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Creating Successful Collaborations between Startups and Large Corporations within the AEC sector

A qualitative study of the motives, challenges and critical factors in collaboration

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

DOAA ALKALALI
ERIK MALMQVIST

DEPARTMENT OF ARCHITECTURE AND CIVIL ENGINEERING
DIVISION OF CONSTRUCTION MANAGEMENT

CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2020

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MASTER'S THESIS ACEX30

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Examensarbete ACEX30

Institutionen för arkitektur och samhällsbyggnadsteknik

Chalmers tekniska högskola, 2020

Department of Architecture and Civil Engineering

Chalmers University of Technology

SE-412 96 Göteborg

Sweden

Telephone: + 46 (0)31-772 1000

Department of Architecture and Civil Engineering

Göteborg, Sweden, 2020

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ABSTRACT

Actors within the AEC sector have traditionally been notorious for conservative mindsets and failure to utilize innovation. Members of other sectors have accomplished more in this regard and increased their trust in external parties to be part of the innovative advancement, for example through startups. Thus, the aim of this report is to establish understandings of the synergies between startups and large corporations within the construction industry, with the primary perspective being that of the large corporations. The main research question investigated was “*How can large-sized construction companies and startups create successful collaborations?*”.

In order to attain this aim, the study was conducted by combining a literature review with an empirical study, based in the Swedish construction industry. The study has found that startups and large corporations within the AEC sector have complementary attributes. From the startup perspective, the motives behind collaboration include (1) the possibility to validate ideas with help of feedback; (2) attaining experience and knowledge of the sector; (3) receiving help in defining problems to solve; (4) receiving economic funding when co-developing products; (5) the possibility to scale ideas once being validated; (6) gaining credibility. On the other hand, desires of the large corporations include (1) being introduced to new solutions; (2) challenging established ways of operating; (3) accessing agile processes when co-developing products; (4) reducing the costs related to innovation; (5) obtaining custom-made products; (6) enhancing market image. Advantageously, the collaborative approaches are to be formalized and a reasonable point of departure for large-sized firms is to make sense of their contemporary situation and acknowledge how the motives apply to their respective core strategies.

In addition, critical factors need to be managed by the large corporation in order for the partnerships to be categorized as successful. In this sense, it is of importance that (1) an obvious entry point for startups is created at the large corporation; (2) the collaboration objectives and procedures are clarified; (3) the large corporation establishes a higher sense of urgency; (4) sufficient resources and involvement of appropriate participants are provided.

Key words: large corporation, startup, AEC sector, innovation, startup-corporation collaboration, collaboration motives, collaborative approaches

Att skapa framgångsrika samarbeten mellan startups och stora företag inom byggsektorn

En kvalitativ studie om motiven, utmaningarna och kritiska faktorer i samarbeten

Examensarbete inom masterprogrammet organisering och ledning i bygg- och fastighetssektorn

DOAA ALKALALI

ERIK MALMQVIST

Institutionen för arkitektur och samhällsbyggnadsteknik

Chalmers tekniska högskola

SAMMANFATTNING

Aktörer inom byggsektorn har traditionellt varit beryktade för konservativa tillvägagångssätt samt svårigheter att dra nytta av innovativa upptäckter. Inom detta område har andra sektorer varit mer framgångsrika när de inkluderat externa parter i utvecklingen, bland annat genom att bjuda in startups i diskussionen. Således är syftet med denna rapport att etablera förståelsen kring hur startups och stora företag inom byggindustrin kan dra nytta av varandras kompetens, med *”Hur kan stora byggföretag och startups skapa framgångsrika samarbeten?”* som huvudfrågeställning.

För att uppnå detta syfte genomfördes studien via en kombination av litteratursökning och empirisk undersökning med grund i den svenska byggindustrin. Sammanfattningsvis har den här studien upptäckt att startups och stora företag inom byggsektorn har kompletterande egenskaper. Sett från startup-perspektivet inkluderar motiven till samarbete möjligheten att (1) validera idéer med hjälp av feedback; (2) få en ökad erfarenhet och förståelse för industrin; (3) supporteras i definieringen av problem som behöver lösas; (4) få ekonomisk ersättning vid gemensam produktutveckling; (5) få möjligheten att expandera när idéer har blivit validerade; (6) öka sin kredibilitet. Det stora företaget vill istället (1) bli presenterade för nya lösningar; (2) bli utmanade av nya arbetssätt; (3) bli exponerade för agila processer i gemensam produktutveckling; (4) sänka innovationskostnader; (5) erhålla skräddarsydda lösningar; (6) förstärka bilden av företaget. En fördel är att formalisera dessa samarbeten och en rimlig utgångspunkt är att det stora företaget skapar en förståelse kring dess nuvarande situation och inse hur motiven relaterar till de uttalade kärnstrategierna.

Dessutom måste kritiska faktorer hanteras av det stora företaget för att dessa samarbeten ska kunna klassificeras som framgångsrika. Där är det viktigt att (1) det finns en naturlig ingång för startups till det stora företaget; (2) målsättningarna och samarbetets tillvägagångssätt har klargjorts; (3) det stora företaget lägger större vikt vid denna typ av samarbeten; (4) tillräckliga resurser och inblandning av relevanta aktörer är tillhandahållna.

Nyckelord: stora företag, startup, byggsektor, innovation, motiv till samarbete.

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Preface

This study constitutes the final part of the master's program Design and Construction Project Management, and is carried out at the Department of Architecture and Civil Engineering, Chalmers University of Technology, Sweden. The study has encompassed the period of January 2020 to June 2020, and has been conducted with Martine Buser as examiner and Christina Claeson-Jonsson as supervisor.

The master's thesis is founded upon a literature review alongside an interview study, aiming to investigate the synergies between startup firms and large-sized corporations within the AEC sector. By uncovering motives, challenges and critical factors, the ambition is to promote better startup-corporation collaborations in the construction industry. Findings are anticipated to be useful for practitioners in the field, as well as inspire further research in the subject.

We would like to thank Martine Buser and Christina Claeson-Jonsson for their continuous guidance, constructive feedback, and assistance throughout the course of the study. We would also like to acknowledge our peer groups for their valuable contributions during the review sessions. Furthermore, we express our sincere gratefulness to all the participants of the interview study for generously sharing their experiences and knowledge on the subject, providing the study with important insights from the industry. Finally, we would like to express our gratitude for our families and friends for their endless support and encouragement.

Gothenburg June 2020
Doaa Alkalali & Erik Malmqvist

1 Introduction

In the face of a growing technological advancement within the AEC sector, startup firms are increasingly recognized as an important player. The synergies between these small firms and larger construction companies is however yet to be thoroughly investigated. In this introductory chapter, background information is provided to help set the subject of study into a context, which then leads the reader to the aim and problem formulation. This chapter also provides the scope of the study, how it relates to sustainability aspects, as well as an outline of the report.

1.1 Background

The construction industry is one of the largest and is substantially impacting many countries' national expenditures and revenues (Noghabaei et al., 2020). Characterized by a fragmented nature and complex relationships between the involved actors, the AEC sector is repeatedly blamed for its poor performance and low levels of productivity. Many building projects are for instance recognized by Noghabaei et al. (2020) to exceed both time and cost targets. Furthermore, the industry is frequently rumored to attain conservative mindsets, failing to sustain today's increasing pace of change (Ingemansson, 2012). In addressing these issues, a range of new technologies have risen to the surface over the past decades (Noghabaei et al., 2020). However, inherent shortcomings in the adaptation and implementation of these technologies persists to be evident for many actors within the sector.

In other industries being in a similar situation to the AEC sector, an increasingly utilized approach has been relying on both internal and external competencies, in an ambition to further develop their businesses and remain competitively empowered (Thieme, 2017). In regard to this, collaborations with startup firms have been fulfilling an important function. A startup is defined by Dewey (2020) to constitute a small firm recently inaugurating their operations, but with a clear intention of growth and an aim to impact the market. Rather frequently, startup firms promise new ideas and technologies addressing problems that other established actors in the sector might have ignored or failed to solve. This definition will be used throughout the master's thesis when addressing startup firms.

Collaborations between startups and large-sized corporations are, theoretically speaking, expected to be successful (Prashantham, 2019b). This is argued to be due to the two parties' complementary attributes, as established corporations possess resources and legitimacy that startups desire, and startups carry agility and promising innovations that corporations value. However, these partnerships have not always proven to be gratifying in reality, and differences in the corporate and startup ways of working suggest challenges in how the two actors should engage (Weiblen & Chesbrough, 2015). Several alternatives exist in formalizing these collaborations. In this master's thesis, a deeper investigation of the relationship between startups and large-sized corporations is provided, placing its focus on the construction industry. The departing point takes the perspective of large-sized construction companies, as the study is conducted together with a major building contractor in Sweden. Insights from both startups and established corporations will nonetheless be considered as well. Solving business issues together with these innovation-oriented firms can be propitious

for the large players in the AEC sector, as well as favor the development of the construction industry as a whole.

1.2 Aim

This report aims at establishing an understanding of the synergies between startups and large corporations within the construction industry. This will be investigated in order to identify prerequisites for a fruitful collaboration between the parties. By distinguishing both good practices and common pitfalls, the intention of the study is to map the way in which large-sized construction companies can set ground for rewarding relationships with startup firms.

1.3 Research questions

To help attain the aim of the master's thesis, the following main research question will be addressed together with the three associated sub questions:

How can large-sized construction companies and startups create successful collaborations?

- What are the motives for committing to startup-corporation collaborations?
- What are the alternatives when formalizing collaborative approaches?
- What are the critical factors in a startup-corporation collaboration?

1.4 Delimitation

This master's thesis was conducted within a predefined time frame of one academic semester, hence limiting the scope and depth of the research. The number of studied perspectives, as well as the collected amount of empirical data, was adjusted to conform to this constraint. Geographically, the first hand data was obtained through corporations active on the Swedish market.

The study focused on providing valuable knowledge on how large-sized corporations can effectively collaborate with startups in the AEC sector. The perspective of large-sized construction companies is, in this report, represented by a large building contractor in Sweden. Furthermore, the startup perspective was based on experiences from startup firms operating in the Swedish construction industry. Insights from other sectors were gathered but solely to gain an understanding of how partnerships between large entities and minor organizations can succeed on a general level. Finally, this thesis was conducted in a qualitative manner, limited to the participants' experiences, and does not provide the reader with a complete overview of the subject. Nonetheless, results can be interpreted as general tendencies in such collaborations and can be applicable to other cases.

1.5 Sustainability aspect

The construction industry has a significant environmental and economic impact (Bracco, 2019). The sector is for instance responsible for approximately one third of the generated waste, and constitutes 11% of the world's greenhouse emissions. Considerations regarding different aspects of sustainability are increasingly demanded,

and Bracco (2019) claims that solely designing sustainable buildings is not enough. Instead, construction companies need to ensure that sustainability measures are taken throughout the entire building process. Thus, better collaborations between the involved parties in the construction industry could improve the design, production and operation of buildings.

In regard to this manner, the construction industry should perhaps benefit from the arrival of new entrepreneurs, eager to advance the sector. This study relates to the aspect of sustainability by stressing the potential of collaborations between startups and large corporations in the building sector. Fruitful relationships between the two players could therefore foster innovative solutions to sustainability concerns within the construction industry. Furthermore, successful startup-corporation relationships should potentially derive financial earnings and growth for both parties, as well as for society at large. Lastly, in establishing an ecosystem in which both entities can complement each other and thrive together, a more inclusive sector can start to take form, and an increased diversity in actors can be attained.

1.6 Structure of the report

In order to simplify the navigation of the study, the seven chapters constituting this report are described with their respective purpose and content below.

Chapter 1 - Introduction

This chapter provides a background to the subject of study and presents the motivation for the conducted master's thesis. A problem formulation is described as well as the research questions addressed. Furthermore, the limitations of the research and how the study contributes to the issue of sustainability are underlined.

Chapter 2 - Methodology

The chapter presents the research approach, explains and motivates the used methods regarding the theoretical and empirical data gathering. How the analysis was conducted, as well as the research validity and reliability is reviewed. Lastly, the ethical concerns are treated.

Chapter 3 - Theoretical Framework

The third chapter explores theoretical concepts through previous literature and research of the subject. This is to provide sufficient knowledge for further analysis. The presented theory is related to characterization of startup firms and the construction sector, different approaches to innovation and collaboration, as well as drivers and challenges.

Chapter 4 - Empirical Findings

The empirical findings are described in the fourth chapter, providing a view of how collaborations between startups and large companies are conducted in practice in the Swedish construction industry. Furthermore, the chapter presents insights of large corporations in other sectors in regard to this issue. The empirical findings will, together with the theoretical framework, form the basis for the analysis.

Chapter 5 - Discussion

In the fifth chapter, an analysis between theoretical and empirical findings is carried out. The similarities and differences between the two aspects are highlighted, as well as a discussion of the main themes of the report. Ultimately, the findings of this study are analyzed in relation to the raised research questions in order to contemplate different proposals on how the identified results can be utilized.

Chapter 6 - Conclusions

In the conclusion chapter, the research questions of this thesis are answered, and in such providing proposals on how successful collaborations between startups and large construction companies could be established.

Chapter 7 - Future Research

With the basis on the outcomes of the study, suggestions on further areas of research are highlighted by the authors.

2 Methodology

This section defines the procedure followed in order to reach the conclusions of this study. First, the research approach is described and then the two categories of data collection, comprising a literature review as well as an empirical study, are explained. Subsequently, the methodology utilized for analyzing the qualitative data obtained is specified. Ultimately, an explanation regarding the trustworthiness of the findings is provided.

2.1 Research approach

The research topic chosen for this master's thesis was developed together with a large-sized firm operating in the Swedish construction sector, at times referred to as the case company in the report. It was first approached by conducting a search for literature and relevant theories, ahead of an empirical study taking place. Gradually, these two processes became intertwined and took place simultaneously as new perspectives were discovered. The findings were later analyzed and conclusions were drawn in order to provide answers to the research questions declared.

There exist several ways on how to conduct research, and this master's thesis was performed in the shape of a qualitative study. According to Bryman & Bell (2015) such an approach allows the researchers to obtain nuanced understandings of the subject, rather than quantifiable measures. In order to understand the current situation in the construction industry, in-depth interviews with startups as well as representatives of one large-sized firm, all operating in the construction sector, were conducted. A summary of the respondents can be viewed in Table 2 and Table 3. The reasoning behind the dual perspective was to recognize the possible discrepancies between the two categories of organizations and the requests each side held. In addition, interviews were held with individuals with startup-related experience at companies in other sectors than the AEC sector, see Table 1. This expanded the understanding of how relationships between large-sized entities and startups can be fostered in reality. It also allowed mutual complications to be identified.

