Understanding Digital Transformation Strategy

The case study of a large-scale construction company in Sweden

Master's thesis in Design and Construction Project Management

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ABSTRACT

The trend of digital transformation has influenced many industries to adopt digital technologies, construction being one of them. Most organizations have started to become interested in the new digital technologies that are available. Even though the interests in these technologies seem to be high, the development of a digital transformation strategy has been limited. It is also believed that digital technologies will impact the industries and the organizations within, shifting the way of business models and their strategies. Therefore, the purpose of this thesis is to understand the development of digital transformation strategy, understand and identify necessary actions and initiatives through digital transformation, try to find out the challenges during the development of digital transformation, and what are the senior management's responsibility and engagement to ensure that the organizations' strategy design in digitalization, transforms the companies to the future.

Keywords: digitization, digitalization, digital transformation, strategy, construction.

CONTENT PAGES

Preface

This Master's thesis has been carried out in Gothenburg. Inputs and findings were collected from the case company which is in Gothenburg. The thesis is the final part of the Master's degree in Design and Construction Project Management at the Chalmers University of Technology.

We would like to express our gratitude to all persons involved that made this thesis possible. A special thanks to those of you who have agreed to be interviewed and continually answered our questions.

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We would like to express our deepest gratitude to our families, Aras, Lara, Atlas, Natalia, and Öznur who were supporting us during our studies.

Finally, we hope that the findings and results may be helpful for the actors within the Construction industry and for all the players who continuously work to improve the industry.

Gothenburg, June 2022

Cetin Ozsari

Umut Ala

Notations

AR	Augmented Reality
BIM	Building Information Modeling
CEO	Chief Executive Officer
HR	Human Resources
ICT	Information and Communications Technology
IoT	Internet of Things
IT	Information Technology
VDC	Virtual Design and Construction
VR	Virtual Reality

1. Introduction

This chapter presents the thesis background, problem statement, purpose, and research questions as well as scope and limitations.

1.1 Background

Digital transformation has emerged as a key agenda that impacts all industries including construction. The word Digital transformation has gotten so widely used (and misunderstood) that it has become extremely confusing (Gong and Ribiere, 2021). Digital transformation is still a vague notion, with various interpretations among professionals and academics. Although there are several definitions of digital transformation, in generic terms, it refers to the incorporation of digital technology developments and opportunities into business practices, processes, competencies, and models.

Individuals' and organizations' use and behavior, as well as market structures, were modified as technology developments accelerated. Consumers, particularly digital natives who are more connected to the Internet, have changed the way they pick, acquire, and consume products and services (Henriette et al., 2016). Companies can improve their performance by utilizing digital technology such as mobile technologies, collaborative technologies, and the Internet of Things (Henriette et al., 2016). The use of digital technology to develop value-added goods and processes in businesses and integrate them into their processes, structures, and working models is known as digital transformation.

The construction industry has been changing over the past few years and digitalization has an important impact on the construction industry as well. According to Rachinger et al. (2019)," digitalization has put pressure on companies to reflect on their current strategy and explore new business opportunities systematically and at initial stages". Digital technology is becoming increasingly vital in attaining business objectives, and its widespread implications have resulted in the reorganization of entire industries. (Nylén & Holmström, 2015). In support of this Kaufmann et al. (2018) emphasized, that digital transformation is about more than just technology; it is about structure, processes, and people.

For businesses, a digital transformation fueled by digital technologies has become critical. Organizations must, on the one hand, cope with new disruptive actors that have caused problems in traditional industries. (Moscati & Engström, 2019. Companies, on the other hand, must be able to adjust quickly and individually to customers who have become more knowledgeable of market offers and more challenging by imposing their own competitive game rules (Moscati & Engström, 2019). Many companies in the Swedish construction industry have acknowledged that they are beginning to integrate new digital applications (Moscati & Engström, 2019).

To manage these complicated shifts, businesses must adopt management practices. According to Matt et al. (2015), formulating a digital transformation strategy is vital for an entity to integrate the complete coordination, prioritization, and implementation of digital changes within a company.

1.2 Problem Statement

Throughout the last decade, the construction industry has launched a number of initiatives to explore new digital technologies and exploit their benefits. The construction industry is moving towards a higher degree of digital transformation.

The construction industry's continuous transformation to digitalization has the potential to affect business dynamics in many ways, including shifting power positions among actors, the emergence of new operational techniques, the reorganization of structure, and the development of new players with new responsibilities. All stakeholders in the industry should be prepared for the abovementioned problems and their specific new responsibilities in consideration of how swiftly and unpredictably developments typically occur in the digital environment.

The construction industry faces some major challenges in the direction of digital transformation, getting management to realize what digitalization is, and what opportunities and threats it presents. Forward-thinking, transparency, and digital adoption must be fostered in organizational cultures by top management, and the management team must be committed to leading the digital transformation strategies in the correct direction

as it is important to know that leaders drive change, deal with technologies that bring about change (Holotiuk & Beimborn, 2017; Kane et al. 2015).

Organizations engage in continuous digital innovation to develop or improve products, services, and business models, which is referred to as digital transformation. Adaptation of new products, systems, and tools may require significant shifts and changes over the company's existing approach to business, therefore organizations initiate changes to their operational structure and strategies to support new forms of value creation in digital transformation.

However, the transformative impacts of digital technology deployment in the construction industry have yet to be completely understood (Olanipekun and Sutrisna, 2021). As argued by Nikmehr et al. (2021) and Lipsmeier et al. (2020), construction companies need a strategy to align their processes, business models, and organizational structures if they want to succeed in digital transformation. However, developing a digital transformation strategy is seen as challenging because of the complexity and difficulty of digitalization processes (Holotiuk & Beimborn, 2017).

1.3 Purpose and Research Questions

This study aims to understand the development of digital transformation in a large-scale construction company by examining how managers interpret digital transformation, what actions and initiatives are taken to adapt in order to achieve digital transformation, and what challenges have been encountered along the digital transformation journey. To achieve this, the research followed the listed below research questions.

RQ1: What is the current state of understanding of digital transformation in the case company?

RQ2: What actions and initiatives are undertaken regarding digital transformation in the case company?

RQ3: What challenges have been encountered throughout the case company's digital transformation process?

1.4 Scope and Limitations

The scope of this thesis is limited to understanding the digital transformation strategy of a large-scale single-case company in the construction company. Limitations are related to having a limited number of interviews only with those who have worked in the digital transformation or strategy within the case company. The case company operates in different countries but no one from the other countries is included. However, the case company is one of the largest construction companies in Sweden.

2 Theoretical Framework

In this chapter, the theoretical framework used to gain an understanding of the empirical findings is presented and described. We will also offer the reader of the thesis an understanding of the previous literature as a background for understanding digital transformation in the construction industry. The first part covers understanding the definitions of digitization, digitalization, and digital transformation; the second part covers digital transformation strategy. Lastly, the third part covers the strategy aspect and its interaction with digital transformation.

2.1 Digital Transformation

Digitalization has emerged as an important agenda shifting the current business models and processes in all industries. Construction industry organizations are changing significantly to adopt the changes resulting from the increasing use of digital technologies. Digitalization is seen as a transforming process presenting organizations with opportunities and challenges that can either motivate or force them to change. Liu et al,. (2011) state that digitalization has an impact on the market, production conditions, and corporate interactions, forcing companies to change constantly for new competitiveness. According to Rachinger et al. (2019), digital transformation has pushed companies to review their existing business strategies and focus on new business opportunities in a structured and proactive manner. In order to understand digital transformation, it is necessary to grasp the paradigms and contents necessary for the realization of digital transformation.

As described in the above section, understanding digital transformation is essential to understanding how it can impact a company's digitalization development. Unruh and Kiron's (2017) digitalization framework can be used to understand digital transformation and will be explained on Figure 1.

Figure 1: Digitalization framework, Unruh and Kiron (2017)

2.1.1 Digitization

Digitization refers to creating a digital representation of physical objects or attributes. Digitization is a term used by scholars from several fields to describe the technical process of turning analog data streams into discrete and discontinuous digital bits. The origins of digitalization can be traced back to the 17th century when philosopher Gottfried Wilhelm Leibniz (1705) published his Explication de l'Arithmétique Binaire, which described a base-2 number system with two value symbols: 1 or 0.

According to Gobble (2018), digitization is the simple process of changing analog data to digital data, such as replacing hand-filled forms with online versions that go right into a database. Scanning a document or uploading a voice clip, for example, turns pages into bytes. It typically captures the process of converting a manual procedure to a computerized one. (Gobble 2018). Digitization is more about systems of record, and, increasingly, systems of engagement, that will significantly improve operating efficiencies and decrease errors. In support of this, digitization does not alter the nature of the business; it does not generate new business models or disrupt key corporate strategies (Gobble 2018).

Digitization does not strive to optimize processes or data, yet provides access to intellectually rich resources that are often difficult to utilize. When digitized data is utilized to automate processes and improve accessibility, it requires a digital infrastructure (Osmundsen and Bygstad, 2022). According to Castagnino et al. (2016), construction project planning, construction project design, and engineering may all benefit from digitalization. The use of digital technologies in various construction processes is expected

to reduce uncertainty and improve the quality of finished products (Castagnino et al. 2016). Therefore, digitization can be seen as the first important step toward digital transformation in every industry.

2.1.2 Digitalization

Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities. According to Aghimien et al., (2018), digitalization is the process of arranging and transforming information into a digital data collection. This converted information produces binary data that computers and other computing devices can comprehend and process. Berger (2016) defines digitalization as working with information and communication technology tools and practices. Liao et al. (2017) state that digitalization's main contribution to businesses is to encourage the use of computers and connections between industries. This leads to a production chain that can be automatically and flexibly adjusted, as well as the creation of new service types and business models. Matt et al,. (2015) state the exploitation and integration of digital technologies often affect large parts of companies and even go beyond their borders, by impacting products, business processes, sales channels, and supply chains. By combining different technologies, digitalization opens up new possibilities and makes it possible to make completely new products, services, business models, and customer relationship models (Matzler et al., 2018). Throughout the digitalization process companies can achieve success in terms of experiencing optimized resource utilization, reduced costs, increased employee productivity, and work efficiency, optimized supply chains, and increased customer loyalty and satisfaction. (Kagermann et al., 2013).

In organizations situated at the early stages of the digital transformation process, digital solutions have an operational focus, with the role of addressing individual business problems (Kane et al., 2015). Digital transformation is seen as more complex than a mere technological shift, going beyond the digitizing of resources and resulting in the creation and extraction of value from digital assets (Parviainen et al., 2017). Hence, digitalization can be considered a driver for long-term development, with digital information flows seen as necessary for digital transformation.

2.1.3 Digital Transformation

Over the past few years, organizations in the construction industry have been trying new technologies in order to get an advantage over their competitors and the current environment. In this context digital transformation has become a key agenda requiring better understanding among construction sector organizations. In broader terms, digital transformation is about how the use of digital technologies is causing big changes in society and business (Agarwal et al., 2010). On the organizational level, digital transformation is seen as a process in which companies must find ways to innovate with new technologies by coming up with strategies that embrace the implications of digitalization and drive better operational performance (Hess et al., 2016).

