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Dynamic Capabilities in Digital Transformation

How to be Successful in Digital Transformation

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Abstract

Although firms on a large scale seemingly have realised the importance of becoming more digital in order to stay relevant in the future, organisations struggle to implement and scale digital initiatives outside isolated functions. This highlights the strategic and organisational hardships of transformation efforts. As such, there is an unrealised gap between current industry trends and effective implementation, leading to untapped potential and opportunities to be reaped by those who successfully manage to transform. Leading the purpose of this research, which is to gain better understanding of enabling factors that could alleviate firms trying to implement simulation technology to their business processes. Derived from the challenges associated with digital transformation, the purpose of this research is to investigate how capability management can be leveraged in digital transformation efforts.

This topic has been researched through a qualitative method and more in depth through five semi-structured interviews with customers of the firm EDR Medeso. Each respondent has experience with both simulation technology and the organisational process of implementing it to the organisation. A narrative literature review has been carried out to support the conducted interviews, where two major themes of digital transformation and dynamic capabilities have been identified. Within the concluding chapter of the theoretical framework, the two themes have been identified as complementary which has resulted in an merger of the two. From this the authors have derived a combined framework containing 22 actions for firms facing a digital transformation to follow.

The analysis further contrasts the presented framework with the conducted interviews, through which 17 out of 22 actions are confirmed by the empirics. To conclude, the managerial implications are that the presented framework gives guidance for firms to successfully digitally transform.

Keywords: *Dynamic Capabilities, Digital Transformation, Simulation Technology, Digitalisation of R&D, Innovation Management*

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We would therefore like to take the time and thank EDR Medeso and Marcus Oledal for the opportunity, feedback and the contacts we have gained during the process of writing this thesis. A special thanks to all the respondents for taking the time and helping us to gain data for our study. Without all of you this thesis would not have been possible.

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1.0 Introduction

Within this chapter, a background will be given to a narrow and defined area of discussion regarding digital transformation. Furthermore, purpose, research question and delimitations, lastly a guided outline of the thesis will be presented.

1.1 Moving into a Digital Future

Industry 4.0 and the digitalisation of R&D are currently two of the biggest trends within manufacturing industries (Naujok, 2016; Knobbe & Proff, 2020; Machado et al., 2019). The digitalisation of R&D contributes to better cost efficiency and enhanced process capability through faster prototyping with modelling and simulation technology. Hence by reducing cost and development times, companies can mitigate much of the risk normally associated with product development (Naujok, 2016). However, companies tend to be careful with such investments since they often venture into lesser known territories that potentially could upset the current operations. As such, it is a risky endeavour that also might come with expensive investments and often requires specialised human and operational capabilities (Naujok, 2016). This is emphasised by a consultancy report from Mckinsey (2019) which states that digital transformation is vital, yet challenging for firms to undergo. Leading to a situation where businesses today are situated with the challenge of scaling the business processes to become fully digital, in fact only 11% have successfully accomplished this task (Forsman, 2019). Even more worrisome is that a majority, 54% of businesses, do not even have a clear vision of how their digital transformation efforts are going to take place (ibid). However, the implementation of new technologies could also potentially entail a large shift in strategy and organisational structure, leading to a dilemma for management of how digital technology can be leveraged to sustain current and develop new capabilities. As such, research of digital transformation becomes vital in order for corporations to face the challenges of incorporating new technology effectively. A company acting within these trends are the Swedish simulation technology company EDR Medeso who are a retailer of simulation software and are focused upon helping their customer both with the software need as well as organisational challenges of implementing this type of technology into their customers' organisational practices. As

such, EDR Medeso and their customers are familiar with the challenge of successfully undergoing digital transformation in regards to the implementation of their software.

1.2 Problem Discussion

In the light of the background discussion above, it is concluded that while digital transformation has been identified as a crucial consideration for most firms, it has been proven to be a difficult process of implementing a more digital way of doing business within current operations (Canhoto, 2021). The strategic implications of this dilemma has showcased that technology adoption does not always line up with current strategies of the firm. Magnusson et al. (2021) describes this as the illusive option of strategy zero, meaning that old strategy and technology exist simultaneously as new is adopted, therefore there is the risk of falling in old tracks and missing the opportunities of emerging technologies. As a consequence of divergent existing technologies, strategy is often misaligned with the implementation of the new technology, resulting in inadequate resource allocation for the latter. According to Bughin et al. (2019), companies that allocate the same resources to the same business units and technologies year after year are worse at realising strategic goals and undermine performance, as such, ROI on the new technology as well as performance of existing technology becomes suboptimal.

Within management academia, the concept of Dynamic Capabilities (DC) has emerged as a growing explanation model to face changing environments from an organisational capability perspective (Eriksson, 2014). Yet, the researchers have found limited applications of such theory where concrete actions are suggested. As such, current theoretical models are mostly abstract and do not help to explain firms ability to utilise such capabilities in real world circumstances. Thus this raises the question of how organisational capabilities could be leveraged to successfully achieve digital transformations.

1.3 Purpose

In accordance with background and problem discussion, the purpose of this thesis is to explore digital transformation and capability management in relation to simulation technology implementation efforts. By examining current firms who are implementing simulation technology into their practices, the researchers aim to create an understanding of the potential enablers that support effective use of capabilities and strategy alignment in

digital transformation processes. More specifically, the researchers have found no papers on simulation technology as case study. As such, the theoretical contribution of this thesis is to facilitate a better understanding of how firms can accelerate DT efforts. Furthermore, the research aims to produce practical insights to managers and executives on how capabilities can be utilised to improve internal processes and strategic alignment.

1.4 Research Question

Based on the problematization and purpose of the thesis an overarching and complementary sub-question has been developed.

I. *What are the potential enablers of digital transformation?*
II. *How can organisational capabilities be leveraged to successfully digitally transform?*

1.5 Delimitations

Limitations have been added to narrow the area of research in which this thesis aims to explore. Firstly, as the thesis is written in collaboration with the company EDR Medeso, the pool of potential respondents is limited to their customers. In turn, EDR Medesos customers tend to be manufacturing or producing firms, as such the scope is limited to this type of firm. Therefore, the findings within this thesis may not apply to all types of organisations. Secondly, it's worth highlighting that all new innovations or technologies do not with certainty bring enhanced value, but as all included firms are already investing in simulation technology the researcher has chosen to assume that there are benefits of implementing simulation technology. As such, the scope of the research focuses on managerial aspects of digital transformation, and implementing new technology into the organisational practices, rather than technological value.

1.6 Disposition

This thesis uses a structure of the following chapters 1. Introduction, 2. Theoretical Framework, 3. Methodology, 4. Empirical Findings, 5. Analysis 6. Concluding Discussion, 7. References and 8. Appendix including interview guide.

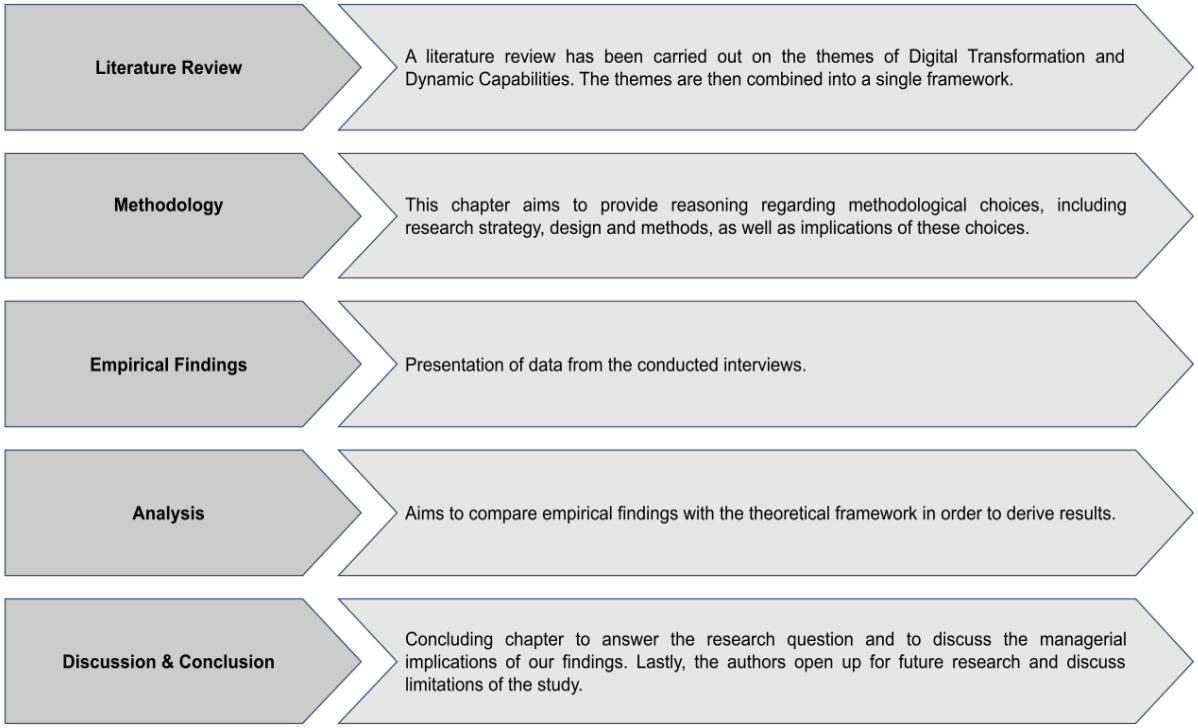

Figure 1: Disposition of thesis

2.0 Literature Review

A literature review has been carried out with the primary focus of highlighting theories highlighting the transformational process of adopting new technologies through the theoretical themes of dynamic capabilities and digital transformation. Within the later part of the chapter, the two themes will be combined into a single theoretical field, through the construction of a framework addressing both DT and DC.

2.1 Digital Transformation

During recent decades technological advancement within information technology have led to radically new ways of doing business, leaving virtually no industry nor organisational function unchanged. The field of digitalisation has emerged as a result to give firms guidance in how to tackle and respond to new technology. Within this specific field there are three main terms that are deemed relevant; digitalisation, digitization and digital transformation (Wenzel, 2022). Each and every of these terms refers to digitalised advancement of firms but target different settings, digitization refers to conversion of analog data to digitised data. Digitalisation according to Wenzel (2022) refers to the general theme of increasing digital technology within the context of the firm, digital transformation is more specifically referring to the actual business transformation;

> "*Digital transformation is a special kind of business transformation, driven by digital technologies and digital capabilities, enabling companies to effectively compete in an ever-changing digital world through rethought business models, refocused organisational structures, and values as well as optimised processes and methodologies.*" (Wenzel, 2022., p. 21).

Within management academia, the field of digital transformation has gained increased attention as firms face challenges to successfully undergo change in order to create new capabilities (Jacobi & Brenner, 2017; Canhoto, 2021). First of, to create the adequate foundation for achieving success within a firm's digital transformational initiatives, Jacobi

and Brenner (2017) argue that the whole firm needs to prepare and support the change. Wenzel (2022) is in line with this viewpoint and secondly adds that the transformation is often required and is necessary to cope with increasing external pressure and competition. Thirdly, it is essential that change becomes a natural part of the conducted business rather than being deemed as a temporary solution (Jacobi & Brenner, 2017; Schwertner, 2017). As this is argued to increase the likelihood of achieving an organisational culture which supports innovative activities and dexterity in its core fundament, resulting in a more rapid and effective defence mechanism against changing business environments (Schwertner, 2017). While there is an inherent risk in transformation itself, Schwertner argues that companies who conduct business with higher risk-enthusiasm tend to have higher performance than those who are more risk-averse.

Another aspect that has been emphasised is that transformation has a tendency to clash with existing business models since the processes and structures regarding legacy technology are not necessarily compatible with new technology (Wenzel, 2022). Schwertner (2017) highlights the human aspect as particularly challenging during organisational transformations. The author reasons that employee resistance can emerge as new technology can implicate new working methods, knowledge requirements, or a changed need of resources. To counter the human factor, Schwertner (2017) argues that organisations undergoing change need to evaluate and streamline the current business model, the innovation part is thus argued to be vital to keep competitiveness. There is further academic coherence regarding that change efforts in digital transformation require strategic alignment and leadership that substantiate the cultural and structural development in order to fully leverage digital transformation as a corporate asset (Jacobi & Brenner, 2017; Schwertner, 2017; Warner & Wäger, 2018).

Given the pressure for firms to keep up with an increasingly more digital and uncertain landscape, researchers have highlighted the need for firms to continuously review and revise the organisational structure to fit an innovative mindset. When broken down, this entails that the focus should be upon creating a culture that embraces speed and agility (Jacobi & Brenner, 2017; Canhoto et al., 2021). However, continuously adopting change involves large strategic dimensions, Schwertner (2017) emphasises the need for a clear strategy as well as leaders who encourage a culture of innovativeness and risk taking. Jacobi and Brenner (2017) also emphasises culture and strategy differentiates between the traditional way of change and transformational changes, as transformational changes targets both strategy and culture. Other

research argues that successful digital strategy implementation prerequisites the right culture which in turn needs to be carried out by the right leaders (Kane et al., 2015). To be able to cope and succeed with digital transformation, Jacobi and Brenner (2017) identified three vital areas of the transformation process:

1. Leadership and Vision.
2. People and Culture.
3. Organisational Structures and Processes.

In this paper, Jacobi and Brenners three vital areas of the transformation process will act as the base for DT theory. While the basic structure will follow these main areas, other literature is incorporated in order to strengthen the theoretical base of the study. According to the authors, this structure will facilitate the narrative review of the literature and furthermore provide an easy to follow structure of the paper.

2.1.1 Leadership and Vision

Matt et al. (2015) argues that companies must incorporate a proper strategy for the technology which also needs to be aligned with the overarching company strategy. The strategy needs to target the entire organisation and not just functions of the technology itself, this will entail development of support processes between entities (ibid). As such, IT and digital transformation are argued to be considered integral parts and not separate units from the core business. Rather than using them as a supporting function, implementing them in the foundation can truly leverage advantages in sustained performance (McLaughlin, 2017). The fit between such is important for mitigating conflicting goals and objectives which otherwise hampers potential results and complicates internal resource allocation (ibid). As such, the digital strategy becomes an aligning factor within the corporation and mitigates friction between stakeholders.

According to Jacobi and Brenner (2017), a common pitfall in digital transformation is deficiency in the communication of the importance of change through the various hierarchical levels. Part of it is strongly connected to a lack of transfer of vision and strategy from upper management which result in weak integration. Furthermore, the strategy needs to be easily understood by all stakeholders in order to achieve satisfactory communication between

executives, managers and process operations (Jacobi & Brenner, 2017; Schwertner, 2017). With a clear strategy, there are less conflicting objectives between entities, resulting in smoother resource allocation both in terms of capital expenditures and capability management (Schwertner, 2017). The strategy needs to be rooted in the executive level in order to get a proper foothold in the organisation (Karimi & Walter, 2015; Matt et al., 2015; Fitzgerald et al., 2013). This is important because digital transformation affects the entire organisation directly or indirectly through new processes, new priorities in resource allocation, strategic change and so forth (Matt et al., 2015). The executive level can thus act as a support function for all instances. However, operationally it is the managers that ensures alignment, accentuating the importance of getting them involved in the transformation process (Jacobi & Brenner, 2017; Matt et al., 2015). It is often them who manage vertical communication and integration between input from different hierarchical levels.

Strong leadership in digital transformation may be a deciding factor in determining successfulness. The lack of strong leadership can compromise the ability to work cohesively towards a common goal and increase risk of miscommunication and alignment (Jacobi & Brenner, 2017; Karim & Walter, 2015). Having a strong leader that is devoted to engage and motivate relevant stakeholders is argued to have the ability to decrease organisational resistance, and, sequentially increase the chances of successfully implementing change initiatives (Karim & Walter, 2015). Many companies struggle with leadership during digital transformation. Pre digital transformation, organisational structures usually do not have clearly defined roles that presume who is in charge of what during such transformation (Matt et al., 2015). With undefined responsibilities there is a risk that no one fully takes the responsibility which could derail the transformation efforts, resulting in sub-optimal performance (ibid). Imposing a Chief Digital Officer (CDO) in the organisational structure might prove effective delegating responsibility. According to Jacobi & Brenner (2017); Matt et al. (2015), a CDO with high technical expertise mitigates otherwise possible conflicts of interest or unclarity for other executives and anchors digital importance within the core business. However, even though the role of CDO is on a quick upwards trajectory globally (PWC, 2016), this organisational structure might not fit all companies and does not automatically solve responsibility issues. Thus, there is a need for case specific internal evaluation of responsibilities and organisational structure.

2.1.2 People and Culture

People are one of the most common influences of organisational resistance in transformation efforts (Schwertner, 2017). Jacobi and Brenner (2017) emphasises embracement of corporate culture that supports creativity and risk taking as tools for handling changing business environments. Companies who stimulate such an entrepreneurial environment are generally better at reacting to trends and needs of their customers and therefore sustain performance over longer periods of time (Jacobi & Brenner, 2017; Kane et al., 2015). Because of corporate structure and hierarchy, larger corporations especially tend to have long processes of decision making and slower reaction times to changing environments (Jacobi & Brenner, 2017). Collaborative efforts promote innovative thinking and the concept of openness and organisational sharing which is important in dealing with rapidly changing environments since agility is needed to tackle more entrepreneurial competition. Moreover, younger companies naturally take more risk to gain competitive advantages and to break into a specific market.