Furthermore, this study utilized an inductive approach to analyze the obtained data. It is used when handling qualitative data for the purpose of evaluating explicitly set aims (Thomas, 2006). Making sense of frequently encountered raw data is said to entail applicable concepts. As stressed previously, this paper had a predetermined research scope, established jointly by the researchers and their supervisor, to classify how large-sized firms in the construction industry can collaborate with startups. The data provided extensive insight and patterns were recognized to understand the requirements necessary for a structured approach to be implemented from the corporation perspective.

2.2 Data collection

As mentioned previously, the collection of data was acquired by conducting both a literature review and interviews. The latter provided the main insights in terms of how the partnership works in practice in the Swedish construction industry, with the prior establishing relevant theories and supporting the shaping of questionnaires. How these two types of data were collected will be described in this section of the paper.

2.2.1 Literature review

According to Snyder (2019), there are several motives to why conducting a literature review is relevant. First, it provides the researcher with a group of evidence and theories within a certain field, and secondly, since numerous studies are examined, the outcome can be unique. In this case, the literature study is aimed at identifying relevant theoretical concepts to help gain a sufficient understanding of the subject. Since the research field in regard to the AEC sector is rather unexplored, the literature has been mainly based on general theories, and practices of other industries.

The review conducted composes of several segments. The initial subsections of the literature review consider common traits of startup companies and the innovative surroundings in which they operate alongside large-sized firms. When this has been established, reasoning as to why collaboration between the two parties is desirable, as well as the associated challenges, are presented. By displaying the previously conducted research in this order, the reader is first introduced to the values startups can generate, followed by under which circumstances they can generate value. In addition, some of the different structured forms of collaboration between large-sized companies and startups are defined. Due to the relevancy of the topic and the countless organizations in different sectors either already practicing or having intentions to develop this type of relationship, abundant variations of how this partnership form can be established are of existence (Mocker et al. 2015; Schättgen & Mur 2017). The most common forms of collaborations between startups and large-sized corporations has been highlighted in this report. This is presented in an attempt to demonstrate the numerous possibilities though which collaboration can be obtained.

The search for literature was first performed by utilizing the database provided by the library of Chalmers University of Technology and Google Scholar. Among the key words applied in the search, startup, collaboration, large-sized company and construction sector were included. Subsequently, the references of the relevant findings were scrutinized in order to surpass the limits constrained by the databases, thus, the backward approach (Webster & Watson, 2002), was applied. Mainly, the references used in this report were published in academic journals, but some were also discovered in e-books, master's theses and organizations' websites.

2.2.2 Empirical study

Following the literature review, the empirical study of this paper is presented. The main purpose of conducting interviews was to recognize the current condition and activities concerning the relationship between large-sized firms and startups in the construction sector. Thus, both perspectives were necessary to explore. In addition, respondents of large corporations operating in other sectors were included in order to provide useful insights.

The interviews were organized by using a semi-structured approach. As Longhurst (2003) describes, this type of verbal interchange allows the participators to steer and prioritize certain points of a prearranged questionnaire. To the interviewees requesting the prepared questions prior to the interviews taking place, the questions were delivered

via e-mail. In all other cases, the respondents were not prepared in advance apart from being informed regarding the subject of the study. Due to the discrepancy between how the different types of organizations are operating and their volatility, three different questionnaires, one for each organization type, were constructed. These questionnaires can be viewed in Appendix 1, Appendix 2 and Appendix 3. Nonetheless, the main themes were identical, comprising previous experiences in this type of collaboration, how an ideal layout of the relationship would be designed, and which forms of established collaboration arrangements would be most relevant to pursue. In addition, the startups were asked to describe their current business situation.

In total, seven different startups with ongoing activity in the Swedish construction sector were contacted. Which startups to approach was decided after research of which ones were active in the Swedish construction industry and partly by recommendations of the supervisor. As a preference, startups with potential solutions related to the digitalization of the construction industry were selected. Of the contacted startups, six responded and agreed to partake in the study, as seen in Table 2. The number of employees at the startups differed between three and 60, how long they had been in business varied between seven months and eight years. Despite this disparity, all of the startups were in collaboration with large-sized companies. This allowed the study to investigate a wide spectrum of experiences, all encompassing the definition of a startup.

As for the large-sized firm perspective, all interviewees represented the same construction company. Five individuals were asked to participate and all of them accepted. They are summarized in Table 3. Since companies in the construction sector in general have a fragmented structure, it was of essence to involve individuals with different focus areas within the company but that they still played a relevant role in collaborating with startups. All of the respondents representing the large-sized construction company were suggested by the supervisor.

The third perspective of the empirical study encompassed respondents representing large corporations operating in sectors external to the construction industry. In total, contact was made with four corporations renowned for their engagement with startups, and three of them accepted the request. A brief presentation of them can be viewed in Table 1. All of the respondents from external sectors had experience in engaging with startups and could, therefore, provide insights in how they, as large-sized firms, commit to startup-corporation collaborations.

All of the interviews except one were held via virtual meetings. This was mainly due to the pandemic which occurred during the research period. Each of these interviews were recorded and later summarized in writing, also the central quotes stated by interviewees were directly transcribed and included in the report. The time each interview took differed, but they were all in the range of 30 and 60 minutes depending on the interviewee's experience in this type of collaboration and how much time they could allocate. The interview which was not possible to conduct by having a meeting, was instead held via e-mail with the respondent answering the questions of the questionnaire.

Two ethical components, essential to consider when conducting interviews, are anonymity and confidentiality (Longhurst, 2003). Thus, it is of importance that the interviewees are anonymous if they desire, and that the data collected is protected from

reaching parties which are not intended to be in possession of it. In this study, all individuals, as well as the company they represented, remain undisclosed. Once the data was gathered, it was stored on password protected devices and online storage centers. There, it was only accessible to the authors of this paper and when necessary it was also available to their supervisor. Also, the interviewees which requested to read the summary of the interview they had participated in, were permitted to do so ahead of publication.

Table 1. An overview of the participants from the three large-sized companies outside of the construction industry.

Respondent	Industry	Role of interviewee
A	Biopharmaceutical	Chief operating officer and project manager
B	Information and communication technology	Business developer at Internet of Things
C	Medical technology	Technical category manager

Table 2. An overview of the participants from startup firms operating in the construction industry.

Respondent	Business focus	Role of interviewee
D	Improving project management through digitalized solutions	Country manager Sweden
E	Increasing safety of scaffoldings through a digital tool	Co-founder
F	Integrating lean practices through a digital tool	Co-founder
G	Facilitating project management in a digitized way	Co-founder and chief market officer
H	Coordination of e.g. Building Information Modeling and digitized strategies	Process manager
I	Providing technological solutions for increased safety on site	Chief executive officer

Table 3. An overview of the participants from the large-sized construction company.

Respondent	Role of interviewee
J	Head of strategy and operation development
K	Digitalization project manager
L	Group strategy developer
M	Lean specialist
N	Group strategy

2.3 Analysis process

When the data had been assembled, the next step was to analyze it with the intent established prior to the initiation of the research process. In this way, it was possible to determine that all relevant data was gathered, which is described as essential by Kothari (2004). There, it is also stated that large volumes of data gathered is not uncommon. Correspondingly, that was also the case in this study.

In order to facilitate all of the raw data, an important step in its processing is to classify the data in groups (Kothari, 2004). This was performed in a qualitative manner, where the first dividing aspect was if the interviewee had the perspective of a startup or a large-sized construction firm. The data gathered outside of the AEC sector was also separated. Subsequently, it was conducted according to the interviewees' perceptions of how startup-corporation collaborations were approached, their experiences of collaborating in this form, the challenges which occurred, and the desired relationship between the two types of entities in the future. For this, the written summations of the interviews were utilized.

By structuring the data in such a way, it allowed the foundations of startup companies to be recognized ahead of the current situation and the future prospect being described. Thus, key findings from each category could be acknowledged and put in relation to the research questions determined. Also, it aligned with the structure of the findings of the literature review, allowing to detect similarities and differences.

2.4 Trustworthiness

One approach to evaluate trustworthiness in qualitative research is to consider the credibility, transferability, dependability and confirmability of the study (Thomas, 2006 referring to Lincoln & Guba, 1985). These four different criteria have been reflected upon during this investigation.

First, credibility refers to if the findings gathered are correctly interpreted (Anney, 2014). In this study, the interpretations were supported by a supervisor operating in both the corporate world and the field of research. Thus, the strategy of peer debriefing

(Anney, 2014), was performed in aspects of for example data collection, methodology decisions and the analysis. Second, transferability is defined as the possibility for other researchers to replicate the study and draw the same conclusions but with other respondents (Anney, 2014). This is possible if a substantial description of the research process is provided, which for this study is defined previously in this chapter. Nonetheless, transferability has also been described as impossible to realize due to observations being unique depending on their context (Shenton, 2004 referring to Erlandson et al., 1993).

Third, dependability indicates how well the findings are relevant from a time standpoint (Anney, 2014). Again, peer examination was performed for this paper. A stepwise replication could have enhanced the dependability, but due to the time scope of the study, it was not possible to have other independent researchers following the same progression. In addition, the nature of collaboration between startups and large-sized firms is evolving at a rapid pace, and one of the purposes of the study was to examine the current situation. Fourth, confirmability is to which degree objectivity is assigned to the study (Anney, 2014). The impact of the authors personal opinions was minimized by finding coherence in the data gathered from the interviews, combined with previous research in the field as presented in the literature review.

3 Literature review

This chapter lays the foundation for the theoretical framework that is utilized in this study. Literature related to the characterization of the two entities and in which business ecosystem they interact is presented. Furthermore, large corporations' path to innovation is investigated. Finally, different forms of startup-corporate relationships, advantages and challenges are explored.

3.1 Business ecosystem

To grasp a better understanding of the subject of study, it could be valuable to view the two parties in relation to the business ecosystem in which they operate, alongside some of the key players in that network. A business ecosystem is explained by Hayes (2019) to be an interlinked complex network involving different types of actors such as suppliers, distributors, competitors, and governmental agencies, all of which operate to provide common services or products. These players could be related through both cooperation and competition, thus supporting and challenging each other to collectively advance the market. Hayes (2019) claims that each entity in the business ecosystem affects and is affected by the actions of the other entities, creating a constantly evolving relationship in which players need to continuously adjust and adapt in order to survive.

For a business ecosystem to thrive, the participants need to create behavioral patterns that facilitate the flows of new ideas, emerging talents and capital (Hayes, 2019). A sufficient business ecosystem can help encourage collaboration addressing social and environmental challenges, utilize creativity and innovation, and stimulate the learning process among the involved parties. Taking parallel to the biological ecosystems, Moore (1993) adopted this concept into the context of business networks, suggesting that companies should not be viewed in isolation or as members of one single industry. This is because successful businesses could not evolve in solitude but are rather dependent on attracting other players to create cooperative networks that satisfy customer needs.

Different ways in which to cluster and address the actors within a startup business ecosystem have been presented. Feld (2012) ultimately divides the participants of startup communities into two main categories fulfilling different functions; leaders and feeders. The author suggests that the leaders of the startup community need to be entrepreneurs, retaining long-term commitments, while everyone else is explained to be feeders. The latter is stated to include governments, universities, investors, mentors, service providers, and large companies. The characteristics and functions of these actors are briefly described in Table 4. As this study focuses on the synergies between startups and large-sized corporations, the nature in which construction companies operate will be investigated further in Section 3.1.2. However, first a deep dive into the traits of startups will be presented next.

Table 4. The different actors involved in a startup business ecosystem and their respective function (based on the literature of Feld (2012) and The International Development Innovation Alliance (n.d.)).

Actor	Role of actor in the business ecosystem
Governments	Play a significant role in promoting innovation in terms of constructing policies and regulations through which startups can blossom.
Universities	Constitute of valuable resources such as students, professors and research labs, and provides environments for research and knowledge creation.
Investors	Actors that invest monetary capital, either for the sole purpose of generating returns, or based on more nuanced motives.
Mentors	Entrepreneurs and investors with substantial experiences contributing with their time, energy and knowledge to help startups develop and grow.
Service providers	Can be companies or individual consultants assisting startups in different aspects such as legislation, finances and marketing.
Large corporations	Providing different forms of resources and opportunities to help startups grow, as well as enhance the large company's own ecosystem.

3.1.1 The nature of startup companies

The importance of startup companies has been validated at numerous occasions. They are said to be key players in terms of economic development and are renowned for their ability to create innovative products (Tripathi et al., 2019). Inserting startups in a macro-economic context, they are said to create three million new jobs in the United States on an annual net job creation basis between 1977 and 2005 (Kane, 2010). In that study, a startup had been defined as a firm active in its first year, highlighting the importance of new companies to emerge on the market. Also, important to bear in mind is that the nature of startup companies differs from what can be classified as conventional and established companies. To achieve an awareness of how these small firms diverge from other business entities, the trademarks will be highlighted throughout this section of the paper.

Prior to understanding the nature of startup companies, one must consider that there exists no universal definition of startups (Cockayne, 2019; Tripathi et al., 2019). A commonly used definition is however that “a startup is a temporary organization in search of a scalable, repeatable, profitable business model” (Blank & Dorf, 2012, p.xvii), stressing that a startup is not simply a smaller version of a large-sized corporation. Cockayne (2019) has conducted research in the field and found that firm size, how long the organization had been in business, growth phase, the absence of a developed product, informality of the work structure, hard work and financial aspects were distinguishable attributes for startups. Another point, frequently highlighted, is

that startups operate under conditions of extreme uncertainty (Ries, 2011). Obviously, this leads to a wide-ranging array of startup companies. One way of sub-categorizing them is to acknowledge them as either hardware startups or software startups (Tripathi et al., 2019), depending on where their focus lies. However, not all startups are focused on technology development but, as mentioned in Section 2.2.2, these types of startups are at the heart of this study.