According to Vial (2019), Matt et al. (2015), and Sebastian et al., (2017), technological aspects are only one dimension in understanding the digital transformation phenomenon, along with strategy as well as changes to an organization, including its structure, processes, business model, value creation, management style, and culture. Digital transformation is "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2019). However, according to Cidik et al., (2017), despite digital transformation initiatives, the construction sector and its projects display cultural and organizational complexity, making innovation difficult to define, implement, and apply.

Leviäkangas et al., (2017) state automation of construction sites, digital design documents, and design process and utilization of big data each have their own characteristics, yet belong to the very same mega-trend. According to Leviakangas and Kauppila (2020), digital technologies are presumed to increase productivity. The increase in productivity is not perhaps always the as straightforward case as believed, particularly if the implementation of digital technologies is not combined with efficient and streamlined processes or when business ecosystems lack a shared understanding of the need for collaborative efforts. Nevertheless, the construction industry is conservative toward benefitting from innovative technologies despite the benefits. The construction industry is way behind in implementing new technologies on time.

2.2 Digitalization in the Construction Industry

In the construction business, digitalization has already pushed the adoption of numerous digital technologies. According to Koeleman et. al., (2019) digital technologies are more likely to help construction companies if they first identify operational changes that will improve performance and then define digital use cases that will make these operational changes possible. Koeleman et. al., (2019) Its process-centric approach helps each use case focus on a real business need and resist the urge to follow technology trends. (Koeleman et. al., 2019). However, the Digital transformation discussion evolves around the widespread use of technologies such as sensor systems, intelligent machines, the concepts of the digital twin, BIM, IoT, etc. In the range of the applications BIM, digital twin, and data-warehouses are one of the most important ones that are shaping the industry and they are focused on by contractors. (Koeleman et. al., 2019, Newman et al. (2020, Boje et al (2020).

According to Teizer et al., (2018) building information modeling (BIM) played a crucial role in the creation and management of digital information for a project's execution. Newman et al. (2020) stated that the industry is slow to adopt new technologies and that most applications focus on BIM. Due to the knowledge gained from digital models, building businesses have recently begun to practice BIM and focus on BIM applications. As a result, the industry's industrialization is largely shaped by BIM technology (Li and Yang, 2017). The wide implementation of BIM in the construction industry provides advantages to companies, especially design and engineering works.

Similarly, the digital twin is another idea, which originated in the context of Industry 4.0. The digital twin is a concept, which tries to mirror the behavior of physical devices through sensor data. Boje et al (2020) argue by reviewing the state-of-the-art application of the process of building information modeling (BIM) during the construction stage that a digital twin for construction sites is needed. They propose that the first generation of a digital twin for construction sites should consist of monitoring platforms that could sense the physical world and execute minor analysis functionalities (Boje et al., 2020). The digital twin concept provides an overview of projects in real-time and eliminates the distance aspects and maintains control. Due to its highly facilitated monitoring capacity, the concept has an important opportunity to become a standard in the industry.

According to Rujirayanyong, and Shi (2006) data warehousing is a relatively young technology that has only been around for a decade. The goal of the data warehouse is to give all users in an organization timely access to whichever level of data they require (Decker et. al., 1997). The daily operations of a construction company generate a large amount of operational data, which is dispersed across multiple functional systems. Rujirayanyong and Shi (2006) stated that data obtained from the execution of the projects could be beneficial in the future, but they are not frequently gathered and centrally housed in the organization. Organizations are realizing the benefits of having a single database for enabling efficient management tasks, and data warehousing is becoming more common (Miller and Nilakanta 1998). Despite its popularity in manufacturing and other business sectors, studies and implementations are still very limited in the construction industry (Ponniah, 2011).

Information technology (IT) is the use of any computers, storage, networking, and other physical devices, infrastructure, and processes to create, process, store, secure, and exchange all forms of electronic data. Information technology helps to build and grow the commerce and business sector and generate the maximum possible output. The time taken by different sectors to generate business is now minimized with advancements in Information technology. It provides electronic security, storage, and efficient communication. Woodhead et al. (2018) argue that IoT solutions would not be generic and could only be applied to certain use cases of research projects. Woodhead et al. (2018) propose that the integration of ICT into the environment of construction sites needs to be accompanied by a definition of communication and connection standards for all data-generating devices. Woodhead et al. (2018) state that the process of identifying, accessing, and exchanging data needs to be defined within norms and regulations.

Fragmented nature of the construction Industry:

The fragmented nature of the construction sector is argued as the key impediment to achieving a successful digital transformation process. For example, Lavikka et al. (2018) mentioned that the fragmented nature of the industry creates knowledge boundaries leading to challenges in communication and collaboration. This results in poor adoption of new technologies and unperceived benefits of the I4.0 implementation. Similarly, Yap et al.

(2019) argue that the fragmented use of construction causes poor project performance, low productivity, and a reluctance to implement innovative solutions. Alternatively, Arayici and Coates (2012) emphasize that a vast majority of the construction sector is constituted by small and medium-size entities, thus their resources are limited to developing novel technology. On the other hand, Due to the fact that many large Construction companies have expanded by purchasing smaller enterprises, they tend to be highly federated, with business units and divisions following their own processes rather than standardized ones. (Koeleman et. al., 2019, Individual projects are carried out at locations that are remote from the company's headquarters. (Koeleman et. al., 2019).

The Construction sector consists of a variety of actors (comprising planners, decision-makers, designers, architects, construction managers, developers, contractors, asset managers, and facility managers) who need to work in collaboration. Fragmentation of the industry makes this value chain a challenging environment for digital tools and hinders their establishment and become industry-wide accepted practices for all actors involved.

Briefly, the integration of technology into business processes is part of the complex puzzle of understanding digital transformation. Digital technologies are being investigated by companies from various industries to determine their benefits and worth (Matt, et al., 2015). According to Vial (2019) organizations need to develop a digital transformation strategy to address changes required to remain competitive in a digital environment. Similarly, Frizgerald et al, (2014) state that it is a necessity to establish a digital transformation strategy to handle digital transformation within a company. He further argues that forming a digital transformation strategy, which acts as a central concept for integrating the complete coordination, prioritizing, and implementation of digital changes within a company, is an important technique. However, Matt, et al., (2015) argues that technology has an impact on corporate operations, job processes, and organizational structures, therefore digitalization is a challenging shift for businesses.
Digital transformation builds on changes and transformations of digital technologies and involves business processes and practices for organizations to handle a new digital world (Matt, et al., 2015; Vial (2019)). Companies typically begin on a digital transformation path by transforming their corporate strategies in order to take advantage of the potential presented by the rising focus on digitalization. (Fitzgerald et al. 2014). Digital

transformation requires a delicate approach and strategy for companies to evolve their business to the next level. Defining the strategy and coordination during the implementation of changes is vital for smooth transitions for construction companies.

2.3 Digital transformation strategy

A digital transformation strategy can be described as a company's main roadmap for digitalization, and it should include crucial measures to reach the company's main goals (Nikmehr et al., 2021). Matt et al. (2015), argue that digital transformation strategies should be synchronized with other organizational strategies in the company, and it changes products, services, and business models as a whole (Fig.2). Therefore, if there is a digital transformation within the company, the company's other strategies will inevitably change.

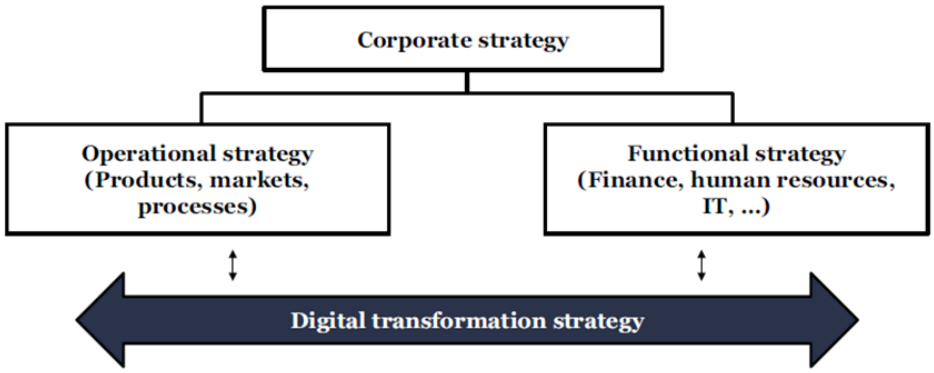

Figure 2: Relation between digital transformation strategy and other corporate strategies, Matt et al. (2015)

Digital transformation strategy should define the goals, and processes for delivering services, products, and value creation. In addition, a digital transformation strategy should include the impact of digital technologies, the digital structure of the company's internal operations, and external connections (Lipsmeier et al., 2020). As argued by Hess et al. (2016), companies that would like to be successful in the future should have a clear strategy for deploying and exploiting digital technologies. This is in line with the discussions in generic management literature. For example, according to Wit (2017), disruptive technology is one of the key drivers pushing construction companies to initiate strategic change. We will review the theoretical framework of Wit's (2017) business model and organizational system, to create a deeper understanding of strategic change in the

construction company and the main challenges which are a result of digital transformation.

2.4 Strategic Change

Digital transformation affects essential activities in construction companies as it has defined in the previous sub-chapter. The argument is no longer whether companies need to change, but rather how, when, and in what direction they should change in regard to digital transformation. Dominguez, et al. (2015) states that strategic change is needed towards digital transformation because of the business environment and external factors such as authorities, competitors, and interest groups that all try to influence, creating the need for strategic change. Thus, ignoring any strategic change will lead eventually to the organization's failure. Nevertheless, organizations that effectively manage a dynamic, changing environment, lead their markets and achieve success (Cabrey and Haughey, 2014; Ben-Menahem et al., 2013; Sushil 2013). Strategic changes are aimed at achieving a new form of alignment – a fresh match between the company's basic set-up and the features of the environment (which is digital transformation in this study) (Wit, 2017). Digital transformation as a strategic change affects the business model and the organizational system, for example, the culture, strategy, and structure of the company (Hess et al., 2016) An organizational adaptation to the external environment needs to align several parts of the organization towards digital transformation. Such as the business model and the organizational systems (i.e., organizational culture, structure, and processes), which are exposed to change during digital transformation (Wit, 2017) (Fig.3).