Furthermore, it is important to consider that all organisations have employees with various levels of technological expertise. According to Jacobi and Brenner (2017) there is often a clash between people who are and are not sufficient in technology use. Even though digital transformation requires new knowledge accumulation for many of the less technologically savvy people, it is important that the transformation does not result in all old competency being shifted for younger technologically interested people, old experience should not be neglected and may prove crucial for successful process implementation (ibid). However, a positive attitude towards digital transformation should be ingrained in the corporate culture (Schwertner, 2017; Kane et al., 2015). Embracing technological change culturally tears down inter-organisational resistance, therefore enabling more aligned operational objectives (Jacobi & Brenner, 2017; Matt et al., 2015). In contrast, not embracing new technology often results in a narrow scope of innovation and silo thinking within the development process (Jacobi & Brenner, 2017; Rammer et al., 2017). It also creates friction between tech-savvy and traditionalist, resulting in conflicting objectives that hampers performance (Kane et al., 2015). Moreover, it is important with ambidexterity in the knowledge accumulation process. On one hand, the existing workforce needs to be aligned and educated with the digital strategy and for the technology that comes with it to stay relevant (Jacobi & Brenner, 2017). Individuals who do not commit to the digital strategy will render themselves obsolete.

However, human resources that have great expertise in legacy operations often prove very valuable if they manage to adapt to the technological shift (ibid). As the organisation commits to a technological shift it is therefore important to educate all employees (Jacobi & Brenner, 2017; Kane et al., 2015). On the other hand, corporations under digital transformation need to gain new knowledge by hiring digitally skilled people. Younger people especially expect and command attractive corporations to embrace digital solutions (Kane et al., 2015), thus embracing digital solutions becomes essential to attract and retain new talent.

It is often the often divergent demands between older employees and new talent that cause strategic uncertainty and inefficiency (Kane et al., 2015). Therefore, to fully leverage the pros of a digital transformation the corporation needs aligned goals and objectives for all stakeholders (Jacobi & Brenner, 2017; Kane et al., 2015). Moreover, a culture that challenges and supports the existing workforce in their desire to learn new things encourages seniors and juniors to work together (Schwertner, 2017; Kane et al., 2015). As they view the world through different lenses and usually have different skill sets that complement each other's abilities. According to Jacobi and Brenner (2017), mentorship both upwards and downwards benefits knowledge accumulation through all levels. Matt et al. (2015) shares this idea of knowledge sharing amongst individuals and stresses the importance of sharing expertise since employees provide different skill sets. As such, older employees can accelerate their digital knowledge development and new talent will learn valuable conducts from employees with years of industry experience.

2.1.3 Organisational Structures and Processes

As transformation aims to innovate and change a firm's current operations, uncertainty can emerge as both stakeholders and processes move from being clearly defined into a more dynamic setting where new roles and processes need to be explored and established. To facilitate the organisation to be better equipped for the transformation process, previous research has identified so-called enablers of transformation which are; the forces of an innovative culture, strong leadership and risk enthusiasm (Jacobi & Brenner, 2017). Yet there has to be a system in place to enable firms to adequately implement these changes. Schwartz (2017) argues that successful digital transformations are dependent upon the alignment between strategy, reconfiguration and optimization of business processes. This alignment

further includes two subproblems, firstly firms need to know what to pursue and secondly how to get buy-in from all involved stakeholders. This is also emphasised by Jacobi and Brenner (2017) who argues that the organisational capability of identifying what and when to pursue change, and how to convince the critical stakeholders, is what is actually driving and making the transformation occur. Entailing a managemenerial aspect of understanding how current products, services or skills are to be impacted by a digitalised setting, and more importantly how to leverage and successfully implement change (Jacobi & Brenner, 2017). To encourage this, teams are recommended to work across functions to gain a more holistics view of the operations and thus avoiding silo thinking. One such example is integrating knowledge tools, such as information systems and communication processes within the whole organisation, as this has been linked to firms being able to be faster, more flexible and increasingly adaptable to new demands (Ibid).

Jacobi and Brenner (2017) argue that there is a certain methodology for firms to pursue, starting with the digital savvy-management. A digital savvy-management layer refers to how new digital strategies are utilised and what types of metrics and KPI are used to define their success, or in other word try to determine the digital maturity of the firm. These structural steps within the digital transformation are defined within the figure down below;

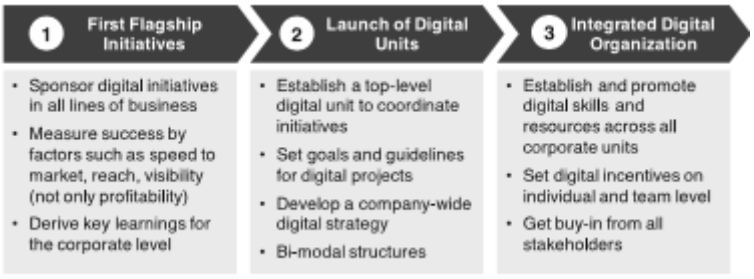

Figure 2: Structural steps in digital transformation process (Jacobi & Brenner, 2017, pp.93)

These steps aim to facilitate the need of gaining internal buy-in from key stakeholders through new types of KPIs, and furthermore by gaining the right amount of attention from top management through the establishment of new units and resources. Jacobi and Brenner's (2017) structural steps of digital transformation is further in line with others research, Bharadwaj et al. (2013) suggest the success of digital strategies is defined by the development of the internal organisational capabilities which aims to increase the interconnection between people, data and things. Robu et al. (2021) shares the viewpoint of Bharadwaj et al. and further argues that the transformation process should start from top

management during the pre-project phase, where the key is to build support, identify stakeholders and environmental factors. During a project phase the establishment of cross-functional teams and project structure should be viewed as an initial step, where the objective is to determine approaches to undertake during transformation and then to continuously evaluate the project and its approaches. Lastly, the implementation of the project is argued to consist of building a supportive structure through education, allocation of resources and establishment of a feedback loop. The steps are said to be aiming towards aligning strategy and organisational structures (ibid), this viewpoint of aligning strategy with business process further shared by Casullo et al. (2017). In detail, it is argued that the firm performance is linked with executives ability to align the business processes with the internal organisational priorities. Wang (2018) shows that firms who lack the ability to prioritise and plan digital transformation initiatives risk seeing the current operation limping. Other research has linked firms' ability to respond to disruptive technology with resource allocation and where an above average allocation of resources directed towards digital transformation efforts is linked with better response to disruptive technology (Karimi et al., 2015).

Lastly, Jacobi and Brenner (2017) recommends firms to build strong partnerships with outsiders, as this enables knowledge sharing between stakeholders of the digital field. The partnerships can take many forms and thus vary in level of integration, e.g. some may collaborate in joint R&D efforts while others exchange valuable technological expertise and use case scenarios for certain technologies. Jacobi and Brenner's (2017) reasoning behind digital partnerships is that it provides a platform for quicker and better products and services according to customer demands. This is achieved by knowledge spillover between partnering companies. Collaborations can include alliances with other industry key players to align development of a certain technology and complementary products and services of such, creating a more complete ecosystem benefitting technological development and mitigates risk of bad investment decisions.

2.1.4 Concluding Reflection on Digital Transformation

Based on Jacobi and Brenner (2017), three vital areas of the DT have been identified. Each represents a structural part of the transformation process. Furthermore, key elements contributing to a successful DT have been concluded and attributed to a specific element.

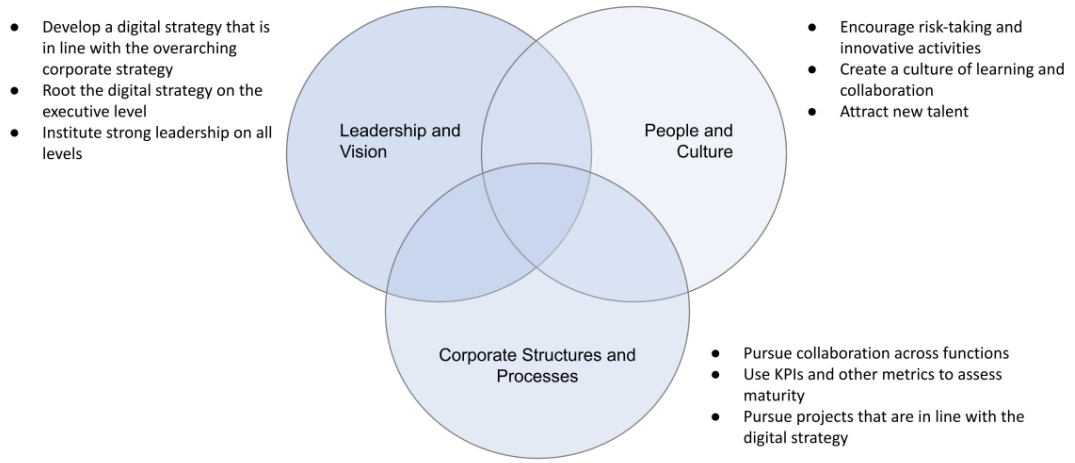

Figure 3: Key elements of DT.

2.2 Dynamic Capabilities

The introduction of DC theory will be utilised to create a combined framework presented in the next chapter. As such, DC theory is integral in order to understand the base assumptions made later in the paper.

As firms are facing an increased pressure to remain competitive in changing markets, firms' ability to anticipate and more importantly react to new technology have become increasingly important. As a response, the concept of DC has been developed with the purpose of explaining firms' ability to transform and react to these changes (Teece, 1997). DC stems from the resource based view (RBV) of competitive advantages, meaning that it assumes that firms could be conceptualised by its resources and how these develop and mature over time (Einhardt et al., 2000). Based upon RBV, DC explores the role of how strategic management can be used to adopt, integrate, reconfigure and utilise organisational skills, functions and resources. Teece et al. (1997) refers to the term “dynamic” as a representation of an organisation's ability to renew competences and how well they match a changing environment. Within this setting, the term “capability” is linked with the role of strategic

management to take an active action of developing, integrating, adapting and reconfiguring the organisational competencies to match the changing business environment. Much of today's literature builds upon Teece's (1997) definition. In practice the DC concept therefore aims to aid firms in its transformation processes to adapt to new technology or changing environments (Teece, 1997). As such the concept of DC connects firm performance during market shifts with how receiptable firms are internally to embrace and incorporate new capabilities into current business processes (Teece, 1997; Einhardt, 2000), indicating that competitive advantages are stemmed from managerial and organisational processes and routines rather than a specific technology. Routines are in turn defined as a method or social pattern of interaction that aids in describing the working method of which an individual or group uses for tackling problem solving (Teece, 1997).

The usage of DC within research has grown since Teece's first article from 1997 and has since then been applied within vastly different fields (Eriksson, 2014). For example, the conceptual standpoint DC has in addition to the RBV has also been linked with evolutionary and behavioural aspects of firm growth as well as the Schumpeterian view of creative destruction (Ambrosini & Bowman, 2009). During recent years DC have found more specific niches, e.g. used for explaining how external sources of technology can be leveraged to increase internal technological diversity (Li-Yang et al., 2016). In other cases DC have been leveraged as a framework to explain how middle managers can successfully identify risk and which issues that they should sell to the top management (Dutton et al., 1997). Research has also been directed towards using DC as a tool to conceptualise digital transformation, strategy alignment and firm performance (Canhato et al., 2021; Wamba et al., 2017). Bharadwaj (2013) argues that digital transformation can be considered to become a dynamic capability when business strategy and the digital infrastructure aligns, as such the concepts of DC and digital transformation have in previous research shown to complement each other.

Given the variety of applications of DC within previous research it should be noted that the concept has faced certain criticism. Winter et al. (2003) doubt the empirical usage of the concept, the field has since then expanded but the concept has been criticised for its high level of abstraction and difficulty to measure empirically (Ibid; Easterby-Smith et al. 2009). Within this thesis the aim has been to concretize the DC concept by applying Teece (2007) framework which divides the DC into three sub-areas; 1) *Sense* which refers to firms capacity to scan and identify opportunities and threats. 2) In turn, *Seizing* refers to the ability to

capitalise on the identified opportunities and 3) reconfiguring internal assets to maintain the competitiveness of the firm.

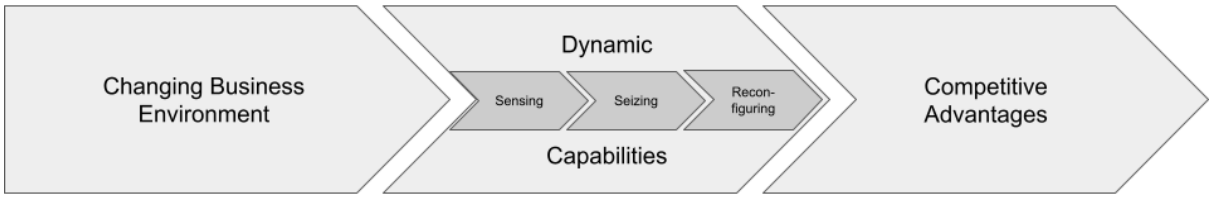

Figure 4: Main components of DC. Based on Teece (2007).

2.2.1 Microfoundations

The concept of DC has previously faced criticism due to it being abstract and hard to pinpoint what characteristics that could be identified as DC (Winter, 2003). Previous research has established some sort of consensus that DC leads to competitive advantages, however, the underlying processes of DC are not as clearly defined (Eisenhardt & Martin, 2000; Winter, 2003; Ambrosini & Bowman, 2009). Teece (2007) argues that organisational processes can be broken down into what he calls "microfoundations", microfoundations refers to specific organisational processes, systems, structures and skills as potential sources of DC. Eisenhardt, Furr and Bingham (2010) defines microfoundations as social phenomena where the actions within a group or individual level is what actually forms the organisation and thus its activities and strategy. This could be viewed in accordance with Teece (2007) who argues the purpose of formulation microfoundations is not to gain a comprehensive picture, but rather put words on specific processes that aims to integrate strategy and innovation (ibid), the DC framework is thus argued to be viewed as an umbrella concept. New articles of Helfat and Winter (2011), Canhoto et al. (2021), Yeow et al. (2018) have further utilised this viewpoint to gain new insight on how to identify microfoundations in the setting of digitisation and digital transformation. Previously mentioned dimensions of *sensing, seizing* and *reconfiguring* have further been used as analytical tools to identify these microfoundations that facilitate organisational capabilities to achieve transformations and gain new sources of competitive advantages (ibid).

2.2.2 Sensing

A key component of firms ability to remain competitive is found to be within the ability to sense external and environmental threats. In accordance with Teece (2018) this can be broken down into the firm's activities that aim to scan the external environment of opportunities and threats. While sounding easy in theory, this has been shown to be an intricate issue for managers to overcome as this is its nature biases such as tunnel vision tied to the process of scanning the periphery (Eriksson, 2014). As such managers throughout the various organisational levels need to sense, pick up changed consumer demands, technological developments that are bordering with the specific functions. Teece (2018) argues that there are certain barriers for firms when it comes to sensing the environment, firstly the quantity of the managers that are tasked with sensing the environment are of great importance as reliance on too few risks of creating tunnel vision. Secondly, a too centralised hierarchy risks creating barriers as vital information might get lost during the process of information moving up (or down) during the organisational ladder. Thirdly, the culture can act as a barrier if it doesn't facilitate the need for openness of the managers (ibid). These barriers entail that the foundation of the challenges is managerial coordination of the activities aiming towards sensing the external environment resulting in missed opportunities that other firms risk capitalising upon. In other research, managerial hands-on experience has been shown to have a positive impact upon advancing and increasing the acquisition of new knowledge and in turn developing new capabilities (Kim et al., 2011; Löwsted & Schiber, 2020).

In contrast, firms who successfully use the ability to sense the business environment are relying upon a proactive approach scanning technologies and market development within local and adjacent industries (Teece, 2007). In fact Teece (2007) argues that firms with strong DC inhabit a strong entrepreneurial spirit, as they not only adapt to the business system but rather develop with it through the collaboration with other entities, firms and organisations. The organisational culture needs to facilitate proactiveness by enabling managers with ease to precisely send information through the organisation system, where the scope is required to be directed towards rivals, suppliers and potential customers.

2.2.3 Seizing

Once an opportunity or threat has been identified by a firm, a proper response needs to be carried out, the quality of the response is within the concept of DC referred to ability to *seize* (Teece, 2007). In practice seizing ability is carried out through new services, products or processes, however as Teece (2007) points out, firms can more easily spot an opportunity but then fail to capitalise. Common failing factors have been described to be risk aversion, budgeting issues or lack of commitment (ibid). Thus the ability for firms to understand what changes in which functions or components needs to be carried through in order to gain additional value is what is primarily concerned with the seizing capability (Yeow et al., 2018).

