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Supplier Based Innovation  

Collaborative methods to promote innovative products in the construction industry  

MAXIMILIAN SCHROEDER AND SOFIE BÖRJESSON
Master of Science Thesis

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Abstract

Initial observation shows that there is a knowledge gap between the demand of the end customers and the supply of material and products provided by suppliers. The culprit manifests in the nature of the construction industry, seen as conservative and not prone to innovation combined with lackluster incentives between the contractor and supplier through framework agreements. Collaboration is not developed, presented through the fact that each actor relies on each other to gain information on sought after products and material. The research aims to present how supplier-based innovation can promote the development of new products and materials that are of value to the end customer. This is done by conducting a case study within a general contractor and interviewing suppliers, purchasers, and end customers to understand how collaboration could be a first step to create an ecosystem in which new products and materials are developed. The results show that collaborative product development would be suitable in certain instances, such as with a general contractor with an own developing unit in collaboration with a preferred supplier or framework supplier.
Acknowledgement

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Sammanfattning

Inledande observation visar att det finns ett kunskapsgap mellan efterfrågan från slutkunderna och utbudet av material och produkter från leverantörer. Boven visar sig i byggbranschens karaktär, sedd som konservativ och inte benägen till innovation i kombination med svaga incitament mellan entreprenör och leverantör genom ramavtal. Samverkan utvecklas inte, detta kan observeras genom att varje aktör förlitar sig på varandra för att få information om eftertraktade produkter och material. Forskningen syftar till att presentera hur leverantörsbaserad innovation kan främja utvecklingen av nya produkter och material som är av värde för slutkunden. Detta görs genom att genomföra en fallstudie inom en byggentreprenör och intervjuar leverantörer, inköpare och slutkunder för att förstå hur samarbeten kan vara ett första steg för att skapa ett ekosystem där nya produkter och material utvecklas. Resultaten visar att samverkande produktutveckling skulle vara lämplig i vissa fall, till exempel med en byggentreprenör med en egen utvecklingsenhet i samarbete med en föredragen leverantör eller ramleverantör.
Förord


Först vill vi tacka alla inblandade deltagare i projektet. Detta omfattar naturligtvis alla intervjunpersoner som gett oss stor insikt och kunskap inom detta fält. För det andra vill vi tacka våra handledare, både hos byggentreprenören och hos KTH, Agnieszka Zalejska Jonsson, för att ha guidat oss genom denna resa och försett oss med mycket uppskattad uppmuntran, råd och tankar.

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1. Introduction

This chapter aims to introduce the reader to the thesis. Background covering explored topics will be presented. Research problem, the aim with the thesis as well as the research questions will be covered.

1.1 Background

In order to increase the ability to work with innovation within new product development, it is increasingly more common for companies to partner with suppliers. Supplier innovation work intends to rethink incentives, relationships, and management. It allows the firm to extract knowledge and competence which is not obtained in-house. To this end, supplier innovation creates new business opportunities, and by working closely with the suppliers from the initial stage of the project it is possible to create new opportunities through cost efficiency which can reduce the total cost of a project (Göbwein et al., 2019).

Importance of innovation within new product development

Innovation can be seen as a strategic long-term topic for the firms to be able to participate in a competitive market (Teece et al., 1997). However, it is argued that companies do not innovate by themselves but rather, innovation is often made possible through networks. This idea is further supported by the open innovation paradigm which promotes innovation efforts by accessing external resources (i.e., knowledge, technology, workforce) which the focal firm may lack (Patrucco et al. 2017).

Further building upon the benefits of continuous innovation, including development and improvement of new products, it is crucial for firms to be able to remain competitive and have a global reach in the market (Kumar et al., 2015). The innovative competence can be seen as necessary to remain competitive and even gain a sustainable advantage in the market (Patrucco et al. 2017; Lintukangas et al. 2013). In the context of the open innovation strategy, the ability to acquire knowledge and capability from the external environment (i.e., “absorptive capacity”) becomes crucial. Absorptive capacity can be defined as “a firm’s ability to value, assimilate and utilize external knowledge” (Cohen and Levinthal, 1990; Stock et al., 2001; Tu et al., 2006). This knowledge-transfer process is largely determined by the qualities and characteristics of human resources (Von Hippel, 1988; Cohen and Levinthal, 1990).

Involvement of the supplier

To achieve innovative success within firms, the competencies and resources of the suppliers should be highly valued and by working closely and sharing competence with the supplier it is possible to reach innovative ideas and goals (Yan et al., 2017). The features of including the suppliers have many beneficial aspects and have been proven to be connected to improvements within performance, sharing of knowledge, gaining access to the technology of the supplier, shortening of development times, more qualitative projects, and lower costs.

Today, the suppliers are involved to a much greater extent due to all the advantages within
innovation (Potter and Paulraj, 2019). Studies within the field have also underlined the importance of working with several suppliers continuously through all the phases of a project (Ates et al., 2015). This includes the design, development, and production phase. It is against this background that suppliers are considered as one of the strongest sources of innovation (Henke Jr and Zhang, 2010; Möller and Törrönen, 2003; Tether, 2002). Moreover, it is argued that sustainability is a driver of innovativeness (Nidumolu et al., 2009), and the sustainability of a firm is driven especially by adopting green and ethical practices in the management of collaborative supplier relationships (Tate et al., 2010).

Supplier involvement concerns the integration of the capabilities of suppliers. To be able to accelerate and achieve innovation, it becomes more and more common with increased collaboration with the suppliers (Servajean-Hilst and Calavi, 2018). The major innovative possibilities lie beyond the capabilities and resources of the firms, but by involving the expertise from the suppliers, at an early stage in new product development, successful results can be achieved. For a company striving for achieving innovation, the involvement of the suppliers at an early stage of the product development brings several positive benefits (Kumar et al., 2015). Among those are cost reduction, improved quality, reduced development times etc. It also seems to reduce possible risks of the process of innovation at the initial stage. The collaborative relation between the buyer and supplier in supply management does have a great impact on the performance of a firm innovationally (Lintukangas et al., 2016). It can be stated that the innovative capability of a firm has its major base in the innovative ideas of the suppliers.

Due to Servajean-Hilst and Calavi (2018) the purchasing function plays a significant role in involving the suppliers in an early stage. The suppliers continuously work with and adopt their innovative work to track the changes in the market (Kumar et al., 2015). In addition, the important role of the suppliers within product innovation also refers to the significant impact on the performance and success of the supply chain. Advantages that come with this is that the product development time becomes reduced and possible problems in the innovation process can be identified beforehand. This due to the availability of technology knowledge is increased by involving the suppliers at an early stage.

The role of purchasing
Throughout the years purchasing has been used as a tactical support function with the main purpose to reduce costs (Ates and Memis, 2021). As collaboration and sharing competence between firms today is becoming more common, purchasing is now becoming more strategic and takes a more prominent role within the strategic plan of the firms today (Ates and Memis, 2021; Carr and Smeltzer, 1997; Castaldi et al., 2011). For a firm to be able to contribute with competitive advantage, the purchasing function today must be strategic. Carr and Smeltzer (1997) defines strategic purchasing as “The process of planning, implementing, evaluating and controlling strategic and operating purchasing decisions for directing all activities of the purchasing function toward opportunities consistent with the firm's capabilities to achieve its long-term goals.” Strategic purchasing implies a more open, collaborative, and long-term relationship with the suppliers. The suppliers then tend to become more involved in the
business and the problem-solving becomes joint (Patrucco et al., 2017). Strategic purchasing can be explained by the purchasing function being linked to the strategic planning process (Carr and Smeltzer, 1997).

The function of purchasing within firms plays a key role when linking external suppliers and internal organizational customers to create and deliver value to external customers (Novack and Simco, 1991). The importance of the collaboration with the suppliers within innovation and new product development is impossible to dismiss. Companies do not tend to innovate by themselves (Patrucco et al. 2015), internal constraints within the firms stops innovation from being possible to achieve by themselves (Kim et al., 2015). To achieve innovation, collaboration with the suppliers is crucial. But collaboration with the suppliers seems to not be very easy to implement. Therefore, the purchasing function plays an important role within even making the collaboration possible through its linking ability.

**Supply management**

Within firm performance, one significantly important factor has been shown to be supply management (Lintukangas et al., 2016). Strategic supply management does have a big impact on a firm's competitiveness and business performance, in fact Yeung (2008) found that strategic supply management is highly correlated with a firm's competitive advantage and business performance. In general, it has been stated that companies benefitting their network and having open behavior in their search for innovations are likely to have greater innovative performance (Laursen and Salter, 2006).

As supply networks gained importance due to an increase of purchases in general, the knowledge of the purchasing department and competence of the buyer has become crucial (Gadde and Håkansson, 1994). Three fundamental factors have been identified regarding supply management capabilities: fostering close working relationships with a limited number of suppliers, promoting open collaboration among supply chain partners, and achieving long term strategic orientation to achieve mutual goals (Chen et al. 2004). These factors have been thought to be of particular importance in the context of new product development (Di Benedetto et al, 2008). The arguments that adequately skilled human resources and the greater the skills and abilities of purchasing professionals, the more effective will be the process of supplier involvement and collaboration (Wynstra et al, 2003; Handfield and Ragatz, 1999).

1.2 Research problem

Innovation is important for firms to gain and retain a competitive advantage in the market. To achieve innovation within product development, involvement and collaboration with suppliers is necessary since companies do not tend to innovate by themselves. As Lintukangas et al. (2016) state, the innovative capability of a firm mainly depends on the innovative ideas of the supplier. Considering previous studies, several issues remain open. Past studies are not fully consistent on the implications of supplier collaboration with regard to innovation performance. Moreover, a wide analysis of the simultaneous effect of supplier
collaboration and purchasing capabilities within firms is still missing (Patruccio et al. 2015). Finally, there is the absence of studies focusing on the innovation effects between supplier and purchasing on the end customer. End customer being the entity that initiates the project.

1.2.1 Aim

The aim of this thesis is to investigate how to make use of supplier based innovation. To get a better understanding of the effect of supplier based innovation within a construction company contracting projects, but also to analyze the effect on the end customer. The study is limited to commercial buildings and the focus is on innovation within current framework agreements. The study is conducted as a case study.

1.2.2 Research questions

The overarching question this thesis aims to answer is:
How does supplier based innovation affect the market value of buildings for the end customer?

- Do current framework agreements between purchasing and suppliers promote innovation with regard to new product development?
- When is the general framework for successful collaboration proposed by Littler et al (1995) suitable to use within the construction industry?
2. Literature review

This chapter extends the background and presents previous research from earlier studies to give the reader a deeper understanding of the subject. The chapter consists of four parts: definitions, supplier collaboration practices that may affect innovation, purchasing function for supplier innovation, and involvement of purchasing with regard to new product development.

2.1 Definitions

2.1.1 Purchasing

The process of purchasing and it’s cycle implies the translation and formulation of a desired outcome into a specification (Murray, 2008). When looking at product development linked to purchasing, purchasing integration can be seen as equivalent to managing the supplier involvement in the new product development project. It is not common to pay attention to long-term strategic collaboration in this case (Wynstra et al., 2003). There are mainly three different roles of the goal of purchasing within product development plays. The three are the rationalization role which concerns the firm's competitive strength through minimizing production costs, logistics costs etc, a structure role which is about handling the firm’s supplier network (as purchasing can influence the structure of supplier network) and a development role which concerns the systematically technological development with the development of suppliers and the supplier network.