Startups functioning in a digital context filled with ambiguity need to, according to Ghezzi & Cavallo (2020), be innovative and able to adapt to change. Consequently, utilizing lean and agile practices are argued to be benefiting in relation to their respective business model, therefore, it is frequently adopted by startups. In short, Lean Startup Approaches (LSAs) embrace the five principles of lean, (1) Create value for the customer; (2) Identify the value stream; (3) Create flow; (4) Produce only what is pulled by the customer; (5) Pursue perfection. This is followed in order to differentiate between what the customer desires and what is irrelevant (Ghezzi & Cavallo, 2020 referring to Ries, 2011; Blank, 2013). Further, LSAs are the pathway towards a startup achieving its product-market fit (Ghezzi & Cavallo, 2020 referring to Eisenmann et al., 2012). This is realized after hypotheses have iteratively been tested by creating minimum viable products (MVPs), which are unfinished products that still can display their value (Moogk, 2012), and the customer's desire has been fulfilled. The tests are performed in close contact to experts or the actual customer, which provide the feedback required in order to develop a tailor-made product (Moogk, 2012). As insinuated previously, LSAs relate to the concept of startups' agility. An agile entity is described to have the ability to combine previous learnings with current learnings when delivering products of high standard, while having a restricted budget and limited time frame (Ghezzi & Cavallo, 2020 referring to Jyothi & Rao, 2012).

As an entity pursuing to develop a high-quality product and being new on the market, startups face a number of challenges. One of the fundamental issues is to receive funding (Salamzadeh & Kawamorita Kesim, 2015). Further, when expanding, there is a need for additional employees and to succeed in finding the appropriate ones, to a reasonable cost, is crucial. Also, startups can not only be absorbed by their own idea, they need to be responsive to potential competitors and other limitations associated with the market. Despite these hindering factors, support mechanisms exist and to recognize partners with knowledge on how to accelerate is a key to turn an idea into reality. One type of partner is the large corporations in the construction sector, the conventional traits of their environment will be described next.

3.1.2 The nature of the construction sector

The construction industry is characterized by its particularly complex nature, which is partly owing to industry specific uncertainties and interdependencies (Dubois & Gadde, 2002). The streams of resources and activities, the environment in which building projects are proceeded, the required levels of scientific knowledge, as well as the diversity in numbers of actors and interactions in-between them, all compose a business ecosystem that is difficult to manage.

As recognized in Section 1.1, the challenges of the sector are plentiful and innovation is reserved. When observing a construction site for instance, Orstavik et al. (2015) argue that the adopted practices seem to be stagnant and frequently rooted in tradition. A

significant cause for this is that the value creation activities within the building sector take place in a fragmented environment, inclusive of multidisciplinary and heterogenous sets of project stakeholders. Dubois and Gadde (2002) describe the networks within the AEC sector as loosely coupled, constituting two types of connections. First, there are strong interdependencies within individual projects, and second, the relation in the permanent network is loose. The authors clarify that even though this type of system may favor productivity in the short-term perspective, it is believed to be a reason hampering long-term innovation and learning.

Supporting this notion, Blayse and Manley (2004) have identified further factors influencing the innovation of the building sector. These factors are: (1) clients and manufacturers; (2) the structure of production; (3) the nature and quality of organizational resources; (4) procurement systems; (5) regulations and standards; (6) relationships between individuals and firms within the industry and between the industry and external parties. In fact, the relationships across firm boundaries are also put forth by Holmen et al. (2005) as critical to achieving technological development in a corporation. Furthermore, Ingemansson (2012) claims there to be a connection between innovation in the construction sector and the construction companies' ability to collaborate on solutions with external actors.

An emergent trend of innovation in today's society is the one of digitalization. Although construction companies lag behind in the implementation of digital technologies in comparison to other industries, the rate at which change is occurring is affirmed to be accelerating (Hautala et al., 2017). Many of the new-coming solutions address the entire value chain, aiming to improve processes encompassing planning throughout maintenance. Rather than merely contributing with a slight improvement to the objective, these tools can fundamentally modify current business models, processes, and ways in which work is usually conducted. Orstavik et al. (2015) advocate stakeholders to embrace this change and pursue innovation, as the authors claim this to be the only way for corporations to truly prosper.

3.2 Different approaches to innovation

The prominence of innovation is widely acknowledged as a measure for corporations to establish and maintain competitive advantages. Although disagreements on how the concept of innovation is to be defined, Johannessen et al. (2001) argue that the generally agreed upon key focuses are novelty and newness. Such qualities are not solely reliant on investments in R&D departments, but there is an array of models through which innovation could be cultivated in an organization (Johannessen et al., 2001). Rather than constituting smooth and linear processes, Kline & Rosenberg (2010) claim that a complex, uncertain and disordered phenomena is to be expected. Hence, difficulties in how innovation could be actualized are highlighted by the authors. The way towards an innovative reality for corporations is for instance promoted by Kline & Rosenberg (2010) to include close coordination of satisfactory technical knowledge alongside adequate market judgement. Furthermore, the process is advocated not to be viewed upon in solitude but as a sequence of change within the complete system. In pursuing innovation, corporations may aim at improving internal deficiencies, as well as explore externally bestowed opportunities. Both of these categories are investigated next.

3.2.1 Internally based innovation

In accordance with the internally based factors affecting business innovation, Johannessen et al. (2001) have identified several processes that are of importance to be considered. These were explained to include the culture of the company, information and communication exchange, learning processes, and utilization of internal competencies. The authors argue the bottom line to relate to establishing an internal awareness of the importance of newness and novelty. This is as both cultural and structural constructions of corporations may be grounded in promoting traditional working methods, and thus restricting the generation of new ideas and practices. One way to tackle these issues was suggested by Prashantham (2019a) to be providing the company with internal entrepreneurs, so-called intrapreneurs. Menzel et al. (2007) have conducted research in how this can be realized by utilizing already employed engineers at the large corporations. It is claimed that this is the preferred approach for the companies in staying relevant, however, due to organizational barriers and absence of employees with an intrapreneurial approach, it is not actually taking place, neither in the organizations as a whole, nor in their respective R&D departments.

Five key factors have been recognized by Menzel et al. (2007) in order to strengthen the intrapreneurial possibilities within a company. First, a physical environment stimulating cooperation should be present. Second, hierarchy within the organization should be reduced. Third, top management should stimulate intrapreneurship by earmarking human and financial resources to this cause. Fourth, it is necessary for the intrapreneurs to be mentored by experienced individuals at the company. Fifth, the referred employees need to have time and power to operate in the spirit of an intrapreneur. As these five factors receive increased focus, the intrapreneurial mindset is suggested to become more of a natural component of the organizational culture.

A further way of pursuing innovation internally is to develop LSAs, which, as described in Section 3.1.1, is typically demonstrated by startups. Moogk (2012) suggests that LSAs can be applied to any form of company with success in managing a declining growth. On the other hand, for established entities this has proven to be challenging, according to Euchner (2019). Large-sized firms can introduce internal ventures, using similar processes and having comparable aims with startups, to apply LSAs. However, in this case, the minor ventures must be able to handle both market risks and internal risks. Only the latter applies for independent startups. For LSAs to function successfully in the context of a large-sized corporation, Euchner (2019) argues that internal ventures must align the LSAs adopted with the traits of the corporation's core.

3.2.2 Open innovation

In order for development opportunities to not be diminished, Prashantham (2019a) suggests that innovation should come from both within and outside the company. This notion is based on the concept of open innovation, which constitutes an approach initially coined by Chesbrough (2003). The author highlighted the value in external sources of knowledge to establish innovation in a company. The concept of open innovation relies on the argument that valuable ideas can stem from both inside and outside of a company, as can they go to market. The approach utilizes thereof all possible resources, advocating collaborations outside of boundaries to enable solutions that could not have been generated by organizations on their own (Mercandetti et al., 2017).

Chesbrough (2003) explains that a key factor to success is understanding what necessities are missing within the own company and how to appropriately integrate external knowledge with the own system and architecture. In the era of open innovation, companies do not need to invent the best solutions on their own, but to rather know how to make use of external and internal knowledge in order to create and improve products and services. On the basis of thorough theoretical research, Pénin et al. (2011) confirm that innovation is less frequently undertaken in-house, and many companies have started exploring the open approach and including more actors in their innovation practices. A reason for this is believed to be the increasing complexity in technologies, as Pénin et al. (2011) explain would be difficult for a company to navigate around on their own. Schättgen & Mur (2017) claim that acquiring new technologies and adapting to change has never been as important as today. The higher complexity alongside blurred industry borders call for collaboration as an essential ingredient to succeed in the new era. While competition remains the essential driver for seeking excellence among companies, cooperation is gaining more recognition as being an important factor to collectively advance the market (Pénin et al., 2011).

In the sense of utilizing external knowledge, Chesbrough (2003) encourages companies to make use of startup collaborations as a way to explore potential future interests. Mercandetti et al. (2017) agrees on this note, explaining that startups are a rich source of novel ideas that could be utilized by businesses pursuing the open innovation approach. In addition, innovation is to a great extent driven by startups, and in realizing the limits of a closed internal R&D department, the leading companies have been able to use startups to defend and grow their market position (Mocker et al., 2015). Relating to the concept of intrapreneurs, presented in Section 3.2.1, Prashantham (2019a) suggests authorizing more power to these individuals, and permitting them to be in charge of the commitment with startups.

Open innovation is however not limited to companies operating in highly technological sectors. Chesbrough & Crowther (2006) conducted a study examining incentives for using open innovation among companies beyond the high-tech sector. Findings reveal that companies have chosen to use a more open environment due to the belief that the utilization of technologies from outside the firm is critical to achieve profitable growth. Other motives include maintaining or improving product margins through external technologies. Schättgen & Mur (2017) are convinced that the age of collaboration has kicked off, and those who will succeed are those able to collaborate effectively.

3.3 Motives for collaboration

The drivers for engaging in a startup-corporation collaboration varies between the two parties but could nonetheless bring benefits to both if executed properly (Mocker et al., 2015). In a world where innovation rather than profit is put at center, such collaborations could allow for inventing and testing new solutions to ultimately benefit the market development at large. Due to their fundamental differences, startups and established corporations attain complementary natures, and thus have the potential to give and gain a lot from one another.

3.3.1 Motives for startups

From a startup point of view, a collaboration with a larger company in the industry could for instance contribute with market knowledge and experience, access to valuable networks, and help establish economies of scale (Mocker et al., 2015). Heratri & Klang (2019) explore the different types of drivers for startups, constructing them into four main categories: business development, access to resources, credibility, and scaling up. The business development category refers to the benefits a startup can gain from a collaboration in the developing phases of their product or service. The startup can test the validity of their ideas with the help of feedback and support from the established company. The importance of confirming the market fit with an established company is stressed by Mocker et al. (2015), as a common reason for failure among startups is argued to be a lack of need for the proposed offer in the market. Schättgen & Mur (2017) clarify that corporations often possess a good understanding of how market dynamics function, which could help startups in navigating and creating a desirable product.

Being able to access resources, whether it is in the form of technology, knowledge, capital or markets, is another distinct benefit of collaboration from a startup point of reference (Heratri & Klang, 2019). The acquisition of, for instance, corporate capital, as investor, strategic partner or customer is of great necessity for the startup to gain ground (Schättgen & Mur, 2017). Gaining credibility within new markets is also a critical aspect and could be encountered when partnering with large and well-known corporations (Heratri & Klang, 2019). By using the large corporation as a reference customer or strategic partner, the startup could achieve reliability among other actors in the sector and enhance the chances for future collaborations and customers (Mocker et al., 2015; Schättgen & Mur, 2017).

Finally, while startups are arguably skilled in generating innovative ideas, the process of scaling up these ideas is often perceived as more troublesome (Heratri & Klang, 2019). This could be facilitated if utilizing the established company's marketing channels and networks, realizing a faster scaling up process. Growth and scale up are essential elements to maintain customers and investors for a startup, and only a few succeed in this stage (Schättgen & Mur, 2017).

3.3.2 Motives for corporations

Heratri & Klang (2019) have, furthermore, reasoned upon the corporations' motives for partnering up with startups with respect to the following attributes: marketing image, impacting internal culture, solving business problems, accessing external innovation, gaining strategic insights, and financial returns. In regard to the marketing aspect, Heratri & Klang (2019) explain that many corporations desire to create a reputation of themselves prominently linked with innovation to help intrigue entrepreneurial talents' interest in the company. Working with startups could not only attract future talents, but also help signal a new perception of the company among their customers, partners and current employees (Mocker et al., 2015). The collaboration could furthermore encourage entrepreneurial approaches among the company's employees, positively impacting the internal culture of the organization (Heratri & Klang, 2019). When working together with a startup company, the large organization could exploit less utilized technologies and knowledge, as well as adapt to a more agile or lean structure.

Corporations could also take advantage of the startups' innovative approaches to find solutions for existing problems within the business (Heratri & Klang, 2019). By the nature of the way of working, startups are better primed to capture new technology and improve existing models or create new ones (Mocker et al., 2015). These small companies are fundamentally linked to digitalization, entrepreneurial spirit, and an ability to pivot swiftly, all of which are factors that could favor large corporations in the chase for solutions to business problems. Developing new solutions and products together with a startup rather than internally is often quicker and less risky for the core business of the large company. Schättgen & Mur (2017) explain that structures and processes in larger companies are often constructed to optimize current operations as opposed to foster creativity. Startups, however, are not constrained by existing procedures to the same extent, and in times of failure, the small companies have a much quicker learning cycle.

To be able to position themselves correctly in the market with regards to their competitors and other actors, it is important for large corporations to gain insights and build an understanding of possible future turn of events (Heratri & Klang, 2019). In this sense, startups act as a great early indicator on the direction of development with regards to new technologies, markets and opportunities. Through collaboration with startups, spotting of potential future trends could be facilitated (Mocker et al., 2015). Startups can furthermore be an important channel to expand business operations, as they often carry the necessary traits to be able to compete in newly emerging markets. Lastly, all of the drivers mentioned above could lead to a substantial financial return for the company in the long run (Heratri & Klang, 2019; Schättgen & Mur, 2017). The motives for both startups and corporations are summarized in Table 5.

Table 5. Motives for startup-corporation collaboration (based on literature of Mocker et al. (2015), Herarti & Klang (2019) and Schättgen & Mur (2017)).