The process of seizing and building new knowledge is instead tightly linked with how firms manage to utilise new technology and how this integrates with current routines. From a macro perspective of the firm this has been shown to be tied with prioritisation and synchronising external as well as internal abilities, e.g. a taken strategic direction, however it's not certain that strategic decision integrates with the meso level of the firm (Cruz et al., 2020). For resource allocation between e.g. projects, large measures of coordination is needed to ensure that higher hierarchical decisions align and integrate with the actual operations. As such these decisions tend to be done from the position of the middle manager rather than executive level, entailing that middle managers have an important part to play in terms of identifying needs and in turn implementing solutions to these needs (ibid). From an organisational point of view the coordination can therefore be said to include vital social aspects, Dutton et al. (1997) research showcases that culture affects the likeness of new ideas being pitched to executives. More specifically, organisational traits of supportiveness and willingness to listen to new ideas have been showcased to impact the ability of integrating and seizing knowledge and opportunities. In opposite; distance between general uncertainty, distance between hierarchical levels, violating norms and perceived fear of negative consequences of ideas and suggestions have all shown to create unfavourable internal environments (ibid). With this in mind, it's important to emphasise that each organisational structure is unique, meaning that the combination of traits varies greatly between different organisations and even functions. It is further evident in previous research that key managers have a large effect upon the organisational capability to identify and seize new opportunities,

where some key characteristics have shown to be personal open-mindness, curiosity and willingness to take risks (Canhoto et al., 2021).

Given the middle manager's role of integrating and seizing new knowledge into current structure, another challenge of integrating strategy with new technology has been showcased to impact firms DC. Canhoto et al. (2021) highlights that within European SMEs the manager's role to encourage behaviours have a large effect on the implementing capability of digital transformation. The findings were that the firms within the sample could be linked with five phases of maturity within aligning strategy with technology. Starting from a passive phase where the technology usage is low and strategy is used as an reactive approach to facilitate stakeholders needs. Given the findings, the Canhoto et al. (2021) concludes that SMEs failing with the alignment of strategy tends to be restricted to a short-termism of now, thus prioritising short term goals of efficiency and meeting governmental and regulatory requirements. In contrast, companies within higher phases of strategy alignment are more prone to experminement and open to new ideas, meaning in terms of technology usage that it goes from limited, ad hoc based toolset to becoming gradually more proactively integrating new technology and process into current. Further findings were that neither size, industry nor region impacted the maturity of strategy alignment, as such it is argued that the alignment is driven by key personnel, secondly that the key role of the manager should be to leverage the role as “learners" and “sensors” of potential external sources of knowledge (ibid).

2.2.4 Reconfiguration

Reconfiguration refers to a firm's ability to renew current assets, resources and routines to fit environmental changes. Teece (2007) argues that this ability is vital in order to achieve long term sustainable growth. By structuring the organisation to handle knowledge reconfiguration as a direct response to changing environments, the company's ability to recognise opportunity is enhanced and thus it is an integral part of DC (Macpherson et al., 2004). As reconfiguration focuses on improvements of existing processes rather than disruptive change it becomes a crucial part of managing resources effectively to fit new process operations. One of the main benefits of such agile resource management is the ability to act on trends quickly and deploy resources effectively in order to meet customer needs quickly. An important component in agile knowledge configuration is therefore managers ability to recognise such opportunities in order to be able to leverage current knowledge adequately (Bruni & Verona,

2009). Furthermore, Bergman et al. (2004); Bruni and Verona (2009) stresses the importance of utilising frameworks such as scenario analysis and benchmarking in successful use of reconfiguration of and renewal of knowledge and resources. Such frameworks could support managerial decisions with structured internal and external environmental analysis as well as standardised documents of process improvements measures. Nonetheless, rational replacement options need to be carefully evaluated before altering current operations (Jantunen et al., 2005).

Derived from previously cited research, reconfiguration is an integral part of DC. It is however important to keep in mind that no single implementation process will fit all organisations. Rather there is a need for organisations to combine knowledge accumulation and utilisation to reconfigure the internal capabilities and processes (Prieto et al., 2009). According to Prieto et al. (2009); Macpherson et al. (2004), DC is a result of coherently working with all above in combination.

While researching reconfiguration of organisational capabilities, Lavie (2006) observes three mechanisms that impact technological change:

1. *Capability substitution.* Radical change of capabilities, resulting in competence-destroying activities that replaces current operations. It is likely that incumbent capabilities act as built in resistance and thus counteracts the change initiative. Since the capabilities interfere with current operations they are developed externally and are as such not influenced by previous development.
2. *Capability evolution.* Continuous improvements of current operations. The organisation enrols learning processes in order to develop existing capabilities in response to changing environments. Focus on learning and development of current operations.
3. *Capability transformation.* Combination of internal knowledge with external knowledge found in other parts of the industry.

How learning is conducted differs depending on which reconfiguration mechanism that is being utilised (Lavie, 2006). Capability substitution emphasises external knowledge acquisition to disruptively change and replace current capabilities. In contrast, capability evolution builds upon existing knowledge and capabilities and how they can be leveraged in order to develop new iterations of internal capabilities. Lastly, capability transformation

combines current operations with knowledge from other industry entities, often through M&A, and thus has the ability to expand learning outside the normal domain of the company, often leading to the development of truly disruptive innovation (Lavie, 2006).

According to Hawass (2010), reconfiguration capability is one of the key fundamentals of the innovation process. Some researchers have also found connections between learning reconfiguration and innovation performance (Laursen & Salter, 2006; Danneels, 2007). According to Laursen and Salter (2006), companies who implement an open approach to external sources of knowledge are far more likely to innovate successfully since it enables free minded sourcing of information and thus mitigates risk of path dependency. A good example of positive outcomes of proper reconfiguration capability utilisation is IBMs transformation in the 90s. IBM was struggling with bad performance which in large could be attributed to a overbelif in old strategies (Harreld et al., 2007). According to ibid, they did not meet changing market needs and technology requirements quick enough due to a lack of strategic flexibility. Internal changes in management brought new strategic direction and IBM chose to focus on innovative ways to solve consumer issues as well as abandoned old solutions and processes (Hawass, 2010). As of today, history proves that IBM managed to transform itself to become a global leader within its industry. According to Harreld et al. (2007), it was the "cultural transformation that allowed it to reconfigure itself and to reallocate resources" that resulted in a strategy that benefited from technological advances and the success that came with it.

2.3 Theoretical Framework - Combining Dynamic Capabilities with Digital Transformation

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This sub-chapter aims to combine previously presented literature into a single framework which is applicable upon firms ongoing digital transformation. As such, this has required interpretation from the researcher upon how the theories complement each other.

Within the previous chapters the focus has been directed on the topics of DT and DC as two separate topics. Within this chapter the concept will be tied together as it has been shown in previous chapter and research that DT is linked with uncertainty in terms of economic

potential, buy-in from stakeholders as well as how the transformation fits current business processes. Whereas Jacobi and Brenners framework (Figure 3) showcases characteristics that are favourable for a firm's ongoing digital transformation, it does not provide insights into how firms can adequately form its resources to better anticipate and react to changes. The concept of DC has been argued to alleviate some of these uncertainties by scoping the transformational process through the dimensions of sense, seize and reconfiguration. Yeow et al. (2018) describes this as a problem concerning the alignment of resources within the dynamic setting of change, for example the authors illustrate a common gap between the needed internal capabilities and the actual internal capabilities. Within the digital setting, one such gap many firms are likely to face is the lack of the right digital expertise to be able to successfully implement digital transformation projects. As such Yeow et al. (2018) argues that the DC framework can help companies in such a setting to better identify the need, and in turn sense the environment to gain and hire new competence, and from that reconfigure current teams and operations to better fit with the digital transformation efforts. In fact, previous research of Marx et al. (2021) confirms that the performance effects of DC are positively linked with increased competitive advantages within their quantitative study on 53 german SMEs. The authors emphasise the importance of firms' sensing ability as particularly vital, since changing customer preferences as well as increased pressure on renewal of internal resources are common, this view is further shared by Colli et al. (2022). Specifically, Colli et al. (2022) argues that managers tend to hold a negative perception of digital transformation activities which in turn inhibits the limps the ability to act dynamically.

From the perspective of the previously presented frameworks, the researchers argue DC should be viewed as a complementary concept, describing how firms build capabilities that enable successful digital transformation. To better gain understanding of how each organisational dimension of *Leadership & Vision, Culture & People* and *Organisational Processes & Structures* can be built through DC, the next sub-chapters will focus upon combining these two frameworks together.

2.3.1 Leadership and Vision

Within the setting of applying dynamic capabilities in digital transformation, the dimension of leadership and vision aims to aid the description of what type of overarching characteristics are favourable for creating an adequate foundation for transformation

initiatives. Previously mentioned authors of Teece (2007) agree with Jacobi and Brenner (2017) regarding leadership's importance of the ability to sense external and internal opportunities. However as Teece (2007) points out, the characteristics of strong leadership within the firms is not always present, which can lead to an anti-cannibalisation environment that supports status-quo at the expense of the innovation strategy. The alignment of strategy and leadership are thus said to be a matter of handling internal perception, for managers, meaning that there is an organisational need of explicit roles and responsibilities to facilitate the possibility for change and align this with the firm strategy (Teece, 2018). Thus DC can be linked with the viewpoint of Jacobi and Brenner (2017), who argue digital efforts require strategic alignment between leadership and vision. However as previously mentioned characteristics only emphasise a static viewpoint, therefore each characteristic is intended to be analysed from an DC perspective.

Naujok (2016) emphasises that within digital transformation initiatives of R&D, tunnel vision can easily emerge, leading to biases regarding opportunities and threats of any given technology. Firms as a result tend to be too careful with the investments, leading to a gap between digital transformation strategy and overarching strategy. One challenge that has been found, is the ability to scope and set the right type of expectation of the initiatives, since digital transformation can mean a vast amount of different opportunities (Colli, 2022; Teece, 2018). The responsibility to identify and sense opportunities falls primarily under the manager's responsibility, the managerial experience therefore becomes important both in terms of gaining the right technical expertise but also in formulating a clear business case (Colli, 2022; Löwstedt & Schiber, 2020). This could also be viewed from another perspective, as the manager is identified to be within a key role of the digital transformation, firms are argued to gain benefits of implementing routines for continuous assessment of the roles and required knowledge to gain better alignment. According to Yeow et al. (2018) this needs to be addressed through internal communication whereas the purpose is to find potential competence within the various functions. Another responsibility that according to Yeow et.al. needs to be incorporated as routines for evaluating allocation of resources and what effects this has on short term and long term alignment of strategies. As such, the organisational ability for continuous assessment of capabilities and allocation of resources are necessary to minimise potential silo thinking and sunk-cost fallacy (McLaughin, 2017). In this regard, the middle managers have been found to be an favourable position to the transformation processes since middle managers tend to have a better and more detailed

understanding of the ongoing operations compared to executives (Dutton et al., 2017; Naujok, 2016). They can therefore more easily sense key opportunities in terms of needed technology or emerging demands from customers.

Middle managers are also faced with the task of implementing the digital transformation within their roles of project leaders. However, this responsibility should be explicit, whereas as Yeow et al. (2018) argues that the role should include direct responsibility of handling and linking the digital transformation initiatives internally between departments. Importantly, the middle manager role is argued to need the right amount of authority to be able allocate resources effectively, and to create readiness and ability to seize identified opportunities (Dutton, 1997; Mclaughin 2017). From a top management perspective this means that there needs to be a supportive mindset, Karimi and Walter (2015) argue that this is possible through executive engagement within each new unique initiative. They further argue that this can create synergies between middle managers, as their hands-on knowledge is combined with executives' more senior experience, furthermore executive engagement gives explicit importance and support to the transformation process.

2.3.2 Culture and People

Risk-taking and innovative activities often go hand in hand with one another. In order to be truly innovative, there is always an element of risk involved. As a means to encourage risk-taking and innovative activities, it is significant for the company to use its sensing capability to explore innovative processes internally and externally (McLaughlin, 2017; Kane et al., 2015). Internal structures are required to recognise innovation ambition include observation and communication of projects, both service and product related, which stands out from standard procedures (McLaughlin, 2017). However, creative ideas often stem from external inspiration (Kindström et al., 2013), thus sensing the external environment might prove even more beneficial in the digital transformation process. Such external sensing provides the company with the ability to predict industry trends as well as a clear sight of innovation performed inside and outside the value chain of the corporation (ibid). The encouragement of risk-taking and innovative activities start within the executive level in order to achieve stickiness over time in the organisation (Karimi & Walter, 2015). They provide signal value to the cause and thus act as anchoring of the culture attempted to be implemented across the organisation (Karimi & Walter, 2015; McLaughlin, 2017). Innovative

activities not only provide value in form of opportunity, but also provide a substructure for long term derive of value from modernisation of processes (Karimi & Walter, 2015). According to Karimi & Walter (2015), innovative activities should be characterised by defined boundaries rather than set directions on workflows. This is supported by McLaughlin (2017) who argues that entrepreneurial activities are vital in order to seize opportunities presented by the environment in which they operate. This is further backed up by Teece (2007), according to him encouraging innovation and relatively free system anatomy lead to corporate performance improvements. Importantly, finding new ways to do things impose risk in the operations, however without risk there is less value to be leveraged from innovative activities (Kane et al., 2015). Thus, risk-taking culture should be encouraged rather than frowned upon.

In regards to learning, it is important to establish systems that oversee the current knowledge-base in the organisation. Consequently it also becomes easier to identify what knowledge needs to be acquired in relation to the technological shift. According to (McLaughlin, 2017), knowing what knowledge that needs to be acquired provides the organisation with an overview of its digital maturity. By continuously collecting data the corporation has better evaluation ability and thus can make more informed decisions regarding learning activities. Collaboration culture is another tightly connected branch which can benefit from learning activities (Schwertner, 2017; Kane et al., 2015). Sensing not just the external environment, but also internal in the form of other entities gives an outlook on how the organisation is coping on a broader level (Jacobi & Brenner, 2017). As the entire organisation needs to be aligned with common goals and objectives, being able to sense where the own organisation is lacking will benefit in improvement work and thus long term performance (ibid). Once knowledge gaps have been sensed, the organisation needs to seize the opportunity to develop new learning routines (McLaughlin, 2017). Such routines need to be adapted in line with the digital strategy of the corporation in order to leverage benefits (Kane et al., 2015). This also plays a vital role in the collaboration aspect, routines should therefore be developed so they incentivise knowledge sharing across entities and hierarchical levels (Teece, 2007; McLaughlin, 2017). The reconfiguration aspect of learning and collaboration is tightly linked to the resource allocation and prioritisation of learning activities and education. There are also situations where the knowledge could not be found internally in the organisation and thus reconfiguring resource allocation could include external knowledge acquisition. Furthermore, it is not important how knowledge is acquired,

but that the general culture supports all forms of learning and collaboration within and outside the organisation (Jacobi & Brenner, 2017; Kane et al., 2015).

Attracting new talent may prove vital as a means to obtain needed knowledge in digital transformation. First of all, the organisation needs to sense the requisite for new digitally skilled employees (Kane et al., 2015). Otherwise there is risk for silo thinking and path dependency that is hard to break free of (Schwerner, 2017; Kane et al., 2015). Once there is a sense of urgency for new talent within the organisation, there is a need to seize the opportunity to hire digitally skilled people. In order to attract such an audience, there has to be a clear digital strategy that aligns with the overarching strategy of the company (Jacobi & Brenner, 2017; Kane et al., 2015). This does not only attract new talent, but also works as a retention mechanism (Kane et al., 2015). Since needed knowledge is acquired through recruitment there need to be a long term commitment to the technological shift. If not, it is likely new talent will leave for other companies. Moreover, not retaining new talent decreases credibility for the change initiatives and operations tend to fall back in old tracks due to lack of strategic commitment and lack of digital experience (Kane et al., 2015). Reconfiguration is thus linked to the organisational ability to change and set up new structures for attracting and retaining new talent as part of the capability transformation needed when combining old and new knowledge and abilities.

2.3.3 Corporate Processes and Structures

Jacobi and Brenners (2017) research emphasise the need for internal corporate infrastructure to support the digital transformation initiatives. According to the authors, firms should follow a certain number of steps to achieve a structural methodology of a transformation (Figure 4). The starting phase, or the so-called flagship initiative, is focused on determining the digital maturity of the firm, and from there build up structures to enable measurement of progress and success. Within the Teece article from 2007, he emphasises the importance of firm sensing and defining the enterprise boundaries in order to match the current business model. This reasoning borders on a high level of abstraction. Within the research of DC, the sensing ability in terms of corporate structure is primarily linked with utilising cross functional teams, incorporating adequate routines and utilising external partnerships (Teece, 2007; Bharadwaj, 2013).

As previously described, cross-functional teams are a method of putting several employees from various functions into the same team. Firms who utilise this way of structuring teams are argued to gain advantages of utilising competences of several functions and are therefore more likely to be able to sense threats and opportunities that come from more angles (Karimi & Walter, 2015). During the project phase ad-hoc problem solving can become more easily available as competence from the involved departments are concentrated into one team, thus minimising possible silo structures (Jacobi & Brenner, 2017; Schwerner, 2017). The increased availability of information can ease the coordination and overlapping activities and further aligning the activities of the various departments (Eisenhard et al., 2000). This however entails that the firm needs to have adequate skill management, and understandance of internal competences to match the planned projects. Another aspect is the possibility of viewing cross functional teams as a means to combine internal and external knowledge, as firms today act within an integrated and tightly linked ecosystem firms need to assess what complementary assets and capabilities that could be acquired from an external environment. Partners can aid the firm in the sensing activities as they can identify unmet needs or outstanding views (Eriksson et al., 2014), Eisenhard et al. (2000) further argue that utilising external sources of R&D activities can lead to superior performance. This is in line with Laursen and Salter's (2006) study which showcases that companies who implement an open approach to external sources of knowledge are far more likely to innovate successfully since it enables free minded sourcing of information and thus mitigates risk of path dependency. Firms therefore need to establish routines for project planning and assessing maturity of the competences of the firm and in turn evaluate current corporate infrastructure.