Sarin et al (2003) stated that bundling strategies are used due to the fact that they provide benefits for both suppliers and buyers. One benefit of such integration is the process of bringing together potentially diverse products and services which may create value (Epp and Price, 2011). This value may be realized through monetary savings, increased convenience and reduced compatibility risks (Harris and Blair, 2012; Sarin et al., 2003).

2.1.2 Procurement

The procurement process is defined in the National Procurement Strategy as the process of obtaining goods, works and services and involves both acquisition from third parties and from in-house providers (Murray, 2008). The process of procurement approaches the whole cycle which starts at identifying needs throughout until the end of the contracts of services or until the end of the useful life of the asset.

The difference between the process of purchasing and the process of procurement may be explained by that the procurement process involves the decision of “make or buy” while the process of purchasing does not (Murray, 2008). The “make or buy” decision that is included in the procurement precedes the purchasing cycle. The procurement process may be difficult to define due to its complexity, but it plays a very important role within creating a competitive advantage for a firm. By an advantageous procurement process it is possible to
link the suppliers in the supply chain and to manage and assure the quality of the suppliers in the chain (Novack and Simco, 1991). Depending on the circumstances, procurement can be defined differently, in a more narrow sense or a wider sense. In a narrow sense it can be explained as the process of buying goods and services for a firm, but in a wider sense it can be understood as the process of obtaining goods and services for a firm. Overall, Novack and Simco (1991) explains that procurement consists of all those activities necessary to acquire goods and services consistent with user requirements.

2.1.3 Innovation
First and foremost, it is important to differentiate between invention and innovation. Invention is defined as “something that has never been made before, or the process of creating something that has never been made before” (Cambridge Dictionary, 2022), whereas innovation has been defined as “the generation, acceptance and implementation of new ideas, processes, products or services” (Thompson’s, 1965). An innovation is not required to be something completely new. In fact, even though a new idea may seem like an imitation or a different application of an old idea, it has been argued that it remains an innovation all the same for “as long as the idea is perceived as new to the people involved” (Van de Ven, 1986). Furthermore, innovation can be divided into process and product innovation and can be applied to any industry. Process innovations offer a new or significantly improved delivery method whereas a product innovation is a product that is new or significantly improved (Organization for Economic Co-operation and Development, 2022). When defining innovation on the firm level, one could describe it as the process of introducing new ideas to the firm which result in increased performance (Roger, 1998). It therefore mainly revolves around the perceived market advantage in which innovation benefits the firm.

In the construction industry innovation has been linked to new ideas, activities, or changes in routines in the different fields of processes, products, materials, forms of organization and markets (Bygballe and Ingemansson, 2014). Furthermore, others have pointed out that innovations related to design or product innovations rarely are categorized as innovations within construction (Winch, 2003). One prominent figure within the innovation research in construction is Sarah E Slaughter. She defines innovation as a “non-trivial improvement in a product, process or system that is actually used, and which is novel to the company developing or using it (Slaughter, 2000)”.

2.1.4 Collaborative product development
There are multiple definitions of collaborative product development. Examples are:

1) Collaborative product development (CPD) is ‘any activity where two (or more) partners contribute differential resources and know how to agree complementary aims in order to design and develop a new or improved product’ (Dodgson 1993).

2) Cooperative relationship between firms aimed at innovation and the development of new products (Lawton-Smith et al., 1991).
New literature has addressed the fact that collaborative product development and participation in collaborative networks of firms is assumed to bring value to the involved entities. The value is mainly attributed to an increase in the “survival capability” in uncertain market conditions as well as greater possibility of achieving common goals (Camarinha-Mato and Abreu, 2007). Other benefits include access to new skills, reduced time to market, innovation, expanding the market (Büyüközkan & Arsenian, 2012).

However, collaborative product development is not without risks. Most prominently the major risks associated with CPD are leakage of a firm's skills, experience and knowledge that may form the basis of its competitiveness and additional financial and time costs incurred in managing the collaboration (Parker, 2000). These risks can be mitigated as much as possible through a number of success factors that have been identified throughout the years. These are mainly: Trust (Barnes et al. 2006) and communication and partner selection as well as good preparation (Littler, 1995).

2.1.5 Supply management

Supply management can be defined as building and managing the relationship between buyer and supplier (Chen et al. 2004.). Mentzer et al. (2011) suggest dividing the definition into three different categories, which are management philosophy, implementation of a management philosophy and a set of management processes. Mentzer et al. (2011) defines supply chain management as “the systematic, strategic coordination of the traditional business functions within a particular company and across businesses within the supply chain, for the purposes of improving long-term performance of the individual companies and the supply chain as a whole”.

2.2 Supplier collaboration practices that may affect innovation

A number of studies have been conducted which focus on the effects of supplier collaboration practice. For instance, Lintukangas et al (2017) conducted a study in which the authors hypothesized that supplier collaboration practices in four specific areas would lead to higher innovation performance for the focal firm. These areas are: green and ethical supply management, early supplier involvement, systemic purchasing and inter-firm learning. The results showed that two examined practices positively attributed to higher innovation within the focal firm. These two are: Green and ethical supply management and systemic purchasing.

Previous studies have also shown that green supply management practices do have an effect on firm performance. Zhu et al (2007) stated that the implementation of green supply management practices varies by industry, but regardless of implementation levels, a higher level of green supply management was associated with better performance outcomes. Furthermore, Bowen et al (2001) stated that no connection between short-term implementation of green supply management and firm performance was found, however, he
noted that proactively promoting a green supply approach can prepare firms for stronger long-term performance.

When it comes to systemic purchasing, Lintukangas et al (2017) argue that superior innovation performance is gained through engaging in collaboration with the systems-providing supplier, which in turn could lead to improvements in the processes of the focal firm. Furthermore, it is argued that the modular structure of systemic and bundled supply could help bring new products and services to the market quicker.

Interestingly, early supplier involvement was not attributed to higher innovation performance. There have been a number of studies showing possible benefits of early supplier involvement. For example, Bidault et al (1998) state that early supplier involvement is more common to take place within a collaborative relationship, rather than a more formal arms-length relationship, thus creating more opportunities of innovation between the supplier and purchaser. Moreover, Schiele (2006) argues that suppliers play a crucial role for the innovativeness of a firm and thus it can be interpreted that having close collaboration with suppliers naturally has innovation benefits.

Lintukangas et al (2017) state that a possible explanation of why early supplier involvement was not associated with stronger innovation performance in their study is due how innovation was measured in the study. The study only focuses on the focal firms own ability to innovate whereas early supplier involvement is significantly thought to contribute to new product development (Möller et al., 2005; Schiele, 2006). The same argument is presented for inter-firm learning.

2.3 Purchasing function for supplier innovation

Earlier studies show that the suppliers and their knowledge play a crucial role within innovation and new product development. Previous research by Cousins (2005) states that purchasing is a value-adding process that is seen as strategic to the firm. Paulraj et al. (2006) state that the purchasing role has shown a positive relationship with an improved supplier involvement, a two-way communication between buyers and suppliers and long-term relationships.

To be able to manage the suppliers and carry out the innovative work, the purchasing function plays an important role (Wynstra et al., 2003). Rosell et al. (2011) carried out a study exploring the effect of the purchasing function in relation to a successful innovation performance. The result of the study shows and confirms that purchasing capabilities are important to actualize supplier innovation. Mainly the study confirms three different hypotheses regarding purchasing capabilities for supplier innovation. First, a positive relationship can be seen between purchasing capabilities and a high degree of innovation in products from suppliers. Secondly, the effects of innovation become reduced by a strategic focus on innovation. At last, purchasing capabilities have a significant effect on supplier innovation for strategic products. Especially, the results show that the purchasing capabilities plays a major role within collaborative development of strategic products. The purchasing
function adds to the quality and cost of products, but purchasing does also contribute to innovation within product development. The study of Rosell et al. (2011) concludes that firms striving for innovation need to strengthen their capabilities and within new product development, they need to review the role of purchasing.

Patrucco et al (2017) further expands on purchasing capabilities and knowledge. In their study they present the term absorptive capacity, which can be defined as “a firm’s ability to value, assimilate and utilize external knowledge” (Patrucco et al., 2017). They argue that for the firm to gain new knowledge, specific expertise is required within that specific field to allow for the knowledge-transfer process to take place inter-firm. Absorptive capacity is largely dependent on the characteristics and quality of human resources. Generally, according to Patrucco et al, 2017, it can be related to the following aspects:

- The level of general knowledge, meaning an employee's formal education
- the level of firm-specific knowledge, meaning employees work experience
- the organizational setting, assuming that the firm's absorptive capacity is not solely the sum of the absorptive capacities of its employees but also influenced by the organizational structure
- The level of internal knowledge-sharing and cross-functional integration
- The type of relations with partners

2.4 Involvement of purchasing with regard to new product development

The benefits of involving suppliers early on in the production of new parts have been understood for a long time. In fact, Clark (1989) presented results that stated that the reason behind Japanese automobile manufacturers' advantage over American or European counterparts was due to the close collaboration with suppliers. Advantages presented in that study refers to shorter lead-time and cost savings. Since then, it has been argued that involving suppliers early on with regard to new product development has almost become an industry standard (Johnsen, 2009). Nowadays, the main reported benefit of involving suppliers early on in new product development is due to the innovation possibilities it entails (Koufteros et al. 2007).

When looking at the question of how to establish successful collaborations between buying and supplying firms, a key player is seen in the professional within the purchasing department within a firm (Schiele et al, 2020). Purchasing knowledge has been identified as a strong influence for supplier integration success and at a later stage, innovation (Luzzini et al, 2015). Against this backdrop, it is central to study the effects of purchasing integration with regard to new product development (Schiele et al, 2020). Schiele et al (2020) further expanded on this background and formed a hypothesis that the participation of professional purchasing agents early on in the supplier integration process plays a decisive role to distinguish successful projects. The results showed that early supplier management integration was positively associated with firm success. They also noted that it was especially
important that the purchasing professional be sufficiently knowledgeable and competent in the field, otherwise negative effects such as negative effects on cost, time to market, and efficiency (Littler et al. 1998). When it comes to firms that successfully integrated their purchasing department with new product development processes, the authors identified four measures those firms applied: top management support, structural differentiation, explicit processes and a collaborative corporate culture (Schiele, 2020).
3. Theoretical Framework

In this chapter the theoretical models will be presented. These act as the foundation and will be compared to the empirical data that is collected.

3.1 Model for implementing innovation in the construction industry

Slaughters' model for implementing innovation consists of six different stages, as shown in figure 1. It is based on Marquis' general model for implementing innovation (Slaughter, 2000), but has been modified to fit the construction industry as the model may not entirely encompass all the complex iterations inherent to the construction industry.

These stages contain different tools and aspects considered to be important when implementing innovation, whether it is project-based or firm-based. As this thesis focuses on the general implementation of innovation, especially with regard to new product development, the general model proposed by Slaughter is applicable.