Motives for startups	Motives for corporations
Developing business model	Solving business issues
Gaining credibility in the industry	Enhancing market image
Accessing market knowledge and expertise	Accessing external innovation and strategic insights
Scaling up	Impacting internal culture
Financial support	Financial returns

3.4 Different forms of startup-corporation relationships

There are a variety of ways to interact with startups, and many corporations are standing before the choice of how to approach and integrate this engagement into their business (Mocker et al., 2015). For many years, collaborations between the two parties have been conducted in informal manners, but Mocker et al. (2015) report that structured ways of collaboration are increasingly rising to the surface, in an attempt to exploit entrepreneurial practices more sufficiently. A formalized engagement adds to the

chances of accomplishing successful collaborations, as it for instance sends clear signals, both internally and externally, of the corporation's intention to support new talents (Mocker et al., 2015). Once the decision of interacting with a startup is made, Schättgen & Mur (2017) believe that corporations should reflect upon the reasons why they want to engage with a startup, as different objectives call for different strategies. Whether a company chooses to establish innovation from within, by for instance acquiring promising new talents, or opts to partner up with a startup to produce a common solution, Mocker et al. (2015) highly recommend corporations to start off the engagement in smaller proportions, test, iterate and then grow. Evidently, the spectrum of corporate led initiatives is broad, and some of the most common collaboration forms between startups and large-sized corporations are presented below.

3.4.1 Investment and acquisition

The most prominent approach to engage with startups have traditionally been related to exerting an equity-based influence. This could for instance be accomplished through direct investments in startups, often referred to as Corporate Venturing (Mocker et al., 2015). By financially supporting interesting startups, corporations can access new competences and markets. Corporate Venturing requires less capital and achieves innovation at a faster rate in comparison to internal R&D departments. Weiblen & Chesbrough, (2015) characterize this model as an outside-in approach to innovation, explaining that knowledge and expertise are acquired from outside of the company to accelerate internal practices. Direct financial return is usually less prioritized in this approach than the strategic benefits of interacting with new technologies through startups (Mocker et al., 2015). From a startup point of reference, the capital as well as technical and market insights provided through Corporate Venturing could facilitate the path to success (Weiblen & Chesbrough, 2015). However, being bound to a large company could also result in some drawbacks. This form of startup-corporation relationship can limit the startup's opportunities to engage with competing corporations in the field. An extended form of an equity-based relationship is acquisition of startup companies, which Mocker et al. (2015) explain could be an impactful way to obtain complementary technologies and solve specific business issues.

3.4.2 Programs and events

Many corporations might instantly think of investment and acquisition when aspiring to support startup companies or enhance their own business. Mocker et al. (2015) argue however that for a vast majority of corporations it is usually more suitable to try and leverage on the new competences brought by startups through mutually valuable relationships. Prashantham (2019b) supports this claim, explaining that the emerging approaches to engage with startups are progressively relying on collaboration rather than corporate ownership. This could for instance be conducted through different forms of startup programs, that act as an interface to the corporation and lays ground for a potential collaboration. Startup programs usually give multiple startups the opportunity to elaborate and develop their ideas with the different forms of support from the sponsoring company (Weiblen & Chesbrough, 2015). From a corporation perspective, such programs allow them to engage with a large number of startups at once, and gain a thorough exploration of new technologies, and business opportunities. A critical point in this approach is bridging the gap from the outcomings of the program to fit in with the corporation's core business. From a startup point of view, such programs help avoid

lengthy vendor qualification processes and strict certification requirements. Unlike the equity-based relationships described in Section 3.4.1, startup programs help limit the risk of dependency to the large company.

One type of startup program that has rapidly grown in popularity is the Accelerator program (Weiblen & Chesbrough, 2015). Usually Accelerator programs operate in a time-limited setup, where corporations seek startups that fall into a certain desired category and offer intense support, funding, coaching and co-location. Startups can in this environment learn, test and iterate their solutions together with the host company. Mutual benefits could be achieved if the startup gains the company as a high-profile customer, and the company finds a solution to their challenge (Kohler, 2016). Another form of startup program is the Incubator, which acts as a business support system focusing on helping startups in their early stages (Mocker et al., 2015). Incubators intend to help startups validate and support their ideas to business propositions, preparing them for market entry (Schättgen & Mur, 2017). By engaging with startups through Incubator programs, the established corporation could shift the mindset among its employees to foster an entrepreneurial culture.

Engagement could also be executed in a less committed level, through self-contained events that often take the form of a competition (Mocker et al., 2015). While such events do not provide immediate return in terms of business relationships, they are a good way to start exposing employees to a more entrepreneurial mindset and explore new perspectives and business trends. They also act as a way to enhance the corporation's brand outwards. Competitions could for instance focus attention on a specific business issue and encourage participants to provide new solutions.

3.4.3 Partnership and procurement

Strategic partnerships with startups could be accomplished through both a short-term transactional relation, and a long-term commitment (Mocker et al., 2015). One way of establishing a partnership with a startup is through Product co-development. This refers to a jointly produced solution, by the startup and corporation, to a business problem. In a Product co-development, products or services are specified and developed together, to then be piloted in the corporation. Mocker et al. (2015) highlight that mutually defined objectives and technical specifications result in a better product development. Hence, the success of this type of relationship is often dependent on a clear brief from the company, a pre-designated budget, as well as a clear time frame within which the company decides whether to extend the partnership beyond the pilot.

A partnering relationship requires alignment between the parties in terms of complementary capabilities as well as conforming cultures. From a corporation point of view, it could be of great value to facilitate internal bureaucratic systems when partnering with a startup. Working with a large company in a committed collaboration could be an important step in the startup's scaling process. In line with this form of relationship, Kohler (2016) explains that when providing a joint solution with a startup, the corporations become a distribution partner. The startup can in this way benefit from the corporation's network rather than having to build up their own.

Corporates could furthermore access emerging technologies by establishing a supplier relationship with startups (Mocker et al., 2015). This is a quicker approach to exploring

new opportunities or solving business issues. Similar to the other approaches, it is important for corporations to approach this relationship in a more collaborative attitude. For the startups, gaining validation from a lead actor on the market can often be an important step for scaling. The different forms of startup engagement for corporations to pursue are summarized in Table 6.

Table 6. Different types of relationships between startups and corporations and their key objectives (based on literature of Mocker et al. (2015) and Schättgen & Mur (2017)).

Type of relationship	Description	Main objectives	Commitment level	Startup stage
Acquisition	Acquisition of a startup	Expand market & solve business issues	Substantial resource commitment	Maturity Stage
Investment	Direct investments from corporates in exchange for equity	Expand market	Substantial resource commitment	Early/Growth Stage
Incubator program	Business support programs for startups in exchange for equity	Create internal entrepreneurial mindset & attract new partners	Substantial resource commitment	Seed/Early Stage
Accelerator program	Business support programs for startups in exchange for equity	Create internal entrepreneurial mindset & attract new partners	Substantial resource commitment	Seed/Early Stage
One-off events	Corporate-hosted events for startups	Create internal entrepreneurial mindset & attract new partners	Limited resource commitment	Seed Stage
Partnership	A commercial agreement focused on creating joint value	Solve business issues	Limited resource commitment	Growth/ Maturity Stage
Procurement	Startup supplies products and services	Solve business issues	Limited resource commitment	Growth/ Maturity Stage

3.5 Challenges in collaboration

When large corporations and startups enter and develop a partnership, it is not always a carefree process. Several barriers are related to this type of collaboration, for example fairness, prolonged decision-making processes and other time related aspects. Already at the initiating phases of a collaboration, difficulties have proven to emerge. In that stage, the large-sized companies have found difficulties in identifying the fitting startup, which will be able to accommodate the needs requested (Bannerjee et al., 2016). From the other perspective, startups are often conscious of which company to contact but not which specific individual at the company. The latter can be organized by assigning such inquiries to a dedicated role, given both financial and decision-making power.

Once the interaction between the two parties has been established, previous research has identified the inertia and slow decision-making process of the large-sized firm as a challenge (Weiblen & Chesbrough, 2015; Jacobson & Ramslöv, 2017). Using a similar approach as described above, the effects of this is said to be reduced by the corporation implementing a separate unit, handling the connections with startups (Weiblen & Chesbrough, 2015). Special attributes of the individuals operating in this unit is then requested. For example, it is beneficial if they have had experience from working in a startup, thus, sharing a similar mindset. Also, a key for this separate unit to flourish is for it to have the mandate to make decisions.

The two types of entities may also have different intentions entering the cooperation (Jacobson & Ramslöv, 2017). On one hand, the startups' main desire is to build a proof of concept, whereas on the other, corporate employees are described to have a broader mindset and more long-term time horizon than what merely a specific project requires. This relates to different degrees on how willing the two parties are to take risks, and this can lead to divergence. On a similar note, an essential barrier for this type of collaboration, from the large-sized firm perspective, is linked to them having more urgent activities elsewhere (Jacobson & Ramslöv, 2017). The aspect of time does not solely relate to the startups' conceivable impatience with protracted decision-making processes. If the large corporation decides to initiate a program, it is possible that it takes several years ahead of it providing benefits (Weiblen & Chesbrough, 2015). Further, it is stated that due to for example changes in strategy at a company level, these established forms of collaboration are abandoned prematurely as a result of the firm shifting focus.

Another critical factor is to not misuse a perceived leverage and treat the partner unfairly. Weiblen & Chesbrough (2015) have pointed out that, in this form of collaboration, power is distributed to the large corporation. However, despite being in a position of power, their reputation can be ruined in the startup community if they act disrespectfully, resulting in the innovation ending up elsewhere. One way for large corporations to prove their capability is by showing their track record of previous success stories. This can also indicate that they have understood the general mindset of startups, being aware of how they can communicate needs appropriately and that they have improved their learning culture (Jacobson & Ramslöv, 2017). The challenges for collaboration between startups and large corporations are summarized in Table 7.

Table 7. Common challenges in startup-corporation collaborations (based on literature of Jacobson & Ramslöv (2017), Weiben & Chesbrough (2015) and Bannerjee et al. (2016)).

Challenges for startups	Challenges for corporations
Identifying the right interface	Identifying the fitting startup
Different intentions	Different intentions
Slow decision-making process	More urgent activities elsewhere
Imbalance in power	Can take long time before earnings are realized

4 Empirical findings

This chapter presents the collected data of the empirical study, which is founded on semi-structured interviews. The results are categorized with regards to the perspective of large-sized corporations in other sectors, the perspective of startups in the construction industry, and finally the perspective of large-sized construction companies.

4.1 Perspective of large corporations in other sectors

The findings of three large-sized corporations, operating outside of the AEC sector, regarding startup engagement is presented next. The respondents can be viewed in Table 1. The companies are respectively active within the fields of biopharmacy, information and communication technology, and medical technology. The section is divided into themes of the approaches to startup-collaboration, perceived challenges, as well as the ideal situation and future outlook. A summary of the findings from this perspective is provided in Table 8.

4.1.1 Approaches to startup-collaboration in other sectors

The three large-sized companies, from sectors outside of the construction industry, presented various ways in which they have approached the startup market. Evidently, none of these companies rely on one single method. Instead the engagement with startup firms have been conducted in different ways within the companies. However, all three organizations have in one way or the other, experience in participating in larger startup dedicated programs or initiatives.

For the case of the company represented by Respondent A, it is a company active in the biopharmaceutical sector, a long-term commitment for assisting startup firms had commenced. This is established by hosting an industry incubator program, mainly funded by external private and public parties. The program is aimed to help startups that have grown to the age of scaling, referred to by the interviewee as scale-ups, in reducing some of the costs. This is realized by offering office spaces and permission to utilize other features of the available infrastructure at the site. Besides this, the small-sized companies can benefit from the range of experiences the large-sized company possesses. If requested, meetings between the parties can be scheduled and formal interactions can then take place. In total, 27 small-sized companies participated at the time of the interview. However, other external larger firms and academic units are also part of the ecosystem encompassed by the incubator. The variety of entities involved is supposed to shape an environment where complementary rather than competitive knowledge is added, which can drive innovation merely by having them gathered at the same location. To assure a collaborative environment, the companies selected to be part of the incubator are those with no competing ideas to the host company, or other participants of the program. For the host company, the main intention of the incubator is not to form collaborations with the participating startups firms. However, other entities are allowed to unreservedly unite in different projects.

The second company, represented by Respondent B, has engaged in another type of startup program, namely the accelerator. The corporation is a global Internet of Things organization, with its basis in information and communication technology. The company was described to consist of many different departments and active in

numerous business ecosystems, with no singular entry point for startups. The perspective that the interviewee contributed with was smart mobility oriented, and in that field the company was involved in a startup program together with five other companies operating in the same territory. For startups to become a part of this program, they apply to one of the two annually held pitch days and need at least two of the six established companies to become interested and ready to commit resources. The collaborative process is then initiated and during a six-month period, which can be extended to a total of twelve months, continuous meetings take place. In short, the procedures are said to consist of three periods. First, an exploration phase is initiated, followed by a test for a proof of concept and finally the idea is forwarded to the go-to-market phase. The latter can either be realized by the established company introducing the startup to relevant customers or that they directly acquire the product or service themselves. However, as Respondent B puts it “most of the startups do not reach past the exploration phase, some proceed to the innovation phase and then we do business with a few of them”.

Unlike the other companies, the firm represented by Respondent C does not host its own startup program. Instead the company’s approach to the startup market is conducted on an ad hoc basis, as well as by taking part in an externally led incubator program. The company operates within the medical technology field, providing solutions that help healthcare professionals optimize patient care. It has been explained that the relationship with startup firms varies with respect to the intended outcome. For instance, if a commercialized relation is to be realized, the purchasing department is involved, while if a solution is to be co-developed, the R&D department is engaged. The company’s startup collaborations have however been dominated by the approach of acquiring the startup’s idea or solution. This is partly to prevent competitors gaining access to these benefits. The company has engineers working with early development constantly scanning the market and seeking out interesting new firms for potential collaborations. However, when startups wish to establish contact with the company, the procedures are less systematic. There is no obvious interface to approach but is to some degree reliant on personal contact and which individual they approach at the company. Regarding the incubator program that the company participates in, the interviewee perceived the outcomes as positive although they had not resulted in new co-developed products with startups. This platform is utilized by the company to gain exposure to the startup market on equal terms, as Respondent C expressed “you enter with open minds from both sides”. Furthermore, learnings in new working methods and ideas have been obtained.

4.1.2 Challenges for other sectors

Several challenges have been acknowledged by the interviewees of the three large-sized companies in regard to their respective startup relationships. The notion on the clashing natures of startups and established corporations has been agreed upon as a demanding, but crucial aspect to consider. Based on the experiences of Respondent A, the different traits of the participating companies in the incubator program have been highlighted. It was explained that the small-sized companies desire a high-paced process because, as the interviewee said, “time is money”. One way of mitigating such discrepancies is the layout of the incubator, having all entities in the same environment in order to enhance their understanding of each other.