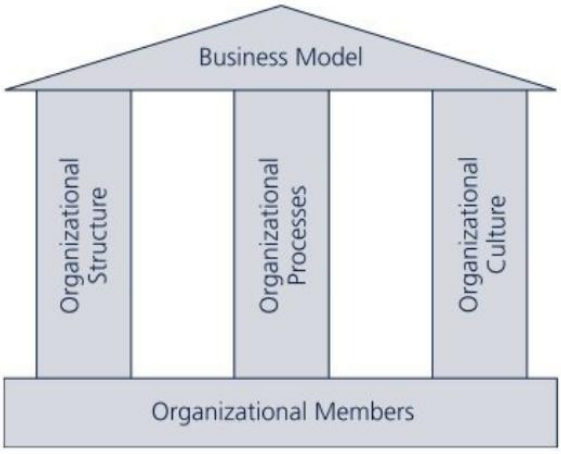

Figure 3: General view of the business model and the organizational system, Wit (2017)

2.4.1 Business model

A construction company's business model is basically how the organization's business is conducted in order to make a financial profit, who the target customers are, and what customer values (Morris, Schindehutte and Allen, 2005; Margretta, 2002). According to Matt et al. (2015), digital transformation in a construction company results in significant improvements, a rise in value for customers, and the development of new business models. The construction industry might deploy digital tools in their "business models" in a number of areas, BIM, AR, VR, and Digital Twins are some of them that both customers and organizations can benefit from. The organization obtains some sort of input depending on the business it is operating within, transforms it by creating a further value, and is left with an output that results in a product and/or service for its intended clients (Wit, 2017). "The business model is 'supported' by the organizational system."

2.4.2 The organizational system

Wit (2017) defines the organizational system as the way construction companies are structured. Construction companies' organizational systems can be split into three categories, and these categories can be affected by the result of digital transformation according to Bartlett and Ghoshal (1995), which are culture, structure, and process.

2.4.2.1 Culture

Members of construction companies create a mutual understanding of how to behave within the organization and they create a culture in which shared values and standards are formed over time and these often come to be quite influential in the organization as to how to behave (Wit, 2017). According to Tijhuis and Fellows (2011), culture in the construction industry denote negativity, including "'macho', 'opportunistic', 'short-term', 'conflict/disputes'" and additionally, integration of multicultural organizations into the "standardization" of digital transformation is not feasible in the construction industry. According to Wokurka et al. (2017), great digital transformations with significant expected business benefits for clients and the organization failed due to a clash with the organization's culture.

2.4.2.2 Structure

A construction company is divided into tasks and groups of people with different responsibilities and functions, they all need to be aligned in order to synchronize for the organization to be efficient and effective (Lawrence and Lorsch, 1967; Wit, 2017).

Digital transformation may change organizational structures that are required to cope with and exploit new digital technologies. (Hess et al. 2016).

Digital transformation has evolved differently in different companies and countries, and this change has created new digital roles such as BIM coordinators, VDC Specialists, etc.; and these roles have started to change the organizational structure of the company (Bosch-Sijtsema et al., 2019).

2.4.2.3 Process

There are both informal and formal processes happening in construction companies and some of the latter processes stretch over the whole organization, for example, investment planning, tendering, budgeting, or business planning, while others are limited to smaller sections of the organization. When digital technologies were fully integrated into the construction company, it mostly affected organizational systems that are connected with its processes (Hess et al., 2016).

2.4.3 Types of change towards digital transformation

Nevertheless, it is still questionable to which extent the business model, or the organizational structure has to be changed towards digital transformation. Sushil (2013) describes the construction company torn back and forth between the two forces of continuity and change. The softer part of the change, which takes this sense of continuity into account, is often designated as an operational change compared to the more radical one, the strategic change. Still, the notation of Wit (2017) is adopted, who points out that likewise the digital transformation can be achieved through either an evolutionary ("continuity") or revolutionary ("discontinuity") changing process where both ultimately result in a fundamental change in the business model or the organizational system. Obviously, both are of opposite and contradictory nature although both practices are needed and have a valuable reason for being (Wit, 2017; Sushil, 2013, Borwick, 2013). If a company seems to stagnate during its digital transformation process due to a high

number of insurmountable rigidities, a radical move is required to overcome these. That is why rigidity is the most common reason for a revolutionary change Wit (2017), lists some resistances such as;

- psychological: employees' reluctance towards change as this requires an unwelcome adaptation
- cultural: difficulty to change an organizational common belief system
- competence lock-in: loss of competence advantage in the market.
- system lock-in: the company is locked to a standard or a system
- stakeholder lock-in: existing contracts with buyers or suppliers.

Besides these rigidities, there are some triggers that digital transformation shall adapt to revolutionary change such as; if a company's market position is threatened if regulatory pressure in highly regulated industries and if first mover advantage as to be the first company to gain the advantage in the market. All of the aforementioned changes indicate the company's digital transformation response to the environment. Nevertheless, companies can also be proactive as they can shape the environment to their own advantage (Wit, 2017; Ben-Menahem et al., 2013; Sushil 2013).

Compared to revolutionary change, for the evolutionary process, it is not so easy to identify clear needs or triggers. It is a slowly developing and evolving process with small adaptations. Mostly evolutionary change occurs where strategic alignment demands an organizational learning process as learning is a slow and time-consuming process with the appropriation of new routines, competencies, and know-how. Furthermore, evolutionary change can be observed where managers and leaders in companies lack power and thus are not capable of implementing revolutionary change, although revolutionary and evolutionary change are opposing concepts, a company is only successful if it can apply both concepts effectively depending on the situation (Wit, 2017).

2.4.4 The paradox of revolutionary and evolutionary change

Digital transformation requires strategic change, and it is important to discuss how it can be achieved. The literature emphasizes two different changes, revolutionary and

evolutionary. However, it is not clear for the construction companies which change type can be used for digital transformation. Digital transformation leaders have to deal with the combination and balance between revolutionary and evolutionary principles in the strategic alignment process (Wit, 2017). According to Tushman and O'Reilly (1996), in order to challenge this paradox, ambidextrous organizations are required.

If the organization has been shaped as a consistent system, people are unwilling to change as humans strive for stability. In general, this stability is needed as a framework for the efficient functioning of the organization. Indeed, companies need lengthy periods of stability toward digital transformation (Hess et al., 2016). Though proponents of this perspective argue that it is not fully possible to evolve and adapt harmoniously step by step in digital transformation. As the resistance and rigidities toward digital transformation are too high, only an abrupt and radical shift succeeds to align the company on the right path. During the radical revolutionary change, the employees do not align with the change process in digital transformation because the new direction and new technological tools are unclear and the old structure is shattered (Gersick, 1991). However, this might be needed from time to time as the construction company tends to shift away from the environment at some points. With this growing gap, the tension and the pressure to change augment, and the resistance towards a revolutionary change to digital transformation decreases. Therefore, managers tend to expand the sense of a crisis or create one to adapt to the company more easily (Wit, 2017; Borwick, 2013). Extensive changes can often be observed when the leader changes in construction companies because they can act more objectively and have no connections yet to the employees. In any way, strong and risk-taking leadership is needed when overcoming the rigidities of digital transformation. Leaders have to find a balance between stability and change (Wit, 2017; Borwick, 2013).

From this point of view, a revolutionary change is not needed in any way during the digital transformation and seems to be nothing but a waste of energy. After such changes, organizations need to recover from the shock and strive for stability so that they ultimately end up at the same starting point. As pointed out before, learning is a progress that takes time to develop and thus cannot be realized by a short radical change. Moreover, proponents argue that with continuous alignment employees are more involved in the change process and are motivated to adapt towards digital transformation. Evolutionary change thus requires a company-wide effort and not only leadership skills compared to

revolutionary change. Managers should guide rather than command (Wit, 2017; Borwick, 2013).

2.4.5 Managing the change

According to Wit (2017), the responsibility for strategic change in digital transformation might rely more or less on the top management within the organization. Hambrick and Mason (1984) are supportive of the influence of top managers in both strategic decisions on digital transformation and their effectiveness.
Similar to Hambrick and Mason (1984), Clark and Soulsby (2007) expresses that managers' values influence their sense-making of the environment and in consequence their actions. Also, Dominguez et al. (2015), based on Boyne and Meier (2009), claim that strategic change is a product of managers' interpretation of contextual circumstances and mobilizing resources within the manager's supervision is critical for implementing digital transformation. These ideas reflect the involvement of managers in leading digital transformation. Particularly, the notion of the change is a product of 'managers' interpretation' places these at a central position in the formulation of digital transformation. Additionally, Dominguez et al. (2015) explain that senior management might be the most influential in initiating a change since they have "the greatest formal power". However, they state that "power is distributed between the CEO, the top management team, the board of directors, and the shareholders" (Dominguez et al., 2015).

Nonetheless, McCabe (2009) poses an opposition to the role of top management in digital transformation. According to McCabe (2009), literature on the 'Strategy-as-practice' approach argues that the actions (i.e., resistance) of employees on lower levels are being underestimated by digital transformation leaders. It might be argued that top management's accountability for digital transformation if perceived as a reflection of poor organizational performance, can result in changes in top management (Fredrickson et al. 1988).
This is assumed to be related to cultural differences. In cultures where a top-down leadership style is visible, top management is responsible for digital transformation. In these cases, top managers have the power to develop digital transformation initiatives and handle any resistance; it is also their role to formulate the change, while the lower organizational levels are only involved in the implementation phase (Wit, 2017). On the

other hand, in cultures where leadership is less controlling, top management is not imposing the digital transformation, rather the whole organization is managing the process and the top managers are seen as facilitators (Wit, 2017).

According to Drucker (1992), one cannot manage change; one can only get ahead of it, and those who survive are the change leaders. Most organizations are unable to successfully become digital leaders; those who succeeded so because they are able to successfully lead digital transformation and change (Westerman et al., 2014).
Leaders need to undertake the role of a coach and develop people and innovation should be encouraged by leaders, so employees meet the daily challenges of the organization better (Sims, 2002). However, smart digital transformation leaders realize that the rapid changes in digital technology, globalization, and diversity within the workforce necessitate a leader who can create a vision that can compete with these changes; a strategy of how to implement the vision; and the ability to communicate the vision and inspire people to take part in the digital transformation.

3 Methodology

This chapter explains the research design and methodology adopted in this thesis.

3.1 Research Design

The empirical research in this thesis has been of an exploratory nature. Exploratory research is defined as an investigation into an unclear problem. An exploratory research study is appropriate when the research questions are ambiguous or there is insufficient theory to assist the development of hypotheses (Hair et al. 2020). Drawing from the research gap identified regarding how digital transformation unfolds in construction industry organizations, the exploratory approach was chosen to assess the digital transformation strategy and to understand the view of industry experts on development.

Inductive research methodology is used to define the link between theory and research. The inductive technique begins with data collection and observations, which are then used to develop a theory (Bryman and Bell 2015). Inductive approaches relate to qualitative research strategies. When conducting research in exploratory fields, a qualitative research strategy is widely perceived as appropriate (Easterby-Smith, Thorpe, and Lowe 2002). Qualitative research, on the other hand, promotes words over figures and is used to develop theory and get a new and deeper understanding of a researched subject (Bryman and Bell 2015). For these reasons, the qualitative strategy was considered appropriate in this study.

Interpretivism is chosen as the epistemological consideration since belief in every single reality requires an interpretation of that reality in its context (Bryman and Bell 2015). To provide light on a new area of research, interpretivism is utilized to investigate and get an interpretive understanding of a matter from a previously unconsidered perspective. Interpretive approaches prioritize the meanings and give room for acknowledging alternative explanations of the same problem.