As previously described, the sensing activities lead to a number of potential opportunities that the firm can pursue, although it should be noted that not all are potentially beneficial for the firm. Within previous research a need for tools that can help corporate structure seize the right opportunities and discard the irrelevant ones have therefore been highlighted (Colli et al., 2022; Teece, 2007). Colli et al. (2022) for one, argues that firms can face a barrier when implementing new technology of it being hard to translate new technology into a clear positive business case. To combat this, it is suggested that firms should establish routines of continuous reflection towards defining perceived value and potential of the specific technology. In line with this, Mclaughin (2017) emphasises the need for clear definition of requirements for the project to be aligned with the current digital strategy, and then continuously evaluates these requirements. The purpose of this is to ensure that the defined

requirements are being achieved (ibid). A dimension of this could as Karimi and Walter (2015) argues, that the resource allocation should be based upon continuous evaluation of the projects, if a new application or increased success is linked with the development additional resources should be allocated or vice versa, the authors argue it can lead to increased flexibility if the demands change or if new application areas emerge. As such, the corporate structure thus entails large dimensions of reconfiguration, given previous presented research of Levin (2006), corporate process and structures can be viewed to engage both capability evolution and transformation since the recommended activities aims to clarify what to pursue, what requirements are needed and with what types of skills and then continuously update these to be adequate to the dynamic environment.

2.4 Concluding Remarks on Theoretical Framework

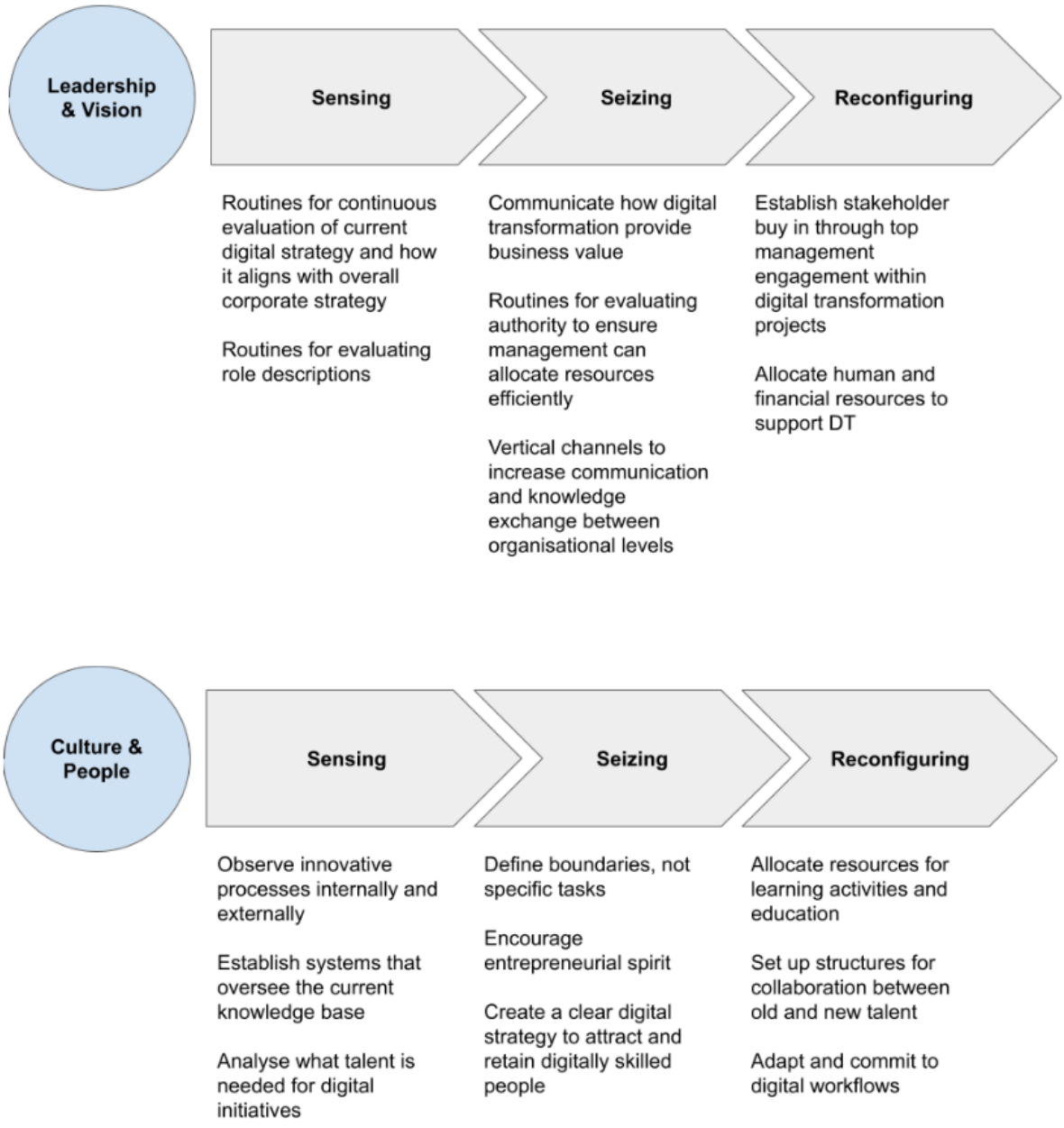
A literature review has been carried out with ambition to find literature that help firms identify enabling factors for DT. This has led to a theoretical framework with two major themes; DT and DC.

First of all, DT within this thesis has relied upon Wenzel (2022) definition that clarifies that DT refers to firms tryings to increase their digital capability through the process of ongoing business transformation. This could further entail new working methods and business models. Within management academia, implementation of new technologies have been described as challenging due to several aspects, such as cultural resistance, inadequate structures and lack of leadership. Jacobi and Brenner (2017) have concretized this by stating that successful DT rely upon three dimensions; 1. Leadership and vision, 2. People and Culture, and 3. Corporate Structures and Processes.

Secondly, a more general theme of DC has been identified within the literature. Teece (1997) defines DC as a firm's ability to identify and undergo change. During more recent years, Teece (2007) has boiled this down to three dimensions; companies sensing, seizing and reconfiguring capabilities. The literature review indicates that firms who embrace sensing, seizing and reconfiguration capabilities can increase their DT likeliness of success.

All in all, Jacobi and Brenners (2017) vital dimensions offer guidance in how firms can pursue DT. Teece (2007) offers a perspective on how firms' capabilities could be broken

down to either support or inhibit organisational change through the dimensions of sensing, seizing and reconfiguring. As such, the researchers argue that the themes are complementary to each other, since they offer two valuable perspectives on how firms could tackle change initiatives. Therefore, the researchers have chosen to combine the existing framework from Jacobi and Brenner (2017) with Teece (2007) into a single framework. This has led to the creation of a 22 action framework of enabling factors for firms pursuing DT, which is summarised in figure 5.



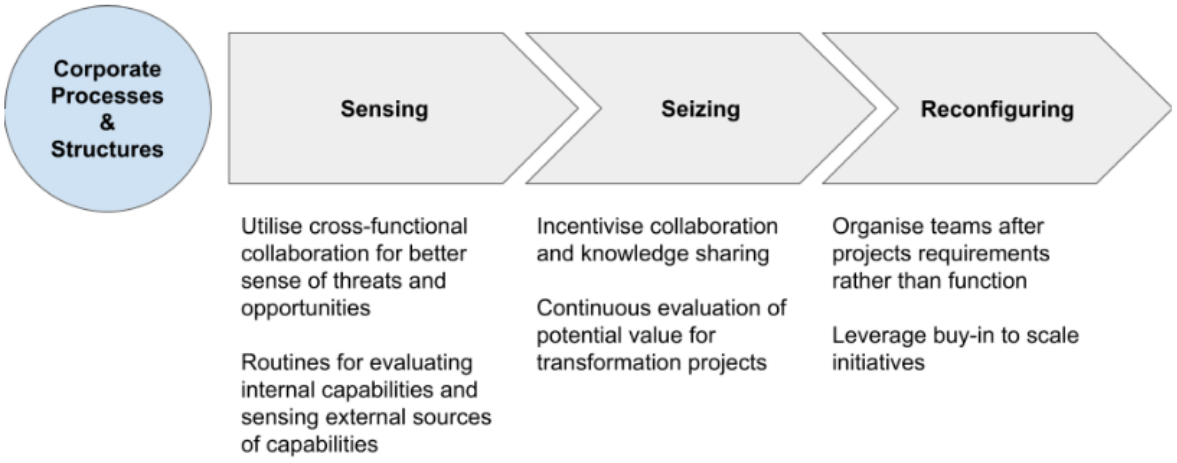


Figure 5: DT/DC framework with actions

3.0 Methodology

This chapter aims to give in depth reasoning of this thesis methodological choices, including research strategy, design and methods. The authors will further present how data have been collected and from which criterias using semi-structured interviews and a systematic literature review. Lastly, the authors will reflect upon potential problems of validity and reliability of the thesis.

3.1 Research Strategy

The purpose of this research is to further explore and contribute to existing research within the fields of digital transformation and DC through exhibiting potential enablers and barriers of technology adoption. To optimise results, a discussion regarding research strategy has taken place between using a qualitative or quantitative strategy. Qualitative research puts more weight on the respondents' way of thinking rather than the preconceived notion of the researcher since it complements data with opinions, reasoning and motivations (Bryman & Bell, 2015). Thus, qualitative research emphasises contextual understanding of the collected data as a complement to reviewed literature, where the collected data serves the purpose to

gain deeper insights, knowledge and experience of industry professionals. In contrast to the qualitative research strategy, the quantitative research strategy is argued by Bryman and Bell (2015) to be best suited when the research question aims to understand if and how variables relate with one or another. Thus, a quantitative research strategy tends to aim only to answer the questions of whether there is a relation between the variables. Therefore, a qualitative approach is argued to be most appropriate since the purpose is to understand how companies can affect their rate of adoption, which in turn requires insights from stakeholders within different organisational settings. Therefore, the research question is argued to be geared towards in-depth reasoning, benefiting by a qualitative approach since it gives more thorough explanations than quantitative answers.

In qualitative research, an inductive approach of relating theory and empirics is commonly used. This aspires to enhance existing or to create new theories on the theme by recognizing existing structures as well as expanding on those (Bryman & Bell, 2015). It is therefore appropriate since the aim of the research as it relates two separate fields, digital transformation and dynamic capabilities. In contrast, a deductive approach is often based on existing theory and creating a hypothesis around such, making it more suitable for quantitative studies since these are easier explained by quantifiable data (Bryman & Bell, 2015). An inductive approach gives the author's room to research the relationship between digital transformation theories and DC with insights from industry stakeholders to further strengthen argumentation of findings. Regarding the discussion above, an inductive approach is argued to be best suited to this research.

Lastly, the ontological perspective of constructivism is applied, indicating that research will apply the viewpoint that organisations can and should be viewed as socially constructed entities which can be influenced by cultural and subjective aspects (Bryman & Bell, 2015). As such, one organisation or individual is prone to influence one or another. It is thus vital to point out as the analysis is based on key stakeholders' own subjective experiences of the organisational process. Therefore, the constructivist perspective could illustrate the research assumption regarding social entities and the interaction between these.

3.2 Research Design

As argued within the previous chapter, the research strategy builds upon an qualitative and inductive approach, with the aim to provide a possibility to provide deep understanding of the

chosen purpose and questions at issue. To facilitate the research strategy, a multiple-case study has been chosen. A case-study is, according to Bryman and Bell (2015), suitable when the research aims to target why or how a phenomenon occurs, in this case, firms' ability to succeed with digital transformation. Therefore, the choice can be motivated by researchers' ambition to find characteristics or traits of organisations that impacts its capability of implementing innovative technologies. Comparing different organisations aims to enable a more profound understanding of digital transformation and technology adoption by analysing differences and similarities between observed case companies. Implying that social phenomena such as cultural aspects can be identified and understood (ibid). From a theoretical point of view, the comparative research design could therefore be argued to facilitate understanding of the literature review and presented theoretical framework.

However, it should also be noted the chosen research design arguably has a few flaws. Since the case study design will rely on semi-structured in-depth interviews, the researchers' own biases will risk affecting the analysis. Furthermore, the generalisability can be hard to assess since each respondent has its own perception and opinion that in itself develops and can change over time (Bryman & Bell, 2015). Applying a multi-case study approach could arguably increase the generalisability of the research by contrasting which aspects and capabilities the different organisations inhibit and how this affects its digital transformation. While case study focusing on only one company might have enabled a more in-depth analysis it would risk being too narrow of a scope for being able to adequately answer the research question at issue. A single case study could enable a purpose at explaining how a single company could implement a digital transformation whereas this research aims to resolve or clarify which enablers and barriers for digital transformation (ibid).

3.3 Research Methods

The proposed research aims to include two types of sources: primary and secondary data. The primary data will be conducted through semi-structured interviews with respondents who have been identified to have relevant professional experience. Secondly, secondary data will also be included in the form of peer-reviewed academic articles selected through a narrative literature review.

3.3.1 Primary Data Collection

In accordance with research design and method, the proposed research includes semi-structured interviews as a method to gain deeper understanding of how various organisations view its capabilities in relation to digital transformation. This could be viewed in accordance with Bryman and Bell (2015) who argue that semi-structured interviews enable researchers to compare and link similarities within a sample of data within a set focus of research. This reasoning motivates the usage of semi-structured interviews since the ambition of the primary data collection is to gain a deeper understanding of the topic and in turn provide comparability as well as structure to the data generation process. Furthermore, the usage of semi-structured interviews indicates that the conducted interviews will be based on the same interview guide to increase the flexibility for the respondents to answer more freely as well as add the potential of follow up questions. As such, flexibility has been prioritised over a strict focus, this is motivated in accordance with Bryman and Bells (2015) view that the need for deep insight is suitable with the methodological choice of having a comparative, multi-case study design.

To facilitate the aim of gaining deeper understanding of capability management in relation to digital transformations, the potential respondents need to have relevant experiences to be able to give fulfilling answers for the conducted research. Therefore, a purposive sampling method has been chosen. A purposive sampling method is built upon a principle of choosing respondents strategically (Bryman & Bell, 2015). To gain real-life insights, the theory will be combined with interviews with key stakeholders within organisations that are currently ongoing or have undergone the transformation process of adopting simulation technology. In total 5 interviews have been conducted with 6 experienced executives within companies who are currently implementing simulation technology into their organisational practices. The choice of respondents have been motivated with the assumption that managers have a larger potential to inhabit understanding of both simulation technology as well as the process of implementing new technology into the organisational practices. Additionally, executives from several different countries have been interviewed, as the purpose has not been to generalise the findings between different countries. The inclusion of multiple nationalities within the sample is instead motivated by the fact that it is not considered to significantly impact the outcome of the collected data. This is important to highlight as the researchers have been

primarily concerned with the managerial experience linked with both simulation technology and technology implementation.

Table 1 - Summary of interviews.

Intreviewee	Date of Interview	Interview Format	Interview Duration
✦ R&D Executive A	17th of March	Virtual Meeting	44:15:00
✦ R&D Executive B	25th of March	Virtual Meeting	42:52:00
✦ R&D Executive B	25th of March	Virtual Meeting	42:52:00
✦ R&D Executive C	25th of March	Virtual Meeting	41:02:00
✦ R&D Executive D	28th of March	Virtual Meeting	58:15:00
✦ R&D Executive E	29th of March	Virtual Meeting	51:38:00

The sample all consists of international firms from Sweden, Denmark, Switzerland and USA. All included firms inhabit manufacturing processes and rely upon R&D to develop new types of products, and processes to manufacture these products. The number of employees range from approximately 5 200 to 60 000.

Conducted interviews are based on a semi-structured approach which enables respondents to properly expand on their understanding of the questions. This mitigates risk of the research bias and preconceived notions to influence empirics. In contrast, unstructured interviews could potentially harm the comparability since responses likely will differ in characteristics, and structured risk being too strict, resulting in less deep insights. However, it should be noted that the choice of semi-structured interviews with purposive sampling do have a few shortcomings. Since interviews are dependent on the availability and interest of possible respondents, the primary data runs a risk of being inconclusive. Furthermore, interviewing several organisations might lead to an issue of comparability if the operations characteristics are too dissimilar (Bryman & Bell, 2015). To avoid such situations, a contact person has been assigned at the partner company which facilitates interviewees based on relevance, appropriateness and availability. It should also be noted that the purposive sampling method decreases the generalizability of the results to an entire population (Sekaran & Bougie, 2016), however as this not the purpose of the research it’s not necessarily deemed to be relevant.

3.3.1.1 Interview Guide

When conducting interviews, the researchers focus on the individual experience in the form of thoughts or feelings rather than organisational capabilities. This is motivated with a hope to be able to contrast individual differences within entities and possibly find common factors between. Interviews are held with customers of EDR Medeso.

To increase the comparability between the different sets of data an interview guide will be conducted, the guide aims to enable a more profound coverage of the chosen theoretical framework. The questions will be formulated to be open-ended to reduce the possibility for the respondents to not be steered by the interviewer's bias and to increase the respondent's own perception when answering. To decrease potential confusion or misinterpretation of the questions, they will be formulated to be as simple as possible based on recommendations by Saunders et al. (2012). Secondly, the questions will be revised internally to ensure that the questions are interpreted in an adequate way to limit potential misunderstandings or incorrect answers. As this could lead to a potential problem of having the analysis relying on inadequate data, as such the process of ensuring that the questions are understood correctly is crucial for this study's validity. Thirdly, to ensure that the respondents are not steered in their direction of responses, each interview will start with open, general questions and gradually ask more specific questions. This has been done in accordance with Kvale (2007) recommendations of setting up a context for the respondent of the topic, but also crucially enabling them to familiarise with the interviewers. Which according to Kvale will enable the respondent to feel more comfortable and talk more freely.

