is described by Teece (2016).

Teece also reference 'building slack' into the organization as an expensive, yet powerful tool to create agility. Currently, this is something that Cream is struggling with. Although recognized by the partners as an important aspect, one that they aim to build for, the workload on each member means that the firm is operating at over-capacity. Although not sustainable in the long-run, this is tied to a number of factors tied to both firm specific and general industry related factors. A problem for the firm has been that they did not plan for internal scale in that sense. Starting out, they had a lot of overcapacity and they were struggling to make ends meet. Operating in a cyclical business with, what can be considered a relatively risk-averse mind-set, the partners did not anticipate the rapid growth and was not aiming for an expansion of the internal organization. The main priority for the partners is currently to build a stable financial situation for the company, a priority that comes with the sacrifice of potential agility, which is in line with existing theory of small businesses. Nevertheless, Grufvisare (Grufvisare 2017, personal communication, 22 April) holds that the introduction of slack into his production line is a strong source of competitive advantage since it allows for extra resources to be applied in order to consistently meet delivery deadlines, as well as creating a readiness for new opportunities that can be beneficial to the firm. A description that is right in line with the advantages of slack building, as described by Teece et al. (2016).

5.2.3 Innovation through Inspiration

The tendency to reinvent the wheel within the industry (Gann & Salter 2000) is something that learning from other actors as well as from other industries can mitigate. Hardie (2010) note that up to 90 percent of the innovation in industries with a weak relationship with the pure sciences comes from adoption of preexisting technology from other industries. Cream’s methods are a clear example of innovation and new solutions based on preexisting technologies used in new settings or in new ways. Their development of a new 3D CAD based construction technology for module housing construction is one example of such adoption and combination of technologies and methods from many different industries and developed alongside academia.

The potential for innovation through inspiration and adoption of other industries is further supported by Fairclough (2002) as well as Widén (2004), who both hold that especially small companies can greatly benefit of adopting preexisting technologies and methods. In order to do so, Blayse and Manley (2004) argue that codification of knowledge and absorptive

capacity (organizational learning) plays key roles as well as relationships with manufacturers (network) and champions and company culture (organization). To effectively organize for innovation through strategy is based on the combination of these elements and the function of quality and quantity of such organizational capabilities (Blayse & Manley 2004). Cream are in many ways incorporating these elements in their strategy through their culture and branding, focused on innovation, their technology specialization, knowledge archive and knowledge transfer meetings, as well as actively building their network and connections to specialized knowledge.

5.3 Education & Knowledge-sharing

Another strategic consideration is how to structure and facilitate education and knowledge-sharing, within the firm, as well as with external actors. Blayse and Manley (2004) argue that the industry is dependent on tight collaboration between different stakeholders to maximize innovation opportunities, something that is confirmed in interviews with both Grufvisare (Grufvisare 2017, personal communication, 22 April) and Johansson and Stark (Johansson & Stark 2017, personal communication, 28 April). In order to facilitate collaboration and learning, there is a need to create rich flows of knowledge exchange between different actors. Yet, Gann and Salter (2000) emphasize how firms tend to retain information crucial to successful collaboration, rather than transferring information and knowledge between the actors within the collaboration.

Johansson (Johansson 2017, personal communication, 20 April) describes how Cream is keen to share their knowledge further to actors within projects they collaborate in. They intend to enrich the knowledge flows not only inbound by enhanced education and sensing ability, but also outbound to customers and actors within projects they collaborate on. He describes Cream as being data driven when persuading a client about their specific solution or innovation, thus concretizing the advantages of the design. Johansson also points out that informing and educating clients and project participants of the implications of various alternatives and systems is a key part of their strategy. He sees several advantages of the firm gaining a central role in the project and to facilitate knowledge flows between different actors. By doing so, he believes that the system of actors within the project benefits from making the knowledge flows integrated in all actors. When the knowledge is integrated in the system of actors, coordination of the project is enhanced, thus innovation gets more easily implemented. Knowledge-sharing acts as a key to Cream, when selling and implementing new solutions.