3.2 Ethical considerations

All interviews were conducted with the interviewee's full consent. To maintain participant confidentiality, individual and organization identities are replaced with pseudonyms.

3.3 Literature Study

The research started with a literature study focusing on understanding the current knowledge on the intersection of strategy, digitalization, and digital transformation within construction-specific literature in the form of books, reports, and articles. Secondly, literature related to Digitalization and Strategy was studied as a combined topic. Alongside this, consultation was held with our supervisor at Chalmers and company as well as with a peer-review group throughout the process. These consultations were an aid in finding relevant literature.

As mentioned by Flick (2009) the literature study should include the following parts.

- Theoretical literature about the topic of the study.
- Methodological literature, where the studied area is how to do research and how to use these research methods.
- Literature about earlier research within the topic (empirical literature).
- Compare and contextualize both theoretical and empirical literature.

For this thesis, methodological literature was studied before the theoretical literature study commenced.

Keywords that have been used when performing the literature study have been digitization, digitalization, digitalization strategy, digital transformation, etc. The theoretical framework is based on a literature review and divided into three main parts. The first part is the understanding of the digitalization framework with the definitions of digitization, digitalization, and digital transformation, the second part defines digital transformation strategy, and the third part is the strategic change framework, paradox, and leading change.

3.4 Interviews

In order to obtain primary data and gain better knowledge about the digital transformation, interviews were requested by the authors with personnel who work in the digital transformation in one of the biggest construction companies in Sweden. When it came to selecting interviews, individuals were contacted based on recommendations from

supervisors or other individuals invited to participate in the study. Additionally, the authors considered if the job title was appropriate to the thesis topic when selecting an interviewee.

The interviews were recorded, if the interviewee agreed to it, thereafter transcribed verbatim to make sure that no information was missing. Both authors participated in the interviews by asking questions, this was done to make sure that every issue was addressed. Interviews were performed with a semi-structured approach, this allows the interviewers to combine open-ended questions with clear predefined questions (Wilson, 2014). According to Wilson (2014), semi-structured interviews are preferable to use when there is knowledge about the subject, but furthermore, in-depth information is requested.

This thesis is based on empirical data collected through these interviews along with theoretical information from academic publications. Since most of the literature study was done before the interviews the authors had knowledge about the subject. Strengths of this approach are not limited as follows; reveal unknown issues, Illustrate more complex issues through clarification and probes, give the interviewers the possibility for broad comparisons across the different interviews, and provide a mechanism for redirecting conversations that deviate from the issue at hand, requires less training than unstructured interviews while the weakness is, time-consuming to analyze results, consistency among interviewers is important not to make the comparisons difficult, some training and experience are required for the interviews to run smoothly (Wilson, 2014).

As the research took place in Sweden but the interviews were held in English. The goal was to ask the same questions to all interviewees, some interviews were held in person, and some were held via Teams. To keep the anonymity of the interviewees they were not mentioned by their real names and the company names were also kept anonymous throughout this thesis.

3.4.1 Selection of Interviewees

Interviews were conducted with people from one of the leading construction companies in Sweden. The organizations were chosen for this study because they have an active agenda regarding digital transformation. Table 1 below illustrates the interview type and duration of the interview.

Interviewee	Type	Time
Interviewee A	Face to face	80 min.
Interviewee B	Face to face	70 min.
Interviewee C	Teams	60 min
Interviewee D	Teams	70 min
Interviewee E	Teams	45 min
Interviewee F	Teams	65 min
Interviewee G	Teams	60 min
Interviewee H	Teams	60 min
Interviewee I	Teams	60 min

Table 1: List of interviews

The people that participated in the interviews were professionals that the authors thought worked with tasks related to digitalization. Along with the first contact with professionals a short project description and a definition were shared. This was done for the person in question to decide if the person saw themselves as suitable to take part in an interview. This resulted in a more open dialogue with the participants and a recommendation to talk to someone else within that company.

3.5 Analysis

Data analysis is a stage that incorporates several elements such as transcription, coding, thematic analysis, and data reduction (Bell and Bryman, 2015).

The interviews were recorded, transcribed verbatim to the software, and stored in a shared database folder. The researchers started reading each interview transcript as soon as the transcripts were uploaded. This is the process through which data is divided into component parts and then categorized, thereafter, researchers analyze for recurrences of patterns of text inside and across cases, as well as for connections between topics (Bell and Bryman, 2015).

Both researchers kept listening to the recordings. Once the transcripts and recordings have been compared, a large amount of information acquired should be sorted and reduced to make sense of it (Hair, Page, and Brunsveld, 2020). “The researcher is making sense of

data through reading, and data is being interpreted—that is, the researcher is linking the process of making sense of the data with the research question, as well as with the literature and theoretical concepts" (Bell and Bryman, 2015).

The data analysis stage is fundamentally about data reduction, and this involves selecting, simplifying, and transforming the data to make it more manageable and understandable (Hair, Page, and Brunsveld, 2020; Bell and Bryman, 2015). The process requires choices about what should be emphasized, minimized, and eliminated from the further study (Hair, Page, and Brunsveld, 2020).

3.6 Research Quality and Trustworthiness

Researchers and practitioners have been concerned about data and information quality for decades (Nurse et. al., 2011). Each research study should be reviewed within respect to the techniques employed to obtain the findings, and the findings should be as trustworthy as possible (Graneheim and Lundman, 2004). Business research is often assessed using a number of quality criteria, the most common and well-known of which are reliability, repeatability, and validity (Bryman and Bell 2015). There is an important connection between quantitative research and these quality standards, which has created a discussion regarding whether or not they should be used to assess qualitative research quality in this context (Bryman and Bell 2015).

According to Lincoln and Guba (1985), the value of a research study can only be properly assessed if the findings are based on reliable sources. To make this assessment correct for qualitative research, define a set of quality criteria where trustworthiness is a key aspect. According to Lincoln and Guba (1985), credibility, transferability, dependability, and confirmability are all aspects of trustworthiness.

3.6.1 Credibility

Confidence in the data and analytic methods' capacity to meet the research's intended emphasis is expressed in the term credibility (Polit & Hungler, 1999). When deciding on the scope of a study, the context, the subjects, and the method of data collection, the first concern is always one of reliability. Selecting participants with a variety of backgrounds enhances the likelihood of gaining new insights into the study subject (Graneheim and

Lundman, 2004). Considering that interviews are the primary mode of data collection in this study, this quality criterion is critical. The following procedures were carried out by the researchers to make certain of the minor deviation. Questions that explained the questions following were initially asked in the interviews. Second, the interviews were recorded so that any confusion in the notes collected during the interview could be clarified later on. However, if confusing answers still were found after compiling the data, a follow-up phone contact or email was not carried out to the respondent to clarify the issue, due to the lack of time. Hence, researchers avoided using unclear data.

3.6.2 Transferability

The degree to which the findings can be extended to various social contexts is referred to as the transferability criteria (Bryman and Bell 2015). Authors can make recommendations about transferability, but whether the findings can be transferred to another context is the reader's decision (Graneheim and Lundman, 2004). It is important to describe the culture and context, participants' selection and characteristics, and the data collecting and analysis procedure in detail to help with transferability. Transferability can be improved by presenting findings in a coherent manner with appropriate citations (Graneheim and Lundman, 2004). Many actors in the industry were interviewed by the researchers to develop an understanding of the differing perspectives of the actors. It should be noted that due to its focus on a particular sector of the construction industry, it would be difficult to predict the results of applying the same approach in a different situation, even if the information provided in this study is considered comprehensive and transferable to another context.

3.6.3 Dependability

According to the reliability requirements, researchers must retain detailed records of their research process to analyze their findings later (Bryman and Bell 2015). There is a danger of inconsistency during data gathering when the data is large, and the collection takes place across time. (Graneheim and Lundman, 2004). It is critical to ask the same questions of all participants (Graneheim and Lundman, 2004). Interviewing and observing, on the other hand, is a dynamic process in which interviewers and observers gain fresh insights into the

phenomenon under research, which can then affect follow-up questions or reduce the scope of observation (Graneheim and Lundman, 2004). An open debate among the study team can address the extent to which judgments about content similarities and differences are consistent across time, as shown in our images (Graneheim and Lundman, 2004).

As a starting point, it's critical that all participants be asked the same questions. A confidentiality agreement between the researcher and all of the companies necessitated anonymizing all of the data collected. Records will be made public, but their contents will be kept anonymous.

3.6.4 Confirmability

The objectivity of the study and the researcher are considered in the confirmability criterion (Bryman and Bell 2015). Due to the fact that interviews were the primary data collection method in this study, there was a risk of affecting the respondents. This was largely reduced by using non-leading questions in the interviewing process. In addition, the semi-structured interview method allows for more open-ended questioning, which leads to the process to collect objective answers. In summary, this study is deemed credible by the researcher, the findings are transferable with restrictions, and the dependability and objectivity of the study are relatively high.

3.7 Work Contribution

The authors of this thesis worked together very closely in order to provide a credible outcome. The vast majority of the work has been completed concurrently with reflective conversations about each component in order to arrive at a consensus over how digital transformation should be understood. The development of each section has been an iterative process, and both authors have had an equal opportunity to shape the final outcome. Both authors took part in all the interviews and were equally involved throughout the process of making contact, conducting the interviews, and transcribing the data.

4 Empirical findings

In this chapter we will present the most significant findings linked to the purpose of this study based on the transcribed material from the interviews and secondary data collected from company documents.

4.1 Knowledge-based to data-driven company

When interviewees were asked to describe how digital transformation is understood in the case company, they referred to a data-informed company. The case company has decided to move from being a knowledge-based company to a data-driven company.

"We've decided that we need to move from a knowledge-based construction company to a data-driven one, and that's why it's a program we're doing and we're trying to transform the way our company works in a way that goes digital." (Interviewee A)

The analysis shows that digital transformation is talked about in the company explicitly and the interviewees are very aware of the subject but have a slightly different understanding. However, according to the findings, when it comes to a digital transformation most employees think about VDC. The analysis also showed that the company has an initiative named the "SAT" program which is the common point of reference while the interviewees were describing their understanding of digital transformation.

"SAT" program serves as a sort of umbrella over everything, but it is getting a little slow in terms of execution and internal debates, we need to think hard where are heading and how the "SAT" program should operate" (Interviewee B and C)

There is also a lack of awareness about initiatives such as data warehouse, "SAT" program within the case company. According to most of the interviewees, there are continuous disagreements within the organization regarding the "SAT" program, therefore case company seems progressing slowly during the execution of the program. However, the "SAT" program is considered as the overall strategy of digital transformation in the company and has a governance role over other initiatives toward digital transformation.

Interviewees unified around digitalization is inevitable in the construction business and will affect the case company. The case company getting assistance from digital tools available to control the complexity of construction. However, some of the interviewees are concerned about the organization's lack of implemented program awareness.