The interviews have firstly been recorded through teams, zoom and google meetings. Each audio-file has then been transcribed manually to paper. It should be noted that interpretation has been assumed to be needed in regard to how a word is pronounced or voice used. In order to decrease potential biases from the authors the interviews are transcribed word for word.

3.3.2 Secondary Data Collection

A narrative literature review was conducted following the establishment of a research question and general purpose of the research. Reviewing literature ensures a critical reflection on existing publications (Bryman & Bell, 2015), thus the ambition is to provide a more nuanced view of empirical findings. This does however entail a challenge with the inductive

approach as it aims to generate and create new theory, whereas it can be challenging for the authors to decide whether to include or to exclude litterature. The alternative approach of a systematic literature review can therefore be argued to become too strict as it relies upon a more clear definition of the area of research before starting with the data collection (ibid). Thus the flexibility of being able to include new found litterature and concepts offered by the narrative approach in combination with suitability with the qualitative research strategy have been decisive when deciding the data collection method.

An argued drawback of utilising the narrative approach is letting potential bias too narrow of a scope defining the data collection. To counter this, the thesis has used a defined method to aid the process of getting a greater analytic ability of the relevance and credibility of existing sources. The literature review laid the substructure of the research, and therefore formed the knowledge base which affected the interview questions for them to be as relevant as possible, hence why the literature review proceeded the primary data collection. Secondary data was collected through databases such as Google Scholar and GU Supersök. According to Bryman and Bell (2015), relevant search words warrant less bias and more legitimacy from the authors when conducting a literature review and thus search was limited accordingly. Furthermore, sources were selected based on a number of key criteria that validated the likelihood of relevancy for the research: 1. title; 2. abstract and summary; 3. total citations.

Table 2: Key Terms, Inclusion Criteria and Exclusion Criteria.

Key Terms	Inclusion Criteria	Exclusion Criteria
✦ Dynamic Capability (ies) ✦ Digital Transformation ✦ Dynamic Capabilities and digital transformation ✦Digitalisation of R&D	✦ Peer reviewed articles ✦ Studies discussing enablers of digital transformation ✦ Studies discussing barriers of digital transformation	✦ Publications in other languages other than Swedish or English

3.4 Data Analysis

In accordance with the norm of qualitative research, a thematic analysis was used to quantify and conceptualise the collected primary data. The usage of the methodology of thematic analysis is motivated by its characteristics as it enables a systematic and robust way of structuring and comparing the gathered data in relation to the research purpose (Bryman & Bell, 2015). In practice the Thematic analysis is done through several steps, the first one

being transcribing the conducted interviews and then based on first impressions ascribing codes to words, sentences or any section that is condemned relevant for the researcher's purpose. Secondly, all the transcripts and codings are to be analysed on multiple occasions where the aim is to group the codings together to form themes, the process should thereby be viewed as continuous. In turn the themes can be constituted by two or more codes, therefore linking data, patterns and theory together. This is in line with what Bryman and Bell (2015) argues is the optimal usage for thematic analysis, as the method is linked with flexibility in the process of interpreting data and allows categorisation and comparison of the collected data. Therefore, thematic analysis is argued to be an adequate method to code, conceptualise and quantify interview answers into data by using categorization, e.g., colour coding. In turn the colour coding is based upon the theoretical framework, whereas the ambition of this method is to create a greater ongoing understanding of the interviewing process. Bryman and Bell (2015) describe that the advantage of colour coding is that it can showcase how frequently certain themes appear in interviews, and if a code is too vague to be adequately included in the analysis. As such the researchers might discard certain coding if they are not found to add any additional value.

To conclude, several advantages of using a thematic analysis have been formulated, however, it should be noted that there are drawbacks linked with the method. First, the categorisation process lacks specific principles and methods, the overall result of the coding risk of becoming complex or diffuse. Secondly, since the interviews are analysed through a narrow scope, the holistic view of the context might get lost. Whereas these drawbacks could potentially harm the reliability of the suggested research. Although, it should be noted that there are some remedies that can be adopted (ibid). For one, the researchers plan to go through the interviews and coding on several occasions to minimise tunnel vision. Additionally, the coding is planned to be discussed internally and be done in cooperation with the contact person at EDR Medeso. Therefore, the pros of the thematic analysis are argued to outweigh the cons. Lastly, since the process of coding is complex it is crucial to try to be as objective as possible and thereby minimise potential bias to enter the analysis. To reduce potential bias entering the set of codes and themes, the transcripts will be analysed on multiple occasions with different purposes. To conclude, the thematic analysis is argued to be a preferable choice of method in accordance with the other chosen methodological choices of design, strategy and data collection.

3.5 Research Quality

3.5.1 Credibility

Credibility refers to the accuracy and reliability of the research (Bryman & Bell, 2015). There are according to Bryman and Bell (2015) steps the researcher can take to contribute to the credibility. First of all, the empirics and findings are validated by the respondents of the research, ensuring that empirics from interviews are not misinterpreted and that findings are not misleading. Secondly, research is conducted in the best manner, thus being as neutral and objective as possible. An imminent risk for the credibility is the researcher's ability to find the best respondents. Respondents who lack knowledge about digital transformation and simulation technology might respond with answers that fit their comprehension of the issue and therefore give an inaccurate perspective. This is mitigated as best as possible by sending interview questions to the respondents prior to the interview, enabling them to evaluate whether they are fit for the job or not, and to give them time to formulate good answers. The draft of the research is also sent to respondents and mentors at EDR Medeso to get feedback on possible misinterpretations or faulty information.

3.5.2 Transferability

Transferability refers to what extent the research can be used in other contexts (Bryman & Bell, 2015). Opposed to quantitative research where transferability is of bigger importance, qualitative research is more often intended to be used solely for a specific purpose and is thus not as generalizable (Lincoln & Guba, 1985)**.** However, for findings to be as transferable as possible, the process of this research is comprehensively described, and results carefully analysed. Whether findings are transferable to other industries or other research is up to the reader to determine.

3.5.3 Dependability

Dependability refers to the reliability of the findings and how well the process is documented, this enables readers to critically review the methods used (Saunders et al., 2012; Bryman & Bell, 2015). It also manifests how consistent and repeatable the findings are, and thus can increase trustworthiness. Other researchers should be able to draw the same conclusions by

the gathered data. To increase the dependability of the research, the research process is thoroughly described and other researchers will be requested to analyse and to critique such.

3.5.4 Confirmability

Confirmability refers to what extent the researcher's subjectivity interferes with the research. Less subjectivity equals a higher confirmability. Qualitative research is inherently subjective to a certain degree since it is based on interpretations of respondents in relation to a selection of theories (Bryman & Bell, 2015). To increase confirmability, interview questions were carefully selected based on an extensive literature review and the premise of being as open as possible to influence the outcome of answers as little as possible. Furthermore, interviews are recorded and transcribed, ensuring that empirical findings would not be influenced by misinterpretations or possible faulty remembrance.

4.0 Empirical findings

Within this chapter the findings from the collected primary data will be presented through using the three dimensions of Jacobi and Brenners framework; 1. Leadership and Vision, 2. Culture and People, and 3. Organisational Processes and Structures.

4.1 Leadership and Vision

4.1.1 Develop a digital strategy that is line with the overarching corporate strategy

From an overarching perspective, there has been found to be a consensus within the findings that there is a perceived alignment between the sampled organisations digital strategies and their overarching strategies. How the two are perceived to be tied together do however vary, three out of five argue that the digital strategies tie to the overarching through a common mission of creating efficiency within R&D development or through increased product performance. For respondent, D, while stating that there is a clear alignment, he further adds that there should not be any difference at all in the first place. The main focus should be customer centricity, helping your customer to become more profitable, efficient, sustainable

etc. The contradiction is not perceived to be within the strategy in itself, but rather within the activities that define the core offering or business model. This is highlighted as D is working within producing industrial products built out of metal, and currently the profitability comes from selling these products directly. D however sees a future where the profitability instead will come from selling digital services related to these products, and thus raises the question of where the future value lies. Is it from selling hardware or digital services linked to this hardware? Highlighting the problem of how the value, or the end goal is supposed to be defined, as future value from digital strategies might entail disruption of current business processes. Respondent E, is also in line with D, as he points out;

Respondent E - "*There is a reason for the digital transformation. That is of course, first to be a business that earns money and that kinda of comes from the overall strategy. So there should be a clear alignment. We are not doing it because it is fun, but it is also fun. I think that's important.*"

Other respondents are also in line with E. For example, respondent A is stating that gaining alignment for digital transformation initiatives is often linked with internal battles in terms of both showcasing the business value of digital initiative but also in terms of justifying the required resource allocation. According to A, they have experienced this being due to misalignment in between core functions, in this case engineers and with upper level management in terms of what value could potentially be extracted from embracing digital transformation initiatives. With this said, A, argue that a large building stone to the success of their implementation efforts of simulation technology have been within successfully showcasing a business value through tangible examples of what simulation actually provides. E.g. how simulation technology reduces developing and lead times within R&D, A therefore argue that these efforts have helped to increase stakeholders buy-on and thereby creating alignment. Within the interview with B, this is highlighted as a problem of knowing what and how to extract value from digital transformation;

Respondent B - *"Every company has a different reason, area, nisch, and to me i've seen that we got the most false starts there. In regards to what do we want to transform, and what outcome do we want as a result? I mean you will find our organisation on the app store, right, I don't know whether that's the app that delivers the most value to our customers, but you will find that we are out there."*

C further adds to the perspective of the hardship of aligning stakeholder rather than strategies. Whereas one example is the struggling process to gain buy-in or understanding in regards to technical tools or projects from local pockets, with people who lack the knowledge of the technical aspects. Aligning these local pockets of knowledge with the management is thereby described as a barrier, and organisations are argued to be needing a plan to raise awareness and recognition for the digital tools, initiatives and simulation technology in order to gain the required attention from management.

4.1.2 Root the digital strategy on the executive level

As highlighted within the previous chapter of aligning digital and overarching strategy, the work of anchoring this on an executive level have been identified to be of various difficulty from the findings of the conducted interviews. Moreover, the challenges have also to some degree varied. Respondent B for example, whose organisation has undergone four organisational transformations linked with simulation technology during the past 20 years. For them, the Digital transformation project is initially anchored at the top and then pushed down, where lower level managers are meant to actually implement the strategy. As described by B, entailing that there needs to be an understanding of how DT efforts such as simulation technology could influence the whole organisation;

Respondent B - "*You can simulate all the routes, all the other usage, all the other customer experiences that you can't test. So it's not just a front-end*[1] *thing, it has a different purpose within every phase, and the problem is that if you don't do the work early on you don't have anything to use during the back-end*[2] *and you won't invest in it just for the back end. You have to invest in it on the front end and the back end will come a lot more cheaply.*"

Through this statement, B argues that investments need to take the whole internal value chain into consideration, meaning that simulation technology in this case not only affects specific areas of the product or organisation. In this specific firm a top-down approach is argued to have been favourable in terms of formalising the implementation process. Within their R&D

[1] Front-end refers to development activities within the product development stage. E.g. how a cylinder could be adjusted to become more sustainable or efficient.

[2] Back-end refers to how the end-user experience, e.g. how mileage accumulation of a motor affects its performance.

each new development is required to follow a type of protocol where the prototype's capabilities are required to be simulated before being tested. The viewpoint of the requirement of formalising the transformation initiatives also shared with C respectively D. C states that top management must have belief in product or service and only then will it become easier for other to buy in, when isolated within a single function, e.g. R&D, the potential usage and stickiness will be limited. Adding to this, C is arguing that the strategy needs to be evaluated and communicated on a continuous basis between middle management and executive level in order to update the strategy and implementation activities;

Respondent C - "*The more time spent on formulating and formalising digital strategy the higher chance of success in terms of implementing DT."*

Respondent D agrees, and further adds that a too strict focus on a single function risks leading to silos where potential synergies such as data sharing are risks of being missed. Potential challenges have been described to showcase and communicate initial success, D states that trust needs to be built through identifying local ambassadors at the executive level that could drive and showcase the initial business value. In accordance with A, B and C, D inhabits the view that the initial business value can be hard to showcase but a vital part of gaining full internal stakeholder support which is required to formalise the routines coupled with DT initiative.

Respondent E explains that his organisation is facing trouble within the area;

"*Top management does not speak about digital transformation. That comes from further down from strategy and out KPIs. Top management focuses on the business results and numbers. In order to meet that need, we can't do it without digital transformation in different areas.*"

In opposition to B, C and A, E explains that trends are sensed more through a bottom-up approach which in his case makes it difficult to root the DT initiatives at an executive level. Whereas a realisation has come a simulation strategy is needed, currently simulation technology is described to only be used sporadically rather than through a formalised approach and since its not formalised, E describes that simulation is used on a risk mitigation basis which have made it more difficult to formulate business value.

All in all, the overarching theme that rooting the digital strategy on an executive level seems to be agreed upon by the respondents, however there are some inconsistencies regarding identified facilitators and challenges of achieving executive buy-in. In accordance with previous respondent, the overwhelming majority of further confirm that leadership have an pivotal role too, or as one respondent claims

Respondent D - "*The effect of leadership is humongous, you really need to have management buy-in. It is crucial.*"

4.1.3 Institute strong leadership on all levels

Within the conducted research a majority of respondents have in some sense highlighted that there can be an internal struggle of gaining resource allocation to one's projects, as organisational resistance easily can emerge when new working methods or new technology are presented. Respondent A describes that the stickiness of new changes is related to organisational pressure by the leaders, which he does by a few measures. First of all, leaders need to explicitly address organisational change through creating clear roles and responsibilities for the transformation, even for those who have a "clear none-role in the change". Secondly the leadership need to be built upon a executive consensus culture, A states the following;

Respondent A - "*You need to prepare the leaders, you need to force the leaders to talk about simulation and to ask for simulation. I have a team of three chief engineers and seven managers and at some point in time I divided them into two groups: those who are pursuing simulation and know what to do, and those who are not pushing for it. It came as a shock because I put the chief engineers in the group that are not positive to simulations. Some called me later and asked if I thought that they were against simulations. I told them no, but you are not pushing for it*."

Through this example, the respondent highlighted that managers and leaders role within transformation initiatives once a decision has been made upon which direction the organisation is going to take, the management team need to show full support to the initiative even in cases when they are not fully convinced of the potential or value.

The other respondents share this view to a large extent, C for once argue that the executives role within change is to focus on formulating strategy, then pushes these initiatives down the organisation. Further he states that a top-down approach, and communication is therefore considered important to enable managers to prioritise and then execute. Within respondent Bs organisation, which have had four major transformations related to simulation technology during the last 20 years, their CTO have had an vital role sensing trends, setting vision and strategy for the future operations. B mentions that his first CTO acted as an ambassador of changing their R&D processes;

Respondent B - "*So he had a good vision, and he was kinda scary in a way. We loved him, but he was scary at the same time. Well, so when he said that we were going to stop testing, and change we were going to do more analysis instead, we kinda all got onboard*"

B argues, in accordance with the quote above, that when leaders actively push for transformation they take the role as an organisational catalyst. D's viewpoint is further also in line with B, as D argues that leadership should be viewed as the enablers of transformation rather than the controller of it. Meaning, leaders need to communicate in a way so that people understand, which he emphasises can increase the trust and make the strategy to stick better. The goal is to create an army of aligned ambassadors of the change, and to fulfil this ambition D means that leaders have to define and set clear roles for involved parties within the change, as unclear roles can create misalignment and mixed messages. Leaders have to challenge themselves in order to break free of old successes, which is stated to be important as the environment is constantly changing, and people are looking to their leaders for answers. As such they therefore need to be strong.

Respondent D - "*When facing a big change like this, most people tend to get a little anxious and tend to look to their peers and leaders for answers. If that is not clear, then it can get a little messy because the organisation may get mixed messages on what is a good approach*"

Within Es organisation, he described that the executives' roles are not entirely clear in terms of driving the DT efforts, which have led to unclear roles and responsibilities. This is also described from the perspective of a lack of communication, vision and clear direction in regards to these efforts, and according to E, there is a perceived struggle between functions

for resource allocation. The organisational process is more described as a bottom-up approach rather than top-down, to summarise, E describe the role of the leadership within his organisation as following

Respondent E- "*They are not always clear. That can give some challenges because when there are no clear responsibilities then you can get some clashes*"

4.2 People and Culture

4.2.1 Encourage risk-taking and innovative activities

There is consensus between all the respondents except E that risk-taking and innovative activities are important in DT. A, B and D further expands that you need to embrace a culture of always striving to do things better by pushing people to break free of old habits and to do things in a new way. For B, these activities are connected to an organisational strive to always innovate themself to excel to the next s-curve of innovation, also adding that it is fun to be on the front edge of things. However, breaking free of old habits is also presented as a challenge in most organisations. A and D further expands that expert culture, the feeling that you already know it all, is very damaging and prohibits these activities. Additionally, D explains that as the drivers of success change over time, so must the organisational activities as well. According to B and D these activities are part of a plan to be proactive rather than reactive when it comes to DT. According to B, you need to balance innovation and risk by also monitoring trends for possibly 10 years ahead before even investing in it. For organisation D, simulations especially have enabled them to be proactive in their work by being able to predict what's going to happen before it happens.