Grufvisare (Grufvisare 2017, personal communication, 22 April) acknowledges the importance of rich knowledge-flows to spur innovation not only inbound and outbound, but also within the firm. He exemplifies by stating how knowledge-flows became richer when they reorganized the structure of the firm, thus breaking up rule-bound hierarchies as suggested by Teece et al. (2016). Instead of having employees in their factory who were specialized in a specific action, they transferred responsibility to the employees to think and act to solve problems themselves. Until then, problems had been dealt with at manager level. By doing this, Grufvisare means that the collaboration in-house increased so that rich knowledge-sharing was created between the employees, similar to what is argued by Teece et

al (2016). It also created a culture of knowledge seeking and openness towards new methods and processes, factors that otherwise are known to hamper innovation in the construction industry (Engström & Levander 2011). These two factors are both conducive to innovation according to the literature.

Blayse and Manley (2004) also talk about the importance of attitudes to facilitate innovation and Hardie (2010) hold attitudinal change as a prerequisite for the participation of small construction firms in efforts to increase innovation in the industry. The capability to collect and process rich information have been found to be characteristics of firms within the construction industry, more able to successfully apply innovations in their business process and strategy (Engström & Levander 2011). To break up boundaries in the organization increased the ability to innovate, because knowledge-flows were created which facilitated learning, feedback mechanisms and coherence within the firm. To flatten the hierarchy allowed employees to think, act and develop ideas by themselves with a greater autonomy and to actively seek solutions inside and outside of the company. An active search for 'best-practice' through individual process combined with follows-ups and knowledge sharing led to increased productivity and several process innovations spun out of this.

Much like the example above, Cream have a culture of knowledge seeking and sharing. The team actively search for projects to develop their skills and clients and partners willing to work on innovation. They also actively search for inspiration and learnings from outside the industry and academia. However, for small companies such as Cream, where the entire team can work on the same project, knowledge flows easily. Yet, when ramping up, they have encountered the difficulties of maintaining knowledge flows among the team. When bringing on their first employee, the need for a structure, as previously discussed, became evident. Something that is now under development. However, as shown by the supplier company, and supported by Blayse and Manley (2004), when employing a critical mass of technical capabilities, the leverage of that capacity through increased absorptive capacity can have a large positive effect on innovation.

5.3.1 Knowledge/Innovation Brokerage

Yet another input into the strategic consideration to focus on education and knowledge-flows, is the one of taking the position as an innovation-broker. Innovation brokers disseminate knowledge, and this way knowledge can flow from actors outside the core network, or even from other industries, to firms who otherwise would not be aware (Blayse & Manley 2004). Cream's recent connections to academia and active focus on new materials and solutions from inside and outside of the industry together with their strategy to educate customers and project participants makes them carry strong resemblance to that of a knowledge or innovation broker. Their profile and focus means that they attract clients and actively seek out project that allows them to take an active role in working with new and/or environmentally friendly solutions. Their strategy and plans are to develop this role further through capturing more of a leading role in projects, primarily through the role of project coordinators or project managers, which will allow for more control and bigger influence over projects. But also through creating events and lectures that will spread knowledge about the firm and the themes

and topics that they focus on and contribute to their network development as well as attracting suitable partners and clients and increase knowledge in their business environment.

5.4 Procurement

The construction industry has a strong focus on price in the procurement process (Hardie 2010; Engström & Levander 2011). In an industry where the product is simple and tantamount to its substitute, price is the only means of competition. Yet, in industries where the product is complex and quality and price is difficult to discern, a strong focus on initial cost is problematic (Lind 2011). Such focus limits incentives for firms to innovate in general (Hardie 2010), it promotes short-term profit maximizing behavior since it does not allow for long-term mutual value propositions when forthcoming deals are not predicated upon the quality delivered, but the lowest price offered (Lind 2011). Something that Johansson (Johansson 2017, personal communication, 20 April; 19 May) agrees to be true. Cream therefore make important distinctions for each client and each task. When the procurement is strict and does not allow for flexibility, they sometimes does not submit an offer. When negotiating directly with the client, they have a clear goal of providing suggestions in-line with their profile. Nevertheless, they have a pragmatic approach where they allow themselves to follow a more traditional approach if the client does not respond to new ideas and solutions.