"Digital transformation itself will not solve the great challenges in the construction industry." (Interviewee G)

Information is knowledge and transforming knowledge into wisdom requires a certain set of actions. An organization's holistic perspective can be used for strategic purposes, according to the interviewees, and then used to drive digital transformation, a new way of working that transforms the business model and delivers new services to customers.

4.2 Digital Transformation Strategy

The analysis shows that digitalization is seen as an important aspect of the broader strategic agenda of the company. Although digitalization is seen as a key part of the strategic agenda, interviewees coming from various parts of the organization differentiate the companies approach toward digital transformation. According to the findings, the case company has implemented separate strategies in different departments such as IT, HR, Finance, etc., that are not interconnected.

"Separate strategies are available. The first is the digitalization strategy or "SAT" program, followed by the IT strategy, but they do not have any link with each other" (Interviewee B).

"IT and digitalization plan connected for the first time and previously they were like two separate islands" (Interviewee B).

There are differences between the interviewees when it comes to the digital transformation strategy, comments of the interviewees have some commonalities but accommodate lots of divergences, especially regarding the name of digital transformation as a strategy or not. Some interviewees stressed that even though the case company has evolved regarding digital transformation, they don't have any digital transformation strategy. However, some

interviewees argued that the "SAT" program is a digitalization strategy. The common point of reference was the notion of being a data-informed company as a strategy. According to a few interviewees case company does not need a separate digital transformation strategy, instead, the case company should have a corporate strategy that focuses on digitalization and sustainability, with the involvement of other departments of the company.

"We have a fairly new IT strategy analysis from the strategic part, and very few people are aware of it, and they may not even need to know the IT strategy." (Interviewee D).

"IT strategy is more a foundation that supports the other decisions, and the IT department is driving the IT strategy" (Interviewee D).

The interviewees mentioned the importance of IT Strategy, nevertheless, it can serve as a support function for digital transformation strategy. The IT Strategy is intended to improve the information flow, and therefore, the software is needed to optimize the existing processes that the case company requires according to some interviewees. Findings also show that the relationship between IT strategy and digitalization is primarily about governance as the IT department governs the IT strategy, however, they support digitalization initiatives without driving them. Some departments in the organization wanted more development in terms of tools, and it has been consolidated at the group level so that the IT and IT strategy get a stronger focus. The case company undertook initiatives to establish links between strategies driven by the departments, as a result of the initiatives, a comprehensive perspective emerged, and individual efforts connected to each other. At the conclusion of our interviews, we were unable to confirm the existence of a clear digital transformation strategy.

4.3 Drivers for Digital Transformation

According to the findings, numerous topics are driving digital transformation in the case company, yet the opinions are consolidated around the need for new kinds of value creation, increased safety in construction, and reduced environmental impact. Another common input was the existing data systems that received complaints from the interviewees which are identified as non-competent systems and particularly old.

Construction companies are focusing more and more on digitalization to interact with all the stakeholders and generate value together. Value creation and customer satisfaction are emphasized as an aspect that is vitally important for the case company. Digital transformation is seen as a crucial approach for capitalizing on opportunities to fulfill neglected customer needs and gain a competitive advantage in the market.

"Value creation is the main driver of the digital transformation" (Interviewee F)

The existing digital infrastructure in the company is perceived as a non-competent system. The findings showed that the systems are not capable of meeting the demand for the digital transformation, furthermore, maintaining the existing systems creates a huge resource input, therefore the case company is continuously losing money.

"Considerable number of the existing systems are at the end of their life cycle therefore we need digital transformation." (Interviewee D)

Productivity and efficiency are another important dimension of the drivers of digital transformation. The results showed that the case company developed awareness of the digital transformation will aid the company to increase its productivity, and efficiency, and improve the safety of the workspaces. Furthermore, the interviewees emphasized the importance of impact on the environment. The case company is particularly focusing on reducing the impacts, with the implementation of digital systems which are increasing the organizational capacity of monitoring the impacts to the environment.

"Productivity is one of the main drivers of the program as well as to provide a safe work environment and reduce the environmental impact." (Interviewee E)

Interviewees mentioned that the case company has established development initiatives and conducted internal interviews from various parts of the company, which resulted in a significant amount of data collection and revealed a vast number of needs. They also took into consideration what they have learned from their previous work experience. The most important capabilities of the organization for the future identified are tender management, contract management, and design management.

"We have identified more than 100 new areas of improvement and the team carved out several development initiatives." (Interviewee D)

According to the findings the case company has strong motives to implement digital transformation since the company is aware of the potential benefits of the transformation of the business to a digital one.

4.4 Revolution or Evolution

The data analysis shows that digital transformation in the case company is interpreted as strategic change. However, the nature of the change was interpreted somewhere between evolutionary and revolutionary change.

"Digital Transformation is from top-down, it is a revolution rather than an evolution, but evolution would have been easier. I am not unsure if it is a revolution or an evolution because it will influence all the activities. "(Interviewee B)

According to the case company page, revolutionary digital transformation is undergoing that affects everything they do and the relationships with those they interact with. Some interviewees labeled the company agenda regarding digitalization as a revolutionary path. However, when they were asked to describe it in detail, they had different views about the form of change in digital transformation.

"*Well, the revolution, I think. It is a revolution because it is happening very quickly, but at least we try to do it in a controlled way, so for us, we try to keep it as an evolution." (Interviewee D)*

"It is an evolutionary change. But all these changes are very new, so people within the organization perceive it as revolutionary." (Interviewee G, H, I)

Some interviewees mentioned that the case company must make this transformation gradually although it is happening so quickly that can be considered a revolutionary change. Some other views also stated that there are so many changes therefore it should be

considered an evolutionary change. Such different interpretations indicate the difficulty of creating a mutual understanding in a large-scale company.

4.5 Actions and initiatives towards digital transformation

The interviewees were asked about the actions and initiatives taken toward digitalization from the very beginning. The data analysis showed that the case company had digitalization as an important agenda for the last two decades. It was seen that the case company has undergone some unsuccessful initiatives. The decision-maker over defining the strategy was shifted in between the departments and this shift occurred multiple times and ended up a failure.

"Digitalization or data-informed business should not come under the scope of IT." (Interviewee D).

Interviewees especially emphasized that some of the previous digitalization roadmaps were developed by the IT department in the company or IT consultancies. However, initiatives carried out by them did not provide desired results. The main reason behind this outcome was emphasized as IT people's lack of construction knowledge.
It was seen that the CEO and the strategy department emerged as key actors leading the latest agenda around digitalization. Most interviewees also added that the recent CEO has a driving role in establishing a new strategic direction for the company and formed a council of the business leads in the company where the outcome was the shift of initiative from the IT department to the Strategy department. The case company established its roadmap and defined short-term and long-term goals, nevertheless, due to the ever-changing nature of digital technologies, they are continuously adjusting its targets. It is also noted that the redefinition of the targets sometimes creates major impacts and hinders the case company from achieving desired results and creates additional stress.

"Strategy creation and implementation is a problem in the construction industry and the case company is as good as its competitors in the market" (Interviewee F)

The findings pointed out that the strategy establishment and road map of the case company is not the best one, however, the interviewees are confident that this is a general problem

in the construction industry. Some of the interviewees emphasized the importance of constructive criticism that will aid strategy creation. Furthermore, findings point out some of the areas such as the design and planning phases of the construction ahead of the other phases, due to the known and proven established systems such as BIM (Building Information Modeling) and other planning tools.

"Execution phase is the most challenging part to implement the digital transformation, where you feel that you go back to pen and paper." (Interviewee E)

Interviewees also stated that the execution phases of the projects can be considered the most underdeveloped portion of this transformation effort, with many activities still being carried out without the assistance of digital implementations. It's also noted by interviewees that in most cases the requests that arrive from the execution phase are quite simple to handle and solutions are available. The data analysis pointed out that the implementation of technological changes requires certain steps to follow. These steps are argued in the findings that; firstly, to identify and define the problem thereafter define an action, secondly, verify the identified solution whether it can handle the problem or intended system modifications.

"The flow of information among partners that accurate information enables us to identify tools." (Interviewee A).

'We have been working with identifying the capabilities and the system structure in the future but not the tools themselves" (Interviewee F).

According to the interviewees, the case company is one of the largest in the industry, so they already have most of the market demands covered. Furthermore, interviewees stated that the case company conducts field studies and makes interviews with the staff to identify problems. But, still, the execution phase is inherently uncertain, therefore, they need to be more flexible to adjust. According to the findings, the team effort and the contribution of the team members is crucial. In addition to that, the importance of the partners, and their collaboration is an important aspect of the identification and implementation of digital technology.

The interviewees were asked about the governing department of the digitization program from the start. The data analysis showed that the case company had digitalization as an important agenda for the last two decades. It was seen that the case company held several workshops to not only determine the key aspects of digital transformation but also to identify not functioning elements of the existing structure in the company. Business areas, such as HR, Finance, etc. represented in this workshop. Some of the interviewees stated that the digitalization initiatives began with Virtual Design and Construction (VDC). There were unsuccessful initiatives led by different departments and the final decision was to assign a program manager to the digital transformation initiative.

"The research and innovation department is not driving the "SAT" *but we are. VDC is 10-20 years ahead of the other departments as they were on this road 10 years ago." (Interviewee A)*

"Digital transformation agenda should not stay only in the headquarter level" (Interviewee B).

The data analysis showed that the "SAT" program includes people from each business area, and the work group within people from every country and every part of the company. Interviewees stated communication is crucial for the success of the program "SAT" and the case company is trying to engage everyone and most of them think that the whole company needs this transformation agenda. Furthermore, they emphasize that the objectives of this transformation initiative should be spread to all layers of the company.

The findings show that the case company has formed data warehouses and has a central implementation platform. With the central implementation platform, case company targets limit the rare products and tools, and that increases the flexibility of the case company and makes it easier to replace those tools if ever necessary. The findings also demonstrated that the case company has adopted a hybrid strategy regarding the tools, and the case company is creating some tools such as Purchasing system and project management tool, construction connector in-house, and outsourcing some of the tools that pose standardized solutions in line with the approach in place for the central implementation platform.

Findings highlighted that the company's current business model does not support connectivity, therefore ongoing projects are not connected and do not communicate with each other in terms of system and data. Interviewees argued that the information is

gathered, however, the harvested information cannot be used efficiently due to the current business model used in the company. Figure 4 illustrates the current business challenge. According to the interviewees that the case company identified properly the miscommunication and gap between the projects. However, there is not an available tool in the market that can provide this connection and unite the information.

