Implementing Digital Business Strategies

A study of the impact and application in the Medical Technology Industry

CHRISTOFER TÄRNELL
Implementering av Digitala Affärsstrategier

En studie om dess påverkan på medicinteknik industrin

CHRISTOFER TÄRNELL
Abstract

Digital innovation is a key to solve problems of future healthcare. Medical Technology (MedTech) firms will have to employ successful digital business strategies (DBSs) to become innovative and increase the efficiency to solve the problems in healthcare. This thesis aims to outline important aspects when employing a DBS in a MedTech firm. The results are based on empirical data from consultants working with digital strategies as well as professionals working in the MedTech industry. I conduct semi-structured interviews with 11 professionals of different backgrounds to gain their perspectives and insights on how to successfully implement a DBS in an organisation. I discuss and conclude their opinions concerning the business model and change management aspects of a DBS. The focal point of this thesis was partially led by my commissioner, Human Care.

From the literature review and interviews, I introduce several interesting findings which can be helpful for both management of MedTech firms as well as consultants working with DBSs. Some of the findings contributing to successful DBSs includes improving the organisation’s innovative ability and creating opportunities for new innovations. This can be done by working more agile, introducing new competences and co-innovating with customers of the firm. Furthermore, the DBS can change firms’ business models. Interviewees find that the impact can be minor or extensive depending on the DBS employed and can ultimately lead to entire new business models being created. The DBS can have disruptive impact on incumbent firms’ current business and create completely new products or services. Management must correctly evaluate their current position and future desired state to develop a strategy fit for their specific firm. Finally, I find that there is a clear correlation between the changes in the business model and the change management work when implementing a DBS. I present some areas that management of MedTech firms must attend in order to increase the chances of success in their DBS.

Keywords: Digital Business Strategy, Business Model, Change Management, Medical Technology, Leadership, Competence, Innovation, Digital Disruption.
Sammanfattning


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Abbreviations

CEO - Chief Executive Officer
CDO - Chief Digital Officer
CIO - Chief Information Officer
DBS - Digital Business Strategy
GPO - Group Purchasing Organisation
HMO - Health Maintenance Organisation
IDN - Integrated Delivery Network
IT - Information Technology
IVD - In Vitro Diagnostics
KPI - Key Performance Indicator
MedTech - Medical Technology
MT Department - Medical Technology Department
MVP - Minimum Viable Product
R&D - Research & Development
SME - Small and Medium-sized Enterprise
IoT - Internet of Things

Glossary

Internet of Things (IoT) - Sensors are installed into everyday objects, network connections enables them to deliver data that can be useful to firms providing the products as well as customers using them. [Hunke et al. (2017)]
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1 Introduction

1.1 Background

Use of digital technology and digital innovation is often seen as a solution for firms to apply in order to solve inefficiencies and make the organisation more competitive. Transforming firms to become more digital is said to be a common solution of many issues society faces today and will face in the future. The term “digital” is for many managers a scary term and causes a lot of stress since their competitors seem to utilise it and their customers demands it.

In many ways, the use of digital technologies is crucial for future healthcare, as life expectancy increases, people are living longer but the workforce supposed to support them is steadily decreasing [WHO, 2015]. This trending demographic shift is putting pressure on current healthcare systems, both from a capital and human capital perspective. Currently, the state of healthcare will not be sufficient in the near future and innovation is required to solve this growing concern [Zaltman et al., 1973; Das, 2017].

However, most researchers target the applications of the technology and how these possibly can solve the inefficiencies in the healthcare sector, almost no research mentions how this evolution in healthcare will affect the stakeholders producing them, i.e the MedTech industry. One thing that researchers overlook is that regular MedTech firms in most cases have no previous history in producing connected things such as: 4G devices, computers and similar. Firms often feel pressured on this matter and realise the needs of becoming more digital. How this should be done, on the other hand, is for many MedTech firms unclear. The possibilities that digital innovation creates are endless and it might change firms’ current business models [Westerlund et al., 2014] and the entire organisation itself.