During identification the specification of the objectives of the project and/or organization are identified as well as the identification of potential alternatives (Slaughter, 2000). When
examining innovations, it has been found that the innovations can originate from anywhere in the value chain, meaning innovation can come from a number of different sources. However, according to Slaughter (2000) the most frequent sources of construction innovations have in previous years been known to be manufacturers and suppliers. The purpose and the desired outcome of the evaluation stage is to compare the options in terms of how well they could potentially achieve the different aspects of the project’s objectives. The commitment of the organization is often recognized by the invested resources to develop and implement the innovation (Tatum, 1987). The resources invested in the innovation can be in the form of financial, personnel, equipment, and material resources. The main objectives of the preparation stage are to obtain the different resources needed and to inform and educate the personnel that will be directly affected by the implementation of the innovation. Any modifications discovered to be needed in order to acquire the true objectives of the innovation in the project are usually done during the use stage. Due to the ever-changing project teams, it is important to directly evaluate the projects implemented innovation to learn as much about its effects, how it was actually working in the project and what aspects need improvement. It is important to gather this information quickly for it to be as true as possible (Slaughter, 2000).

3.2 Model for successful application of collaborative product development

Littler et al (1995) have after extensive literature review been able to identify factors which are argued to be imperative for successful collaborative development. These factors and in the order in which they are to be implemented can be seen in figure 2. So as to inform the reader of the width of these factors, they will be presented more in depth. The framework is regarded as the innovation and thus is related to the model by Slaughter in the sense that the identification and evaluation stage has already been conducted and this framework would be applied in the commitment stage.

\[ \text{Figure 2: General framework (Based on the general framework by Littler et al (1995)).} \]

The first stage of the framework is setting up the collaboration. This consists of a number of important parts, the first one being selecting the supplier with the right capabilities. This is one of the most important aspects in order to achieve a successful collaborative product development seeing how this is about meeting the demand of both the supplier and customer. Previous experience is a factor of great importance, as a supplier that has been involved in earlier successful collaborations is easier to trust and may provide a sense of security for the involved parties. After the first crucial aspect, another factor to take into account is the timing of supplier involvement. The supplier can be involved in different stages of new product
development; however, it has been shown that early supplier involvement (ESI) increases the effectiveness of the project (Petersen et al, 2005).

Furthermore, responsibilities and accountabilities are two aspects of great importance. These two relate to separate categories of supplier involvement, naturally depending on the degree of involvement from the supplier. Specification of clear goals is also a part of this first stage. This aspect can be divided into two distinct parts: technical goals and business goals. Technical goals can be understood as goals that aim to improve the product development. Business goals refer to goals and trade-offs in cost, quality, and scheduling.

The last important aspect of the first stage is that of the establishment of “limits” in terms of information to be shared. This relates to the risk of leakage of information and knowledge within collaborative product development. Therefore, it is important to limit the knowledge, skill-sharing etc. between the partners.

The second stage of the framework relates to the allocation of resources. This stage can be divided into two distinct, important parts. The first one relates to sufficient staff resources. Sufficient staff resources refer to the division of the organization into a structure of competencies. Sufficient financial resources, however, means that for a project to have financial stability, it must have a rooted management with the responsibility for the costs and the overall economic aspect of the project.

The third stage in the framework revolves around personnel involvement. Aspects that are brought up at this stage is the involvement of members as well as chemistry between involved actors. First and foremost, for a project to be led efficiently, the involvement of senior management is a requirement. An example of how the senior management role can be realized is through the installment of a steering committee. The steering committee can be defined as the project's decision makers (Tonnquist, 2010). Suitable members of this committee should be made up of employees from all the involved partners and that have suitable senior experience and competence.

Furthermore, an essential aspect for successful collaboration is good chemistry between the involved individuals. It is from this point of view the involved parties can further construct and develop the collaboration (Littler et al, 1995). One of the most vital factors of personnel chemistry in the collaboration is the ability to work together regardless of organizational culture (Trott, 2008). Also, the presence of a collaboration champion has been noted as an important success factor for a collaborative project. A collaboration champion can be defined as an individual with great enthusiasm for and commitment to the venture, who is also influential and well-placed within the partner organization (Barnes et al., 2006).

The last stage in the framework is related to that of process management. There are a number of aspects that are taken into account in this stage. Firstly, Littler et al (1995) argue that frequent monitoring of progress in the product development is essential for successful project outcome. This is supported by Tonnquist (2010) as he states that frequent follow-ups and
check-ins during the course of the project are necessary in order to make sure that the project is heading in the right direction. Another aspect to take into account is that of assessing external factors. This should be done continuously as the market and environmental changes occur faster than the ability for humans to learn something new (Tonnquist, 2010). As the market and environment is likely to change during the course of the project, it is impossible to stick to all the details planned at the start. One way to handle this issue is to divide big projects into smaller projects so as to not lock in something that is not feasible or useful to the market. It is with regard to these aspects that shows the importance to maintain project flexibility and agility (Tonnquist, 2010).

Conflicts can be defined as disagreements among the working parties about the tasks being performed, including differences in viewpoint, ideas and opinion (Kit Lam et al, 2007). Conflicts can easily occur in collaboration product development as all the involved parties, naturally, want to gain benefits or some sort of advantage from the collaboration. One way to handle this, according to Kit Lam et al (2007) is to study the conflicts which often arise in collaborative product development and from the get go plan on how to resolve these conflicts with partners.

The last important aspect that Littler et al (1995) highlights is the importance of perceived mutuality of contribution and benefits from parties that are involved in collaborative product development. Asymmetries with regard to these aspects have a high probability of leading to dissatisfaction and trust issues among the involved parties. As a consequence, this could eventually lead to the termination of the agreement and naturally the collaboration as a whole. This shows the importance of an agreement of equality between the parties, when it comes to effort put in and benefits gained from the project.
4. Methodology

This chapter provides a detailed explanation of the methodology used for this thesis. Every stage of the process has been carefully evaluated and examined to provide the best possible results from the study.

4.1 Case study within firm

The study carried out is a case study within a firm. By this, it is meant that the study is limited to one single firm. The aim of this chosen approach is to examine a specific phenomenon in real life to be able to get an increased understanding and to see how the formulation of the research question behaves in real life practices.

4.2 Data collection

To fulfill the aim of the paper and answer the research questions, a qualitative research method is used. The data needed consists of knowledge from individuals with relevant experience within the scope of the research questions. These individuals are suppliers, purchasers within a construction company working with framework agreements and end customers. By collecting data from actors with different positions within the innovation work, it is possible to gain knowledge from different actors, ranging from supplier to end customer and an understanding of the link between them is likely to be presented. The aim with the choice of actors to interview was to get as wide a range as possible. This is done by interviewing people with different experiences and backgrounds. The data is collected through semi-structured interviews. A literature study is performed to gain background knowledge and information within regard to the subject. This is done to be able to conduct well informed and prepared interviews with relevant key questions (Saunders, 2019). Keywords used to find relevant literature: Supplier based innovation, collaboration, innovation, collaborative product development, purchasing, construction. Scientific papers are mainly gathered through Google Scholar and KTH primo.

4.2.2 Interviews

The semi-structured interviews carried out in the study is a method that allows an open conversation with some guidance in order of key questions. An informal tone will be used in the interviews to allow the respondent to use personal thoughts and experiences in the answers (Longhurst, 2016). The method of semi-structured interviews makes it possible to adjust the follow-up questions accordingly to the answer of the respondent, meaning that the interview can be adapted to the competence of the respondent. By using the same key questions and themes, it is possible to use the same framework to analyze the data in a similar way. This method is preferable and usable in capturing different expertise and knowledge within the subject (Rabionet, 2011) and by using the semi-structured interviewing method, it is possible to capture knowledge from a group with different professionals within the field.
and therefore their different aspects and be able to analyze the data to seek for patterns (Barriball & While, 1993).

The interviews held for the study are shown in the table below and consist of three interviews with suppliers, eight interviews with purchasers working with framework agreements at the construction company and four interviews with customers to the construction company. It is important to emphasize that at the time of writing this report, the circumstances in the world with regard to the war in Ukraine limited the possibilities to interview suppliers due to pressured conditions between purchasers and suppliers. This is due to rising costs and supply chain issues which has put significant strain on current framework agreements between the actors.

<table>
<thead>
<tr>
<th>Actor</th>
<th>Supplier</th>
<th>Purchaser</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier 1</td>
<td>26/4 - 2022 kl. 15:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier 2</td>
<td>25/4 - 2022 kl. 10:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier 3</td>
<td>18/5 - 2022 kl. 15:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchaser 1</td>
<td></td>
<td>11/4 - 2022 kl. 10:00</td>
<td></td>
</tr>
<tr>
<td>Purchaser 2</td>
<td></td>
<td>11/4 - 2022 kl. 10:15</td>
<td></td>
</tr>
<tr>
<td>Purchaser 3</td>
<td></td>
<td>20/4 - 2022 kl. 14:00</td>
<td></td>
</tr>
<tr>
<td>Purchaser 4</td>
<td></td>
<td>21/4 - 2022 kl. 13:00</td>
<td></td>
</tr>
<tr>
<td>Purchaser 5</td>
<td></td>
<td>22/4 - 2022 kl. 10:00</td>
<td></td>
</tr>
<tr>
<td>Purchaser 6</td>
<td></td>
<td>20/4 - 2022 kl. 14:00</td>
<td></td>
</tr>
<tr>
<td>Purchaser 7</td>
<td></td>
<td>19/4 - 2022 kl. 14:00</td>
<td></td>
</tr>
<tr>
<td>Purchaser 8</td>
<td></td>
<td>20/4 - 2022 kl. 10:00</td>
<td></td>
</tr>
<tr>
<td>Customer 1</td>
<td></td>
<td></td>
<td>30/3 - 2022 kl. 13:00</td>
</tr>
<tr>
<td>Customer 2</td>
<td></td>
<td></td>
<td>29/3 - 2022 kl. 10:00</td>
</tr>
<tr>
<td>Customer 3</td>
<td></td>
<td></td>
<td>31/3 - 2022 kl. 9:40</td>
</tr>
<tr>
<td>Customer 4</td>
<td></td>
<td></td>
<td>13/4 - 2022 kl. 13:00</td>
</tr>
</tbody>
</table>

*Table 1: Schedule of interviews*
4.3 Ethical considerations

When carrying out semi-structured interviews, there are foremost two main aspects to take in consideration (Longhurst, 2016). The two are confidentiality and anonymity. The information gathered from the respondents needs to remain secure and not to be shared with anyone else. The information is kept confidential, and therefore the respondents will be presented anonymously in the report. For the security of the respondents, it is also necessary to inform them that it is possible to leave the commitment of their contribution to the research at any time. The respondents should also be fully informed of the result of the research upon the completion of the work. Being an interviewer, it is crucial not to be judgmental and be able to listen even in case of the respondents expressing in a certain way or having a certain opinion.
5. Empirical data

5.1 Suppliers

The selection of suppliers is presented in the matrix. The suppliers vary in size, scope and range with regard to their business. Some suppliers have a global range and provide a wide range of services and solutions whereas others are geographically limited to the market in Sweden and provide one specific solution or product. At the time of writing this report, all the suppliers currently are included in a framework agreement with the construction company.