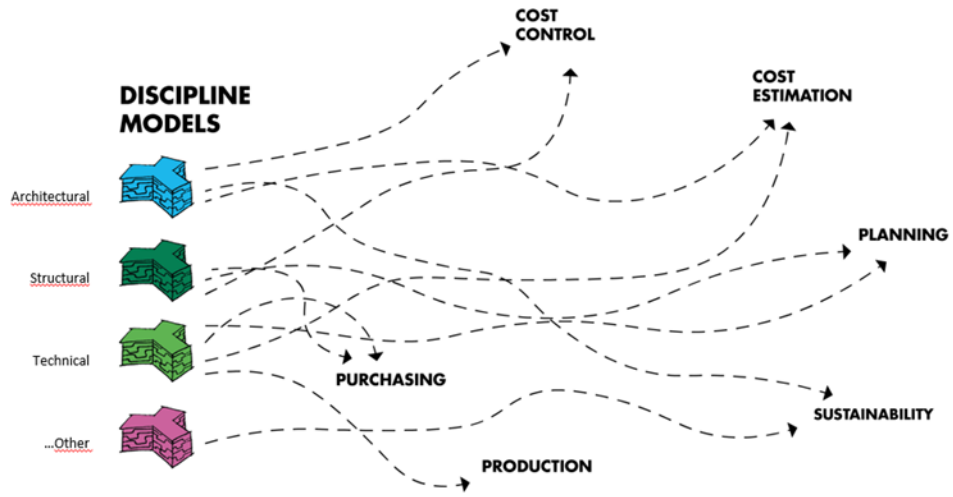

Figure 4: Current business challenge

Therefore, the case company designed a connection to the system called the Construction Connector. The system is meant to provide all the building element information related to the main activity within the project. However, regardless of the country, an organization can have a strong link to the financial system through the project service, even if it is in Sweden, Norway, Finland, or Denmark. Figure 5: illustrates Integration focus- centralized and always updated information.

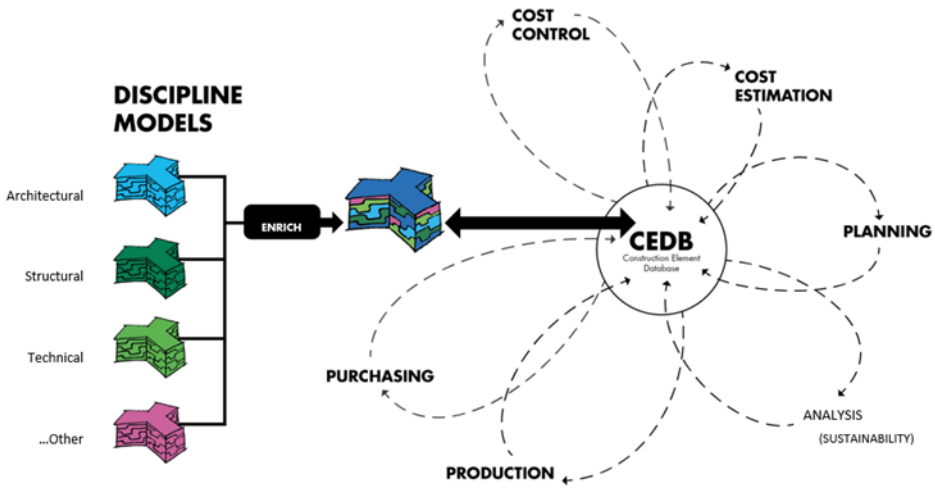

Figure 5: Integration focus- centralized and always updated information

Interviewees argued Construction connector uses integrated multi-disciplinary performance models for the design and will improve the performance of the construction industry of the projects by incorporating the elements of product, organization, and process modeling. Construction connector is hindered by the customary centralized nature of the construction industry. Figure 6 illustrates the decentralized to an integrated flow of information

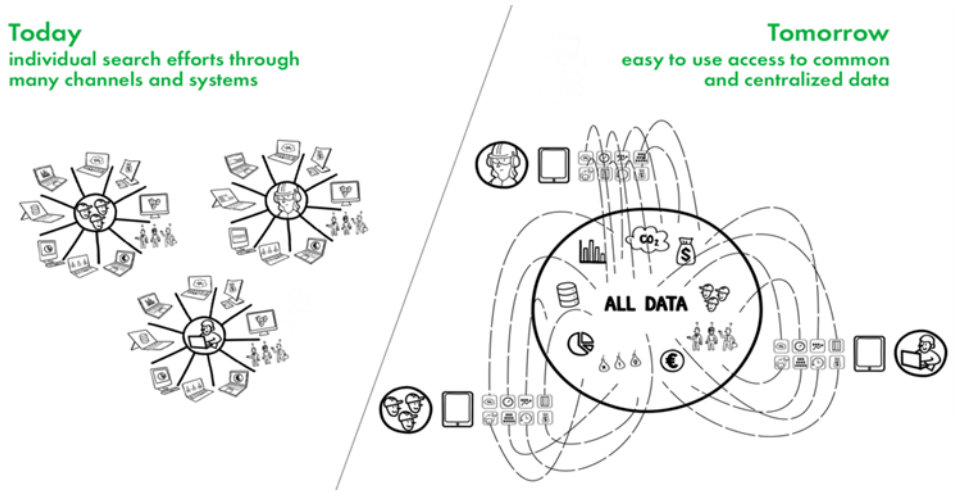

Figure 6: Decentralized to integrated flow of information

4.6 Responses to the changes in the organization

Data analysis showed that the case company faced both structural and cultural change issues. Most of the interviewees argued that there is resistance when they talk about the digital transformation related changes. According to findings, the resistance is not triggered

by the legislation as it is more or less similar in all Nordic countries. When the terminology starts to be standardized with digital tools, it becomes difficult to be accepted by the operation teams in different countries. They show resistance by arguing that the way they do business is different, and they argue that the recommended practice is not valid in their own country.

"We operate all over the Nordics, but we do not benefit from being a big company as the local organizations have their local business solutions and operate in different languages." (Interviewee D)

"One of the biggest challenges in the digital transformation is to work in different countries as each country historically wants to do it their own way." (Interviewee H)

The interviewees believe that some individuals are resistant to change because they are afraid of it, and they relate this resistance to the construction industry, which has been using the same methods for the past half century. However, some interviewees see from the other perspective and added that the resistance was replaced within the case company with encouragement as new tools or a new way of working that attracts younger people, so the case company is transforming.

"Changes with digital transformation bring in massive data flow and the human aspect can be resistant when important things happen around individuals" (Interviewee A).

The implementation of digital technologies created a great struggle among the individuals due to rapid change. It also includes a certain amount of mind shift towards the way of working compared to the development of digital transformation. Few interviewees argued that the mindset in the case company is not a visioner among the employees and only a few of the employees understand the change. Some interviewees have opposing views and they think that resistance to digital transformation cannot be generalized to the case company as employees of the organization do not wait for strategic changes during their busy working structure. Changes in the case company are a whole change of understanding of how to obtain the information for the company's mission and simultaneously how that knowledge is then shared with others. Some parts of the "SAT" program have established a system

structure for digitalization, but the case company is lacking people that are competent to handle digital information. Findings show that the CEO, board, and majority in the organization think that the case company still needs competence and the people within the company to drive digital transformation-related works. On the contrary, some interviewees think that their individual perspectives positively changed towards digital transformation, and the case company has a competent human resource that keeps up the speed of digital transformation in the company, in addition to the involvement of the younger generation who demands digital technologies will facilitate the implementation of digital transformation. Additionally, the construction site works are mostly evaluated over physical performance, and the employees who are working at the site have already overloaded schedules and lack of time to provide sufficient feedback, which creates a drawback for the implementation phase of the digital technology.

"Digital tools can be complex and require an adaptation period, and individuals not used to work in digitalized way suffer the most" (Interviewee B)

According to the interviewees, complex digital tools are a major obstacle in front of running a feasible and profitable business with the existing human capacity. It is difficult for the employees working on the site to predict what is possible today with the tools that they have in hand but when they invite the partners to discuss possibilities and opportunities, this approach clarifies doubts and opens areas of innovation. Some interviewees stated that the digital tools that they are trying to implement are not the finished products in most cases and it needs adjustment over time, therefore it requires dedicated people that are open to taking risks and trying out the solutions provided, so it is a challenge for the innovation department to identify the early contributors to the business. Some interviewees emphasized the importance of "change management" which is a great challenge in the construction industry despite this initiative having great support from the management level.

4.7 The role of senior management

Many of the interviewees agree that the CEO is the key person deciding all digital transformation agenda. Case company's recent CEO is coming from the construction industry compared to the previous CEO who has not had a construction background. It is

also noteworthy that all the changes related to the understanding and setting structure of the digital transformation have been developed after the most recent CEO joined the company.

"The CEO obviously takes responsibility for digital transformation. CEO makes the final decision" (Interviewee D).

"CEO is the decision maker for all the system's functions, including IT, HR, finance strategies and so on" (Interviewee F)

According to many interviewees, when the company's most recent CEO arrived and noticed that things were looking bad from the business perspective as the company was in a position where it could not really make the money needed. The CEO would like things to go considerably faster and believes that they should take greater action than they do now. Tied to the aforementioned, when there is a change in top management, the digital transformation framework also changes. According to some interviewees, this means that the role of the CEO is critical, and it is worth noting that the most recent CEO recognizes that this is something that must be done in terms of digital transformation. The CEO is interested in digitalization and recognized the importance of digital transformation.

"The senior management team is the driving force and owner of a data-driven company for all strategic activities." (Interviewee F)

Data-driven company initiative is owned and driven by the senior management team, which includes the company's whole development portfolio. The data-informed company's management team reports to the steering committee. They have developed a governance model for running development portfolios. Depending on their size, they must make decisions regarding the portfolio at various levels. But when the data-informed company management team needs to make a choice, they do not go all the way up to senior management, depending on the scale or scope of the development initiative.

"CEO sometimes furious that management does not see the same thing and are not doing everything they can to make it happen" (Interviewee B).

"Steering committee of the data informed company is a little frightened of taking decisions" (Interviewee A)

When it comes to the support from senior management, most of the interviewees were agreeing that some members of the management are supportive, while others are adamantly opposed, and it can be seen how far they have progressed in the digital transformation journey. Findings show that the CEO is frequently disappointed when management members do not share the same interest and engagement for digital transformation. Furthermore, findings show that senior management and construction site management are literally far from each other. Although all the instructions are clear about the implementation of one of the initiatives, interviewees claim that it is difficult to apply new instructions to the site level and it takes a while to reach the site. Accordingly, digital transformation strategy development in the case company is top-down, and this approach requires the rest of the organization's acceptance that starts from the senior management.

"Alignment is an ongoing process, and senior management engagement is quite beneficial" (Interviewee F)

Senior management started with alignment because no one knew if it was the best answer that would meet their needs, but now they know what they need to do. Although they are not perfectly aligned within the whole organization, they are working a lot to succeed with a "change management" program. Every actor in the construction industry, including the client, consultant, architects, detailed design engineers, and, of course, suppliers, is dependent on one another. Some interviewees claimed that they are having problems aligning these actors and that they have not made any progress in some initiatives since managers are not behind the ideas. When it comes to digital transformation, support from all levels of a business, especially senior management, is critical, according to all of the interviewees.

5 Discussion

This chapter explores and connects the findings from the interviews and the literature study to address research objectives. The chapter is divided into four parts. First, understanding of digital transformation in the case company, second actions and initiatives regarding the initiation of digital transformation, third challenges in the process of developing the digital transformation strategy and finally sustainability in digital transformation.