Firms need to use clear strategies as well as sophisticated and structured implementation processes to achieve and utilise the potential of digital technology to survive in the future [Belcredi et al., 2016]. This can be done using Digital Business Strategies (DBSs). A DBS is a strategy which uses digital tools as means to develop the business. This can both be digitising products or digitising processes within the firm. Successful implementation of a DBS will be crucial for the future existence of many firms in MedTech. The competences of how to successfully approach a DBS and implement it in the business is absent and the impacts it has on the organisation is also unknown. MedTech firms will in the future need to transform and digitise. Thus, I have concluded that there is a need to conduct further research to understand important factors when MedTech firms implement a DBS. These strategies often require extensive transformations in the organisation and I will investigate on the change management aspects associated with a DBS as well as the business models’ roles in a DBS.

1.2 Research Problem

The necessity of implementing a DBS to become more digital in MedTech is crucial and the importance of understanding how this will impact the firm is equally significant. However,
current research focuses on the application areas of a DBS and research regarding the firms intended to produce these products is scant. There is a need to develop an understanding of the strategical factors and implementation process of how a DBS can be used in a business. This will help MedTech firms address their needs and how they should tackle the development of digitalisation from an organisational perspective.

Authors have viewed different aspects of a DBS and found that it might change many parts of the organisation. Matt et al. (2015) have concluded that it may affect the firms processes, products and sales channels. Downes and Nunes (2013) goes as far as mentioning that the firms business models might change. However, researchers tend to overlook the aspects needed to be considered when implementing a DBS in the organisation.

The technological shift will impact the organisation and it will enter an area which involves a lot of uncertainty. I have found that it is necessary to understand the change management aspects of the DBS and how the firm needs to realign its business when implementing a DBS in the organisation. An organisational change requires firms to deal with resistance and identify factors to successfully implement it (Kanne 2004; Kotter et al. 1995), this is absent in the research regarding DBSs. Authors have also outlined that the business models might be impacted, and even new created (Westerlund et al. 2014). They do not, on the other hand, outline how the implementation process of a DBS is connected to changes in the business models. Thus, I have found a research gap where there is a need to better understand the change management and business model aspects when implementing a DBS.

1.3 Purpose

The purpose of this thesis is two-sided. Firstly, this thesis aims to understand important change management factors when a MedTech firms implement a DBS in their organisation. This includes understanding what firms needs to consider when implementing a DBS. Secondly, I will investigate how the firm’s incumbent business models are impacted from the implementation process of the strategy. This aims to investigate how the different components of the business models are affected.

1.4 Research Question

In summary, there is a need for a better understanding of how a DBS will impact the MedTech industry and an approach of how to handle this uncertainty must be developed. More specifically the following research question needs to be addressed:

- What are important aspects to consider when MedTech firms implement Digital Business Strategies?

In order to answer the research question at hand, more specific research questions have been formulated:

- What are important change management factors to consider when implementing a DBS?
1.5 Delimitations

I have chosen to delimit my research to only cover the Swedish MedTech industry as the contextual setting in Sweden is similar, however, between other countries and continents it might differ, to generalise the findings of the research it is important to maintain the setting constant. Sweden employs a strict Governmental Procurement in the healthcare sector and this might impact the findings and potential framework compared to other settings, thus, the geographical limitation. Secondly, the commissioner of this project is Human Care, a Swedish MedTech firm, and it lies in their interest to conduct further research into their business areas.

Furthermore, this thesis is not limited to cover any particular size of business because of two reasons. Firstly, 95% of Europe’s MedTech firms are SMEs. This means that the research will already involve similar firms because of the industry’s nature. Secondly, by including all types of firm sizes, this allows a comparison whether there exists any difference between the challenges small and large firms faces.

I have chosen to limit the thesis to only cover firms producing Medical Devices, as defined by the European commission. The reasoning is quite clear, since the regulations differ between Medical Devices and In Vitro Diagnostics (IVD) it is valid to limit to only research one to increase validity. Extending the project to also involve the IVD market would require more thorough research and given the time constraint is deemed as too extensive.

I will only cover the areas outlined in the research questions. Namely, the change management as well as the business model aspect of the DBS. The delimitation is chosen as I am interested in finding how firms should implement the strategy internally as well as being able to outline the issues firms faces when performing a strategy of a digital nature, in an often very analogue business environment.

Moreover, this thesis is also limited to cover the MedTech industry and do not involve the entire healthcare industry, i.e hospitals and elderly care. The digitalisation of hospitals and the entire healthcare industry is an important aspect as well but revolves another area. The digital development in hospitals and elderly care certainly affects the MedTech industry, but is an entire different subject to investigate.