Respondent D - *"Innovativeness is about understanding the whole process which enables the adoption of new business models"*

E seem to have a completely different view to the rest in most cases. The adoption of simulation technology especially is described as a reactive approach that comes from a must in requirement due to complexity rather than being seen as an opportunity to be proactive. The overarching theme in Es responses is geared towards the downside with such activities. Risk-taking and innovative activities are seen as waste of time and money and that risk

should be mitigated at every cost. In contrast, most of the other respondents seem to think of digital transformation as an investment in the future that is essential in order to stay relevant and to survive in the future. B believe that they have a culture of entrepreneurial spirit. Constantly challenging the way you do things to find better ways is partly why they believe they have managed to stay relevant for such a long time.

Respondent B - *"Digital transformation is like venture capital, you bet on a thousand companies and one will succeed"*

Risk-taking and innovative activities are generally seen as a way of responding to an ever changing environment, and for all but one organisation they are viewed as investment for the future. Only E challenges that view and generally seem to consider risk-taking and innovative activities as negatives in terms of capital expenditures and time. However, as C states, not taking risk might be a risk in itself. C adds that it is more important to acknowledge risk and to communicate it properly than to entirely try to avoid it.

Respondent *C* - *"There will always be risks, but if we don't try we will not succeed"*

4.2.2 Create a culture of learning and collaboration

There is vast consensus that a culture of learning is beneficial for the company. However, the respondent also agrees that it is challenging for the existing workforce to adapt to new digital technologies. According to A, most people will eventually learn new things but there are some that do not. A continues with a statement that learning will never come by itself and that it is the organisation's responsibility to put pressure at the employees to adapt. D states a similar thought and emphasises training activities, especially when trying to scale digital initiatives. According to A and D, learning new things takes a lot of time but it is very important and therefore you should repeat it over and over again.

Respondent A - *"Hard to learn a old dog to sit"*

Another aspect of learning brought up by B and C is to actively analyse and learn from what you made in the past. Furthermore B speaks about entrepreneurial spirit and how that is embedded in the learning culture. According to B, learning from past mistakes is not only the

norm but encouraged. C has a similar approach and thinks that you should learn from what made you successful in the past, and then selectively forget so you do not beat the same path again. Furthermore, C explains that environmental changes will require new methods for success.

In regards to collaboration, all insist that it is very important for success. The organisations of both A and B utilise informal networks for most of the collaboration. Both emphasise that informal networks are more agile than collaboration through hierarchy, B expands that they use internal talent networks for contacting whoever have the right competencies. Furthermore, B explains that there is no requirement for collaboration, but that it is highly encouraged within the organisation. Both C and E think that there is an element of silo culture within their organisation, both also believe that it is a hindrance for effectiveness and collaboration. C adds that silos restrict potential synergies between departments as the workload is not shared between departments. This problem seems to stem from performance measures not aligning between units making it hard to sell the collaboration since they operate with individual bottom line goals. In the organisation of E they have a similar problem where many want to shine individually which can be problematic.

4.2.3 Attract new talent

Within the subject of hiring new talent there is some discrepancy between the organisations. In organisation A, B and D there is a great urge to attract new talent, while C and E do not express much of a need at all. According to A, it is crucial that you hire young people with digital skills in order to not become obsolete. A adds that you can not hire people without such skills at all when in a DT.

Respondent A - "*That's actually one of the topics that we addressed because you can not take people that have been working 25 years in development and suddenly go to them and say that they now have to change completely. Some of them will pick it up but the majority of the people working in development will not pick up the new method. You need to hire younger people or people with other skills, digital development skills. In some point we said that you can not hire any people without native digital knowledge*"

Something every organisation seems to agree upon is that retention of current talent is of uttermost importance. A, D, and E believe that it is hard for older employees to adapt to digital initiatives since they do not have native digital skills. However, they all stress the importance of retraining them to be able to work in a more digital environment. C, D and E adds that even though retention is important, people that do not want to change their habits to fit digital initiatives might be better to cut from the organisation given that they can not effectively be reallocated. There is consensus that old talent has a lot of industry and business experience that new talent does not have. According to B there is a loss of experience if only focusing on hiring new talent and thus losing experienced personnel, furthermore they argue that especially senior staff offers more bang for the buck when it comes to business performance. A, B and D have similar thoughts on how to achieve maximum effectiveness with old and new talent, to combine their knowledge and make them learn from each other. A expands that people with digital skills will support older industry professionals in digital, while the latter will provide valuable knowledge to the newer colleagues.

Respondent A - *"Young people teach digital, old people teach experience"*

Respondent B - *"There are no new problems, just new engineers"*

4.3 Corporate Structures and Processes

4.3.1 Pursue collaborations across functions

Key takeaway from the conducted interviews concerns that while there is a consensus regarding the importance of collaborating across functions. There can be a few challenges that are perceived to inhibit the effective use of collaboration. C, describes that the need of organisational coherence and integration of all functions is a prerequisite to even being able to digitally transform. Reason being that it is necessary to get from a trial and error culture to knowledge culture**.** An identified problem of achieving this is that there can be contradictory as different functions can have different goal orientations. C notes that while the R&D function of his organisation can easily collaborate between functions, in other functions such as supply chain or saleas, there might be a bigger struggle to collaborate.

Respondent *C* - *"The R&D projects, their organisation is strictly matrix so there we have assigned people in the functions. There we get the focus but sometimes it is a struggle to win the focus. It is often tough negotiation when you want to pull a guy in from the supply chain into a project. That requires a lot of negotiation and following up to make sure that we actually get the attention that we agree on.*"

Other respondents further also indicated that resource allocation can be a hindrance of achieving a more formal project based collaboration across functions. Or as E describes it, there can also be an internal battle between silos as there is individual prestige at stake which can hinder the overall performance of the organisation. Instead respondents, A, B and E indicate that informal networks and personal knowledge is important in order to know who to address when problems emerge. B also emphasises efforts to formalise centre's of excellence as a way to ease the matching process between project with issue and the right competence. Secondly he believes that these centres of technical expertise helps the organisation to utilise existing competence rather than new employees with the same nische competence. D describes the collaboration within his organisation from a design loop perspective, where problems within a product or R&D project needs to be looped through several functions so that each can give their perspective, this type of collaboration between units is by D argued to be very important and often leads to better and more well thought out end products.

4.3.2 Use KPIs and other metrics

Neither of the organisations use specific KPIs in order to measure the effectiveness or success of digital initiatives, rather all rely upon more indirect measures. According to A, the success is hard to measure as the effects are indirect. B has a similar statement and thinks that it is hard to quantify ROI of digital initiatives, thus they use mostly qualitative measures rather than hard goals. Furthermore, B adds that changing complexity and variety within each project easily makes benchmarks irrelevant. D also explains that measures need to be adapted depending on where they are in the organisation and that they often are more qualitative rather than quantitative.

A tries to measure efficiency, quality of output, speed etc. which relates to being able to show tangible results that illustrate business value of the technology. Similarly, C thinks that you have to be clear on how you measure the success as DT is often broken down into several

implementations in different areas during a long period of time. C also speaks about being able to showcase tangible success stories, whereas communication in this case is crucial rather than quantitative KPIs. D also emphasises that success needs to be tangible and that you need to formulate business cases in order to do that. E as well is geared more towards justifying business cases through holistic profitability measures rather than directly measuring the digital initiative itself.

4.3.3 Pursue projects that are in line with the digital strategy

According to A, B and C it is very important to pursue projects that are in line with the digital strategy. According to A, the main driver for adopting new digital technology is to create efficiency. Similarly, B sees digital as a more effective and cheaper way to do things, therefore they always strive to use it first. On the opposite, D and E usually start with traditional ways of doing things and then resort back to digital alternatives. However there are some differences there as well. In the organisation of D they do have formal writings that encourage use of digital and they believe that such formalisation is very important to make a change stick. In contrast, the organisation of E does not have any formal writings for digital and therefore digital tools, simulation especially, is used on a very ad-hoc basis.

Respondent C - *"You must support the digital strategy otherwise you should not be there"*

In general A, B, and D think that they have good alignment while C thinks that it is more of a struggle. The organisation of E does not have a formalised digital strategy and can thus not be evaluated. The reason C gives for not having that great of an alignment is that there is a need for change in business model when implementing digital technologies and those changes always present some discrepancy between new and old ways of operation. However, they always strive to get better since they think it is key for survival. According to A, you need to utilise a strong management layer that forces the use of simulation and other digital tools in order to not fall back into old habits. A also acknowledge that it is hard to align the activities with the digital strategy and that you therefore need to push for it all the time, not just support it. B have similar experiences where great leaders need to push hard in order to achieve the best results. When it comes to simulation, they have much focus on hard-coding it in resource and monetary management.

Respondent A - *"It is hard to align activities with the digital strategy, you need to constantly push for it in order to make it stick"*

5.0 Analysis

The purpose of the chapter is to combine the empirical data with presented litterature. Through this approach the researchers aim to create a discussion that aids to help answer the presented question at issue. The analysis will be concluded with an revised DT/DC framework which either confirms or rejects previously presented microfoundations or so called actions.

5.1 Leadership and vision

5.1.1 Sensing

Routines for continuous evaluation of current digital strategy and how it aligns with the overall corporate strategy

In accordance with the derived actions of figure 5, most of the respondents seem to have some kind of routines aligning to the overall corporate strategy. Only one organisation states that they do not have any explicit digital strategy. However, even those without one seem to believe that it is important that digital initiatives align well with the overall strategy of the firm. This is in line with both Matt et al. (2015) and McLaughlin (2017) which both emphasises the importance of alignment between the strategies in order to leverage their advantages in sustained performance. Three out of five align them through common missions of creating efficiency within development, increased product performance and customer satisfaction. Furthermore, there is consensus regarding that in order to achieve maximum efficiency, there should not be any differences between the digital strategy and the overarching, as such the findings are indicated to be in line with the DT/DC framework. When it comes to routines for continually evaluating the digital strategy there is consensus that it is important to systematically revise it in order to have a relevant digital strategy. Only respondent E, argued that his firm did not have an explicit digital strategy, this could be

viewed from the perspective that E valued his firm's simulation maturity the lowest of all respondents. Which is argued to limit the effectiveness of the firms implementing efforts of simulation technology. As such, there is an indication that routines for continuous evaluation of current digital strategy and how it aligns with the overall corporate strategy increase the effectiveness of DT, thus there is validity to the first action in the DT/DC framework.

Routines for evaluating role descriptions

In relation to establishing routines for evaluating role descriptions the results are inconclusive. Not enough has been said in order to derive any valid confirmation for this action. Its should be noted that the findings suggests that the role formulation has to be clear for all persons within the change, this could indirectly indicate the evaluation of role description can be beneficial if the efforts aim to clarify how either leadership can be more driving in the transformation or how employees can take upon more explicit tasks and responsibilities. As previously mentioned, D described highlighted that if the roles are not clear, mixed messages or overlapping responsibilities might affect organisational efficiency. Teece (2007) argues that a too tight hierarchy and lack of managerial coordination might reduce the capability to sense threats as information risks getting lost within the organisational ladder. Yeow et al. (2017) further argues that responsibilities within DT should be clear. As such, whereas the findings doesn't explicitly confirm the microfoundation, it could be argued that there is a present consensus within the finding regarding clear leadership roles are beneficial, which in could be viewed to be in DT is in line with Jacobi and Brenner (2017) and Karim and Walter (2015). However, as previously mentioned this does not relate to how organisations evaluate their role description to better fit DT efforts.

5.1.2 Seizing

Communicate how digital transformation provide business value

In accordance with previously presented findings, the overall majority of respondents argued that a potential barrier for implementing digital transformation has shown to be showcasing initial business value within the organisation. This is described through several aspects, firstly it can be hard to showcase the potential of new, digital technologies or as in this case, simulation technology. Especially in situations where the leadership don't inhabit a sufficient

amount of technical expertise to fully understand how simulation technology could for example increase the efficiency within their organisation. This effect is further elevated as simulation technologies' effects on R&D processes tend to be indirect or hard to measure.

Secondly, as several respondents mentioned, the communication of the firms digital strategies serves the purpose of highlighting how digital transformations, in this case simulation, can enhance the overall business value. But as the effects can be indirect, a majority of respondents have argued the communicational capability is rather about creating tangible success stories and how the technology directly impacts the organisational capabilities than expressing ROI or other more direct measurements such as time to market to distinctively showcasing the business value. To contrast the empirical findings, the literature suggests communication regarding digital transformation strategies should be distinct in order to gain leverage of showing business value (Jacobi and Brenner, 2017). More in depth, Digital transformation litterature of Jacobi and Brenner (2017), highlights within their structural steps of transformations processes, where it is argued that the measurement and communication of success should be considered other include other metrics than profitability, e.g. usage of speed to market, visibility or reach. Teece (2007) argues that in cases where new business opportunities have been identified, the human factor of risk aversion and lack of commitment can act as barriers for organisations to adequately capitalise. As such, both empirical findings and literature highlights the role of leadership. The leadership has to take an active role to communicate potentially tangible examples, acting as internal salesmen or ambassadors of the digital transformation initiatives. Respondent A described this as; *"Either the managers are actively pushing for simulation, or they are against it"*. Or as Colli et al (2021) puts it, firms are likely to face implementation barriers when trying to translate new technology into clear positive business cases. Within the context of the empirical findings, the only respondent who argued that their implementation process of simulation technology where driven through cost and profitability measurement, were also the one who struggled the most with making sense of communicating its digital strategies and gaining internal buy-in.

The analysis could indicate some clashes between findings and literature regarding how a distinctive communication can be achieved, on one hand findings suggest that more indirective measures of storytelling is suitable when technology has an indirect impact such as simulation technology. On the other hand the literature suggests the usage of measurable

KPIs, although these do not have to be financial. There is however a coherency between literature and empirics in terms that the leadership needs to be the driver of communicating the strategy. The analysis therefore indicates the DC/DT framework could be confirmed in this case, with the reservation that literature's suggestion of a communicative method is complemented with the findings emphasis upon storytelling.

Routines for evaluating authority to ensure that management can allocate resources efficiently

Other aspects within the literature that have been highlighted as potentially challenging while undergoing transformation processes is the middle manager's role and the authority linked with it and further ensure that vertical communication highways between managerial levels. Middle managers are argued to be required to be the drivers of implementation processes of new technology, as they are in a more favourable position in terms of hands-on expertise in regards to both organisational and technical aspects (Dutton et al., 2017; Naujok, 2016). From a dynamic capability perspective, Cruz et al. (2020) highlights the need for coordination between managerial and executive level to ensure that sufficient resources and decisions align with actual operations. In accordance with the empirical findings, this coordination between hierarchical levels has been illustrated from respondent E, who states that since his organisation lacks a clear digital strategy, neither the description roles nor resource allocation is sufficient. Which in turn have impacted their implementation efforts negatively as there is a type of built in organisational resistances due to the lack of coordination between managerial levels. In this case, a bottom-up has enabled the organisation to sense the need of implementing simulation technology. However as the coordination and required buy-in between managerial levels lacks, the organisational capability to seize and act upon the opportunity is restricted. In contrast, other respondents have driven the transformation from a top-down approach. For example, respondent B highlights his CTOs role as a trailblazer, a leader who inhabits knowledge of simulation technology which are leveraged to create an understanding of how the technology could best be implemented across the organisation, not just the R&D function. Within this setting, the resource allocation to the middle managers are described as necessary to gain sufficient results. The latter example is also in line with presented litterature from Karimi and Walter (2015) which suggest that top-management engagement and technical experience is important to ensuring the success of the implementation efforts, as this increases likeliness of efficient

resource allocation and stakeholder buy-in. However, the empirical findings do not cover how middle management authority and capability to allocate resources could be evaluated nor ensured. Thus the presented action within the DT/DC framework has been argued to be inconclusive.

Vertical channels to increase communication and knowledge exchange between organisational levels.

The literature suggests that communication capability between hierarchical levels is a common pitfall of digital transformation as vision and strategy can be hard to align with the whole organisation (Jacobi and Brenner, 2017; Schwertner, 2017), other pitfalls have been found to be tunnelvisions and silo thinking (Yeow et al., 2017; Canhoto et.al, 2021). According to the findings, a majority of the respondents have highlighted informal networks as the primary source of knowledge exchangement between organisational levels. Respondent B highlights that his organisation utilises technical centres of expertise to enable more easily reached technical support, however the impact of these centres upon digital transformation is inconclusive. Based upon the interview with respondent B, it could be indicated that the technical centres are beneficial, however it should be noted that this specific organisation inhabits a global reach, thus these centres might be highly valuable for large organisations while difficult and irrelevant for smaller firms. Thus from the perspective of the previously presented DC/DT framework, the findings indicate there is value to be found by increasing the organisational communication. However the data is argued to be inconclusive regarding how vertical channels can be leveraged to increase knowledge exchange and communication between organisational levels.