5.1 Understanding Digital Transformation in the case company

The interview results demonstrated that the understanding of digital transformation in the case company varies. This supports the argument that digital transformation refers to how the widespread adoption of digital technologies is creating major social and business changes (Agarwal et al., 2010). The company undertook many digital transformation initiatives, but these initiatives, although they made progress to transform the company into the digital age, did not achieve the desired results in all target areas yet. According to researchers, organizations require a strategic approach to achieve successful results in digital transformation (Dominguez, et al., 2015).

The goals, procedures, and value creation for delivering services, goods, and value creation should all be defined in a digital transformation strategy. According to Lipsmeier et al., (2020), a digital transformation strategy should include the impact of digital technologies, digitalization of the company's internal operations, and external connections. However, the results showed that various departments position themselves as key actors in the digital transformation of the case company. Some interviewees stated that the “SAT” program is driving digital transformation. On the other hand, some interviewees stated the case company has a special program that drives digital transformation. Findings also pointed out that the case company claims that the programs developed within the company have not sufficiently penetrated the company layers. Thus, it is observed that the leading group of transformation is not well understood within the organization and this situation creates conflict with the company’s digital transformation agenda.

The finding demonstrated with the application of the case companies’ transformation agenda, the case company achieved some important results such as consolidating the IT

and digitalization strategy which were assumed to be "separate islands' ' around the same target. Some Interviewees, on the other hand, stated that it is not necessary for the entire organization to know the action plan of initiatives in detail and that it is sufficient to share the general strategy outlines. Furthermore, the empirical data also showed that digitalization is mostly understood as "tools" and all the strategic company plans are not fully adopted. As stated by Lavikka et al. (2018) that the unstructured industry culture creates knowledge boundaries leading to challenges in communication and collaboration regarding digital transformation. It is a well-known fact that communication channels and widespread information are beneficial for business areas within organizations. This fact is observed as due to hindered communications and insufficient collaboration challenges the case company faced various obstacles that result in misunderstanding of the digital transformation agenda.

According to Fitzgerald et al. (2014), companies typically begin on a digital transformation path by transforming their corporate strategies in order to take advantage of the potential presented by the rising focus on digitalization. The empirical results highlighted that the management level in the case company is committed to the digital transformation agenda, and they unite around the company policy to become a data-informed company. On the other hand, empirical findings also point out that the agreed approach of being a data-informed company is not yet fully penetrated and adopted in all layers of the company. Digital transformation is described as the integration of technologies into business processes and this aspect is confirmed by the interviewees, with minor deviations. According to Fritzgerald et al., (2014) a digital transformation plan is required to manage digital change within an organization.

According to Wit (2017), strategic changes possess a revolutionary or evolutionary perspective. The opinions of the interviewees regarding the revolutionary or evolutionary nature of digital transformation in their organizations are diverse. The company web page can be considered the voice of the case company, addresses the digital transformation as a revolutionary change and some of the interviewees agree with this proposition. However, most of the interviewees mention the pace of the change is very slow, therefore, the change is evolutionary although the main digital transformation agenda is defined by the top management and seen as revolutionary. This is also found in the literature that, in the

process of strategic alignment, managers should consider how revolutionary and evolutionary principles interact with each other and establish an ambidextrous organization to manage digital transformation in an efficient way (Tushman and O'Reilly, 1996; Wit, 2017). Hence, we argue that there is an incoherent view and opinions in the case company in terms of the nature of the change. The organization neither needs to make this change revolutionary, as in its own words nor should this change be a slow evolution, as interviewees' opinions.

5.2 Actions and initiatives regarding initiation of digital transformation

As presented in the findings section, digital transformation has been an issue on the company's agenda for a long time. Different interviewees referred to different starting times depending on their understanding of digital transformation. The case company seems to have taken action towards digitalization since 1995. One important milestone emerged as the establishment of the VDC department in 2006, which later became a key element of the company's digital transformation agenda. VDC actively participated and led in digital transformation. The "SAT" program, which is regarded as the comprehensive modeling of digital transformation that connects various systems of the organization, was one of the most important initiatives that will provide the case company a significant advantage against competitors. In today's highly competitive and tough business climate, organizations must be prepared to deal with a wide range of issues, and adaptability is necessary for success and gaining an advantage over their rivals. (Cabrey and Haughey, 2014). Some of the interviewees stated that the program is the main system structure for digitalization, but the case company is lacking people that are competent to handle digital information. Some of the interviewees state that the company is not used to working digitized and argued that this is not related to the human aspect and said that the construction industry lacks good software. Another opinion emphasized that the steering committee is not taking decisions in an efficient way to achieve the targets. The results showed that there are many negative thoughts regarding the initiative "SAT" in the company. Due to the distinct reasons stated by the interviewees initiative has not produced desired results to assist the company in its transformation journey. The aforementioned aspects hindering the success of the "SAT' program shall be evaluated and corrective

actions, expediting the decision-making process, deploying efficient and capable resources, etc. must be directed.

Data analysis shows that the company's digital infrastructure consists of outdated systems that have difficulties in responding to the company's current needs. Existing digital infrastructure is considered at the end of service life, nevertheless, the case company overspends to maintain the existing digital infrastructure. According to Castagnino et al. (2016) Lack of affordable network services, devices and applications creates a digital gap. Osmundsen and Bygstad (2022) emphasize digital infrastructure is essential for utilizing digital data to automate processes and improve accessibility. The case company is still in process of shifting its infrastructure and this transaction is not completed and resulting in the mismanagement of company funds. if the company has transferred all of the systems that are not compliant with the meet the requirements, the case company would have taken fundamental steps toward its digital transformation.

The case company launched several initiatives to implement the digital transformation program. The digital transformation is shaped around companies' "data-informed company" model that is established around the 2020s for governing other initiatives and programs. Since the concept of digital transformation was not fully understood and perceived as technology implementation, the IT group was assigned to direct the digital transformation, although the IT group tried to drive this business, as interviewees clearly stated, the targeted results could not be achieved due to the lack of construction background and knowledge. Different departments in the company are assigned to drive the digitalization, however, the results were not satisfactory. Senior managers have an impact on both strategic decisions and their effectiveness (Hambrick and Mason (1984). Hambrick and Mason (1984) suggest that results reflect top management's cognitive base and principles in terms of strategy and efficiency. In connection with this, aspects such as the professional growth of top managers have an impact on their actions. Borwick (2013) states that when a construction company's CEO changes, a lot of things change since the new leader can act more objectively and has no ties to the staff yet. When it comes to overcoming the hindrances of digital change, strong and risk-taking leadership is required in any case (Borwick, 2013). In line with the arguments of the academics, the management of the case company actively participated in strategy creation, and along with the support from the most recent CEO, the case company established a strategy to enable the

transformation initiative to achieve success. Internal inquiries were carried out on the model that strengthens the data-informed motto initiated by the steering committee and the management levels including with business area divisions.
The results revealed that the strategic direction of the company is defined to reach the goal of a data-informed company is still in progress The level of the initiatives taken and logical grounds for those decisions are highly important regarding acceptance within the company. Even if the digital transformation journey is very long and dependent on various factors, such as adaptation to the speed of the technology development, conducting correct adjustments to the activated programs, etc. the management level, focuses on addressing the corrective actions directly. It is observed that the case company lost very valuable time, due to misled initiatives for digital transformation.

The digital transformation debate begins to take shape around technological tools such as BIM, shared databases, IoT, and technological various concepts (Teizer et al., 2018). Shared databases and centralized information are representing the next generation for many industries (Li and Yang, 2017). Another important initiative undertaken by the case company is to establish data warehouses that will consolidate the information for the benefit of the entire company. Decker et al., (1997) The purpose of a data warehouse is to provide timely access to whatever level of data is required by all users in an organization. Information harvested through procedures and implementation is meant to be correlated, consolidated, and shared with the company. However, Rujirayanyong and Shi (2006) argue that data from the execution of projects may be useful in the future, but they are not collected frequently and are not hosted centrally in the organization. Since the company operates in several countries this is considered an especially important aspect to enable the correct information transfer between multinational divisions. The case company developed the concept to centralize the business-related data; however, findings show that the maturity of the initiative has not yet achieved its targets. To expedite the establishment of the data warehouses, the company shall hire competent people to work with the system integration-related works that allow the data to be transferred to the main hubs efficiently.

The case company defined a hybrid strategy for the selection and adaptation of the tools necessary for transformation in a pragmatic way. Some of the tools are developed and implemented in-house such as; purchasing system and project management tools, the

construction connector in-house, and the case company outsourcing the tools that are promising standardized solutions. The proof concept called digital twin the company is working on seems to be a promising concept. Boje et al., (2020) propose that the initial generation of a digital twin building site be composed of monitoring platforms capable of sensing the physical world and performing minor analysis functions. However, due to the developments in digital technologies, the concept has promising ideas and is subject to rapid change to adoption in digital transformation (Hou et al., 2020). With the implementation of the concept, the company aims to increase production, provide safer construction sites, a more sustainable construction environment, and enhance customer happiness. However, the proof concept requires adjustment to work properly and in the given conditions of the competence of the execution personnel at the site and their understanding and cooperation with the implementation team are vitally important for the concept to work efficiently. Therefore, the proof concept has been implemented in two projects of the case company.

The programs and initiatives were not able to reach their capacity and expected outcome due to the implementation phase being relatively slow and the direction of the case company's internal discussions regarding the implementation of transformation.

5.3 Challenges in developing a digital transformation strategy

Digital transformation and technological changes require an understanding in the organizations (Matt et al., 2015). The empirical findings revealed that transformation-related programs or initiatives are not widely known within the organization and understanding of digital transformation is limited only to VDC-related activities. Therefore, with this reasoning, it is reasonable to understand that VDC activities effectively communicated with the case company’s projects and employees. If this challenge is not resolved, establishing a sense of unity will become more difficult over time. The lack of awareness of digital transformation could be an effect of a lack of communication and coordination during the development of programs or initiatives within the company (Lavikka et al.,2018; Frizgerald et al, 2014). This challenge can be overcome by introducing various communication channels for sharing the progress of digitalization initiatives, so to increase awareness of the case company's digital transformation journey.

One of the reasons for the construction industry's resistance to change in integrating digital technologies (Bosch-Sijtsema et al., 2019), raises another challenge, which we identified from the findings as a lack of competence. The empirical findings show the IT department's lack of knowledge of construction and a reluctant attitude to trying new tools. According to research on IT in the construction industry, there are significant differences between IT specialists and other operational actors (Bosch-Sijtsema et al., 2019). A shared understanding of IT and business objectives is critical for developing strategies, and organizations should also acquire new skills and adopt a more business-oriented mindset during digital transformation (Bowen et al.,2007; Demuru and Katinis, 2018). Ownership of the digital transformation strategy had been moved from different departments in the case company according to our findings, as a result, digital transformation strategy-related work shifted from the IT department to business-oriented program management. This can be argued that a better solution from the operational perspective, however, mutual understanding cannot be achieved. According to the interviews, the case company requires competency since it lacks competent employees to manage digital information. Both external and internal competence enhancement may be considered, as generating resources is crucial for implementing change (Dominguez et al., 2015; Boyne and Meier, 2009). Evaluating employee's workflow, as well as integrating the site project teams to develop digitalization activities in an early stage, in order to produce training opportunities that can be distributed across the case company may encourage organizational learning and development. However, not everyone can obtain the necessary digital skills, therefore executives should identify new HR options. Nevertheless, the construction industry's digital transformation may benefit from the engagement of younger generations who are more comfortable with digital technology and have a better understanding of how to use it, all relate to Wit's (2017) arguments on competence lock-in.