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Revenue</th>
<th>Short description of supplier company</th>
<th>Short description of the interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier 1</td>
<td>10,5 MdEUR (2021)</td>
<td>One of the world's leading companies in the elevator and escalator industry. The company offers lifts, escalators, and automatic doors, as well as modernization and maintenance solutions that provide added value over the building's entire life cycle.</td>
<td>Has worked in the company for 7 years. Responsible for the offer to the Scandinavian market with regard to new installation. Has no previous work background.</td>
</tr>
<tr>
<td>Supplier 2</td>
<td>0,100 Mdrkr (2021)</td>
<td>Supplier within advanced acoustic stone wool ceilings, metal ceiling solution and ceiling suspension systems mainly for public buildings like schools, hospitals etc.</td>
<td>Has worked in the company since 1993, which is almost 30 years. Carrier started as a seller, thereafter as key account manager, 17 years as sales manager for Sweden and today only as key account manager for the sales with the construction company.</td>
</tr>
<tr>
<td>Supplier 3</td>
<td>0,2 MdEUR (2019)</td>
<td>Is a growing, family-owned company with a hundred years of history. Develops, manufactures, and markets chemical industrial solutions in four business areas: construction, industrial bonding and flame</td>
<td>Responsible for the company's product development. Has worked with product development most of their career and has been with the company for 15 years.</td>
</tr>
</tbody>
</table>
Table 2: Description of suppliers

5.1.1 Product development today

The degree of innovation within new product development varies between the suppliers. For Supplier 2 there is almost no new product development or innovation within the products, it is rather the systems that are the target for new innovation within the segment of ceiling suspension systems and acoustics stone wool ceiling. An example of a system that has been successful is a new corridor system has been produced in a collaboration between the contractor, the customer, and the architect. This example is a new system with standard products that have resulted in the right prices and function. Supplier 3 on the other hand, has a continuous product development with regards to the products.

Within the organization of the supplier, there is always a focus on following the market and being responsive to what the market demands, but also to follow what the customers want and how the competition is doing (Supplier 2 and Supplier 3). For a supplier that is a big organization it may be difficult at times to get new products through. Supplier 2 has a product development department located in Denmark and develops new products all over Europe. At the time being, a new sortiment for hygiene spaces is being released after coming to the insight that the competitors are better in that area. In this product development, other actors have been involved (amongst them the construction company). Furthermore, a lot of innovation within sustainability including recycling etc. is being done, also in close collaboration with the construction company. The process of bringing up a new product starts at the market giving information to the seller, the seller giving information to the marketing department, the marketing department giving information to the business development and product development segment. It is also much about influences from competitors and looking at what they have that one another does not have in the products. Innovation can be both offensive and defensive.

Supplier 1 has a product development department based in Finland. To collect market data, interviews are conducted with a wide range of market coverage, meaning that many different markets are covered (Supplier 1). Interviews are held with a number of different customers and an analysis is made to gauge upcoming trends. Questions are formed so as to understand where the construction and real estate industry is headed in the coming one to ten years. Thereafter, a priority list is made, and product development is conducted related to it.

Seen today and the last few years is that sustainability, especially ecological sustainability has taken priority, especially here in Sweden, with the introduction of climate declaration (Supplier 3). This has led to a focus on improving products with respect to this. The way working with regard to this is to put more pressure and requirements from their own suppliers. The information on what the market demands is gained through continuous
dialogue with the general contractor, no direct contact is generally held with the end customer. Information from end customers is typically gained through participation in industry fairs and seminars and the greatest potential in this field is to accelerate the needs to be more requirement setting from both the general contractor and the end customer. Therefore, a closer dialogue between these actors is sought after.

5.1.2 Collaboration form today
In a theoretical situation in which the supplier would collaborate with a large construction firm, the supplier would directly involve its counterpart at the construction firm when it comes to new systems or solutions that can be provided (Supplier 1). Alternatively, interviews can be conducted with the counterpart where the goal is to see if there’s an interest in testing the new system or solution in a pilot project. Essentially, the main contact is conducted through a team on the supplier side with one purchaser at the construction company. The category manager in the purchasing department is then expected to forward the information to relevant parties within the construction firm. If a new product is presented, all contact is made with secrecy.

In an ordinary project with a collaboration outside a framework agreement, the main collaboration today is with the subcontractors installing the products in the property (Supplier 2). The subcontractors can be seen as the counterpart in such collaboration, which in turn do have a dialogue with the contractor of the project. In that kind of collaboration, the supplier is less involved in the project, than in a framework agreement project. Having a collaboration with the end customer of the project is favorable. But collaboration with the end customer is nothing that is directly apparent today (Supplier 3). On the other hand, the supplier has very close collaboration with several large general contractors. In many cases the supplier has framework agreements in place with general contractors and a continuous dialogue is held between the contact person at the supplier and the category manager at the respective purchasing department. Collaboration with smaller contractors is generally seen on a project to project basis.

5.1.3 Benefits of closer collaboration
Main benefits of closer collaboration are that it strengthens the cooperation and trust in both parties and that the probability for a situation in which either can benefit from increases (Supplier 1). When the supplier is a global market leader within its field, naturally the goal is to retain this position which requires them to be innovative. One central aspect is to have a certain selected strategic partner who are also at the forefront and market leaders so that they themselves have a better understanding of where the market is headed and where the suppliers' new types of innovations can have the greatest impact.

It is emphasized that for it to be truly great development in the services provided by the supplier, the supplier needs to be involved in the project at an earlier stage (Supplier 3). This would yield larger potential for improvement as the expertise that exists within the supplier would be able to identify issues earlier on and have more time and flexibility to deal with
them. Furthermore, collaboration is very important from a quality perspective and to understand what is actually demanded (Supplier 3). For example, when it comes to floor leveling which is a service offered by supplier 3, a great development of the technology used has appeared in the last years, in conjunction with a number of large contractors.

There are several benefits of working closely in a framework agreement with big construction firms (Supplier 2). One is that it is possible to enter projects as a supplier in an earlier phase of the project (Supplier 2). For example, as the supplier sees that a project is going to be performed by the big construction firm, it is possible to have an early discussion with the architect and to be able to rely on the decision that the construction firm will choose products of the specific supplier in the project etc. As a supplier, consistently working proactively with the construction company is important to bring the best products to each project performed (Supplier 2). From the perspective of the supplier, an affair within a framework agreement may not be the most profitable business economically, but it is a secure affair and has many other benefits. An example of another benefit is that it gives the supplier legitimacy in the industry, meaning that the framework agreement and being a main supplier for the construction company within the category, works as a good reference for projects with other entrepreneurs as well.

5.1.4 Opinion on collaborative product development

Collaborative product development is a method that all suppliers believe is viable, valuable, and useful. Supplier 2 even states that the method already is implemented in the business to some extent within developing new systems. However, several factors should be taken into account when implementing such collaborative methods (Supplier 3). First of all, there should be a clear goal, meaning that requirements and needs from the contractor need to be communicated to the supplier. After it is clearer on what needs to be done or improved work should commence with all actors involved as early as possible. Secondly, only one supplier should be chosen, otherwise the risk with regard to knowledge sharing becomes too great. It’s not a viable business plan to share new development with your competition.

For the collaboration method to be useful, all parties must be involved from the beginning of the project (Supplier 1). Collaboration on a project to project basis could eventually evolve into a collaborative product development at a later stage, as needs and requirements are continuously being expanded (Supplier 3). However, one problem that is brought up is that of shared cost, namely, a sustainable contribution model between involved actors (Supplier 1).

5.1.5 Most valued characteristics for collaboration partners

An actor that wants to develop together and tries to be pioneers within their sector is the most valued characteristic for a collaboration partner (Supplier 1). Many companies, especially within the construction and real estate industry are conservative and as a consequence not particularly prone to innovate. As long as the actor is driven to further enhance its offering, then collaboration with said actor would be interesting. Supplier 2 mentions that a good collaboration partner is a responsive and trustworthy partner that has the same goal. It is
important to have a consistent and good dialogue. A good collaborative partner should as well be a reliable, stable and, preferably, a large contractor (Supplier 3). Therefore, the contractors which currently are engaged in a framework agreement with the supplier would be preferred partners to work with. When it comes to the end customer, the supplier 3 states that there are no limitations on who to collaborate with. Although, the supplier states that an end customer that has greater ambition with regard to, for example, ecological sustainability would probably be better suited for such a collaboration, hence an end customer with a drive to change and develop is most valued.

5.2 Purchaser at construction company

The selection of purchasers interviewed at the construction company are presented in the matrix below. All purchasers selected are category managers, meaning that they are responsible for the purchase of respective product/material within the central purchasing unit. The reason for selecting category managers for interviews is due to the study’s delimitation to framework agreements. Most of the categories have framework agreements with several suppliers, which the category managers are responsible for. The selection of category managers were made to represent a width of categories and previous experience of each category manager were kept in mind when conducting the results.

<table>
<thead>
<tr>
<th>Purchaser</th>
<th>Product / Material</th>
<th>Short description of purchaser (Competence, work experience etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchaser 1</td>
<td>Windows</td>
<td>Been at the construction company for two months. Comes from the supplier side within the windows segment, working as a supplier currently included in a framework agreement with the construction company.</td>
</tr>
<tr>
<td>Purchaser 2</td>
<td>Windows and facade</td>
<td>Been at the construction company since 2015 as category purchaser. Has a background working on the supplier side, with focus on glass and metal facades. Is regarded as the specialist within this field in the construction company.</td>
</tr>
<tr>
<td>Purchaser 3</td>
<td>Locks, doors and fittings</td>
<td>Been working at the company for ten years. Previously working on the supplier side for 16 years abroad.</td>
</tr>
<tr>
<td>Purchaser 4</td>
<td>Framework</td>
<td>Was enrolled in the</td>
</tr>
</tbody>
</table>
construction company’s student program six years ago. Been working with various tasks within the purchasing department such as, an analyst, category- purchaser and category manager.

Purchaser 5  Steel  Been at the construction company for eight years, working with purchasing during this period. The whole career has been within purchasing. Been working at another large construction company previously, but also with purchasing within a steel wholesaler firm. Degree is high school engineering.

Purchaser 6  Floor  Has worked at the construction company for 8 months. Works as an analyst at the purchasing department but is currently acting interim category manager for floors.

Purchaser 7  Elevators  Has worked at the construction company, within purchasing for 10 years. Has had various roles, such as developer for the purchasing unit and has also been category manager for other categories besides elevators.

Purchaser 8  Suspended ceiling, tile and clinker  Been running another construction company working with suspended ceilings before entering the current construction company.

Table 3: Description of category managers at the purchasing department

5.2.1 Collaboration form today

The goal of the collaboration with the suppliers is long-term relationships (Purchaser 5 and Purchaser 8) and the framework agreements should give both parties advantages (Purchaser 8). When entering a collaboration or framework agreement with a supplier, it usually is in connection with a need to develop a certain area. It can be a new product, sustainability, security etc. The collaboration today within the framework agreements is mostly
collaborations from many years back, so the relationship is built up over long periods and the
number of framework agreements differ depending on the category.