5.1.3 Reconfiguring

Establish stakeholder buy in through top management engagement within DT projects

All but one organisation argues in some way or another that top management engagement within DT projects are important for stakeholder buy-in. This view is in line with literature supporting the DT/DC framework. In organisation E, the executive roles and responsibilities in DT are not entirely clear. According to E this stems from a lack of communication and vision in regards to digitalisation efforts. In this organisation, top management does not speak

about DT at all, rather focus is strictly on business results. From the conducted interview there is a sense that this results in inefficiency and misalignment between functions and hierarchical levels. Their own take is that DT is driven from a bottom up approach which makes it hard to root the digital strategy on an executive level. Since they do not experience the same digital maturity as the other organisation further strengthens the assumption that top management engagement is valuable DT. In all other organisations there is a strong sense that top management engagement is valuable and a decisive factor in change initiatives. In line with what Jacobi and Brenner (2017) and Schwertner (2017) says, A to D specifically states that they utilise top management as drivers for change. Derived from the interviews top management have the responsibility to prove a business case and then to act as ambassadors constantly pushing for DT to happen. This is not only in line with the DT/DC framework, but also supported by Karim and Walter (2015), Matt et al. (2015) and Fitzgerald et al. (2013). As such, there is clear evidence that successful implementation of DT more often than not starts from on executive level and trickles down through the organisation. However, there is also consensus that the executive layer should act as enablers of change rather than specifically dictate how it should be done, the latter is rather a responsibility that needs to be addressed by lower hierarchical levels. Respondent D summarises the essence of this as:

"Leadership should be viewed as the enablers of transformation rather than the controller of it. The goal is to create an army of aligned ambassadors of change."

Moreover, all but organisation E argues the importance to formulate and to formalise the digital strategy. However, organisation E expresses that a need for an explicit digital strategy is growing and that they most likely will implement one in the near future. Derived from the above, it is concluded that active management engagement will provide the organisation with the best condition for driving DT consistently over time and thus resulting in not only efficiency, but also wider organisational stickiness of the change itself.

Allocate human and financial resources to support DT

All of the studied organisations highlight that there is often an internal struggle to gain resource allocation as new working methods and new technology generally meet some organisational resistance. In order to overcome such resistance there is consensus that previous steps of aligning strategy and to have strong leadership that push for DT. Concluded

from the interviews is that resource allocation is very important in order to effectively implement digital initiatives. Similar views have previously been expressed by McLaughlin (2017) who believes that groups working with digital initiatives should be utilised as supporting functions rather than separate units which makes internal resource allocation. It can thus be said that effective resource allocation for DT is crucial in order to leverage sustain advantages. However, not much has explicitly been said about how the allocation should look, rather we can derive that there are many factors that affect how effective the allocation is. Based on the interviews and presented theory, the mix of strong leadership actively pushing for DT and aligned strategy and objectives seem to be the best way to support resource allocation for DT. Furthermore, the organisation of E, who utilises more of a bottom up approach when it comes to digital initiative seemingly struggles more to get resource allocation to digital initiatives which further strengthens the previous statement. In accordance with the presented DT/DC framework, the analysis indicates that action could be confirmed by the empirics.

5.2 Culture and People

5.2.1 Sensing

Observe innovative processes internally and externally

Teece (2007) refers to the organisational capability to observe key threats and opportunities as the sensing capability of a firm. Furthermore, this capability is argued to be built upon an proactive approach of enabling managers to scan and then act upon identified opportunities. In terms of overseeing the organisational innovativeness, the literature further suggests that it can emerge potential barriers of silo thinking regarding how to proceed with investment choices. Sensing is not only required to understand the external trends, but also how to align the organisation upon common goals and objectives. Whereas the literature suggest is more on an abstract level, the findings are more suggesting that observation of the internal and external processes is about formalising new technologies. Several of the respondents highlight that modern innovativeness is requiring a shift in the way of handling its internal capabilities, especially in more mature business where an established way of doing things has over the years formalised a “status quo” and “expert” culture. This has been highlighted by several respondents as an inhibitor to leverage new technologies, to quote respondent A;

"*Some of these people that have been these people have been working with product development for their whole career, when you tell them that what they are used to do is not the way to do it anymore there is often a problem that they keep going back to their old ways as soon as you do not force them to use simulation*". Thus, in accordance with the majority of respondents, observing innovative processes either internally or externally can be challenging as it entails the requirement of changing the culture and mentality from being reactive to embracing a "what's next" way of thinking. Teece (2018) emphasises that a common problem when sensing opportunities is reliance upon too few actors within the monitoring process of new trends, as it can lead to tunnel vision. Whereas the findings do not explicitly suggest that fewer actors within the monitoring process leads to tunnel vision, the majority strongly oppose the expert culture. Respondent B describes this as thinking like a venture capitalist, monitoring several trends and then investing, however not all observations or investments will lead to successful new processes. Whereas this in some sense could be argued to be within line with Schwartner (2017) who argues that risk-enthusiasm tends to increase performance, respondent B highlights that in their case this type of mindset risks leading to poor yields. One must really understand what value potentially could be gained, therefore, for their organisation monitoring trends is in a sense a long perspective waiting game, where the goal is to be faster adopters rather than the innovators itself. Respondent D and C highlights the idea that innovativeness is about understanding the service or product to its smallest detail and that without the holistic understanding of once processes the potential synergies will be missed.

In terms of manufacturing firms, this is exemplified with industry 4.0, currently machines tend to be able to say "there is a problem", with new technology the same machine will be able to both specify when and where this problem will appear. Indicating a perceived shift of value from being able to build efficient machinery to being able to find and utilise collected data. This shift in perceived value from the respondents could be viewed from the theoretical lense of Jacobi and Brenner (2017) who argues that organisational alignment is partly targeted there to enable and incentive the organisation to find knowledge gaps. Thus, the analysis could be argued to confirm that the empirics could indicate a validation of the DT/DC framework.

Establish systems that oversee the current knowledge base

The literature suggests that firms need to integrate systems for overseeing current knowledge requirements within an organisation, in order to gain better understanding of what competence and knowledge is required to transform. As previously described, the findings suggest that a barrier perceived within digital transformation concerns the organisational ability to formulate new processes. Those organisations who have been identified to incorporate formalisation of simulation technology into their current routines have also been those who have a self-perceived higher rate capability of implementing simulation technology into their organisational structure. The results can therefore be argued to be inconclusive, thus the researchers argue organisations who oversee and formalise their knowledge base cannot be confirmed to be more likely to increase successful technology implementation.

Analyse what talent needed for digital initiatives

The literature indicates that specific competence can be needed to support the digital initiatives (Kane et al., 2015). Within presented findings, the picture is more inconclusive. Whereas respondent A highlights that they are currently focusing upon hiring people who are described as being native within the right type of digital skills as a response to their digital transformation efforts. B in contrast highlights that too much focus upon hiring new talent risks to result in loss of experience. Other respondents indicate no specific strategy regarding talent requirements for digital initiatives. Even though it is plausible, the collected findings can therefore neither confirm nor reject the action from the DT/DC framework.

5.2.2 Seizing

Define boundaries, not specific tasks, and encourage entrepreneurial spirit

According to presented litterature, whereas the executive layer do have a clear role of pushing down digital strategies, the management should have free reins to implement and fulfil the strategy. Karimi and Walter (2015) describes through the lense that innovative activities should be defined by its boundaries rather than the set directions, Teece (2007) argues that relatively free autonomy in regards to implementation efforts can lead to higher performance. Within the presented findings the autonomy is indirectly touched upon by

several respondents, for example respondent D, describes that organisational supportiveness for employees to try new things encourages people. Whereas a big cultural inhibitor is an organisation which has an "*failure is not an option*" culture, as it decintiviseses the employees from trying, and sequentially sometimes failing. Others highlight the mindset of an Start-up, which in itself is a whole field of management academia. For the larger firms of respondent B, the challenge is to achieve a lean approach as current culture and products are deeply rooted into the existing structures, it is highlighted and encouraged that new approaches should be tried and that failure leads to new insight. Yet, becoming lean and truly adaptive can be challenging as it entails unlearning drivers that previously made you successful. Kane et al. (2015) highlights that firms need to find new ways of imposing risks to leverage the innovative activities, the findings do confirm that risk taking is important, however the findings also suggest that a large part is to avoid the pitfall of expert-bias. Respondent D describes this as "*It's not the same drivers that will make us successful in 20 years as it was 20 years ago, that is a success today and that is often very hard for big companies like us with a lot of experience in the field*.".

Thus, it can be argued that the findings do confirm that an entrepreneurial spirit can act as an enabler for gaining innovativeness, it has been shown hard for established firms to achieve this since current culture easily can become resistant to change through the pitfall of experts.

Create a clear digital strategy to attract and retain digitally skilled people

According to Jacobi and Brenner (2017) and Kane et al. (2015), in order to attract digitally skilled people there has to be a clear digital strategy. Kane et al. further emphasises that it also acts as a retention mechanism. Organisation A, B and D agree that it is important to attract new talent, however they do not explicitly say how that should be achieved. Furthermore, organisation respondent C and E do not express much of a need for new talent at all. The results are therefore inconclusive and the action presented in the DT/DC framework can not be confirmed.

5.2.3 Reconfiguration

Allocate resources for learning activities and education

As previously discussed, there is consensus that learning culture is beneficial for the company. All respondents have stressed that old talent needs to adapt to fit digital initiatives, but that it is often hard to get them to adapt to digital workflows. Once again, active leadership is lifted as an important factor for gaining resources to such initiatives. A and D especially emphasises the importance to repeat things over and over again to make such changes stick. This is in line with literature from Jacobi and Brenner (2017) and Kane et al. (2015) who state that education of all employees is crucial for success when committing to a technological shift. As such there is unity between literature and the viewpoint of all respondents. It can thus be concluded that resource allocation for learning activities and education has high importance when reconfiguring the organisation to become more digital. Moreover, all organisations agree that retention of current talent should have top priority but that they need to be able to adapt and learn new things. Derived from that, industry knowledge should not be neglected as it can prove very valuable. B previously stated that old staff offers more bang for the buck which further strengthens the hypothesis that such resource allocation is valuable.

Set up structures for collaboration between old and new talent

According to Schwertner (2017) and Kane et al. (2015), a culture that challenges and supports the existing workforce in their desire to learn new things encourages old and new talent to work together. This is in line with Jacobi and Brenner (2017) whose take is that mentorship both upwards and downwards benefits the knowledge accumulation through all levels. Organisation A, B, D explicitly supports this idea with similar statements of how old and new talent achieve maximum efficiency by combining their knowledge to learn from each other. Even though organisation C and E does not explicitly talk about collaboration between old and new talent, they do support the idea that collaboration overall is a very important factor for success. Derived from both literature and empirics there is a strong consensus that collaboration is beneficial in DT. Even though all respondents do not expressly support setting up structures for collaboration between old and new talent, we make the assumption that it is highly probable that this action from the DT/DC framework is

beneficial in DT efforts. Furthermore, Matt et al. (2015) states the importance of sharing expertise since employees have different skills sets. As such, older employees accelerate their digital knowledge while new employees learn valuable industry experience. This is more or less exactly in line with statements from both organisation A and B. Since most of the organisations with the perceived best collaboration within the sample group utilise some form of structures for collaboration between old and new talent, and there is support in the literature supporting the DT/DC framework, it is concluded that such structures do support DT.

Adapt and commit to digital workflows

The two prior actions regarding resource allocation and collaboration structures in the DT/DC framework are in essence part of the solution in adaptation and commitment to digital workflows. The top four organisations in regards to self perceived simulation maturity have chosen to implement simulations to varying degrees as part of a proactive approach to environmental changes. As such, they have reconfigured part of their organisations to be adapted and committed to digital workflows. There is even a sense that the organisations that have come the furthest in this perform slightly better than those who are slightly behind. Speaking to the latter there also seems to be an urge to expand on the digital side since they believe it would be needed to be as competitive as possible. On the opposite, organisation E seemingly struggles more than the rest in gaining efficiency and creating competitive advantages. As such, the results of adapting and committing to simulation, even though it is hard sometimes, will generate higher probability for success.

Three of the organisations even think that people that do not want to adapt to digital should be layed of the organisation. This is in line with Jacobi and Brenner's (2017) statement that individuals that do not commit to the digital strategy will render themselves obsolete. As such, there is some validity to the action in the DT/DC framework even on an individual level. This is not surprising since actions of individuals are contagious for the organisational culture and actions of others. As previously discussed there are connections between strategic alignment and ambassadors pushing for change in DT, and thus it is reasonable that people that do not want to adapt and commit to digital workflows become inhibitors of the DT itself. To further strengthen the argument, most of the organisation believes that you should not hire people without digital skills at all since it does not provide value to the DT. Also, according

to Jacobi and Brenner (2017) and Kane et al. (2015), it is crucial that a positive attitude towards DT is ingrained in the corporate culture. Based on all the above, the reconfiguring action of adapting and committing to digital workflows is validated.

5.3 Corporate Processes and Structures

5.3.1 Sensing

Utilise cross-functional collaboration for better sense of threat and opportunities

As presented within previous dimensions, the findings suggest that innovation for producing firms is increasingly reliant upon a large understanding of all internal processes down to the detail. In terms of corporate processes and structures, several respondents have highlighted collaborations across functions and divisions. As an example, respondent D describes the cross-functional teams as vital for his organisation capability to both identify local problems, raise internal awareness of the identified issues. The literature suggests that ability to work across functions can increase firm performance as it could be considered an alignment tool of the firm's business processes (Casullo et al 2017; Robu et al. 2021). Within the findings, respondent E mentions that within his organisation there are silos presented, and internal competition culture between employees which according to him affects overall performance. The identification of problems and fixing problems are more reliant upon informal networks. Respondents E description could be viewed as an indicator that the lack of formalised cross-functional tools is affecting the overall firm performance. Thus the findings can therefore indicate that the presented literature confirms the potential value to be gained by utilising cross-functionality.

Routines for evaluating internal capabilities and sensing external sources of capabilities

According to the conducted interviews, cross-functional teams are utilised as one approach to sense issues and opportunities. In reality, several of the case firms are reliant upon informal networks and personal knowledge of whom to contact when issues emerge, or as respondent A describes it "*It is typical within our company that a lot of problems are solved by people that know who to address*". Other respondents of D, C and B agree with respondent A regarding the usage of informal networks, while it is considered to enable an agile approach.

B highlights however highlights the risk of overlapping competence when internal communications are too heavily reliant upon informal networks, instead their firm have instituted technical centres of expertise which formalises the process of finding the right person. Whereas this approach has been highlighted as pragmatic, it has not been covered by the added literature. The literature suggests that cross-functional teams are an alternative approach for getting the whole organisation involved into the process of evaluating core capabilities and to avoid competence overlapping (Eriksson 2014; Eisenhard et al 2000). Respondent D highlights an approach of utilising a type Feedback loop during R&D initiatives, where new projects are required to be evaluated from several functions.

The results could indicate formal approaches for evaluation of core capabilities through methods of cross-functional teams or feedback loops are complementary aspects to the organisational process, as people according to the findings tend to utilise more informal approaches. This could however prove to affect sensing capabilities negatively as it relies upon personal knowledge of the organisational network and furthermore risks of missing valuable insights from excluded stakeholders, resulting in formation of silos. The literature also highlights this as a risk of inefficient usage of internal communication (Jacobi and Brenner, 2017). All in all, according to the above, the researchers argue that the analysis indicates that the empirics confirm the literature presented within the DT/DC framework.

5.3.2 Seizing

Incentivise collaboration and knowledge sharing

As highlighted within the previous chapter of 5.3.1, informal approaches of sharing competence have been identified as a primary driver within a majority of the respondent organisations. The findings have also indicated that stickiness of digital transformation initiatives relies upon the leadership's ability to constantly push down digital strategy to lower hierarchical levels. This could be highlighted through the example of the respondents of B and D in contrast to respondent E. While the organisations of respondent B and D relies upon a defined, formalised methodology to approach in this case the implementation process of simulation technology, the organisation of E only pursues formal guidelines in regards to digital tools, and that the usage is of an more ad-hoc basis. The contrast within the findings could be an indication that management are indeed required to be a strong actor identifying

what knowledge is required and then actively pushing for the organisation to gain and utilise the identified knowledge in its processes. According to Teece (2007) the lack of commitment is one the most common pitfalls for companies when implementing new technologies. Within the literature this has been presented as the managerial aspect of understanding how digital transformation impacts current operations in terms of capitalising on the right opportunities and gaining stakeholder buy-in (Jacobi and Brenner 2017). Jacobi and Brenner further recommend firms to set guidelines, incentivise, and promote digital skills to encourage utilisation of new technologies and help them stick. The findings could as such be argued to confirm the literature in the sense of establishing that the executive layer needs to be the driver of establishing corporate processes that increase the utilisation of new technology, to make them actually stick.

Continuous evaluation of potential value for transformation projects

From the conducted interviews it is clear that it is difficult to measure the value of transformation projects. All of the interviewed organisations state that they do not directly measure the effectiveness or success of digital initiatives through KPIs, rather they all use more indirect measures. There are several stated reasons for this but in essence they all have similar views. For once, results are difficult to pinpoint to specific functions and thus KPIs can not be applied. Furthermore, effects are not always that clear since they generally change the way of operation and therefore are hard to benchmark to legacy projects. Additionally, few projects are exactly the same which makes comparing projects one to another virtually impossible. Rather what seems to work is to measure qualitatively like speed to market, reach, visibility etc. and not only the profitability which is in line with Jacobi and Brenner (2017). According to Colli et al. (2022), firms often face barriers when implementing new technology partly because it is hard to translate new technology into a clear positive business case. Furthermore, they suggest that firms should establish routines for continuous reflection towards defining perceived value and potential of the specific technology. Based on the interviews, there is some truth to this statement. All seem to believe that value can be showcased through business cases, making the transformation more tangible for all stakeholders. By doing this the organisations strive to showcase success stories which could be communicated. Communication is also lifted by a few as a crucial part of the evaluation of such projects.