There is a challenge related to the fragmented nature of the construction industry. In the literature, it was found that the construction industry is complex, project-based, unique, and conservative toward benefiting from innovative technologies, and the industry is slow to adopt the changes (Morris, 2004; Hargaden et al., 2019; Newman et al., 2020). Most of the interviewees confirmed the studies encountered in the literature review as the construction industry is the least digitalized, and the most conservative industry. Interoperable digital technologies in the construction industry are relatively new, and the industry's project-based structure makes it difficult to collect and reuse data, which may

lead to this view among industry experts. However, industries benefit from digital transformation in different ways, including more efficient productions, reduced costs, a wider range of options in products, better information flow, increased sustainability, and the competitiveness of current business models (Hilty & Aebischer 2015). Outsourcing activities argued by Wit (2017) in his framework as stakeholder lock-in and it can be used to develop some initiatives or forming a partnership can have some benefits such as efficient usage of existing resources or reducing the cost of programs driven by the company professionals. As a result, new digital solutions should be implemented with attention and the appropriate resources (Koch, Hansen and Jacobsen, 2019). However, dependency on a third party is a risk to be considered.

Cultural resistance is another challenge in the case company. Companies show a natural resistance to all kinds of change (Wit, 2020). All the interviewees are optimistic about the changes that will be triggered by digital technologies, despite claims that the organization, particularly the organization's foreign operations outside of Sweden, is resistant to the changes. There are cultural discrepancies when it comes to internationally exchanging knowledge and experiences. This indicates that there may be a lack of corporate culture, engagement, and acceptance. This finding highly relates to what Metz, 2021 and Lauer, 2021 stated, that a change, in structural levels, without the participation of corporate culture can be resisted and frequently delayed or destined to fail. A company's culture can be influenced by its senior management's commitment, they motivate and support middle and lower management to go forward in substantial and inevitable change as digital transformation by serving as a role model (Wong et al., 2005; Yeo, 2000). This type of cultural resistance to change, as claimed by Wit (2017) in the theoretical framework, may be overcome by imposing a new organizational system.

The case company does not regard digital transformation as a strategic change but managed it as an operational change with some individual initiatives. According to the company's website digital transformation is revolutionary, however, the interviewees have different views regarding digital transformation but most of them argue that it is an evolutionary change. According to Wit's (2017) framework, revolutionary and evolutionary change are opposing concepts, a company is only successful if it can apply both concepts effectively depending on the situation. Some authors suggest that both complement each other, and

companies should be “ambidextrous” and use both forms of change to succeed in this paradox (Tushman and Reilly, 1996; Krüger, 1996: Wit, 2017). The reason is probably that the case company has begun digitalization studies without appropriate preparation, so they are not aligned within the organization's different departments or business areas. Findings also show that lack of alignment in the organization is one of the biggest challenges and it can be overcome by senior management commitment and engagement. The CEO believes in digital transformation and supports its acceleration, but this does not seem to be enough. It is equally vital for senior management to demonstrate the same commitment and determination as unifying all teams in order to establish the required conditions for executing the digital transformation strategy throughout the entire organization. Senior management plays a significant role in facilitating the necessary changes as it was claimed by Wit (2017).

5.4 Sustainability

Digital transformation will help the construction industry from an environmental and sustainability perspective; therefore, the case company took a decision to become a more sustainable player in the construction industry. Sustainability and climate impact calculations and chemical management system implementation is already started in 2022. Case company drew attention to the environmental requirements, sustainability aspects, and demand from clients and industry are expediting the digital transformation.

Increased demand of not only clients but also the end-user's approach for maintaining a sustainable business that limits CO2 emissions, implements reuse of materials, to reach positive outcomes. Consumer needs, environmental demands, and sustainability drives the digital transformation and case companies believe that if they did not carry out digital transformation now, the construction work would be expensive in the future. Environmental regulations are forcing certain changes, although the changes are both to be compliant, but it is also the company's own choice. Importance of integrating digital platforms is becoming more popular in the construction industry and digital transformation would increase productivity, reduce environmental impact, and create safer work environments.

6 Conclusion

In this chapter, the conclusions are summarized and presented in relation to the research questions. In the final part of this chapter, the suggestion for future research is also presented.

This thesis was about understanding digital transformation development in the construction industry. To gain knowledge about what activities and initiatives were adopted and to identify the challenges encountered during the digital transformation journey. A combination of the theoretical background of digital transformation found in the construction industry, and qualitative study helped establish some interesting findings.
A key conclusion from this study was that the case company did not want to name digital transformation as a strategy and did not consider this change as strategic.
As a result of the findings, it was evident that the organization lacked a centralized digital transformation strategy. This was the result of uncertainty for the ones who have been involved in the development of digitalization. Large companies need digital transformation strategies, including a well-prepared change management agenda, potentially as a result of an understanding of digital transformation among the entire company. Moreover, the absence of change management hinders the efficient deployment of tools and activities.
Digital transformation is a dynamic and evolving process. A digital strategy that guides a company's digital transformation must be viewed as a central and connected element of strategic management. Companies who are trying to adapt digital technologies to their business are facing different challenges as we discussed in this study. Case company seeks to maximize the potential offered by digital technologies and maintain their position as one of the digital leaders in the market.
Digital transformation means much more than developing a company with digital technologies; it requires examining, rethinking and restructuring an organization's core business logic.

RQ1: What is the current state of understanding of digital transformation in the case company?

When interviewees were asked to describe how digital transformation is understood in the case company, they referred to a data-informed company. The case company has decided

to move from being a knowledge-based company to a data-driven company. Findings also pointed out that the case company argues that the programs implemented within the organization have not sufficiently penetrated the company layers. Thus, it is noted that the leading group of change is not well understood across the business and this condition causes friction with the company's digital transformation goal. This misunderstanding occurred due to various reasons and significantly important ones that lead to hindrances in communicating and collaborating, within the case company. Another aspect is observed as the employees have different opinions regarding the change while the organization's own assessments state the experienced change is revolutionary, the employees consider this is a hybrid shift between revolution and evolution. In light of all the company has discrepancies regarding understanding the digital transformation aspect, therefore, the company must explore new approaches that will create a common understanding and unite the case company towards digital transformation.

RQ2: What actions and initiatives are undertaken regarding digital transformation in the case company?

The case company conducted many internal audits and interviews with employees to determine business needs, resulting in launched several initiatives related to digital transformation. One of the early initiatives is considered the establishment of the VDC department which later led to the key "SAT" program. Other significant initiatives toward the digital transformation include, data warehouses, usage of widespread IoT, and a proof concept called digital twin, all of which aim to enhance the interconnection across company departments. However, most of the initiatives launched by the case company were not managed as anticipated, thus they have not yet reached their potential. Although some of the aforementioned initiatives are still in the implementation phase, the case company was able to successfully deploy the proof concept digital twin in two projects. We therefore believe that, given the substantial business portfolio in the Nordic region, case company was partially successful in implementing digital tools. There are several factors that might reduce the effect of digital transformation initiatives in the case company, such as a multinational business environment, the unique nature of the projects, being far from the headquarter, and the resistance to change toward digital transformation. Furthermore, decision-making process for digital transformation initiatives takes considerable time,

resulting in a loss of time and money for the company in order to meet its targets towards digital transformation.

RQ3: What challenges have been encountered throughout the case company's digital transformation process?

Although there are many benefits of digital transformation, following the results obtained in this thesis it can be concluded that challenges affect the digital transformation in the case company. Challenges are identified during our research in a broad perspective such as lack of competence, lack of alignment, organizational culture, lack of technological advancement, insufficient management commitment, and lacking strategic approach to digital transformation.

Most of the challenges mentioned in this research showed that not the entire organization understood digital transformation as a strategic change. Overcoming these challenges does not seem possible with short-term plans. It is necessary to carry out detailed studies so that the entire company shall involve and understand the digital transformation as a strategic change. When it comes to implementing a successful digital transformation strategy, the entire organization must work together. Senior management has a key position in overcoming all these challenges, and it is of utmost importance for the top management to understand digital transformation as a strategic change in order to achieve the desired outcome from the digital transformation. It is also revealed in this study that the "change management" program demonstrates the company's positive action to embrace the whole organization.

This thesis will contribute to the growing body of literature about digital transformation in the Swedish context. Furthermore, provide insight into why and how digital transformation could be deployed in construction industry, as well as highlighting which information and strategies will be crucial for digital transformation to enable efficient transformation through digitalization.

This study is conducted in a single case large-scale company. The empirical data collected from the employees of the company create conflict of interest. Because of the limitations in this study, and the fact that it is based on interpretations and experiences of the company employees in the case company, the conclusion should be interpreted as an indication and not as truth for all construction industry.

6.1 Suggestions for future research

Due to the limitations, this study could be made in a different setting with multiple case companies to gain further knowledge of the subject. One could also choose to investigate the company's resource structure and how the resource structure is impacting the digital transformation efforts in the construction industry.

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8 Appendix

8.1 Interview Framework

1. What is the understanding of digital transformation in the company? How do you see digitalization in the construction industry and in your company? Does this process consider a revolutionary or evolutionary change? Why?

   a. How strategy creation regarding digital transformation occurs in the company? What is the difference between IT and digital transformation strategy? Do they have similarities? How do they impact digital transformation?

   b. When the company noticed digitalization was inevitable and from that point, how did the company dynamics initiate its resources towards digitalization?

2. Can you please describe what actions and initiatives have been taken to achive digital transformation in your company?

   a. What was the initial strategic approach towards digitalization? When did the company produce its digitalization roadmap? Can you please provide information regarding the timeline for the strategy implementation?

   b. How does the company identify technological possibilities and opportunities? Are there any guidelines?

   c. Which department in the organization drives and involves the strategy-related works? How did/do you lead/contribute to the digital transformation program?

3. Can you please describe how digitalization has affected the business model of the company and what challenges has been encountered?

   a. Does digitalization change the organization's structure and/or business model/ process perspectives?

   b. What was the reaction from departments when the program was initiated? What were/are the responses to the change?

c. How far has the company achieved with digital transformation today, is the transformation completed? Do you think the company achieved satisfactory results? What are your next steps?

4. Can you please describe what is the involvement of top management while defining digital transformation strategy?

   a. How should top managers align their organizations to adopt changes that occurred due to digital transformation within the company?

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