Sharing values, how the supplier works with environmental aspects, how the supplier works
with development of products, security and that the supplier fulfills requirements are
important characteristics of a supplier to enter a framework agreement with. Other important
aspects mentioned are geographical location (as a big part of the cost lies in the delivery of
the framework) and expertise, meaning the supplier's ability to deliver a complete framework
regardless of project complexity (Purchaser 4). If entering a collaboration, it should be
entered in an early stage of the project. The aim of having more than one supplier in a
framework agreement is to expose the suppliers to competition and therefore retrieve the best
purchasing and the best results for projects (Purchaser 1). The number of suppliers asked in
each project can differ, sometimes it is only one supplier and sometimes it is all.
Collaboration with the suppliers is conducted on two levels (Purchaser 7). The first one is on
a project specific level, in which the purchasing department is not actively involved but rather
the project manager at the construction company and the project manager at the supplier side.
The collaboration is mainly operative at this stage.

It is very rare to have a collaboration with the customers, but it happens (Purchaser 3). The
collaboration form is very much dependent on the category manager, but also from
employees from technical or sustainability departments if they have a demand that is not
covered at the very moment by the purchasing department (Purchaser 2 and Purchaser 7). A
lack of existing work method or process is a hindrance as the sole responsibility to develop a
deeper relationship with the supplier is up to the respective category manager and is therefore
depending on the category manager's want. It also happens that the suppliers have
agreements with the customers straight away (Purchaser 3). This is something that is not
really appreciated by the construction company.

Focusing on the purchasing department a couple of attempts of close collaboration has
occurred in the past (Purchaser 2). For example, the construction company requested that a
supplier would develop windows that would suit upcoming projects in a more suitable
manner. The windows featured specific design features and the general idea was that this
product was to be produced and developed for the construction company. Unfortunately, the
project was never finalized as the collaboration came to a halt when resource allocation
between the two parties could not be agreed upon.

The number of framework agreements differs a lot depending on the category. However,
there exists a segmentation of a selection of suppliers the purchasing department works closer
with. Criteria’s that are of importance for closer collaboration are, geographical location (as a
big part of the cost lies in the delivery of the framework), expertise (the suppliers ability to
deliver a complete framework regardless of project complexity) and values that cohere with
the construction company (for example with regard to social and ecological sustainability).
Currently, the purchasing department collaborates closely with 15 suppliers.
With internal customers, i.e. the construction company, collaboration is naturally more prominent. It should not be overestimated that collaboration is easy with internal customers, however, as a lot of business politics may hinder cooperation. With regard to collaboration with the end customer, it is mostly with the construction company's own developing unit (Purchaser 4 and Purchaser 7). In those cases, the purchasing department and developing unit work closer together earlier in the project, for example during the design or the building or system selection. Generally speaking, the more advanced and complex the project is, the earlier the purchasing department gets involved. Suppliers are often involved at an early stage as well. However, when it comes to collaboration with external end customers, it is much more project specific, in which case the project managers play an important role in the extent of collaboration.

Currently, collaboration with suppliers in some categories was not a priority (Purchaser 6). This is due to supply constraints and delivery issues. Price is the most discussed topic as of now, however the wish is to retain a closer collaboration in the future. Prior to the supply chain crisis, some forms of closer collaboration were in place, mostly within sustainability and floor leveling. However, the role of the purchasing department has been limited as it acted mostly as an mediator between the supplier and another unit within the construction firm that specialize in technical advancement of new material and products.

5.2.2 Incentives for innovation

Innovation generally lies within the field of the suppliers and where the construction company is open for new solutions (Purchaser 1, Purchaser 3, Purchaser 6 and Purchaser 8). The construction companies do not really work with innovation themselves (Purchaser 1, Purchaser 2 and Purchaser 4). The purchasing department collects more general trends or needs from the market and forwards this information to the suppliers (Purchaser 4), but both the suppliers and the purchasing department are supposed to work together to further develop and enhance the products and material delivered (Purchaser 2). It can be efficiencies, it can be quality improvements, it can be different kinds of improvements. From the supplier side, there is always work on how to develop products, for example when it comes to digitalization and automatization, but it needs to be supported by the market (Purchaser 3) and there are expectations from the market (Purchaser 3).

Looking at one category, there are not many incentives for innovation at all, for example the steel category (Purchaser 5). It is a category without a lot of innovation within the products. Therefore, the proneness to innovate is very much dependent on the category. But one of the criteria for entering into a framework agreement is that the supplier must work together with the construction company to further develop products and material that benefit everyone (Purchaser 6). However, it is not specified how the collaboration between the two actors should take place. Occasionally suppliers will reach out to the category managers with a request to test a new product. In those cases, it is up to each category manager to decide whether the extra workload is worth it.
When it comes to innovation within the company, it is more about the continuous development of offered products and services, which may fall into the category of innovation (Purchaser 7 and Purchaser 8). For example, with one supplier there is an agreement that if an initial meeting is conducted at the starting phase of a project, the construction company will receive a discount (Purchaser 7). Also, if the project lives up to the supplier's expectation when it comes to cleanliness among other factors, the construction company will receive a discount on every delivered elevator for that project. So, in this case, innovation is not really applied to products but rather working methods that aim to effectivize the suppliers' possibility to do a good job.

5.2.3 Application of collaborative product development

In some sense, collaborative product development is already in action (Purchaser 3, Purchaser 4 and Purchaser 1). The use of this type of collaboration for new innovation is dependent on the type of category and project, but an application of collaborative product development would be an advantage (All purchasers). For example, a project in Malmö in which the purchasing department and two or three suppliers went together and created a forum/work method with the aim to develop a new more sustainable framework (Purchaser 4). The collaboration form would be suitable seeing as the contractor would not only become involved in the product development but also tied to the chosen supplier, which can also be seen as an advantage as it allows for very close and meaningful collaboration (Purchaser 2).

New product development usually comes from a problem, and this was the case in this project, where the supplier caught a problem which was able to be tested in reality within the projects of the construction company and not only the labs of the supplier (Purchaser 1). To work with new innovation to prevent market share loss and be able to look forward and see into the future is desirable, but it has to be in line with the strategy for both the construction company and the supplier. It is important to find a win-win situation for both the actors and that it is of interest for them both. Currently, there is an expressed wish to collaborate and develop the affair together, but also to pursue cost savings etc. Another side is also that the construction company is an important actor when it comes to driving the work of the suppliers, especially when it comes to sustainability. The construction company can lead the suppliers and put some pressure on them to be able to gain the best results. From previous experience, this may be good for the suppliers since it is not always clear what direction to take. As a construction company, being a customer to the supplier, a pretty large influence can be put on the suppliers.

The hardest task is for all the involved actors to see a gain in collaborative product development (Purchaser 6). Therefore, it is of great importance to make clear what the needs are in the beginning of such a process or collaboration (Purchaser 7). Such a collaboration would be most suitable in complex projects where a standard solution or product is not adequate. Trust, incentives for all involved partners and good relationships are key factors for successful collaboration. It is also important to listen to the customer since it is the origin of
demand, but also to have the same vision and goals as the supplier and collaborative partners (Purchaser 8).

5.2.4 Highest valued characteristics of suppliers to be included in Collaborative Product Development

There are pre-qualifications that the supplier needs to fulfill, which denotes moral and ethical concerns (Purchaser 1 and Purchaser 3). It is not always the lowest price that is the most important factor when selecting a supplier, it is important that the supplier chosen in a collaboration has both money, technical competence, and resources. For example, quality and effectiveness is more important in the category of locks and doors (Purchaser 3). It is important that the supplier can meet the demand and the volume that is needed within the contracts and that the supplier is able to secure the deliveries (Purchaser 1). “The price is what you pay, and the value is what you get” (Purchaser 1, 2022). Value in a delivery is much more than just the material glass and wood. “The sum of the value is bigger than the price” (Purchaser 3, 2022). As a big construction company and a major actor on the market, you have a perception of the market, including what actors that are preferred collaborators. It is important that the supplier knows the market as well (Purchaser 3) and that the suppliers that want to find new solutions, are driven and willing to take on the investment that such a feat requires would be valued partners (Purchaser 4).

In that kind of collaboration, where the supplier can be seen as the expert, the request on the supplier from the contractor would be the competence, proposal of how to implement the new product, advice, a good and close collaboration (Purchaser 5). The closer the collaboration, the easier it is to be able to implement new innovation. That is also some of the purpose with these framework agreements with carefully selected suppliers, to gain a deeper relationship and have a closer collaboration, which is a foundation for innovation. The supplier must be willing to listen and understand the needs of the construction company and end customer. It is also paramount that the supplier shares the same values so there are no misunderstandings on that front when it comes to all sustainability aspects (Purchaser 7). Also, suppliers that have efficient production methods are highly valued as those suppliers are an easy sell to the project manager, seeing how there would be less risk of a project getting delayed. This includes that the supplier must have an idéa or a specified goal for the development of a product would be a highly valued partner (Purchaser 6).

Purchaser 2 makes a point in stating that they value a supplier that values the purchasing department's business, because that’s how the best results are gained. Characteristics that are sought after are therefore the drive to deliver, do a good job and generally speaking just doing the best possible work in the allocated time frame. Purchaser 2 also makes a point that this is one of the biggest challenges in a framework agreement procurement, because it is hard to evaluate it, or rather the counterpart on the supplier side.
5.2.5 Highest valued characteristics of customers to be included in Collaborative Product Development

The customer needs to follow the industry requirements and that their own requirements are specified against the construction company (all purchasers). Beyond that, a close collaboration is highly valued but also that the customer is working close to the market (Purchaser 1), sharing values (Purchaser 2), flexible and open minded (Purchaser 2), a partner that wants to work together, is committed and find new solutions (Purchaser 4 and Purchaser 7). If the end customer shows that this collaboration is important and continually puts in effort to drive the collaboration then the construction company and supplier will follow suit, the construction company should be invited to cooperate and the end customer should be willing to share risk (Purchaser 4 and Purchaser 7). In addition, a collaborative partner should be able to supply competence, information and materials when needed, but also that they are reliable and come to work on time (Purchaser 3 and Purchaser 8).