1.6 Expected Contribution

I expect to contribute to the management literature and provide insights into the change management aspects and its characteristics in the context of the MedTech industry. It will provide a thorough and detailed empirical data collection from leading professionals view on the implementation of DBSs in general and in the MedTech industry in particular.
Furthermore, their view on the business model’s role in the DBS will also be outlined and de-
tailed to provide a connection between the business model of the firm and its relation to a DBS.
This will detail how firms’ incumbent business models might be affected by the implementation of a DBS.

An increased understanding of the change management and business model aspects of a DBS might increase firms’ success in changing their firm to become more efficient, utilise digital innovation and increase their chances of addressing future requirements of the MedTech industry. Better use of technology in MedTech will ultimately lead to better and more available healthcare.
2 Overview Medical Technology Industry

2.1 MedTech

MedTech can in general be defined as Medical Devices aimed at being applied in healthcare to treat, prevent or monitor diseases of people in need of aid. MedTech also includes In Vitro Diagnostics (IVD), which can be tests done on for example tissue or blood to discover diseases. Furthermore, IVD also involves sequencing tests on DNA. Since IVD is not intended for research in this study, the applications and regulations of these will not be outlined further.

Medical Devices are intended to ease life of patients or help healthcare personnel in their daily work through improved healthcare quality. This is done through earlier diagnoses, less extensive treatment options and reduced stays at hospitals and rehabilitation (Avamed, 2004). The exact definition of medical devices differ between countries. EU defines MedTech, which impacts its member states, as (citing: Council Directive 90/385/EEC on the approximation of the laws of the Member States relating to active implantable medical devices, The European Parliament (2007)):

Any instrument, apparatus, appliance, software, material or other article, whether used alone or in combination, together with any accessories, including the software intended by its manufacturer to be used specifically for diagnostic and/or therapeutic purposes and necessary for its proper application, intended by the manufacturer to be used for human beings for the purpose of:

- Diagnosis, prevention, monitoring, treatment, or alleviation of disease
- Diagnosis, monitoring, treatment, alleviation of, or compensation for an injury or handicap
- Investigation, replacement, or modification of the anatomy or of a physiological process
- Control of conception

The definition of MedTech devices and how to classify them differs between countries but are in some sense quite similar to the amount of regulation and surveillance impaired (The European Parliament, 1993; Canadian authority of the Minister of Health, 2015; Zuckerman et al., 2011; Australian Office of Legislative Drafting and Publishing, Attorney-General’s Department, 2012). However, firms with the intent of entering new markets within MedTech might need certain approval from each legislator in order to establish their business in that specific country (Zuckerman et al., 2011). Furthermore, the industry faces new tougher regulations and firms in the industry needs to adapt to these (Belcredi et al., 2016).

MedTech Stakeholders

MedTech is a special industry and involves several stakeholders that impacts how business is done, products developed and who controls the purchase of products. In general, products are often purchased and utilised by the same stakeholder. This generality does not apply in MedTech, where stakeholders are divided up into four general groups, see Figure... (Behkami and...
Patients are the ones who receive the care and are affected by the quality of the products and care that they receive. The payers of care are either insurance companies or the government depending on private or public care. Either way these stakeholders are interested in purchasing as efficient care as possible, which essentially means that they will put quality against cost into their consideration. Furthermore, the government impairs regulations and sets standards for MedTech companies acting on the market, restricting the way firms can develop products and sets minimum requirements on their products. Lastly, the providers of care are also interested in the way products improve their way of providing healthcare and are able to improve their organisational efficiency. All these factors need to be taken into consideration when developing and producing products in MedTech. Belcredi et al. (2016) points out that these factors are rapidly changing. For example, experiments with integrated care models are being carried out where healthcare providers are moving away from procurement and price to a holistic perspective considering quality and total cost instead.