Respondent B has also described this as a commonly encountered obstacle in cooperation with startups. Big culture clashes are said to occur where the startups are of the opinion that the established companies act too slow and the established companies think that startups lack patience. Nonetheless, the interviewee welcomed the scrutinizing mentality and stated, “we love to be challenged”. The lack of understanding of the other party has however been evident to relate to aspects beyond their differentiating characteristics. Respondent C expressed for instance that startups do not always possess adequate knowledge about the company or the industry in which they operate when presenting their ideas. In such cases the startup representatives, for example, believe that they are providing a unique solution, that in reality is either common or not in line with the company’s operations.

Furthermore, the legal aspects were also expressed as challenging as they require both time and effort to arrange. This concern was mainly apparent for the case of the company represented by Respondent C, which lacked a developed structure for collaboration. However, the interviewee pointed out that this process could be enhanced when dealing with smaller firms as opposed to large companies, as they usually also maintain smaller legal departments. This could make the process smoother and less time consuming. The interviewee also acknowledged that there are further improvements to be done within the company. For instance, a comprehensive policy that provides guidelines in how to proceed startup collaborations is anticipated. Internal communication, and reaching out to everyone in the company, was also mentioned as an area that could be troublesome for a large organization to master. The interviewee affirmed that there are ongoing discussions on how to develop these structures on an organizational level in a good manner. The ambition is to balance the growth of the company while preserving the innovative mindsets, as they could easily get lost in highly bureaucratic procedures. In this manner, it could be valuable to peek at, and learn from other businesses and industries which are more mature.

4.1.3 Ideal situation and future outlook for other sectors

In spite of the persisting challenges in collaboration with startup firms, the opportunities each party could bring to the table were highly recognized by all interviewees, who further claimed these small entities to be a crucial part in forming the future of the sectors.

Taking a look at the incubator program, Respondent A admitted that the success of such initiatives could be difficult to conform. This is as no monetary indications could be evaluated. However, contributions to growth of companies, the number of collaborations initiated, and increased funding were some points mentioned, that according to the interviewee prove the necessity and success of such programs. Also, in this specific sector, profit can be seen in the long-term perspective due to the length of the process to develop a drug. The soft values that the large-sized company can obtain by working close to the small entities are said to include complementary knowledge, inspiring new ways of working, and influencing an entrepreneurial and innovative mindset, were highlighted. In addition, the incubator has received external recognition, which for the host company has been positive when displaying a collaborative-friendly and open firm.

For the company hosting the accelerator program, Respondent B stated the success to be determined by “how many startup projects that lead to a proof of concept and value

in some form”. Examples of value were said to be actual business value and learnings, where these learnings relate to both parties. In practice, startups understand how they can continue to develop their ideas, while the large-sized firms grasp the agile working processes of the startups. As emphasized by the interviewee, “learnings should not be undervalued, they are incredibly important”. On the notion of how to obtain the most out of these programs, Respondent B expressed that “an ideal startup for us is one that is very adjustable and willing to cooperate”. Further, from the program they want a startup that is aware of changes being necessary for their idea to function in the context of one of the partner companies. In return, the startups have individuals from the established companies involved with innovation as their main contact. Besides such resources, the startup companies are provided offices, invitations to marketing events and have the opportunity to test their ideas using groundbreaking technology which the large company is equipped with.

For the company represented by Respondent C, the anticipation for the future is to further develop their approaches to systematically utilize the startup market. This was acknowledged to benefit the small firms as well. For the startups, the earnings of such relationships would be to get their product into the market in an easier way. The medical technology field is special in the sense that products need to be registered and legally approved, which are aspects that the large company can facilitate. The startup can provide fast and iterative processes and an open mindset due to the organization being reliant on less constraints than larger entities.

Finally, both Respondent B and Respondent A have hinted to the collective benefits for their industries in establishing successful relationships between startups and large corporations. Speaking on the relation to the other major companies that are part of the accelerator program, Respondent B revealed that it is rare that a startup’s idea only resonates with one of the partner companies, and that it is encouraged to be in that way. This is identified as a benefit by the respondent, as before the initiation of the program, startup collaborations needed to be individually rooted with other companies for tests. In the program, it is now instead conducted in a structured way. In addition, the risk is now shared among the partner companies, which is viewed upon as beneficial. As the interviewee stressed, the program enables collaboration both with the startups and with the other large-sized companies.

Table 8. A summary of the approaches, challenges and ideal situation for corporations in other sectors.

Approaches in other sectors	Challenges for other sectors	Ideal situation for other sectors
No singular entry point for startups	Culture clashes	Tolerating that success is attained long-term
Startup programs	Startups lack knowledge of company/sector	Continuous learnings
Ad hoc basis	Legal aspects	Startup accepting modifications to ideas
Department dependent	Internal communication	Enhancing reputation of being innovative

4.2 Perspective of startups in the construction industry

Following the perspective of other industries, the viewpoint of startup firms operating within the construction sector is presented. The respondents can be viewed in Table 2. First, the different collaboration approaches with large construction companies are highlighted. Thereupon challenges and ideal future situations are displayed. A summary can be viewed in Table 9.

4.2.1 Approaches to collaboration with large corporations

Although there was not one explicit definition of what a startup company comprises, a lot of the same characteristics were highlighted by the interviewees when explaining the essence of their respective company. The innovative approach and utilization of sufficient technologies were recurrent components in each startup's aim to, in one way or another, improve the construction sector.

Respondent D expressed that startups often attempt to develop solutions to address existing problems or make existing solutions more efficient. This notion of satisfying a present need in the industry was shared by several of the interviewees, and Respondent E stressed the importance of having an adequate product market fit to ensure value creation for the target customer. The startups' solutions were many times developed through customer-driven innovation, granting a more adaptable rather than definite product. Several of the interviewees emphasized furthermore on the services gained through their offer, rather than the digital tool itself. In regard to this aspect, Respondent F clarified that startups often provide "a rather niched but effectful competence knowledge, usually transformed into some sort of technology", explaining furthermore that behind the software they provide "lies an immense amount of knowledge gathered through research and experience from other collaborations".

When describing the ecosystem in which the startups operated, it appeared that several startups had partaken in sector independent support systems, whether it being funders,

advisors, incubators or university led startup programs. The impressions of such partnerships are of a twofold description. Respondent F expressed, for instance, that one of the programs in which they are part of as “rather fuzzy” but anticipated other similar forms. In addition, Respondent E’s impression was in general positive, explaining that they are frequently in contact with their support group to gain valuable knowledge and help in taking the next steps. There appeared no strong interrelation between these types of support systems and the large actors in the construction industry.

A shared view among the interviewees emerged regarding the industry’s need for an increased digitalization and adoption of productive practices. Respondent G explained that, although the construction sector is one of the largest, it is still considered as one of the least digitized. Whether or not the building sector was prone to change brought however more diversity in opinions. While Respondent G believed that the startups were the main contributors to innovation, they perceived that some of the large companies were positive towards utilizing these innovations, claiming that ultimately both parties have to contribute for change to be realized. Respondent H pointed out that the loss of productivity in the construction sector was many times due to old structures and approaches, painting the sector as “a poorly digitized industry, that however, is beginning to understand the need to digitize their components and processes”. Both Respondent E and Respondent D observed positive attitudes towards change among younger people in the industry, underlining the importance for a startup to recognize the actors that want to take part in developing the sector.

4.2.1.1 Experience in collaboration with large corporations

The startups had varying amounts of experience of collaborating with large companies in the building sector. The conducted collaborations were furthermore of different types and features. Although a definite clustering of these collaborations was difficult to detect, they could roughly be arranged into either fulfilling a product development purpose or commercialized goals.

Respondent I explained the formation of their startup, from idea to product, as one comprehensive form of collaboration involving many different actors. In this initial stage they managed to come in contact with an intended end-user that worked for a large construction company to help gain feedback on how to develop their product. Thereupon, they started a collaboration with the large company in which the product was tested in a pilot project. The other type of collaboration that Respondent I encountered with large companies had a more commercialized objective, lacking the open innovation practices. Respondent E’s startup, which is fairly new to the market, considered the collaborations as a way of testing and proving their products. Their collaboration partners were deeply involved in the product development process.

In contrast, both Respondent D’s and Respondent G’s descriptions fell in line with a commercial relationship to the large company, but with room for customizing the product to better suit the customers’ needs. Respondent D considered this practice as less of a collaboration, and more of a way of fostering good customer relationships, as the interviewee expressed that the large companies in this case are “customers but they come up with suggestions for improvement and development opportunities”. As the large companies usually use the product of Respondent D’s startup on a larger scale, their opinion and suggestion become very important to the startup and they try to “take note of their points and find a solution”.

Respondent F described two phases of collaboration with large companies when developing new products. In the first phase, Respondent F's startup continuously develops the product according to the company's evaluation and needs, requiring high involvement in terms of time and effort from the partner company. The interviewee explains that in this form of collaboration they "set aside a dedicated amount of time to build a product based on the company's requirements and the customer allocates time to test and give feedback on the product". In this stage, the company does not pay license or additional costs, as "they add value by spending time on setting requirements and on testing". When the startup has successfully developed a product that is value adding to the company, the collaboration transforms into a commercial relationship, in which the company can buy the product. In this later type of collaboration, continuous updates and feedback is still performed, but the company doesn't have to set aside specific time.

Most of the startups reported that collaborations with large companies were usually department specific or project based, which was believed to be due to the fragmented nature of large companies. The collaborations needed furthermore to be proceeded within central or strategical departments of the company. Respondent F stressed however the importance of including end-users in the developing process. This to avoid making products that are not perceived practical by the operative functions. The interviewee stated that "if you only speak with the central functions and not to any end-users, it could become quite a feature feast", meaning that many required features might not be urgent for practical use of the product.

Several of the interviewees expressed their conducted collaboration to have been initiated by the startup, primarily through communicating their offer to the large companies. In the case of Respondent G's startup however, the large companies have reached out, expressing a need which the startup then suggests a technical solution to. Respondent E calls attention to the word of mouth, explaining that many collaboration partners reached out after hearing about the company from others, or through a shared social media post.

4.2.2 Challenges identified by startups

From the startup perspective, several challenges have been stated in relation to the collaboration with large-sized companies. Predominantly, these have been identified to either be associated with the possibilities for the larger companies to offer scalability, the startup's ability to sell in their ideas or what can be described to be conventional traits of large-sized firms.

Regarding the traditional nature of large-sized firms, this for instance comprises a low sense of urgency in this type of collaboration, protracted decision-making processes and the representatives of the large company not being entirely aware of their company as a whole, as stated by the respondents. In terms of time, the interviewees have described the collaboration process as drawn-out, ahead of the parties reaching an official agreement and truly working together. The reasons for this differ, but have been ascribed to a fragmented environment within the large companies by the respondents. Consequently, the startup companies have needed to be in contact with several different individuals at the large companies in order to start the joint-operations, as mentioned previously. The necessity of top management involvement ahead of signing an

agreement has also been stated as an issue related to this theme. Since the large firms in general have many projects operating simultaneously, the prolonged process is attributed to a lower sense of urgency from the larger company to initiate this form of collaboration.

Unanimously, the interviewees have also perceived a discrepancy between the individuals with decision-making power and the ones using the tool provided by the startups in practice. This disparity is stated to have had an impact on the difficulty to directly approach the appropriate partner at the large-sized company. In addition, a startup had identified that a large company had initiated a collaboration with another startup company within the same niche, without knowing that a similar idea already was being tested by the firm.

Another challenge relates to the ability of the startup company to sell in their idea. At times, making the large company understand what the startup company provides and requires has been difficult. On a similar note, some large companies have been described to simply want to purchase the product provided by the startup and not being part of the development process, which it occasionally requires. Furthermore, some of the large companies have commenced a relationship with a startup and the product has been delivered as specified, but in reality not been used by the large company. Regarding this matter, it sometimes has been a challenge for the large company to immediately use the product delivered due to the associated learning curve. One way of handling such cases has been that the startup teaches their systems to their customers and also offers continuous support and service, for the adaptation time to be shortened.

Identifying appropriate communication channels has also proven to be an area in need of improvement, as Respondent I plainly stated: “it is difficult to find a proper communicating channel”. Additionally, the large companies are requested to communicate their issues better, as well as being more specific when defining the problems, in order to avoid matters which hamper efficiency. As Respondent D desired, “I would like to ask the entire Swedish construction industry what type of solutions they need, then we would be able to build these much faster than them trying to do it on their own.”

4.2.3 Ideal situation and future outlook for startups

In order to cognize the ideal relationship between startups and large-sized companies, the startups projected their visions and desirable aspects which ought to be included in a rewarding partnership. These comprise both the qualities which the startups can provide, as well as what the large-sized companies can facilitate. In addition, general features describing the layout of the joint-process were pointed out by the startups' representatives.

A key to a successful relationship is said to be having an open dialogue early on with continuous meetings taking place. Respondent F had a positive experience in this, stating “where the large company communicated their needs, differentiating between the must-haves and the nice-to-haves”. Here, it is of importance that the startup clearly defines what they can contribute for the large corporations and that they, in turn, show courage by exploring the innovative concepts presented. “The other actor also needs to commit, maybe not financially at once but at least by allocating some type of internal resources”, is a suggestion by Respondent G regarding a way for the large-sized

companies to invest in the relationship. Post agreeing on the terms for the partnership, several of the interviewees have explicitly stated that they request continuous feedback from the users. A successful example of this was when a startup company started out with an unfinished product and received feedback along the way from the large company, to further develop the product. Respondent E explicitly mentioned their initial satisfaction with their product, but when launching it to customers they quickly noted that “the more you understand, the more there is to do”, referring to the ideas sparked by the feedback obtained by the external actors.

As for the contact person at the large-sized company, specific decision-making power is desired to be allocated to that individual. Respondent E claimed that “being in contact with someone at the large company with power over the budget is rather important to make a collaboration happen”. Nonetheless, the end-user should also be integrated in the developing phase of the product or service in order to have the ones directly benefiting from the implementation to carry out the message to the rest of the company. In practice, the end-users have proven to be essential in the aspect of providing feedback which has helped to develop the product further.

Through the interviews with startup companies, it has been identified that the main foundation of collaboration between them and large-sized companies have been on an ad hoc basis. As of the current situation, the interviewees were not aware of the existence of established platforms directly related to the Swedish construction sector. However, provisional events mainly directed towards expanding the network and increasing the awareness of startups within the construction industry occur. Some of the respondents have taken part in these arrangements, others have not. The motives of the current startup-corporation gatherings have mainly been of marketing and communication reasons rather than initiating collaborations.