5.2.6 Integration of customer with supplier and purchasing

The purchasing department plays a major role as a mediator between the end customer and the supplier (Purchaser 6). It is important to take in the opinions of the customer, but most of the requirements communicated are industry requirements more than certain requirements from one special customer (Purchaser 1). Today it is more about having a discussion internally to make sure that the opinions of the customer are under consideration. In an optimal situation, the customer would want to work together with the purchasing department to further develop the sector and each other's businesses (Purchaser 2), much like the purchasing department's own wishes with its interaction with its suppliers. The purchasing department has to make decisions regarding which suppliers that is preferable to work with, to have in its portfolio, and whether or not this supplier is someone they’d like to work with in several projects in the future. Only then is it possible to have a long-term solution, long-term dialogue, long-term mindset about where the company is going. A lot is also regarding continuous dialogue and to be able to establish focus groups (Purchaser 4). For example, if it is known that one of our strategic end customers is about to place an order for a new building with 100 apartments, then the purchasing department can select a few suppliers to be a part of that focus group. Thereon, together these actors can work together and establish system documents, project plans, among other things together. If integration of customer with supplier and purchasing is necessary and valuable depends on the type of project and its complexity (Purchaser 5). In most cases the early dialogue with the customer involves the choice of contract between the customer and contractor and not really the types of products within a purchase. When it would be necessary to integrate these is in larger, more complex and prestigious projects. When it comes to products that are part of a framework agreement then the need for integration with the end customer is not needed as the whole point is that you know you will receive a standard product (Purchaser 7). However, when it comes to products that are seen as outliers then that is a much harder question to answer. Most of the time the end customers just want a building, nothing more, nothing less, which does not open the door for a lot of dialogue and discussion (Purchaser 6).
5.3 End customer

The selection of end customers is presented in the matrix. A mix of public and private clients were sought after to see if there is a discrepancy between interest and motivational factors to pursue more innovative products and material. Furthermore, all clients specialize in different real estate segments.

<table>
<thead>
<tr>
<th>Client</th>
<th>Public/Private</th>
<th>Revenue</th>
<th>Short description of end customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer 1</td>
<td>Private</td>
<td>2,50 Mdkr (2020)</td>
<td>Long-term property owner with a focus on commercial properties in Swedish growth regions. About 90 percent of properties are located in Stockholm, Gothenburg, Malmö.</td>
</tr>
<tr>
<td>Customer 2</td>
<td>Private</td>
<td>0,03 Mdkr (2020)</td>
<td>Property company that initiates, develops, manages, and sells commercial real estate projects like offices, logistic- and retail properties</td>
</tr>
<tr>
<td>Customer 3</td>
<td>Public</td>
<td>2,47 Mdkr (2020)</td>
<td>Property owner that owns, develops and manages, among other things, penitentiary institutions, youth homes, court buildings and police properties. Active all over Sweden.</td>
</tr>
<tr>
<td>Customer 4</td>
<td>Public</td>
<td>6,42 Mdkr (2020)</td>
<td>One of Sweden's largest property companies that builds, develops and manages universities, colleges and other environments for educational, innovational and research purposes all over Sweden.</td>
</tr>
</tbody>
</table>

*Table 4: Description of end customers*
5.3.1 The demand for new innovative products and materials

Innovative products and materials are naturally demanded, and it is something that persistently is worked with (Customer 2, Customer 3 and Customer 4), especially since there is a whole new climate competition today than there has been before. It is all about offering something to the customers that the rest of the actors on the market cannot offer since there is a whole new competition on the market today. “I would say that we generally lead the rental market. We usually take the highest prices, but that is also because we have the best products” (Customer 2, 2022). To be able to offer the best products on the market, it is acquired to do something that all the other actors won’t do, this will demand development and innovation. It can be small things that give a big effect, but it can also be large and costly things. Innovation is absolutely necessary to be relevant in the market, and not at least to reach the climate goals, climate neutrality and Netto 2045. However, there are no structured work methods or processes to obtain them (Customer 1) except from some pilot projects that have been conducted where focus has been on digitalization and sustainable innovation.

Of course, the level of demand for innovative products varies depending on the category and building. Customer 3 states that it mostly is products related to security that is demanded, i.e. suicide safe, impact resistant and fire resistant to name a few. But other than that, they are not very innovative at all, and this is mostly due to the fact that they are not a customer that wants to be the first to try out a new product/material first because of the buildings they own and the customers they have.

Customer 4 has a special unit for innovation and business which consist of business developers, change leaders and innovators working with driving the innovation process, business development and digital transformation. The power of innovation within a firm is limited, and it is necessary to collaborate with other firms and suppliers to develop this powerful innovative ability. There are great possibilities for this within Sweden and the Nordics, and also together with other industries like Tech, but the construction industry is not prone to change and the question about innovation within the construction industry is a question about survival today. The ones who find the solution on how to develop will have a big competitive advantage.

5.3.2 Greatest benefits of innovation

There are several reasons to work with innovation and a lot is about the company’s own ambitions (Customer 1). If it's to be on the forefront of the industry, and secure the survival of the company, then work regarding innovation is a requirement. Another factor is that there is an expectancy from the market (Customer 2) and to add value for customers (Customer 4). Without innovation and development, it will not be possible to keep the customers and the product needs to meet the demand of the customers in the market. Smart buildings are demanded in the market today, but they should also be climate smart. A commercial building today should be as smart as a smartphone, but that is not the case today. And to add on this, it is paramount to start as early as possible as the process to apply new innovation to buildings is time consuming (Customer 1). Furthermore, just working with innovation sends a strong
signal to the labor market, as it is assumed that young, talented people want to work in a company which is driving change, “where stuff happens”.

In terms of innovation linked to sustainability, the advantage is of course a material with less climate impact (Customer 3). It is important to emphasize that this depends on the type of commercial building, for example Customer 3 is limited and the materials used should not be the most sustainable but the safest. This is based on requirements from, for example, the prison service. For Customer 4 the physical property (the campus) is used to test and conduct research, in which there is a value in that for the customers. Together with the customers, it is possible to solve common problems.

5.3.3 Examples of innovative products and materials

There are a few examples of successful innovative products that have been brought forward during the years. One project is called symbiotic building and was hailed as one of Europe's most innovative buildings with regard to health and wellbeing (Customer 1). The aim is to provide a state of the art workplace with a large number of services provided through the marketplace communication app that is installed within the building.

Another example of an innovative product is a system where the aim is to minimize the usage of energy in the buildings (Customer 2). The system is a cooling system where very cold water is pumped up from the rock deep, deep down in the ground. Through this, cold water can be pumped into the ceiling of buildings and therefore cool down the indoor climate of a building. Thereafter, the water can be pumped back into the ground to be cooled down again. Electricity needs to be added in the system, but in the context it is negligible. Therefore, it is almost a climate neutral cooling system that has been created. This project was done together with a couple of researchers together with consultants and has been implemented in a couple of projects in Stockholm and Malmö, and some in Uppsala. It is an example of a project that has been successful in both minimizing the usage of energy and in reducing costs. The investment for the future is not enormous, it is rather effective since it is a profitable solution not only in the management but also in the construction phase.

Materials and products that fall into the category of sustainable innovation (Customer 3). For example, the use of Sedum roofs has been tried out. The use of Sedum Roofs is known to promote biodiversity as well as limits the use of tin roofs which has a much greater climate impact. The use of Sedum roof was, however, discontinued as the maintenance of the roof proved to be unsustainable. Furthermore, trial projects using climate smart concrete have been tested in several projects.

Digital access to buildings is one last example of a collaborative project together with several property companies that started as an innovation project and became a new product on the market (Customer 4). This project was made to build a platform and be able to connect all underlying access locks in the building. This is a product and solution that will be applied as a standard in the future.
5.3.4 The process to equip buildings with innovative products and materials

The process of equipping buildings with innovative products and materials is mostly up to the project manager and the companies mostly do not have a structured working method regarding this (Customer 1 and Customer 3). An example of a process bringing forward an innovative product is deep green cooling, but the process is unknown (Customer 2). What's known about the process though is that the project was done in collaboration with different partners and especially consultants. Something notable with the process of the project was that it constantly checked that the project was commercially viable, meaning that it operated in reality. It is always important to check the demand of a new product and that it is economically profitable.

When entering a new initiative, the objective is that it is a product that should be applicable and scaled up in the end (Customer 4). Through external financing, many of the innovation projects are possible to be carried out in larger scales than if the project would be carried out only in-house, collaboration makes this possible. Through contracting different kinds of partners in a project, both entrepreneurs, consultants, technical suppliers, other real estate companies etc., it can be seen as a validation that the initiative is good, applicable and can create value. By taking an initiative, only interesting one firm, it can be seen as no validation that the project is beneficial. Therefore, partners and collaboration is necessary within the process of working with innovation and launching new products.

5.3.5 Greatest innovation potential on the properties

The greatest innovation potential on the properties is within different fields of sustainability (Customer 1, Customer 2, Customer 3 and Customer 4). It can be within recycling of materials (Customer 1) and reducing carbon dioxide and greenhouse gas (Customer 2 and Customer 3). Sustainable innovation is a current topic and the approach should be to reduce the climate impact of the materials that are known to cause the greatest impact, which there is a great potential in (Customer 1 and Customer 2) This means that efforts should be made to produce more sustainable concrete or glass for example. Another aspect to highlight is “design-for-deconstruction” and “design-for-reconstruction”, meaning that it is adamant that the building is flexible so that it does not need to be demolished after 10-30 years (Customer 3). The properties are viewed both as a technical product with walls, ceiling, indoor climate etc. but also the content of the property, like how to develop the environment inside the properties, and digitalization (Customer 4). It can be viewed as the digital property on top of the physical property as resource/asset. There is also great potential in the outdoor climate, as the colleges and universities are managed as small towns (Customer 4). Therefore, the greatest potential of innovation within the properties can be summarized as the houses, parts of the houses, between the houses and inside the houses.

Another field where there is potential for new innovation is smart houses, this includes including the smart houses in a smarter city (Customer 2). With the difficult and expensive electricity market today, the cities built need to be smarter and better at sharing energy with each other and this requires a change and innovation to readjust. The electricity grid and the
extraction of energy in the cities is extremely volatile and it is not predictable. Today, it is not possible to predict how many families are going to charge their electric car at the same time, therefore it is necessary to start charging electric capacity between cities when needed.

5.3.6 Is innovation talked about?
Innovation is mostly talked about (Customer 1, Customer 2 and Customer 4), but not always (Customer 3). To what extent something is happening is different (Customer 1) and it must be worked on even more (Customer 2). Innovation is something that everyone thinks is important and it is what drives the sector forward. Especially for a big actor in the market who has a lot of power to spread knowledge and competence.
The work with innovation differs between the customers. It can be “profile projects” that stand out with regard to sustainable innovation and digitalization (Customer 2), but it can also be an innovation strategy that has been brought ahead from the perspective that there are big challenges that need to be solved, mostly within climate but also with digitalization (Customer 4). The innovation and the innovation process can be seen as a tool to reach certain goals and to be able to fasten up the speed of development. Customer 4 is working with a certain innovation portfolio, with a certain number of millions dedicated to innovation within the firm each year, more specific to innovation projects which can be everything from design to building up new ability for years.

5.3.7 Dialogue with suppliers
It is common for suppliers to reach out to the customers, more frequent (Customer 1) and less frequent but throughout the years (Customer 2). The aim of that is that the suppliers may think that the customer may buy products from that specific supplier if they meet. But since the customer does not particularly work with new materials and products, the contact is spread out throughout the employees of the company, many of which have no interest in hearing what they have to say (Customer 1). However, sometimes there is a curiosity for new products and in such instances, this interest is delegated to the construction contractors. Most of the information is gotten through the contractors, as a regular dialogue is kept with them rather than with the suppliers.