**Key Stakeholders in MedTech**

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<td>Nurses/Physicians</td>
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*Figure 1: Summary of key stakeholders in Belcredi et al. (2016)*

**MedTech Supply Chain**

The MedTech supply chain also has specific characteristics compared to other more general industries. Because of the number of stakeholders involved as outlined above, the supply chain and transactions becomes complex as well. Manufacturers in the chain can in general be classified into two groups: pharmaceutical and medical device manufacturers, with medical device manufacturers being the group intended for this study. These products are then purchased by group purchasing organisations (GPO), wholesalers, distributors and sometimes by independent contractors from the manufacturers which are then delivered to providers such as hospitals, integrated delivery networks (IDNs), physicians and pharmacies. The payers of the supply chain are employers, individuals and governments. The payers pay through fiscal intermediaries such as insurers, health maintenance organisations (HMOs) and pharmacy-benefit managers, see Figure 2.
Medical Devices Classification

The medical devices have a wide range of application areas and are therefore of different levels of complexity. The European Commission classifies medical devices using a risk-based evaluation model, along with Canada and Australia, where the risk is assessed based on the vulnerability to the human body, taking into account the associated risk with the device (Australian Office of Legislative Drafting and Publishing, Attorney-General’s Department 2012; Canadian authority of the Minister of Health 2015; The European Parliament 1993). Different criteria are set up which determine the classification such as: the duration of contact with the patient, the degree of impact on the specific part of the body from use of the device. From the examples in Figure 3, an illustration of the different classes are given, devices belonging to Class I can be crutches, band-aids and examination gloves, Class IIA Ultra-sound devices and needles, Class IIB contraceptive and heart monitors, Class III pacemakers and prostheses. The US government also employs a classification of medical devices, divided into three different classes (Zuckerman et al. 2011), which is similar to the other regulators but is only divided into three classes.
3 Literature Review and Theory

This chapter will give an introduction to current research regarding what a DBS is. I will then elaborate on change management aspects and the definition of a change project. I will then introduce the concept of business models and the framework that will be used throughout this thesis.

A preliminary literature review indicates that past studies are primarily focused on understanding how digital technology will help caregivers and patients receiving care, and little focus lies on how this development will impact the firms developing the products. Limited progress has been made on identifying the benefits and factors needed to implement a successful DBS in the MedTech industry, when it comes to change management aspects, changes in the business model, processes and similar in the organisation. Moreover, MedTech firms in general do not possess the ability to develop information technology products even less how to produce or use them. The literature review will give an introduction to digital business strategies and the current concepts related to change management and business models.

3.1 Digital Business Strategy

A digital business strategy or digital transformation strategy, henceforth (DBS), will in this study be defined as a strategy where digital technology or digitisation are means to change or improvements within the organisation to change or create value. These strategies are becoming more and more important as digitalisation is becoming a larger part of all types of industries and is not only reserved to the typical internet/ttech businesses such as Google, Facebook and Apple. Several researchers have investigated the area of DBSs and concluded its importance (Matt et al., 2015; Bharadwaj et al., 2013; Drnevich and Croson, 2013). The process of integrating digital technologies in firms often affects large parts of it such as: products, processes, sales channels and supply chains (Matt et al., 2015). The benefit of it is attributed to several parts of the firm and might lead to entire business models being reshaped (Downes and Nunes, 2013). Previously, DBS and the entire corporate strategies were aligned but not seen as one common strategy. However, recent studies argue that these two strategies should be merged to one and therefore the entire business strategy should be a DBS (Bharadwaj et al., 2013; CapGemini and MIT, 2013).

What concludes a DBS and what it consists of is somewhat disagreed upon. Matt et al. (2015) outlines two perspectives and four dimensions of what constitutes a DBS. Where the two perspective consists of strategic planning and procedural aspects. Strategic planning is the process of defining the strategy and deciding which resources to allocate in order to pursue the strategy and achieve the goals of the firm. The latter monitor the development, implementation and evaluation of the DBS. The four key dimensions determining the strategy is: use of technologies, changes in value creation, structural changes and financial aspects. The use of technologies refer to a firms attitude towards new technology as well as its ability to use them. Firms need to decide whether it wants to become market leader and set technology standards or follow established technology. New technological innovation often leads to changes in value
creation meaning that the digital change impacts the core business and often deviates from the analogue traditional business (Gilchrist, 2017a). Increased deviations from firms’ traditional business allows enhanced product development and services, but puts more pressure on firm capabilities and competences (Matt et al., 2015). This means that structural changes requires firms to identify placements of the new digital activities within the organisation. Depending on the extent of changes there is a need to either integrate the new activities in the firm or create a subsidiary within the firm (Matt et al., 2015). Lastly, the financial resources sets the constraint and the extent of the DBS. Financial resources are both a delimiting and enabler, depending on the sense of urgency in your business (Matt et al., 2015).