The perceived necessity of established forms of partnerships has fluctuated between the interviewees. Some of the startups have been positive for a platform to arise and the opportunity to make use of the possibilities it potentially can open up for; “there is always a need for improved collaboration where large construction companies show that they are available and have a desire to invite startups”, as affirmed by Respondent G. Other representatives of the startups have, instead, had a stronger notion for the concept of developing an open dialogue with the larger companies. Respondent H claimed that “there are great returns for both parties to take part in innovative ability and experience”.

Inversely, a few of the startups have been more hesitant towards establishing specific platforms within the construction sector, especially if orchestrated by the large-sized firms. The reasons for this have either been due to a lack of interest from the individual startup and they instead having a desire to nurture their already existing partnerships, or more militant by Respondent I stating it to be “a big mistake by the large-sized companies if they try to create organizations, such as micro-ventures or open innovation units“. Nonetheless, Respondent I was positive towards the organizing of events and had a desire to develop them, making the construction sector more inclusive; “in order to accelerate, they can take place every month ... and include brainstorming and workshops”. Further, the interviewee requests faster decision-making processes by letting the representatives of the large-sized companies to have the authorization to initiate collaboration already at the events.

Regarding the features which the large-sized companies can accommodate, the startups have been congruent of what they desire. These are: actual projects to implement the startups' ideas on, economic funding, experience and knowledge about the construction sector, as well as defining problems which the startups can solve. Also, the large-sized firms have been acknowledged as enablers for the possibility to offer scalability of the startups' ideas. As described by Respondent I, "ideally the company wants to deploy for bigger tests so that the startup can become sustainable", when the product development phase has accomplished the set targets. To reach additional actors in the sector is another aspect in which the large-sized companies can assist. Respondent E stressed this by stating "recommendations by one company to another is by far the best way to increase the product reach".

Correspondingly, the startups have also had similar impressions of what they can facilitate for the large-sized firms. This includes creativity, agility, niched knowledge and custom-made products and services. Additionally, once the ideas have been implemented, a financial return for the large-sized companies is to be expected due to "we make the everyday operations more effective for our customers so that they, at the end of the day, make more money ... this also results in that money for example can be spent on constructing better schools and infrastructure", as claimed by Respondent G.

Table 9 A summary of the approaches, challenges and ideal situation for startups.

Approaches by startups	Challenges for startups	Ideal situation for startups
Startups making first contact	Low sense of urgency at large companies	Large company showing their availability
Solving existing problems	Possibility to scale solution	Open dialogue early on
Making existing solutions more efficient	Approaching appropriate role at a large company	Continuous meetings
Searching for product market fit	Protracted decision-making processes when a large company is involved	Commitment from both sides
Co-developing solutions	Ability to sell idea	Involvement of role with access to budget
Commercial relationships	Identifying appropriate communication channel when collaborating	Involvement of end-users

4.3 Perspective of the large construction company

Lastly, the perspective of the large-sized construction company is considered, based on the experiences of the case company representatives. The respondents can be viewed in Table 3. Their approaches, challenges and described ideal situation of collaborations with startups will be presented in this section, while a summary can be seen in Table 10.

4.3.1 Approach to collaboration with startups

The predominant view of the company's current approach to startup relations, emerging from the interviews, is that these types of collaborations take form on an ad hoc basis. It was established for instance that the company lacks an exclusive policy to address this issue. Respondent J expressed that they "are a rather decentralized organization, so for obvious reasons, the possibility to take initiative is scattered". The interviewee explained that, while this suggests that no one department or project is hindered from initiating startup collaborations, the conducted procedures in each collaboration may very well differ. Several interviewees believed that startup collaborations are taking place in different parts and projects at the corporation without it being recognized on a company level.

Furthermore, the interviewees explained that collaborations with startup firms could be initiated in various ways, ranging from a company led investigation to solve identified problems, to aimlessly coming across interesting new ideas. According to Respondent K, the way in which the corporation handles startup requests depends on which person at the company the startup comes in contact with, claiming that "we are a large organization and we have people that on a daily basis are approached by external companies who present solutions that they want us to buy".

Once an agreement to collaborate is settled, the solution is usually implemented in pilot projects before it is adopted on a larger scale. In this sense, real life experiences can be gathered to help develop and advance the product, and the company gets the chance to evaluate it. Respondent L believed that, informally the ambition is to expand the use of these solutions to the rest of the company once proven successful. However, the interviewee continued in saying "I don't think it has ever reached that far". In many cases, the company has opted for a co-development approach together with startups, to create custom-made products, rather than acquiring the small firms.

4.3.1.1 Experience of collaboration with Startups

Two main cases of startup collaborations were highlighted during the interviews conducted with representatives of the large company. These cases will be described next to provide examples of how collaborations with startups might occur at this specific construction company. The first case included Respondent M, who had the role of an expert in the subject of which the solution was to be developed. In the second case, both Respondent K and Respondent N were involved as project managers of an initiative in which the collaboration took place.

In the first case, the collaboration derived from an identified need in the company regarding a lean working method utilized in the design phase. A desire to digitalize a planning tool in that method emerged. Initially the company attempted to internally address the issue, but the decision to seek external expertise was taken later on. In

searching the market, the company came across a startup that worked with lean practices in other sectors. This specific startup had therefore limited experience and knowledge of working in the AEC sector. Central functions were incorporated in the matter, in order to try and develop a potential solution for the company's problem together with the startup. According to Respondent M, this procedure was flawed, as the involved parties from the large company lacked adequate knowledge on how the solution would be used in practice. Hence, Respondent M was involved in the collaboration at a later stage to help provide expert knowledge and feedback to the startup. Through continuous meetings and development, the main defaults were conquered and the product was launched to be tested in eight pilot projects. The interviewee explained that the emerging issues and feedback from these projects were summarized and communicated to the startup for further development. Through the developing phases of the product, the large company was reluctant to provide the startup with financial support.

In the second case, the collaboration with a startup occurred through a university led project that the company is partaking in, aimed at digitalizing the building sector. This initiative is not explicitly related to startup firms but is rather inclusive of different-sized organizations. In the initial phases of the project, workshops were organized for construction companies to identify areas in which help was required. For the case company, the identified issue regarded logistics on the construction site, and they came across a startup providing solutions in this area. Respondent N explained that "we started by recognizing which issue we wanted to address, and we knew that we wanted to address it with a digital solution".

In this university led initiative, the case company developed an approach based on creating a minimum viable product with their collaborating partners. Respondent K explained this as developing the product to a sufficient level for it to function, and then expose it to end-users in suitable ongoing building projects. In this sense, the startup gains feedback and the product is iteratively developed based on the needs and demands of end-users. For this matter Respondent K explained that "the key was to develop the product together with [construction workers] who were passionate about trying new solutions". Continuous meetings took place between an internal intermediary at the large corporation and the startup. The role of the intermediary was to collect and structure the feedback and efficiently communicate it to the startup, as well as deliver questions and uncertainties raised by the startup to the construction workers. After finalizing the test period, it took almost a year to make it an option for the rest of the company to utilize. The decision of not acquiring the product was taken, and instead it was made available to purchase for the subcontractors of the large company. Respondent N expressed that "it went from an idea, to an innovation which created value for the company". Data on how the product improved the building site was collected to help market this solution to the rest of the company and advocate the use of this solution. The data was also used for external marketing by the startup to attract further customers.

4.3.2 Challenges identified by large construction company

Different forms of challenges regarding the issue of startup relations were expressed during the interviews. Some of these complications concerned the general approach of the company, while others related to more specific obstacles encountered in these types of collaborations.

At a general company level, the majority of the interviewees agreed that creating a well-established approach to utilize startups in the construction sector has not been a main focus of the case company. It was expressed that, for a large construction company, such questions were regularly overlooked as problems occurring in the daily operations often are perceived as more urgent, to which Respondent L commented that “you always procrastinate on the future development steps that startup businesses could help evolving”. As the company had not set any clear ambition on how to exploit the startup market or which problems to address, it is difficult to scan and identify which startups to collaborate with. Subsequently, the exploration of startup collaborations, according to Respondent J, is easily lower prioritized when allocating money and other resources. The interviewee continued in explaining that no one in the company has taken lead in this question, as there is not necessarily a natural position for this issue in the organization today. Hence, there is no obvious role that should be in charge. One of the interviewees believed that a lot of employees were unaware of the potential startup firms can contribute with, explaining that the issue has been discussed as a threat rather than an opportunity.

Along the lines of diffuse company ambitions, internal indecisiveness regarding at what point to pursue a commercial relation rather than a co-developing one was highlighted by one of the interviewees. In that specific case, different desires between the involved parties were expressed, as one side wished to keep developing the product while the other wanted to acquire it. This conflict led to the solution only becoming sub-optimized, as the relationship, according to the interviewee, evolved into a commercialized one too soon.

Legislation and qualification were also brought up by several interviewees as aspects that could suggest challenges in collaborating with startups. When working with small companies in general, one interviewee explained that these firms need to pass a supplier qualification within different frameworks. If a startup does not already exist within that framework, it could take longer time to set such an agreement. Challenges when setting up a contract with external parties were expressed, as a lot of aspects needed to be considered. Additionally, it was mentioned by Respondent N that it is difficult for a large company to initiate a collaboration with a startup that has not started on forming their solution, explaining that “it can be some form of prototype, but must be more than merely an idea”. This because it would be easier for the large company to put the solution into a context and start evaluating and testing it.

Another challenge observed by the interviewees in these types of relationships has been that, in regard to some aspects, little consideration was taken to the specific needs of a startup firm. For instance, several interviewees pointed out that the procedures in large organizations may often be perceived as slow paced. This was due to accountability being divided between many roles across the company. While the large construction company is not heavily affected by the issue of time, it was recognized as a critical aspect for the startups. Additionally, the capacity and size of the startup were discussed as important elements to take into consideration. Respondent M explained that, for a large company it might be challenging to fathom the capability of a small firm, but it was nonetheless important to not set unattainable demands on a startup before providing financial support. On this note, Respondent M expressed that “we can’t just kill them if they don’t have capacity to follow through”.

Lastly, one of the case company's main obstacles in collaboration according to Respondent K is being able to identify the right projects in which to test and iterate startup solutions, as well as to involve the right employees. There is a challenge for the case company in identifying people who are open to test new solutions and able to set aside time to give valuable feedback and share their experiences. The involved people need to have adequate knowledge in how the solution is aspired to be used. Both parties need to understand the requirements and each other in collaboration.

4.3.3 Ideal situation and future outlook for large construction company

Similar to the representatives of the startup companies, the individuals at the large-sized firm partaking in this study were asked to describe the company's ideal situation in this form of collaboration. One of the main points brought up was that the company should set a clear strategy and only involve external partners which align with this direction. This encompasses that the company has identified in which areas they internally have a shortage of necessary competence. Once the appropriate startups have been recognized and contact has been established, a couple of the interviewees mentioned it to be essential that the parties reach a business agreement early on. Points which should be established were said to be the length of the test process, what the agreement comprises and the economic structure. Also, the value for both parties should be clarified. On this topic, Respondent K described that "the relationship with the individuals at the startup is extremely important".

However, several interviewees have acknowledged that the agreement and collaboration process should not have excessively detailed constrained frames. The process is further described to benefit from being less bureaucratic than a traditional agreement between corporations, partly because the resources at the startup are limited and partly because it can harm the innovative environment desired. Adding to this theme, the degree of commitment between the parties was discussed. From one perspective, the large-sized firm should avoid acquiring startups because it may restrict the technology from spreading to the construction sector as a whole and that it was insignificant if competitors also obtained the solutions. On the other hand, acquisition was argued as relevant if it directly impacted the internal information handling in an efficient manner.

One of the respondents, declaring to have an idealistic view of such a partnership, claimed that the large-sized firm had a social responsibility in terms of fostering startups which could provide value for the company. As such, the large company should commit long-term and understand that the partnership comprises more than solely the product or service provided in a traditional business agreement. Thus, partnering with a startup is described as different compared to an established entity and the requirements should then be realistic for a startup to deliver. An example brought up connected to a successful test phase and the large-sized company having a desire to scale.

Internally at the large company, the ideal situation is one where the employees are encouraged to present potential solutions to reach a higher degree of innovation within the firm, as stated by one of the interviewees. A potential way of signaling such intentions was said to be via clear communication from the central strategic unit of the

company regarding an increased urgency of this matter so that the knowledge transfers internally. Since individual construction projects have the authority to initiate collaborations with startups, the employees with decision-making mandate should be aware of how they can spread valuable solutions to the centralized components of the firm. Also, if a structured policy of how these types of collaborations should be carried out is implemented, everyone with such authority ought to be aware of how it is to be organized. The difficulty of disseminating procedures internally also relates to startups that have begun collaborating with an individual project, “it is very easy to get in contact with our core operations in projects, but it doesn’t mean that you have made it into the entire corporation”, according to Respondent J. An additional reason for encouraging internal involvement is said to be that it validates the products and services if the end-users express positive opinions regarding the implementations.

From a general perspective, the interviewees stated that in an ideal situation, the large company should be able to provide a customer base, test beds, feedback on ideas, requirements, financial strength, stability and diversity in competence for the startup. In return, startups are asked to be able to provide agile processes, lower costs related to innovation, challenge established ways of operating, new ideas and custom-made products for the large firm. For a collaboration to be realized it was also stated that the startups should be aware of the general needs of the construction sector, thus, presenting relevant ideas. Areas which have been held as pertinent are artificial intelligence, handling of information, sensors, advanced analytics, facilitation of logistics at construction sites and improving working environment.

In order to improve startup-corporation collaborations, all of the respondents have specified that it would be beneficial for the large-sized firm to have a formalized policy stating how partnerships with startups should be established and operated. As described previously, this was not in place at the time of the interviews. Thus, finding appropriate structures for this was deemed as important in the company’s collaboration with startups in the future. A point of departure for this matter was said to be that the company needs to scan the startup market using a systematic approach and understanding what startups can contribute with. For this, they had initiated participation in an external innovation hub shortly prior to the interviews for this study taking place. The general perception was described as positive but that it needed more time for it to be evaluated accurately. Also, representatives of the company had partaken in other events open for companies of all sizes. These had been accessible to numerous sectors, but one of the interviewees stated that it would have been desirable for these to strictly be niched for the construction industry.