Other customers have a more regular contact with the suppliers (Customer 3 and Customer 4). Customer 3 especially has contact regarding the security products, for example secure doors or windows, which is of importance for the customer. Customer 4 has more sporadically contact with the suppliers since it is expected that the entrepreneur has the expertise to maximize the competence of the suppliers, but within the larger categories. The market is followed continuously to gain knowledge within the field. It may even happen that the customer has been engaged in the decision making within the choice of certain products delivered by suppliers, but that is not a role that is desirable. It is a role that should rely on the entrepreneur and the aim is to work with partners with competence.

If a supplier should be qualified in this type of dialogue with the customer, the supplier needs to be proactive and be able to surprise the property company to a much greater extent.
(Customer 4). It is expected from the property company that the supplier presents solutions on products that create more value. The purpose of having a dialogue with a supplier is not for the supplier to take orders from the property company. That is time consuming, and it has to be a supplier that actually invests in a competence that can reach up to the levels of discussion that is required from the property company. A good collaborative partner is a partner with some basic competence, technical expertise, business understanding and some process experience (Customer 4). Those must be combined in order to promote a good project, all partners may not have all parts though. Added to that, a collaborative partner needs to have an understanding of the market, the competence to get different partners to collaborate, but also have the network in the industry. Customer 4 states that importance in finding the joint challenge between actors and from there the difficulty lies in creating space for innovation. It can be seen as a leap of faith, but it takes some courage to start the innovative process.

5.3.8 Work methods to promote innovation

When it comes to work methods to promote innovation, there are no direct methods that are used to promote innovation (Customer 1 and Customer 3), except from collaboration and partnering (Customer 4). A lot is ad-hoc and relationship dependendent (Customer 1). In order to reach the fullest potential of innovation, collaboration is necessary. Without collaboration it will never be possible to reach the larger goals of innovation. It is possible to reach part of the goals, but it will not be possible to reach all the way. Most of the innovation projects today are in collaboration with other actors, about 75% of the projects with core customers and many of them also together with different kinds of partners like suppliers, consultants, technical developers etc. (Customer 4). Usually, innovative ideas may come from smaller actors, like a technical supplier and it is not unusual that the ideas come from someone in the innovative system from universities, like a researcher. In that case it is possible for a property company to partner with universities and colleges to actually test new solutions, scale them up and make them a part of the specification of requirements (Customer 4). In a good innovation project though, it is a joint work between the partners based on joint premises.

Customer 3 mentions that research & development or some sort of innovation council would be interesting to establish. Another example of an external collaboration that is present and that would be suitable for innovation work is based on the fact that the resources are procured over a 7-year period (Customer 3). This provides the conditions for consolidating and developing very good relationships and creating trust. Trust is incredibly important for collaboration. This means that the customer does not procure contracts/contractors for construction projects, but awards, which means that there is a greater willingness among the contractors to share, exchange information and knowledge. However, the contractors are clear that they perceive each other as competitors and do not want to share everything. Regardless, the external collaboration presented by customer 3 is still perceived to have created a very good platform for trusting collaboration. It also provides the conditions to be able to share innovations. Except for collaboration, it is mentioned that a lot of work is being
done predicting the future (Customer 2). For example, an incentive which has a mission to drive innovation within the company and there is a lot of innovation within the company.

5.3.9 Incentives

For the most part, no incentives are given (Customer 1 & Customer 3). However there have been a couple instances where innovative incentives have tried to be incorporated (Customer 1). An example is, a few years ago when the customer stated that it would bear some cost if the construction contractor was able to find suitable recycled products and material that could be used in the property. This was a quite small scale with small sums involved. The perception today is that it is not even profitable to work with innovation today as it constitutes more risk for the contractor, and it also affects warranty period which adds a lot of uncertainty in an industry where profit margins are already stressed. The incentives from the contractors are very limited as well (Customer 3).

Customer 4 is persistently working with innovation within products and has a conscious commitment on working with innovation. But it is important to denote that it is at first when the whole business and business model changes, that's when it is possible to add value at a different level. Beyond that, customer 4 does not work with new production, instead developing and restoring present buildings is on the agenda and if new production is necessary, it should add to a better totality, which is what the market expects. Usually, there are no specialists on certain material or products employed within the company (Customer 1 and Customer 3).
6. Analysis

This chapter analyzes the empirical data collected from the suppliers, purchasers, and customers above with regard to the theoretical framework presented earlier.

A general observation based on the interviews is that collaborative product development should be applicable within the industry. In many instances, the category managers stated that in a way that is where the sector needs to get to, especially with regard to larger more complex projects.

6.1 Setting up the collaboration

When it comes to collaboration partners there seems to be a convergence of what the actors seek from each other. For purchasers, many stated that some pre-requisites would be of the essence. Furthermore, suppliers that is market leaders within their field and meet certain “hygiene requirements” meaning the aspects regarding economic, ecological and social sustainability are up to the construction companies’ minimum requirements. Naturally, since all suppliers that have a framework agreement in place or are “preferred suppliers” with the purchasing department must adhere to these hygiene requirements, these suppliers could be suitable candidates for CPD collaboration. To add to this, in many instances, suppliers that have a framework agreement with the construction company have had it for a long time, naturally building up trust over time, which is another very important factor for CPD collaboration. Supplier nr 3 is for example the supplier with the longest framework agreement in place and during the interview, they were very keen on deepening the relation further with a working method such as CPD.

When it comes from the perspective of the end customer there does not seem to be an opinion on which suppliers they want to collaborate with. One could argue that a lot of this can be attributed to the end customers not having an employee with expertise on products or material which means that the general level of knowledge regarding suppliers is limited. Because of this, the end customer seems to rely fully on the general contractor in this regard.

Currently, there seem to be general sustainability strategists at most end customers that seek to promote general strategic working methods for the company they work for. An important aspect is, however, that these sustainability strategists seem to play a big role when it comes to promoting requirement setting from the end customer. Many purchasers and suppliers state that more requirements are needed from the end customer to promote the development of new innovative material and products. The end customers agree, however, many also state that both the general contractor and the government plays a big role in requirement setting, the latter through the introduction of laws.

When it comes to timing of integration, there seems to be a wide agreement that integration should occur right in the beginning of the collaboration, for example when systems documents and project plans are being developed, as purchaser 4 stated. This gives ample time to fully understand what needs to be done and gives room for adjustment at a lower price than it would later on during the project. It's all about risk management in this regard,
and it shows to be very successful in many projects, for example the project in Malmö in which the contractor collaborated with a selection of few suppliers in order to develop a new sustainable framework.

With regards to specification of clear goals, all purchasers and end customers believe that is paramount for the collaboration whereas some suppliers, for instance supplier 3 does not see the same importance in it. This can be attributed to the requirement setting from the general contractor and end customer. For instance, the project in Malmö can act as an example again then it can be said that the requirement setting was very clear from the beginning. The contractor sought a framework with less environmental impact than what was currently being offered and this requirement was passed down to the supplier. Supplier 3 states, however, that CPD can naturally evolve through closer collaboration on a project to project basis, seeing as the requirements and improvement potential can appear after working alongside each other for a longer period.

One recurring issue that is brought up by all actors is the requirement setting. From the results, it can be understood that everyone relies on each other when it comes to what must be done. When it comes to incentives, it seems that in theory these exist. Firstly, within the framework agreements that the purchasing department has with selected suppliers. Innovation is never explicitly stated as a goal but rather the goal is to continuously develop the material and products together. So, in theory it is stated that further collaboration between the supplier and the general contractor should be conducted. However, as can be seen from the results from the category managers it seems that a working method of how collaboration should be conducted is much less clear. In most, if not all cases no working method has been installed between the purchasing department and the suppliers. In that sense, very little work is being done through collaboration to develop new products.

In many cases the purchasing department, instead, may act as a mediator between end customer and supplier and give tips and general market trends for the supplier to adhere to. Although, the necessity can be questioned depending on what type of supplier. For instance, supplier 1 is a global market leader within its category with an own R & D development, meaning they have their own methods to collect market data. This type of cooperation may be more suitable with smaller suppliers, i.e. supplier 2, with more limited resources as they can use the extensive connections of the general contractor to gauge the market.

On the other hand, the general contractor places most of the responsibility on the end customer. The arguments given by many purchasers is that more incentives should be given from the end customer. The end customers, however, believe that more incentives must come from governmental regulatory frameworks.
Littler et al (1995) states that for a successful collaboration there needs to be limitations on information that is shared between partners, as a means to reduce the risk for opportunism. This is something that can be understood from the results as well, as the general opinion from the interviewed persons is that for a collaboration of sort to at all be implemented there needs to be a win-win-win situation between supplier, the general contractor and the end customer. One important aspect to understand is that compared to the automobile industry where CPD is much more common, such a collaboration is far behind in the construction industry. Two reasons can be deduced to why this is the case. Firstly, unlike in the automobile industry, where the car company owns its products, the contractors do not. They simply procure these from a supplier. The relationship in the automobile industry is much more dynamic where, for example, a designer at the car company can produce an embryo of an idea for a car part and then pitch this to several suppliers. The supplier with the best total offer will get to work with the car company in producing x amounts of parts. However, this means that there is certainty in the minimum number of products being produced, and the car company will own these products, meaning that the car company will gain a market advantage. This is a much harder feat within the construction industry seeing as how each building is unique and developing standard products may not be suitable every time. Secondly, the relationships in the automobile industry and the construction/real estate industry are very different in nature. Traditionally, the construction industry is more complex with three main actors, the developer, the contractor, and the suppliers. This can be compared to the automobile industry where the car company directly works with a supplier. Due to this, a win-win-win scenario needs to appear for all the actors, something that is seemingly very complex. As a consequence, it seems that most purchasers believe that CPD would be suitable with large contractors with their own developing unit. Otherwise, collaboration that is not directly related to CPD would be more suitable, for instance, end customer 3 mentions that they have a working method in place which acts like a forum or interaction and discourse between general contractors. Here they can have a dialogue without sharing too much information but still talk about current trends and how to adhere to them on a more strategic level.

6.2 Allocation of resources

It is almost impossible for one single actor to obtain all required competence needed to develop a new product. Some suppliers may have it easier than others, for example supplier 1 and 2, as they are market leaders within their category, with an extensive network and an own R&D department. However, when it comes to small-medium sized suppliers, the need for collaboration is more pronounced. For example, supplier 2 stated that almost no new product development or innovation takes place today with regard to products, but rather that the innovation lies in the installed system. From the results one can gather that supplier 2 would not be able to make use of this new knowledge if it was not because of the close relationship with the contractor when it came to the hospital project. According to Littler et al (1995) both parties should contribute with sufficient staff and financial resources. With regard to the hospital project, it is unclear exactly how the cooperation took place, as it was only stated that
there was a “close collaboration” between the parties. This does not mean that the contractor financially helped develop the new system from supplier 2, but maybe expertise was shared with them. Also, supplier 2 got a possibility to try out their new system “live” which is also an important aspect to consider as many general contractors and end customers would rather not try out anything new as it signifies more risk. In the case of hospital project it is unclear to what degree the end customer participated in the cooperation.