Engström and Levander (2011) suggests that the main risk of cost-driven focus is that clients will drive innovation dedicated to lower initial construction cost rather than providing long-term value through higher quality, lower life-cycle costs or reduced environmental impact. A focus on price therefore risks driving the development of the industry in an undesirable direction. Cream's pragmatic approach means more business for the company, yet it takes away resources that could be employed on more innovative project. One important aspect however, is, as pointed out by Stark (Johansson & Stark 2017, personal communication, 28 April), that one does not know what projects lead to what outcomes and what future project can come from working with a specific customer. Johansson (Johansson 2017, personal communication, 19 May) impression is that the architect segment has a strong focus on billable hours when selecting projects. For Cream, the current stream of projects is providing them with the same option, which is described as "convenient as well as necessary" since billing is essential to the survival of the firm and provides stability and predictability for the firm. However, the firm is also operating outside of this framework. In the early stages of the company, available hours was spent on prospective works for clients with interesting and innovative projects or with potential for long-term relationships. On a trust-basis, the firm then provided exploratory project drawings and planning's on the possibility of future project returns and increased business, rather than secure payments upfront. This is something that Johansson holds as a potential way of developing business in the future, in order to reach a more influential role within the project, potentially in the role of project manager, which would increase their ability and the number of opportunities to be innovative.

5.4.1 Risk

Second to costs, risk avoidance is a preliminary concern in procurement proceedings. Risk is often transferred down the contractual chain, leaving many of the small actors carrying an unproportioned risk load, both financially and work environmentally connected (Blayse & Manley 2004). The reliance on contracts with mechanisms for blame shifting reduces trust, and thereby knowledge flows among actors, which is conducive for innovation and especially detrimental to small businesses (Blayse & Manley 2004). Contrary, as risk is more proportionally distributed and the scope for all parties to capture benefits increases, so does incentives for innovation (Blayse & Manley 2004). The current role of Cream, means that their risk in each project is limited. Most work is predicated upon billable hours, ruled by clear contracts. Johansson (Johansson 2017, personal communication, 19 May) sees a clearer risk for contractors, especially smaller ones, which he suspects, adds to their conservatism.

5.4.2 Trust

Results from a study performed by Vennstrom (2011) indicated that the form of contract is of less importance for the outcome of the project. The report rather emphasized the importance of client commitment to the project and the compatibility of the actors involved. Which is in line with the Blayse and Manley (2004) perspective of the well-integrated team, as the key to push innovation. Projects that employ too many players or poorly matched ones, can cause uncertainty within the project and thereby hamper long-term development (Vennstrom 2011). A clear example of this is given by Grufvisare (Grufvisare 2017, personal communication, 22 April) when he describes their liberation from the focus on initial cost, through the establishment of inter-firm trust. He argues that once they have proven their dependability and quality to the customer, the trust and recognition of additional values outside of low costs allows them to focus on mutual benefits and value over the whole process. This includes logistical solutions, flexibility in production and very low numbers of product errors. Johansson (Johansson 2017, personal communication, 19 May) support this view, that the main enabler for partnering and effective team work is trust and mutual goal alignment. For the firms operating in their business environment, structured partnerships in the form of framework agreements or joint ventures are very limited. Cream is therefore evaluating clients on the basis of mutual goal alignment in order to discern whether there is a basis for trust in the relationship. Once alignment is secured the firm can operate more productively.

5.4.3 Knowledge

In construction procurement, the scope of the experience and knowledge of the client is broad. Vennstrom's study (2011) highlighted the need for a well-informed client. Several authors also support the importance of a demanding client to drive innovation in construction projects (Hardie 2010, Engström & Levander 2011), which is supported by both Johansson and Stark (Johansson & Stark 2017, personal communication, 28 April). Clients have a strong tendency to rely on tested and proven methods and often times a less experienced client hires the team, not based on what is best suited for the project, but according to the common principle. Cream emphasizes the knowledge, or at least engagement, of the client as a determining factor for

innovative projects and to allow for new solutions to be found. When the client is set on a solution, it is often very difficult to impact them (Stark & Johansson 2017, personal communication, 28 April). The importance of the client to drive or, at least, show interest and willingness to explore innovation, is highlighted by Cream. When interest and willingness exist, it is possible to educate the client, which is a clear tactic used by Cream. This is why Cream attempts to seek a more central role in procurement. In early stages, they make sure to test the project participants knowledge and drivers to see if there are possibilities and openness to working with their methods and when given the chance, they use these occasions to educate the project firms (Johansson 2017, personal communication, 19 May).