A purpose of taking part in these activities was to expand knowledge of the startup market. However, one of the interviewees mentioned that potentially it is not the large-sized firm that primary should contribute directly with new innovations. Instead it was suggested that they should urge their suppliers to go down that route and encourage them to offer startup developed solutions, ready to operate. In addition, another interviewee stressed the significance of being part of a strong supply chain.

During the interview, the respondents elaborated on their thoughts regarding startup-programs as an established form of collaboration. Two of the interviewees were uncertain whether it would be feasible for the company to start their own program and that it must be understood what a program can provide, as well as the necessity of it. “I

am not sure whether we should have such a program because I am questioning how much technology will be part of our core product”, said Respondent J. One of them explored the idea of whether the construction sector as a whole should initiate a program. This was deemed as more relevant, but the extent of it was believed to be significant, leading to further complications. Another respondent claimed that it is more difficult than it might be believed to implement a program to the organizational structure, stressing that programs may look more impressive from an outside perspective than they actually are.

In addition, the importance of a startup-program to be intertwined with the core business, while still not compromising on the daily work of the individuals involved, was described. In relation to this theme, one respondent emphasized the prominence of experts to be present in the program, so that not only intermediaries are available in the operations surrounding startup collaborations. Thus, to have a well-functioning, internal communication system and identifying the appropriate circumstances as to when to connect each key person at the firm was described as an enabler to make such collaborations successful. Another interviewee believed that the entry point for startups should be at the company’s innovation or research and development department.

On a provisional basis, the company was in the middle of their trials with the solution related to construction site logistics, as described in Section 4.3.1.1. By one of the interviewees this was deemed as a successful approach when testing new ideas. Another of the respondents was also positive, especially towards the structured way of first creating a minimum viable product as a basis. This approach was suggested as a feasible methodology when conducting collaborations in the future, establishing it on a permanent basis within the company. Access to this collaborative alternative would feasibly be awarded to departments with realistic aims of utilizing it. Expanding the time horizon even further, this respondent believed that it would be necessary for the company to launch their own exploration department. Nonetheless, this was not labelled as realistic in the near future.

Table 10. A summary of the approaches, challenges and ideal situation for the large construction company.

Approaches by the large construction company	Challenges for the large construction company	Ideal situation for the large construction company
Absence of startup policy	Understanding potential of startups	Large company implementing a strategy for collaborations
Individual projects initiating collaborations independently	Identifying appropriate startups	Large company being aware of their knowledge-related shortcomings
Ad hoc basis	Finding a place for collaborations within the organization	Intertwining innovation with core business
Co-development	Internal indecisiveness	Having a business agreement in place early on
Solutions tested in pilot projects	Identifying appropriate internal resources	Implementing an internal communication system for collaborative matters
Providing feedback to startups	Qualification aspects of startups	Employees becoming more innovative

5 Discussion

In this chapter, an analysis of the different themes emerging throughout this study is conducted, making parallels between the obtained theory and empirical findings. The identified challenges, suggested approaches, and anticipated future for startup-corporation collaborations within the AEC sector is discussed below.

5.1 Motives for committing to collaboration

In an ever-changing industry, which currently is increasing its transformative pace, large-sized corporations have the possibility to explore and potentially expand their business ecosystem to unveil previously unidentified solutions. At times, the corporations are aware of their latent strength and needs, other times they are not. Increasing the level of open innovation may be a solution to this, where one category of companies that can prove to be useful are startups. As presented in the empirical study, startups see themselves as enablers of innovative solutions in the construction sector. Likewise, it has been identified that the large companies in the industry have activated a mindset of acknowledging startups as beneficial partners to a greater extent than previously. This argues for the cause that the time for startups to take a fundamental leap into the sector is now.

First and foremost, a clear distinction between the established firms and startups has been deemed as a necessity to fathom in order to establish successful collaborations between the parties. When new additions to a conservative sector occur, hesitation is a natural response. This has been identified in the study, and one of the interviewees from the large construction company's perspective even indicated that startups have been viewed upon as a threat. However, the empirical findings show that startups, most probably, will devote greatly for collaborations to reach the aims set, as long as the targets are made clear to them. For this to happen on a regular basis, a prerequisite is that the large corporations have a persistent desire to go down this route. If such collaborations are not approached wholeheartedly, they will not make sense to initiate.

Therefore, it is vital for the two parties to comprehend their motives behind committing to collaboration. In Section 3.3 these have been pointed out from a theoretical standpoint and in the interview study the drivers have been gathered from an applied perspective. Naturally, the startups have connected with large corporations frequently as they have a desire to validate their ideas with help of feedback. This has previously been acknowledged by Heratri & Klang (2019) but also stressed by interviewees partaking in this study. The reason behind this notion is that the large-sized firms often have severely enhanced experience and knowledge of the sector, which the startups wish to attain. As identified in the empirical study, the startups occasionally even request assistance in defining the problems which they then can focus on and attempt to solve. Whether this is realistic to occur with no prior relationship in place can be questioned, as it is probable that a startup will be declined if they are unable to neither prove their instant, nor potential value.

Further, as Ries (2011) have underlined, startups often operate under circumstances described as extremely uncertain. Thus, once entering a partnership, it opens up possibilities to receive economic funding, as Heratri & Klang (2019) have touched upon, and it would ease some of the persistent uncertainty for the startup. Especially as

they develop products which the large corporation later, possibly, will benefit from. If not at that the initial phases of the collaboration, then at least when the developed solutions have been validated. Hence, in that situation the startup needs the large corporation to agree on scaling the idea. Once reaching that stage, the startup will have their brand attached to that solution and they will have gained credibility within the sector. This has been pointed out by Heratri & Klang (2019) as a potential outcome, and startups being part of this study have explicitly expressed the importance of spreading their existence to other parts of the sector. In that sense, their chances of surviving have increased as new partnerships might emerge elsewhere and the potential for longevity is realistic, which Mocker et al. (2015) and Schättgen & Mur (2017) also have acknowledged.

In the study it has been found that large corporations in the construction industry have been less determined in their search for startups to collaborate with. Also this is natural, due to their core activities having a higher sense of urgency and not being related to startups. However, the members of the AEC sector are notorious for their low degree of innovation and if inviting startups into their sphere, they will be introduced to new solutions. Such encouragements, when co-developing products with entities founded on entirely different operational habits, their conventional ways of functioning will be challenged. It is feasible that the advancement of technology most probably will require new ways of operating, so the large corporations may attain both new solutions and efficient techniques to utilize. Here, one specific type of process is the one described as agile, which commonly is adopted by startups and brought up by Heratri & Klang (2019) as an example of operational learning.

Also, the costs related to innovation are expected to decrease when collaborating with startups in the long run (Heratri & Klang, 2019; Schättgen & Mur, 2017). Here, it is important to understand the desired outcome, as the innovations developed must be relevant for the large corporation to implement. In addition, the large corporation has the possibility to obtain custom-made products, which will be developed with the purpose to fulfill specific requirements set by the organization. Establishing new solutions are also expected to enhance the image of the company externally, which both can attract prosperous startups for new collaborations, as well as individual talents to become part of the company. This has been highlighted by Heratri & Klang (2019) and Mocker et al. (2015), but within the case company this has yet to emerge. Potentially, this relates to the limited number of structured collaborations it has been associated with.

Thus, as Mocker et al. (2015) has stressed, mutual benefits for startups and large corporations are simple to identify. It is a form of symbiosis which is not possible to attain individually. With the ongoing transformation of the sector, it will be vital to stay updated and committing to collaboration with startups can be deemed as a pillar for large corporations in this sense. If the large corporation wishes to initiate such partnerships, they will have an advantage if they formalize their approach. Various forms on how to succeed in that will be discussed subsequently.

5.2 Establishing formalized collaborative approaches

As revealed in the empirical study, the partnership between large-sized firms and startups can take different forms. Either they are directly commercial or related to product development. Nonetheless, even more types of engagement were evident in theory. The drivers to choose one over the other depend on several different aspects. The level of commitment, financial agreement and need of a custom-made solution are examples of this. Also, if the large-sized firm demands for the product to solely be available for themselves or if it should be open to the entire sector is a factor to take into account.

Conventionally, investing and acquisition has been frequently targeted methodologies (Mocker et al., 2015). However, in general, this has not been deemed as a feasible approach by the interviewees active in the AEC sector. This is understandable, for example due to the limitations in which it brings to the startups. The technology that the minor actors contribute with are often not at the core of the large-sized companies, thus, it is more feasible to let the entire sector utilize the new solutions. Then the startups also have the possibility to extend their customer range, which promotes independent growth of their entity. Nevertheless, in specific cases, when the solutions relate to the core business of the corporation, acquisition can be feasible. Also, if an individual corporation has a desire to be the sole owner of a solution, acquisition is necessary, as was a significant motive for Respondent C's company.

Instead of purchasing a developed product from startups or simply acquiring them, Mocker et al. (2015) and Prashantham (2019b) suggest a collaborative approach as relevant when engaging with startups. In this area, accelerator programs and incubators exist. The company represented by Respondent B was involved in a type of accelerator program and it was perceived as successful with both learnings and actual business value as outcomes. Relating to the construction sector perspective, representatives of the large corporation questioned the relevancy of implementing an accelerator program. For it to be appropriate, it must connect to the company's core products, and precisely this argument has been judged as critical by Weiblen & Chesbrough (2015). Thus, if this is to be relevant, the reasons need to be further elaborated upon. Also, undoubtedly, it can be stated that initiating a program requires pronounced commitment from the host company when, for instance, guaranteeing coaching, co-locations and other support functions for the startups involved. Considering the other alternative, the company represented by Respondent A hosted a form of incubator. However, the intention was not to collaborate with the minor companies, but to support them and accommodate them in an innovative environment. As such, this is an option that can be used to create innovative networks and enhance the reputation of a brand.

The startup-corporation relationship presented in the literature review with most in common with the data obtained from the construction industry is the product co-development approach. In comparison to the traits described by Mocker et al. (2015), the ones in practice have, however, not been as pre-established. Thus, determining time frames, available budget and such administrative matters prior to collaborating will most likely enhance the chances of aligning the strategic motives with practice.

Another alternative to bridge the gap between the two company types is events. They can function as a decent starting point in order to be acquainted with the different actors

and ideas which they possess. When participating in such events, the large corporations are able to indicate their interest in innovation and specify what type of solutions they require. In turn, startups can understand how well their ideas are suited for the AEC sector and a first contact can potentially be made with the large firms. In the Swedish construction industry, certain events with this approach have taken place but only on a provisional basis. To develop them further has been one of the requests from startups, and it would be satisfactory if this is turned to reality, especially considering the current state of large-sized firms' non-awareness of startups' potential. However, if events should be aimed for more than sole networking purposes can be questioned. To initiate formal partnerships, it is probable that further meetings need to take place.

These forms of relationships directly involve the large corporation in one way or another. However, a suggestion highlighted in the empirical study, was that the large-sized companies should encourage their suppliers and subcontractors to establish relationships with startups, so that the large corporation can obtain innovative solutions in that manner. An immediate risk with this tactic is that the large-sized firm does not receive products which are entirely custom made. Mocker et al. (2015) have deliberated upon the supplier alternative with the mindset that startups themselves can act as suppliers, but still stressing a collaborative approach if this is to be pursued.

Implementing one or even several of these different options of formalized startup-corporation relationship can be viewed as a statement, underlining both internally and externally that cooperation with startups is important. Regarding the large construction company in focus of this report, they already had a collaborative unit in place on a temporary basis. Its success was described by several of the interviewees and the possibility to establish it long-term was expressed as feasible. Probably, it is easier for a company to utilize its current infrastructure than to start from scratch. If a unit specifically dedicated to startup collaborations is not deemed as relevant to the large corporation, potentially, it can implement a unit encompassing all categories of external collaboration. Nonetheless, in such cases it is vital to differentiate between a startup and an established company since the demands you can set, and the procedures of collaboration differ greatly.

As understood by the different variations of collaborations available, the type of commitment to startup-corporation collaboration depends on the underlying motives and what the desired outcome is. In Section 3.3 the motives have been displayed and it is obvious that the two entity forms have complementary traits that, in the long run, can lead to progression of the entire AEC sector. To take the initial steps might be intimidating but after a while it, most probably, will become second nature and may influence the companies' different operations positively. Being active in a sector, which is adopting new processes and maturing to digitalization, will require new ways of thinking and utilizing startups well-adjusted to this environment can be described as vital. If the motives for collaborations to take place resonate with the strategy set out by the large firm, it is reasonable for it to approach startups. However, independent of which type of partnership is most relevant for the individual company, certain critical factors will still be present. These factors will be discussed next.

5.2.1 Critical factors

Large corporations within the AEC sector encounter several obstacles inhibiting the formation of successful relationships with startup firms. Throughout the report, both industry specific challenges and general obstructions have been identified. Reflecting upon both the large corporation and startup perspective, these critical factors will build the basis for this part of the discussion.

5.2.2 Creating an obvious entry point

What has been evident in both theory and practice is that a challenge for startup firms lies in identifying which department or individual to reach out to in large corporations. This is because such organizations can sometimes be short of a pronounced interface for these types of requests. The empirical study has for instance revealed that it could in some cases depend on having the right contacts, or else taking a long route before encountering the right person. Another dimension of this issue relates to involving both people that possess authority to make decisions and those with sufficient awareness of how solutions should be developed. If the premise is that startups should find all these individuals on their own, it has shown to take a long time before any form of agreement can be reached. Internal indecisiveness within large corporations could make these processes even further prolonged and, in extension, create inefficient solutions. If adopting a single-point approach, the company could perhaps easily gain a comprehensive view of the startup market when they have established what to search for.

This relates to the fact that startups frequently initiate contact with the established companies, not the other way around, as recognized in the interview study. A risk in that scenario is that both unnecessary and inadequate ideas are presented. Thus, a suggestion is that the large firms augment their position and even out this ratio. Then, insufficient proposals instantly can be declined, and focus can be turned to the ideas that have greater potential and satisfy a need. Also, this facilitates the startups desire for the large companies to explicitly communicate their deficiencies so that the startups know how they can support. In this way, also startups not conventionally connected to the AEC sector have a chance to contribute. Then, supplementary innovative perspectives possibly can be embraced. However, all interested parties need to do their homework and be aware of the environment in which they strive to be a part of.