6.3 Personnel involvement

In order to obtain an adequate personal chemistry to secure an advantageous environment for a successful collaboration, personnel involvement within the collaboration is a factor that secures this. As the results above show, there are certain characteristics that are especially addressed by the suppliers, purchasers and customers which are important within a collaboration and a collaborative partner. The framework of Littler et al (1995) explains that the presence of a “collaboration champion” who is committed and enthusiastic about the collaboration is an important factor for a successful collaboration. This can be acknowledged by the results through the importance of passion, joy and the willingness to innovate within a collaboration for it to be successful. According to the results, to be able to promote innovation within collaboration circumstances it has to be a safe environment, where it is dared to try, accepted to fail and afterwards learn from the mistakes. To create this encouraging and safe environment, personal involvement of the collaborators with a personal chemistry needs to be present. Good relationships with each other may sound simple but are not to be underestimated. Meanwhile, it is stated several times in the results that shared values with the collaborative partners is crucial for even entering into a collaboration and agreement with another actor. This includes the willingness to strive for the same goal and having the same vision for the collaboration. This confirms the importance of personal chemistry described by Littler.

According to Littler, this person described as the “collaboration champion”, may not, according to the results, be a physical person working only with maintaining the relationships, but the purchaser within the construction company working with framework agreements can be seen as a key person within the company to working with maintaining the relationship with the suppliers. According to the purchasers, the framework agreements can be seen as a two-way-relationship, where it is equally important to make it advantageous for both the supplier and the construction company. When entering an agreement, you rely on each other, and the goal is to maintain a long-time relationship. This is something stated by all parts in the result.

6.4 Process management

The first part of this step according to the model for successful collaboration within product development is the frequent monitoring of progress. Shown in the results, the actors do agree that it is important to keep a close and continuous dialogue between the collaborative partners throughout the whole project. This helps minimizing and avoiding problems that occur during
the process of new product development. The actors also agree that it is most advantageous to enter a collaborative partnership in the initial stage of a project or as soon as possible in order to receive the best outcome. This is to maximize flexibility in the project, meaning being able to change the design or layout with least possible cost. The benefits of early supplier and customer involvement is also related to assessing external factors, which is another aspect to adhere to according to Littler at al (1995). Beyond this, in order to assess external factors, a close and early supplier and customer involvement make it possible to get to know and follow the market in a more manageable way. Following the market seems to be crucial due to all actors, both due to avoiding problems but mostly just to be able to initiate innovation and new project development.

The turnout of the projects and how they develop is difficult to foresee, and many of the successful projects that have been implemented in current buildings are projects that emerged from a demand on the market and from the customers of the product. According to the actors working continuously with innovation within product development, new innovation starts small-scale with an idea of a demand on the market that later grows into a larger scale. Scaling up projects that seem to turn out successful can be seen as a process of monitoring the progress of the projects to avoid failure after investing a lot of money, time and work in a project that later turns out to fail. Many of the actors talk about innovation and new product development more as developing new and already existing systems rather than bringing forward new products on the market, this can also be seen as dividing the projects into smaller projects which avoids problems to occur.

One key issue that is brought up by the actors, and specially the purchasers and end customers is that of opportunism which is related to conflict management and agreement of equality, also two aspects that have been pointed out by Littler at al (1995). The issue is that it is hard to create a win-win-win situation for the involved supplier, general contractor and end customer. However, innovation and new product development can be both offensive and defensive, meaning that in some cases it can be advantageous to alternate between actors and benefit from previous work.
6.5 Summary

Figure 3: Summary of the results compared to the general framework by Littler et al (1995).
7. Discussion

In this chapter the aim is to answer the research question based on the results gathered and conducted analysis. Furthermore, suggestions of further research are also presented.

The aim of this report is to understand how to make use of supplier based innovation and how it can create value for the end customer. Earlier research shows that supplier collaboration is necessary for successful innovation within product development. Therefore, the model described by Littler for successful application of collaborative product development was presented and the empirical data collected from suitable actors was analyzed with regard to the model described by Littler et al (1995).

7.1 Do current framework agreements between purchasing and suppliers promote innovation with regard to new product development?

The answer to this question is found when studying the results provided by the purchasers. The results support that if there is a framework agreement in place with a supplier then both actors should, according to the signed agreement, work together to further develop the products and materials delivered. Innovation is not explicitly stated in the contracts, rather, it is stated that continuous development should be sought after. However, according to the definition that is provided in this thesis, i.e., innovation, one could argue that the continuous development of products and materials fall into the category of innovation. Therefore, it can be deduced that current framework agreements do promote innovation, at least in theory. However, practice does not support this theory. In all instances, it was said that there were no set working methods on how to work together to develop the products. Consequently, not much was being done in that regard.

7.2 In what situation is the general framework for successful collaboration developed by Littler et al (1995) suitable to use within the construction industry?

*Based on the answers given and with regard to the challenges faced when trying to conduct a CPD collaboration it seems that such a collaboration is not suited for all types of projects. There are a number of issues presented. One is that it seems that all involved actors rely on each other when it comes to further development of products. The end customer thinks that the government and the general contractor should do more when it comes to requirement setting, whereas the general contractor believes that it is mostly the end customer's responsibility. The supplier on the other hand believes that the general contractor should be the one that drives the requirement setting. This could be due to the fact that the suppliers have no contact channels with the end customer, hence the general contractor is the only other actor to blame. Seeing as the problem with requirement setting seems to be running in loops, an easier approach would be to have some sort of internal requirement setting within
each actor’s own company. When it comes to the general contractor, collaboration could be conducted within its own firm, where both the developing unit and purchasing department have easy access to each other. This leads to the second point where the interviewed entities believed that the hardest thing with a collaboration such as CPD is to create an incentive where all the involved actors would gain from the collaboration. A win-win-win situation must present itself, something that would be incredibly complex. Therefore, one could argue that by removing collaboration with the external end customer and focusing on collaborating internally, i.e. the developing unit and the purchasing department, a situation where the collaboration between the supplier and the general contractor would yield a gain for both actors has a higher probability of happening. This is with the assumption that both the developing unit and purchasing department sees the gain the same way.
8. Conclusion

Based on the collected information through interviews of purchasers, it is concluded that current framework agreements do not sufficiently promote innovation with regard to new product development.

When it comes to the general framework developed by Littler et al (1995), it seems that CPD collaboration is most suitable with a general contractor with an own developing unit. The developing unit should then collaborate with the purchasing department which in turn would collaborate with either suppliers that have a framework agreement in place with the purchasing department or are labeled as “preferred supplier”.

Furthermore, with regard to answering the overarching question of how the use of supplier based innovation would allow end customer to get hold of new innovative products, the answer is clear: All the involved parties are of the opinion that collaboration between them would allow the development of new products and material that would be of value to the end customer.

8.1 Further research

This study is limited with regard to scope, time and resources. There are numerous paths for continued research within this topic. For example, further research can be conducted through:

- Studying the implementation of CPD between a general contractor (with an own developing unit) and preferred/framework suppliers through a pilot project.
- How to expand current framework agreements between general contractors and suppliers to include more concrete methods to promote the development of new products and material?
- A comparison between the Swedish construction industry with international counterparts with regard to the studied subject, i.e. collaboration between actors to promote the development of new products and material.
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Appendices

Appendix A: Interview questionnaire to customers (Real estate companies)

Introduktion:
● Vad är din bakgrund? Erfarenheter?

Frågor:
● Är innovation (produkt/material) något ni efterfrågar? Är ni intresserade av tillämpning av ny innovation? Är det något ni värdesätter?

● Vad anser ni är den största fördelen med implementation av ny innovation i projekt?

● Kan ni ge något exempel innovativa produkter som installerats i era byggnader och inom vilket område (ex fönster, fasad, tak etc)

   - Följfråga: Hur gick processen till att få ta del av den nya produkten?

● Inom vilket område ser ni störst innovationspotential inom fastigheterna?

   - Följfråga: På vilket sätt skulle dessa produkter ge er en marknadsfördel?

● Pratas det mycket om innovation vid beställning av projekt?

● Har ni någon kontakt med leverantörerna?

   - Följfråga: Vet leverantörerna vad det är som ni efterfrågar?

● Vilket arbetssätt (Både internt inom företaget och externt med andra aktörer) tror ni hade varit bra för att möjliggöra så att ni får ta del av fler nya innovativa produkter?

● Tror du att samarbete mellan olika aktörer är nödvändig för innovation eller kan innovation skapas inom ett enskilt företag?

   - Följfråga: Om samarbete mellan olika aktörer är centralt, spelar det någon roll i vilket skede samarbete mellan aktörerna sker?

● Finns det specialister hos er som är kunniga inom nya produkter och material som blir tillgängliga på marknaden?

● Ges det någon incitament från er sida där ni eftersöker innovation?
Appendix B: Interview questionnaire to category managers (Purchasing department at general contractor)

Introduktion:

- Vad är din bakgrund och vad har du för erfarenheter?

Frågor:

- Skulle ni kortfattat beskriva hur inköpsprocessen fungerar idag?
- På vilket sätt samarbetar ni med leverantörer idag?
- På vilket sätt samarbetar ni med beställare idag?
- Kan ni kortfattat beskriva hur ramavtalen fungerar?
- Vilka kriterier har ni för att ingå i ramavtal med leverantörer?
- Finns det idag “innovations-incitament” inom ramavtalen?
- Tror ni att en samarbetsform som collaborative product development hade fungerat inom er bransch?
- Vad värderar ni mest från en leverantör?
- Är risken för opportunism stor?
- Vad hade ni efterfrågat från leverantören under collaborative product development?
- Vad hade ni efterfrågat från slutkunder under collaborative product development?
- Hur tror ni man på bästa vis kan integrera slutkunden med inköp och leverantör?
Appendix C: Interview questionnaire to suppliers

Bakgrund:

- Kan du kortfattat beskriva ditt företag? (Historia, vad ni håller på med etc)
- Kan du kortfattat beskriva dig själv? (Arbetslivserfarenhet osv)

Frågor:

- Kan ni kortfattat beskriva hur processen att ta fram en ny produkt ser ut?
- Hur samarbetar ni med era entreprenör (byggföretag) och beställare idag?
  - Kontaktkanaler?
- Vilka fördelar ser ni med samverkan, både för er del men även era kunder?
- Tror ni att collaborative product development med involverande av entreprenör och beställare hade varit givande sätt till framtagandet av nya innovativa produkter?
- I vilket skede av processen bör entreprenör och beställare involveras?
- Hur viktigt är det att definiera ett mål med samarbetet?
- Vilka typer av entreprenörer och beställare kan ni tänkas ha nära samarbete med?
  - Vad kännetecknar ett bra samarbete?
- Hur får ni idag information om vad beställaren efterfrågar i sina byggnader?
  - Vet ni vad kunden efterfrågar? Eller upplever ni att kunden litar på det ni har att erbjuda
- Vad är det svåraste med att hålla igång något som collaborative product development?
- Hur kan man skydda sig mot opportunism?
- Jobbar ni aktivt med innovation inom produktutveckling?
  - Hur jobbar ni med innovation inom er produkt för att kunna utveckla/bidra till marknaden?
- Upplever du att innovation uppmuntras av entreprenör?
- Upplever du att marknaden/kund efterfrågar innovation inom er produkt? Uppmuntras innovation?