There is support in the literature from Karim and Walter (2015) and Jacobi and Brenner (2017) that continuous evaluation of these projects acts as aid for resource allocation and thus the performance and longevity. Moreover, continuous evaluation ensures engagement from top management which not only mitigates bad investment decisions, but also provides other stakeholders with confidence that the transformation will provide value. As such, there is support for the continuous evaluation of potential value for transformation projects from the DT/DC framework. Even though there are many hardships of doing so in a way that all stakeholders can see the value, it is concluded that it is crucial in order for the transformation to gain substantial traction.

5.3.3 Reconfiguration

Organise teams after projects requirements rather than function

There is consensus between the organisations of the importance of collaboration across functions. This is in line with Jacobi and Brenner (2017), who argues that work across functions gives a more holistic view of the operations and mitigates silo thinking. Furthermore, this is backed by Karimi and Walter (2015) and Eisenhard et al. (2000), both state that organisations that structuring teams cross-functionally gain advantages by utilising competences of several functions and thus gives better results and coordination of activities between departments. As such, both theory and empirics support this action from the DT/DC framework which conclude that it is beneficial to organise teams after project requirements rather than function in DT. However, derived from the interviews, it is not always an easy task to organise teams this way. There can be a few challenges that are perceived to inhibit the effective use of collaboration. A few of the organisations acknowledge that contradictory goals between functions could be a limiting factor for the effectiveness of this structure. Thus, highlighting the importance of aligning goals and objectives, as well as thorough resource allocation. Respondent E also describes that they have internal battles between silos as there is individual prestige at stake which hinder performance, further strengthening this argument. Also highlighted by a couple of the organisations is that this type of collaboration might be easier in some functions than others.

From the analysis it is concluded that organising teams after project requirements is beneficial for the effectiveness in DT. According to C, this collaboration and integration

between functions is even crucial for a DT to take place at all. Based on this there is evidence that this type of structure enables digital initiative to spread across the organisation. However, there is also evidence that such a structure can be hard to implement. As such, it is important that the organisation continuously evaluate the projects to ensure effective use of resources and collaboration between stakeholders of the project and that they reconfigure teams to fit project requirements rather than function.

Leverage buy-in to scale digital initiatives

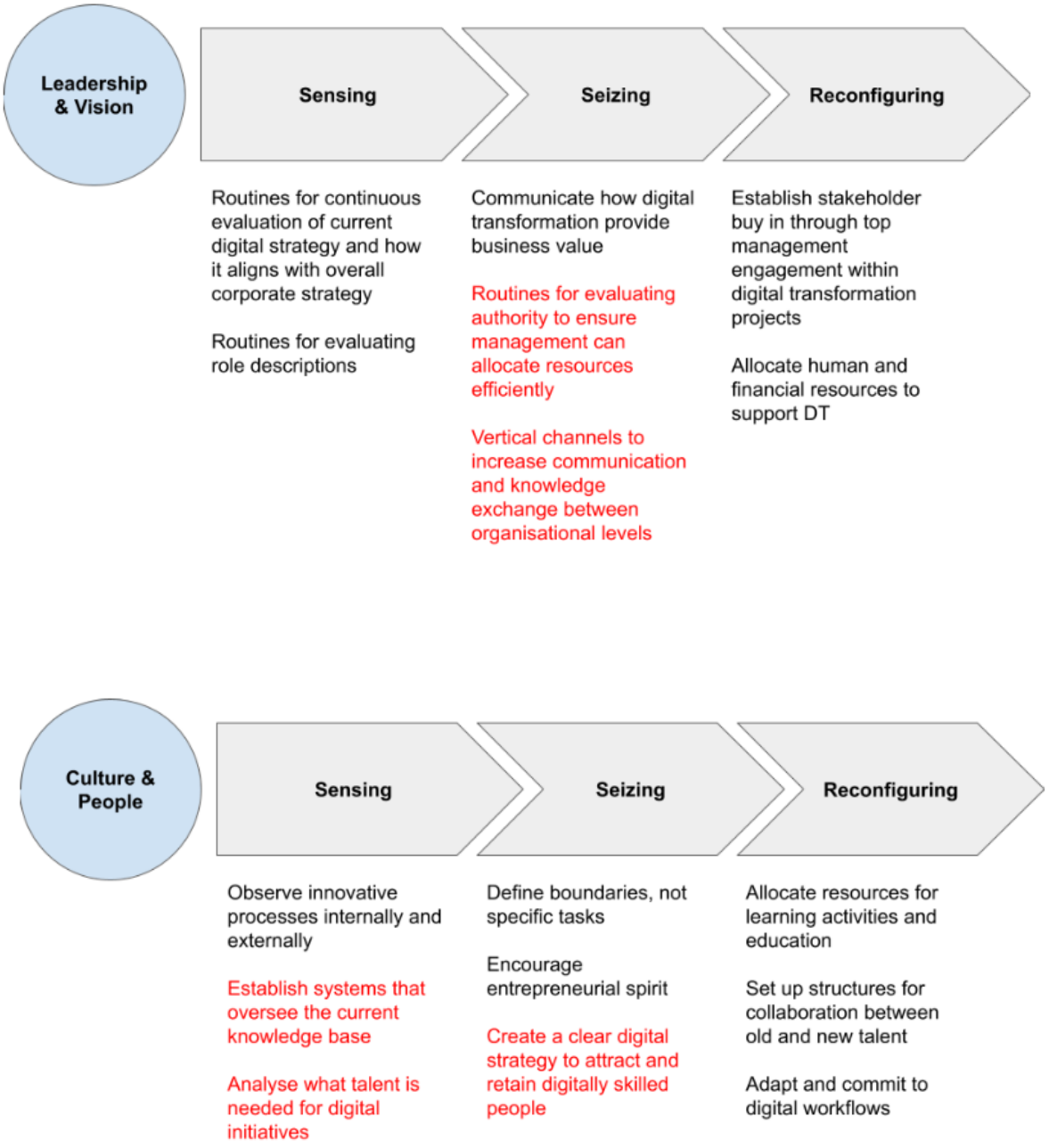
In order to scale digital initiatives, support is needed throughout the organisation. There are several reasons for that. Firstly, top executives and management act as ambassadors in DT, it is more often than not those that people look up to when getting inspiration or guidance on how to proceed in a changing environment. As such, leadership buy-in can be utilised as the foundation for getting a change started. As previously discussed, this is in line with how all researched organisations that have a digital strategy describe how they anchor it in the first place. To further back this argument, Schwartz (2017) argues that successful digital transformation is dependent on alignment between strategy, reconfiguration and optimisation of business processes, whereas one of the main components is to gain buy-in from all involved stakeholders. This is also the view of Jacobi and Brenner (2017) and Robu et al. (2021), to first target top management and get their support to then identify and convince all stakeholders involved. There is therefore reasonable evidence that buy-in from top management will act as guidance for the rest of the organisation and make it easier to sell the initiatives to others. To further tie in to previously discussed subject of aligning daily activities, it is concluded that support from the top and managers that actively push for the digital initiatives has shown to increase effectiveness in change and mitigating risk of falling back to old tracks. By getting proper buy-in throughout the organisation an army of aligned ambassadors is created which will not only provide a good base for change itself, but also aid the stickiness of digital initiatives.

As with most new things, recieving buy-in from all parts of the organisation is challenging, especially when it comes to new technology that could be hard to initially understand. Many of the organisations also acknowledge this fact and emphasise the importance of showcasing business value in order to gain buy-in from the organisation. As such, we can confirm the

action from the DT/DC framework to leverage buy-in in order to scale digital initiatives with a side note that buy-in will not come easy.

5.4 Revised DT/DC Framework

Derived from the analysis, a revised framework has been created. Actions that have not proven to be supported by the empirics have been marked in red. However, this does not entail that they lack relevance for DT, only that they can not be validated by this research.



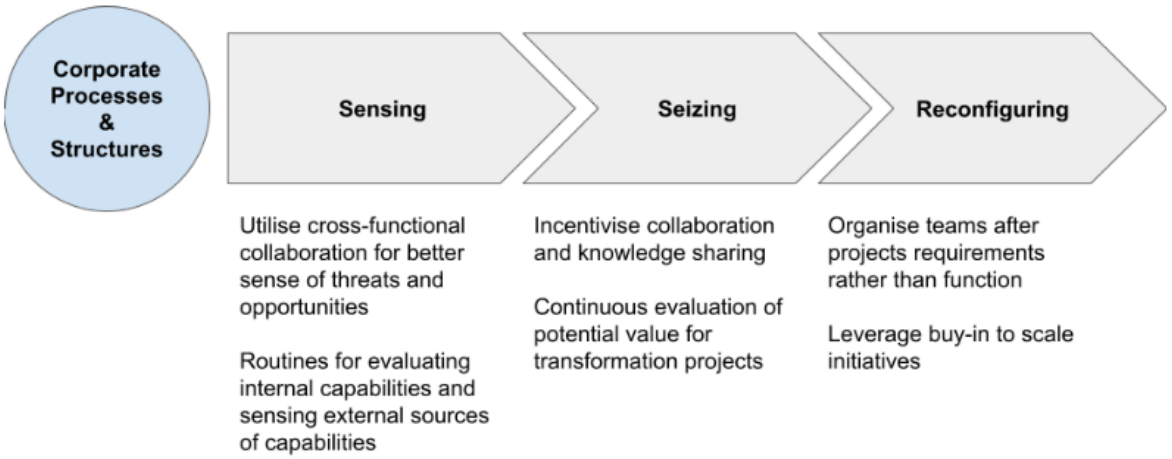


Figure 6 - Revised DT/DC Framework

6.0 Conclusion

Within this chapter we conclude the thesis by giving an answer to its research question and discuss the managerial implications of our findings. Lastly, the researchers will open up for future research and discuss the limitations of the study.

6.1 Conclusion

I. What are the potential enablers of digital transformation?

According to the analysis and the presented DT/DC framework several enablers of DT have been identified. Firstly, leadership has been found to have a crucial role within driving the DT. Within the analysis this has been showcased through that organisational leadership has to act strongly, actively and as an ambassador to push and align the DT into the overall corporate strategy. As such, a top-down approach of implementing DT is preferable in contrast to bottom-up, as it increases the likelihood of stakeholder buy-in. To concretise what value could be gained from DT, leaders are encouraged to use storytelling, and tangible success stories showcasing how the technology can be leveraged to gain business value.

Secondly, cultural aspects have also been identified as potentially enabling. Organisational cultures that embrace supportiveness, risk-taking, and entrepreneurial spirit to be favourable

for in transformation efforts since it increases likeliness for middle managers and employees to use a trial and error approach and thus decreases fearness of failure. Other cultural aspects focus upon embracing and learning, and trial error way of thinking. This needs to be taken into consideration when defining DT initiatives, by defining the boundaries rather than specific tasks as this encourages the trial and error culture. From the perspective of the organisational talent pool, companies should ensure knowledge exchange between the digital-native talents and more senior staff.

Lastly, in terms of corporate process and structures, the thesis has identified that organisations need to formalise several of its internal capabilities. For collaboration this means that cross-functional teams should be the norm, as it enables companies to view its value chain and thus issues more holistically, and also enables knowledge sharing more easily. Regarding the implementation of new technologies, the research has identified that a standardised approach or best practice of how and when to use, in this case, simulation technology increases the stickiness. Routines for continuously evaluating this best practice and the potential of new technologies are also required since it can give new insights into how current processes can become more efficient, thus increasing performance.

II. How can organisational capabilities be leveraged to successfully digitally transform?

As previously discussed, digital transformation has been identified as an important consideration for firms to stay relevant. Organisations that do prepare for a more digital world will have a better condition for the future. As such, the aim of the research has been to find relevant ways to organise organisational capabilities to support digital transformation efforts. By combining literature of digital transformation and dynamic capability, the DT/DC framework was created. Derived from that, a series of 22 suggested actions that will increase the probability to successfully digitally transform by utilising dynamic capabilities emerged. Thus, the more actions in the DT/DC framework that are being implemented, the more likely one's organisation is to succeed in digital transformation. However, empirical findings did not show evidence that all of the suggested actions could be confirmed to influence the success rate. By contrasting empirical findings with the presented actions a revised DT/DC framework was created. None of the presented actions in the original framework could be deemed invalid, however 17 actions have been proven to have enough evidence to be

included in the revised framework. As such, this thesis has been able to conclude an actionable framework for organisations facing digital transformation.

6.2 Discussion and suggestion for further research

This thesis has been aimed towards exploring an expansive field of digital transformations, and more specifically how organisations can potentially increase their capability to adopt simulation technology into their R&D activities. More specifically, this has been done through a multiple case study, using manufacturing companies who are trying to implement simulation technology. The research has highlighted Jacobi and Brenners (2017) dimensions of 1. *Leadership and Vision,* 2. *Culture and People*, and, 3. *Corporate Processes and Structures* combined with Teece (2007) definition of Dynamic Capabilities. This has resulted in 17 actions that we argue could enable firms to succeed in their digital transformation efforts. Regarding Dynamic capabilities, has this research identified the organisational capability of reconfiguring as particularly important, as leadership engagement, stakeholder buy-in, resource allocation have been identified as vital for leveraging DC to succeed within DT. Complementing previous research of Marx et al. (2021) who have argued that sensing and seizing being more particularly important to DC. This has through the analysis led to the research being able to identify enablers of digital transformation as well as capabilities that are possible to leverage. However, it should be pointed out that there might be aspects that have been overlooked or missed that could have been incorporated into the presented framework. The managerial implications from our results could be argued to be that dynamic capabilities in accordance with previous research describe firms ability to react and transform (Teece, 2007). Whereas this concept has been criticised for being abstract or hard to define (Easterbt-Smith et al. 2009; Winter, 2003), the result of this research aims to further clarify some potential actions that could further increase a firm's dynamic capability. Thus we hope the thesis has contributed to both research within the field of dynamic capability as well as the field of digital transformation. As such the managerial implications could be considered to lay within the framework being guiding in terms of gaining an adequate toolset to achieve digital transformation.

The findings presented within this thesis are based upon manufacturing firms adopting simulation technology into the R&D processes, from an generalisability perspective this could implicate that the findings could be hard to apply upon other industries or technologies.

Therefore we would like to open up for future research focusing on more general technology adoption, or more service oriented companies. We would also like to open up for a comparison between service oriented firms and producing firms, to gain a better understanding of what types of issues that could be faced and whether they differ. We would also like to encourage further research of quantitatively testing our framework upon companies as a measurement of digitally transformation readiness of firms planning or trying to implement simulation technology. This could give insight into how widely adopted our presented actions are.

7.0 References

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8.0 Appendix

Appendix A - Interview Guide

1. Could you shortly introduce yourself?

2. How long have you been employed within the firm and your current role?

Simulation technology

3. To what extent is simulation technology integrated in your business?

4. Have your practices changed as a result of adopting simulation technology?

5. How has simulation technology affected firm performance?

Technology Adoption

6. What are the main drivers for adopting digital technologies in your business?

7. What are the main challenges/barriers of digital transformation for your firm?

8. What risks or threats does your organisation consider when deciding to invest in digital technologies?

9. How do you measure the success of digital transformation/initiatives?

Strategy

10. Is there a clear alignment between your digital strategy and your overarching corporate strategy?

11. How well does the organisation align its activities to the digital strategy?

12. How is digital strategy anchored in the organisation?

Leadership, people and culture

13. What role does leadership have in digital transformation? Are roles and responsibilities clear?

14. To what extent does the organisation adjust human resources to fit digital initiatives?

15. How would you describe collaboration within the organisation, both within and between units and hierarchical levels?

16. How do you perceive your corporate culture? In what ways does it support or inhibit digital initiatives?

Appendix B - Interview Request Email

Hi,

My name is Jacob, I am currently writing my master thesis in Innovation and Industrial Management together with Oliver Örskov. We are writing this thesis in cooperation with Marcus Oledal at EDR Medeso office in Gothenburg. Marcus has recommended me to reach out to you regarding the potential of setting up an interview regarding your experience within implementing simulation technology into organisations.

Our master thesis focuses upon the topic of digital transformation, and what potential enabling factors could influence the speed of adoption of new technology. Therefore we like to get in touch with people with experience of both simulation technology and the organisational aspects of implementing new technologies into the organisational process. If you are interested in contributing to our research by participating in an interview.

How does your schedule look during the coming week?

Best regards..

Appendix C - Pre-interview Email

Hi,

To prepare you for our upcoming interview, we will in this email briefly mention the topics as well as attach an interview guide. The interview will be done in two primary sections, firstly will be questions more hands-on related to simulation technology and to what extent simulation has been integrated into your firm. The first section will also include questions regarding why your firm is adopting digital technologies.

The second section of interview questions will be directed towards the strategic and cultural aspect of how your firm is adjusting and formulatning itself to cope with digital transformation. Thus the second section is more directed towards the managerial aspects of the digital transformation efforts.

Lastly, the interview will be carried out through a semi-structured method. Meaning that some questions might be added during the course of the interview to give us the researchers levay ask further questions when needed. The interview will also be recorded to aid us with transcription.

Looking forward to our meeting!