Additionally, Bharadwaj et al. (2013) identifies four different themes that determine the DBS, namely, the scope of the DBS, the scale of the DBS, the speed of the DBS and the sources of business value creation and capture in the DBS. These themes are seen as capturing the entire elements in a DBS. Bharadwaj et al. (2013); Matt et al. (2015) also points out that a DBS involves development of digital products and services (IoT) as well as business boundaries being wiped out and the creation of dynamic business ecosystem.

Olanrewaju and Willmott (2013) identified four core elements that can reshape any business through a DBS: Decision making, Connectivity, Innovation and Automation. These elements are then supported by a cycle of functions of continuous improvement: Customer experience, product and service innovation, distribution and marketing and sales, digital fulfilment, risk optimisation and enhanced corporate control. Gilchrist (2017a) identifies similar areas as key aspects in a DBS where improved customer experience, transforming operational processes, transforming business models, increase operational efficiency and transforming the workforce.

Li et al. (2012) extends the concept of DBSs and constructs a theoretical framework for strategic decision making, supporting capabilities and information sharing in an IoT context. The framework consists of either a get-ahead-strategy, which can be linked to first mover advantage or a catch-up strategy in either the market or technology of the firm. There are both pros and cons of being a first mover or late entrant and the decision making should be based on the firms internal capabilities of employing either of the strategies (Li et al., 2012). The framework can be applied by managers in assess their chosen DBS.

![Figure 4: Get ahead - Catch up strategy](Li et al., 2012)
The ultimate goal of a manufacturing business digitising their organisation is to move towards Industry 4.0, which is a firm that has fully adopted digital technology in its business. Erol et al. (2016) developed a three stage model for businesses to envision and embark on their journey towards Industry 4.0. This framework has a lot in common with the other DBS frameworks outlined above, however, Erol et al. (2016) includes a clear top-down roadmap on how to reach the goal. The first stage involves envisioning the concept of Industry 4.0 in the organisation, identify a value-network of partners to cooperate with. The second stage involves identifying a business model to work towards and how to successfully implement it. In this stage a roadmap is set up where the company evaluates four different segments in a top-down fashion. First, the market (customers) its development and expectation. Secondly, value proposition which involves the development of the product according to the market. Thirdly, identification of key resources, technologies and processes in achieving this. Finally, identifying network and partners to achieve the value proposition stated. The last stage includes specific projects in order to fulfil the statements in stage two.

To conclude the research area of DBS it is clear that many elements and concepts are recurring. Technology, business models, capabilities, competences, partners, eco-systems, customer experience these subjects are all important parts of both the change management and business models literature which will be outlined in the following sections.

3.2 Change Management

A DBS involves many changes in the organisation and realignment of the entire business is often required (Matt et al., 2015). Change management is a way to understand and handle the issues related to these changes. The following section will outline how a firm successfully can change an organisation as well as the resistance that occurs when an organisation is going
through an extensive change. This is, as previously mentioned, an important aspect to consider when in the process of implementing a DBS in the organisation.

### 3.2.1 Change Management terms

#### Change management

The term change management is, as many other management terms, not clearly defined. A definition that has an universal comprehension is non existent (Burnes, 2004). Throughout this thesis the term will have the following definition:

*Change management is about transforming an organisation from a current state to a future desired state. It includes all initiatives, task and activities in an organisation that is crucial to start, activate and achieve, cross-functional and extensive changes in strategy, structures, systems, processes and behavioural patterns.*

The main idea of change management is to create readiness and willingness for organisational change. Employee understanding and acceptance are necessary areas (Gattermeyer and Al-Ani, 2013). Change management is not about setting out specific blue prints of future goal situations or strategic methods or procedures on how to point out strategic objectives. Instead, change management is about constructing the road to change.

It mainly focuses internally on the organisation and the people working within the company and can be described as an ongoing process (Lauer, 2010). According to Hughes (2010) change management addresses the organisational changes transition processes at several levels, namely, organisational, group and individual. Moreover, this may include all employees in the process of change and is not entitled to a heroic manager, however the involvement can vary extensively between different hierarchical levels (Hughes, 2010).

#### Change Project

A change project can be concluded as a change management initiative with fixed objectives and limited resources such as finances, time and workforce. It is different from the regular business and other projects and is often unique in its character.

A change management project is clearly defined as having a start and end. The aim of a project is having a sustainable effective and efficient adoption in the organisational structures and processes (Oltmanns and Nemeyer, 2010). The difference of a *change program* and *change project* is that the change program does not have a clear end. A general term of these would be change process.