5.4.4 Partnering

Ekeskär (2016) conclude that the positive effect of partnering on innovation are well established in the literature. The general upsides include reduced project times and costs, improved quality and increased productivity. Partnering often contributes to increased innovation, interorganizational knowledge flows and willingness to adopt less conventional solutions as well as create a more conducive environment for new knowledge and approaches to be conceived. Yet it is important to stress that partnering is not beneficial when projects are simple and uncomplicated (Ekeskär 2016). At this point, Cream has not yet made any real attempts at partnering (Johansson & Stark 2017, personal communication, 28 April). Much like the traditional structure of the industry, they have often been employed by a larger firm, as a subcontractor or consultant, responsible for small parts of larger projects. This allows for very little flexibility, yet it provides the firm with important time on projects and revenues to support their existence. However, the firm is in negotiations with a partner firm from another city that will potentially increase deal flows and provide important validity and credibility to the firm. This would be a closer partnership and will most likely take the form of a joint venture or a merger.

Gann and Salter (2000) argue that deal structuring skills and knowledge are important factors in a project-based industry such as construction. In order to be a skilled deal maker, detailed knowledge about the dynamics of once counterpart's supply chain and organization are often required. Deal structuring should be aimed at reaching mutual benefit and win-win situations (Förhandlingspodden. 2016a; 2016b). Blayse and Manley (2004) contend that the use of innovative and non-standard procurement systems that promote cooperative problem solving, potentially through partnering or alliances, can serve to promote innovation. They also suggest contracts and measures that distributes risks more uniformly or proportionally. Procurement based on relationships, strong teams and long-term value have a strong tendency to produce better outcomes and more innovative solutions (Blayse & Manley 2004; Hardie 2010). It is therefore highly important for the innovative capacity of the industry to structure construction procurements that promotes and facilitate project partnering. Cream have therefore tested deals with a longer-term focus, rather than short-term profit focus. Their way of building relationships through taking on upfront risks, to share with clients, thereby provides opportunities to shape trusting relationships early on, where they can gain partners and projects where they can acquire a more central role. This in turn, will enable them to have

larger control and influence in the future. This way of giving trust and sharing risk is relatively uncommon in the Swedish market, according to Johansson (Johansson 2017, personal communication, 19 May). Such an approach carries clear resemblance to the arguments put forward by Blayse and Manley (2004) and Hardie (2010) and should thereby serve to create a better opportunity for innovation for Cream.

6. Conclusion

Through literature reviews and empiric data collection from interviews, we have sought to answer 'How strategic considerations can aid small and newly formed entrepreneurial firms' ability to innovate in the Swedish construction industry?'

6.1 General Conclusion

In this paper, we have discussed what factors that drive and hinder construction innovation. It is clear that the construction industry holds a unique position in society and in part, therefore maintains certain characteristics that separate it from all other industries. Nevertheless, an attitudinal conservatism and unwillingness to change or take risks also creates barriers to innovation. Biases caused by lack of information and long-term uncertainty further hampers dissemination of new solutions as well as a blame-shifting and untrusting nature of project procurement create substantial hinders to innovation. In addition, the structure of production is not unique to construction, yet it does have a great impact on a single firm's ability to introduce innovation and new methods, since it most often requires buy-in by a large number of actors within the project, which causes biases and conservative attitudes to have a deeper impact on firms' willingness and ability to innovate within the industry. A small firm operating within such a framework cannot be expected to lead change, however - through the development of a learning organization that can capture project acquired knowledge and where knowledge flows freely within as well around the firm. A firm that develops a cooperative and networking nature with mutual value creation as a guide and applies a focus on out-of-industry innovation adaptation - small firms can create an organization and an environment that is more conducive to innovation. With the power of numbers, even a small change on the firm level can make a big impact on wider Swedish construction market as a whole.