Nonetheless, to implement a specific unit for external collaboration within a large corporation is easier said than done. As proven by the company represented by Respondent B, they had several established startup activities running, but still no general entry point for startups at the company. In addition, the unit in focus at Respondent B's company was solely related to one of the company's business areas. In large corporations with numerous departments and with activity at geographically dispersed locations, having solely one entry point, facilitating all startup collaborations, is obviously a challenge. Possibly, the large corporation should emphasize certain areas of focus and only direct their attention to specific locations where the most relevant projects take place. All the while, this approach would limit the amount of startup ideas they can respond to and that is also not an ideal situation to end up in. Therefore, this field is necessary to study further and preferably it would encompass a case study of such an implementation.

5.2.3 Clarifying collaboration objectives and procedures

When deciding to engage with startups, an important step to establish early on is resonating upon the objectives of the relationship, as different purposes call for different measures (Schättgen & Mur, 2017). Setting clearly identified goals could help the parties better understand and satisfy the expectations and obligations each one has towards the other. Thereupon, it is also of importance to establish the terms of agreement in the process. Aspects such as the form of the procedures ahead, a distinction between must-haves and nice-to-haves in co-development collaborations, the anticipated time frame, and potential plan for scalability could be meaningful to consider and have been highlighted by the startups of the interview study. By operating in such a manner, the startups will have increased possibilities to make sense of their current state as well as their predicted future condition.

However, this is not always simple to create, as clashing anticipations and inconclusive agreements between the two parties are attributes setting these collaborations up to fail (Jacobson & Ramslöv, 2017). The startups' desire for building proof of concept, and eventually being able to scale within the large company is not always granted by the collaboration partners. While this aspect is hinted in theory to exist due to large corporations possessing broader mindsets and long-term time horizons (Jacobson & Ramslöv, 2017), an alternative explanation has been identified from practice. This is related to the decentralized character of the large organizations, as well as employees not having full awareness of the company as a whole.

Startup collaborations have for instance mainly been conducted on an ad hoc basis for the case company, and respondents have expressed that such relationships are surely happening at different parts of the organization without it being recognized on a company level. This could, to a certain degree, be due to the loosely linked networks of the construction industry, allowing individual projects to pursue these types of collaborations independently. More clearly defined procedures upon a partnership are requested by startups, and a tailored policy for such relationships could arguably be one of the missing pieces in the puzzle. This issue is not solely true for construction companies, but large organizations in general, as indicated by the case of the company represented by Respondent C.

5.2.4 Establishing a sense of urgency

One of the recurrently conforming remarks of this study relates to the disparity in the nature of the two entities. This has been mostly evident in that large organizations entail slow and bureaucratic procedures, while startups incorporate fast cycle times and agile structures (Weiblen & Chesbrough, 2015; Jacobson & Ramslöv, 2017). From the large company's point of view, issues related to the daily operations and core business are often perceived as more urgent. A reason for this is perhaps due to companies not realizing the full potential of startup firms in their context, thus ranking such collaborations as less important in times of resource allocation, as mentioned by several of the respondents of the case company. Alongside a decentralized architecture and scattered accountability within large organizations, collaborations are deemed to have lengthy decision-making processes.

This could be harmful for the startups' chances of succeeding and add to the aspect of uncertainties highlighted by Ries (2011). Most of the startup representatives of the interview study have also considered this issue a key factor negatively affecting their collaborations with large companies. Relating the startup collaborations to top management commitments, other innovation activities or the core business of the large company could help promote the importance of the issue internally. This, along with establishing a formalized approach ought to change the lower degree of urgency among large organizations. For example, having individuals at the company completely dedicated to this work, with an allocated budget, would enhance these types of operations. Further, adopting one of the alternatives presented previously may allow for startups to identify a clear route into the company, so that they immediately come in contact with the responsible individuals for these types of matters.

5.2.5 Providing sufficient resources

When a sense of urgency is established in the large organizations towards startup commitments, a crucial success factor is the allocation of sufficient resources. Providing the appropriate help, both in terms of financial and human capital, is important to ensure efficient processes. In this sense, an understanding for the distinct circumstances of startup firms need to be taken into consideration, as it has been evident that companies do not always treat startups in a manner appropriate to their special needs. It could be beneficial to simplify for the startups to work with the large company. Special consideration should perhaps be taken in order to facilitate the cultural differences of the two entities. Basing on the empirical findings, simplifying legal and qualification processes and assigning clear accountabilities could break down some of the barriers for successful collaborations.

Furthermore, it is important to identify the right projects in which to exploit startups' potential solutions. This has been perceived challenging for the case company, perhaps once again due to the fragmented structures. However, the construction industry possesses an obvious advantage. As it was stressed by numerous interviewees, startups have evident possibilities to use construction projects as test beds. These are environments with authentic mechanisms ongoing where iteration and development can take place naturally, which is a leverage not all sectors possess. Thus, it makes sense for startups and large corporations to find mutual benefits in the construction industry.

In regard to the human capital, it was established that both authority holding roles and end-users are important to involve in such collaborations. While the former group helps sustain fast decision-making, the latter provides sufficient skills in developing the solutions. As mentioned in Section 3.3.1, the large corporations are an important source of market knowledge and experience, which could help the startups in achieving a product market fit. Setting aside time for continuous feedback is therefore deemed as an important factor. It has been proven to be beneficial for the case company to include people with open or entrepreneurial mindsets, as these are more eager in testing new solutions and willing to promote these to the rest of the company.

5.3 Future for the construction industry

Throughout this chapter, actions on how to better exploit startup collaborations have been discussed. The approaches underlined have relied upon improving already existing organizational structures, as these were deemed most reasonable for the current

situations of large-sized construction companies. Also, as seen in the empirical study, it is undoubtedly feasible for large construction companies to pursue cooperation with startups, albeit the current discontinuous reality of the industry in this regard. However, if one was to widen the time horizon and look further ahead, more drastic changes on how to access startup markets could be deliberated. Taking inspiration from sectors and companies of higher maturity level regarding the issue, the future of startup-corporation collaborations within the AEC sector can be analyzed further.

The idea of creating an explicit unit aimed at managing startup relationships has been explored by some of the representatives of the case company, but the question of how this would be embedded in the current organizational structure is still up for discussion. Peeking at the large companies from other sectors interviewed in this study, different pathways have been evident. As previously established, the corporation of Respondent C differentiated between startups pursuing commercial relationships, and those engaging in product co-development activities, with the prior being paired to procurement departments and the latter to R&D. Additionally, further exposure to startups was achieved through the company's participation in an externally led incubator program. In the case of the firm represented by Respondent B, there was no explicit entry point for startup collaborations, but a dedicated startup program formed part of the solution. A future setup for construction companies can perhaps be separating between startups with different aims and dividing the internal innovation into two units. One of these units could be dedicated to addressing the current needs of the company, while the other could fulfill more of an explorative function, providing insights of future trends and development direction of the market. In the long-term perspective, it could lead to competitive advantage and longevity for the large corporation if they manage to find new relevant business areas.

However, as could be seen in the empirical findings from other sectors, not all involvement with startup firms resulted in creating new products. Instead, these encounters were considered successful as they contributed with values beyond the merely tangible and measurable. This corresponds well with the presented theory in Section 3.3.2, as some of the benefits in engaging with startups were argued to be fostering entrepreneurial mindsets, radiating an innovative company image, and attracting new talents. If construction companies were to better realize these aspects, other forms of initiatives could become more obvious in the future of the AEC sector. In regard to this, some of the case company representatives have contemplated whether a more comprehensive program, inclusive of other players in the sector, could be a more appropriate evolution than constructing individual company initiatives. Such approaches have been gaining success in other sectors, as evident in Section 4.1.1. Perhaps reaching out to other companies in the sector, and cooperating across firm boundaries, could accelerate the mutual learnings and advancements of the industry.

Further, crossing firm boundaries and developing new solutions together would emphasize that large corporations within the construction industry are attracted to startup activities. It would allow more startups to stay in business, while the large companies potentially would be exposed to innovative ideas at a greater pace than ever before.

6 Conclusion

The aim of this master's thesis was to establish an understanding of how startups and large corporations operating in the AEC sector can collaborate successfully. The insights provided by investigating the research questions of the study showed that the topic has started to become increasingly relevant within the construction industry, and that both large corporations and startups have an interest in finding common ground. Nonetheless, the journey has merely commenced, and numerous elements have the possibility to be improved as collaborations are expected to increase in frequency, as well as being further formalized.

The findings enclose that the different types of companies have complementary attributes, which in combined form can create value for both entities. From the startup perspective, the motives to enter partnerships with large-sized construction firms were concluded to be (1) the possibility to validate ideas with help of feedback; (2) attaining experience and knowledge of the sector; (3) help in defining problems to solve; (4) receiving economic funding when co-developing products; (5) the possibility to scale ideas once being validated; (6) gaining credibility. Considering the situation from the other viewpoint, the motives for large corporations to pursue collaborations with startups were recognized as (1) being introduced to new solutions; (2) challenging the established ways of operating; (3) accessing agile processes when co-developing products; (4) reducing the costs related to innovation; (5) obtaining custom-made products; (6) enhancing market image.

Once the motives for committing to collaboration have been acknowledged, it is advantageous to formalize the collaborative approaches. Here, the large corporation has a pronounced responsibility in orchestrating a setting in which collaborations can be initiated firmly. Several forms have been discussed in the study and which option to commit to depends on the desired outcome and level of commitment. For large companies in the AEC sector, a reasonable point of departure is to make sense of their current condition and acknowledging how well these motives apply to their respective core strategies. Advantageously, this should be established prior to devoting to any of the specific collaborative forms presented in this study. Nonetheless, operations from external industries have the possibility to provide inspiration if the interest is sincere.

Despite the manifold motives to pursue startup-corporation collaborations from both sides, this study has identified critical factors which need to be managed by the large corporation in order for the partnerships to be categorized as successful in the construction industry. These factors were concluded as: (1) creating an obvious entry point for startups at the large corporation; (2) clarifying collaboration objectives and procedures; (3) the large corporation establishing a higher sense of urgency; (4) providing sufficient resources and involving the appropriate participants.

In conclusion, for large corporations and startups to take part in successful collaborations, it is fundamental that both organizations comprehend their desired outcome, as well as understand how they can contribute to make it a fair partnership. This, in combination with making a decision regarding how the process should be formalized, as well as taking the critical factors into consideration, entails a basis upon which prosperous collaborations can be created.

7 Future research

Since this is a relatively novel research topic, numerous studies are expected to occur in the near future. Under predetermined time constraints, this master's thesis has solely recognized the theoretical foundations upon the motives of the two sides, as well as critical factors in a startup-corporation collaboration taking place in the AEC sector. To thoroughly follow such collaborations in practice, with the findings of this study in mind, is essential if the conclusions are to be further validated. An additional aspect anticipated in future research is to consider how it is possible for large-sized firms in the construction industry to be integrated within the contemporary business ecosystem of startups, in order to further comprehend their role in it and acknowledging their responsibilities for it to flourish, if any.

As highlighted in this thesis, well-functioning internal communication systems within the large corporations are essential if the startup collaborations are to be categorized as successful. Large-sized organizations operating in the construction sector are by nature decentralized, thus, to uncover feasible approaches where ongoing processes and learnings are shared in-house, will be fundamental. Lastly, to examine the possible advantages and drawbacks, as well as under which circumstances companies in the AEC sector can initiate a mutual startup program would be of interest.

8 References

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Appendix

Appendix 1. Questionnaire Large Construction Company

1. What is your role?
2. How long have you been working in the construction sector?
3. What is your experience working with startups?
4. Does the company have an elaborated policy for startup collaborations?
5. How does the company identify the need for a startup collaboration?
6. How does the company manage startup-initiated requests for collaboration?
7. How does the company initiate collaboration with startups?
8. Can you describe the process when collaboration has been initiated?
9. Did the company collaborate on a specific project or was the entire firm involved?
10. Describe the decision-making process when collaborating with a startup.
11. If outdrawn, how can this process be shortened?
12. What were some of the obstacles encountered during these collaborations?
13. What were the gainings during these collaborations?
14. How would you describe a fruitful collaboration with startups?
15. What can the company provide the startup with?
16. What can startups provide the company with?
17. What do you think about established platforms for enhancing the structure for collaboration?

Appendix 2. Questionnaire Startups

1. How would you describe your startup?
2. What type of product or service does the startup provide?
3. How many employees does the startup have?
4. What types of industries does the startup operate in?
5. How long has the startup been operating in the construction industry?
6. How would you describe the business ecosystem in which the startup is active?
7. How would you define a startup?
8. What type of collaboration has the startup taken part in with building contractors?
9. Did the startup collaborate on a specific project or with the entire company?
10. How did the startup initiate a collaboration with a building contractor?
11. What were some of the obstacles encountered during these collaborations?
12. Were there any difficulties during the collaboration due to the size of the company? If yes, what were they?
13. What were some of the lessons?
14. How evolved was the startup's business model prior to the collaboration?
15. What were the goals with the collaboration and how were they communicated?
16. Did the startup feel appreciated by the large company? If yes, in which ways? If no, why not?
17. How would you describe a fruitful collaboration between startups and large companies?
18. What can large companies provide the startup with?
19. What can startups provide the large companies with?
20. Does the startup take part in events aimed for connecting startups and large corporations? If yes, which ones and what do such gatherings contribute with?
21. Is the startup part of any startup program led by a large corporation in the construction sector? If yes, which ones and what do they contribute with?
22. Is there a need for startup programs? If yes, why? If no, why not?
23. Do you believe there is a benefit to have a platform for an open dialogue with startups and large corporations in the building sector? If yes, why? If no, why not?

Appendix 3. Questionnaire Other Sectors

1. How would you describe the business ecosystem in which your company is active?
2. How would you define a startup?
3. What type of collaborations has your company taken part in with startups?
4. Did the collaboration involve the entire company or just a specific project?
5. Who initiated the collaboration?
6. What were some of the obstacles encountered during these collaborations?
7. Were there any difficulties with the collaboration due to the different sizes of the companies? If yes, what were they?
8. How would you describe a fruitful collaboration between startups and large companies?
9. What can large companies provide the startup with?
10. What can startups provide the large companies with?
11. Does your company take part in events aimed for connecting startups and large corporations? If yes, what do such events contribute with and how are they organized?
12. Does your company lead a startup program? If yes, what does it contribute with and what does it encompass?
13. Do you believe there is a benefit to have a platform for an open dialogue with startups and large corporations? If yes, why? If no, why not?



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