6.2 Action Plan for Small Firm Innovation

Throughout the paper, a search for innovation drivers and factors conducive to firm development and competitiveness on the Swedish construction market have been sought. A broad market description and analysis through a stakeholder framework has also been provided to describe the environment where the firms operate. Findings have been attempted to be referenced and contrasted to a newly founded case firm, profiled towards innovative solutions. Through an analysis of market and industry characteristics and distillation of relevant theory findings applicable to the case firm, a set of recommendations for

strengthening the future innovative capacity of small firms in the construction industry is presented.

- Network Development
- Build Dynamic Organizational Capabilities
- Scale Knowledge-flows
- Procurement Partnering
- Impact through Knowledge Brokerage

6.1.1 Network Development

Network development is a key consideration for successful innovation. With the nature of the fragmented industry, successful innovation requires efficient collaboration. For newly founded firms, credibility must be established in order to gain trust and establish network connections. As shown by the case firm, a data driven approach can help bring credibility in absence of experience. A focus on deeper integration with outside actors possessing complementary technical abilities of strategic relevance to focus areas would allow the company to more easily adopt and implement ideas from other industries as well as better manage innovative projects and solutions.

6.1.2 Build Dynamic Organizational Capabilities

The essence of successfully developing innovation is to deal with uncertainty and to build new knowledge. Building an organization that can make better informed decisions and to create new knowledge from gathered information requires a highly skilled personnel and systems to reinforce and spread relevant knowledge and acquire and process new information. Absorptive capacity is built through a combination of prior knowledge and technical ability. To follow-up on key learnings in all projects makes the firm able to know what experiences and learnings the company have accumulated and what capabilities they have and what they need to bring in.

6.1.3 Scale Knowledge-flows

For a knowledge-intensive consultancy firm, knowledge is everything. In order to maintain, build and develop that knowledge, knowledge needs to be accumulated through projects, contacts, education and observing other industries. In order to avoid relying on individual actions, codification of knowledge and learning must be built into the process of daily activities. By creating structures and incentives for knowledge sharing, collecting and processing rich information and to efficiently bring in outside expertise, a learning organization can be built. Project briefings, expert domains, conferences, scheduled experimentation times, built-in experiments into live projects etc. are ways to seek to build a learning organization.

6.1.4 Procurement Partnering

As a small firm, price focus and blame-shifting are market mechanism that are difficult to change. A data driven approach to client discussions is a clear way of providing rich

information alleviating client reliance on biases and heuristics. In addition, emphasis should be put on providing value through well integrated teams with mutual driving forces and establishing mutual connections with client to ensure successful projects.

6.1.5 Impact through Knowledge Brokerage

Collaboration and information sharing are key for small construction firms' ability to be innovative. Through an active effort to share knowledge and create value for other firms, the company can gain credibility and trust as well as gaining a central role in subject related networks, which allows for increased chances of future collaboration as well as better access to complementing expertise knowledge to facilitate future innovation.

6.2 Future Research

A suggestion is to further investigate the research topic, but instead focus on small firms with lower academic skill-base, thereby creating a more holistic view of small firm construction innovation within the Swedish market.

Another suggestion is to further examine how conservatism is expressed and how this can act as a hindering factor affecting innovation in the industry, and to study the phenomenon from different stakeholder or sectoral perspectives. Conservatism within the industry is a complex and intangible phenomenon, not yet fully explained. Incentives to conservatism are changing with each stakeholder, and to map out why and how conservatism affect innovation at the level of each and every stakeholder, might lead to findings about how to tackle conservatism on an aggregated level within the industry.

Yet another suggestion for future research, is to study how dynamic organizational capabilities for innovation, best are developed in small firms. The importance of such capabilities cannot be overstated, but a gap of understanding exists in how these capabilities best are developed in small firms within the construction industry. To broaden the knowledge on this research topic might spur small firm innovation within the construction industry, thereby increase the overall performance of the industry.

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