#### Characteristics of a Change Project

To survive, organisations need to change in unprecedented and unanticipated ways (Burnes, 2004). Change management is continuously present as organisations needs to adapt to new requirements. There are several criteria that the characteristics of change initiatives are dependent on. The change projects can be divided into three general characteristics (Pesch, 2010):
- Structure of change: planned vs unplanned
- Reason to change: proactive vs reactive
- Intensity of change: evolution vs revolution, adoption vs reconstruction

Firstly, structure of change provides the perspective of unplanned or planned changes. Planned changes, are changes that the company have accounted for. On the other hand, unplanned changes arise spontaneously and are not accounted for (Orlikowski and Hoffman, 1997).

Secondly, reason to change identifies whether the change is proactive or reactive. Proactive changes are constructed by the firm whilst reactive changes is a firm’s response to an unexpected internal or external event. In the reactive case, the firm addresses the need to change. These arise as a result of a changing business environments, which can be derived to competitors activity but often involves several dimensions and high complexity (Pescher, 2010).

Thirdly, intensity of change distinguishes the way the change is happening. Researchers outlines two different ways of change. They either change through evolution or transformation by intense action (Meyerson, 2001; Kanter, 2003; Beer and Nohria, 2000). Beer and Nohria (2000) outlined the origination of the approaches to change, "Theory E", based on economical value and "Theory O" viewing the organisations capability. "Theory E", resembling Kanter (2003) idea of "bold stroke", is more drastic to the company and discontinuous in nature. It often involves changes in processes, IT, technology, lack of sufficient resources or by rapid business environment changes. Changes rise quickly and is often painful for the company. Furthermore, "Theory O", by Kanter (2003) called "long march", is on the other hand an evolutionary, smooth, decentralised company development over a longer time period and is less drastic for the firm.

A usual way to analyse change and the intensity of it is the framework created by Balogun and Hailey (2008). They outline four different intensities of change.

![Figure 6: Four intensities of change](image)

Balogun and Hailey (2008)
3.2.2 Three-step model

There are several models that describe a change project. The project is divided into different phases and is seen as a process throughout the change management literature. Furthermore, the most established and commonly used model is Lewin (1947) three-step model of change. The model consists of three different phases in the change project, namely, the unfreezing phase, the changing-phase and the refreezing-phase. Following the findings of Lewin (1947), other authors have build their research around this theory. Tushman and Nadler (1978) for example, identified three similar phases of a change project. On the other hand, Krüger et al. (2009) and Burke (2017) concluded five stages in a change project and Kotter et al. (1995) found eight steps in order to achieve successful change. Others, such as Kanter (2003) concluded ten commandments to implement change and Doppler et al. (2011) extended the number of phases to twelve.

In a DBS, understanding how to handle these three phases is crucial. It often involves radical changes for the organisation as well as the people working there.

![Figure 7: Three-step model Lewin (1947)](image)

The unfreezing-phase is the first phase. The changing organisation can be seen as being in a stationary equilibrium, as a result of both equal amount restraining and driving forces. These forces, both internal and external, maintain the equilibrium, and are called "forces of inertia". The driving forces in the equilibrium are mostly logically and data driven, while the restraining are originated from emotions (Thompson and Martin 2010). In order for an organisation to successfully change the forces needs to be unfrozen. Thus, the people working in the organisation have to be taken out of their regular behaviour and habits including questioning the way they are thinking (Senior and Fleming 2006). The unfreezing needs to create awareness among the employees that change is needed and prepare people of the changes. Grover et al. (1995) mentions the unfreezing phase as creating a climate of change. According to Balogun and Hailey (2008) it is important to create willingness and readiness in the entire company during this phase. Readiness and willingness is also two central parts of Krügers 3W-model.
Schein (1996) outlines three steps in order to uphold a sustained and successful unfreezing. First of all, the current status of the organisation has to be disregarded. Secondly, the current ways of working needs to be regarded as obsolete. Finally, the organisation must establish psychological safety. This approach weakens or maintains the restraining forces and strengthens the driving forces (Krüger et al., 2009).

The changing-phase includes carrying out the intended changes via mechanisms and levers (Balogun and Hailey, 2008), to help the organisation align with the desired future state. Strategies, structures and systems needs to be renewed and established, which will result in the emergence of new behaviours and ways of working within the organisation (Senior and Fleming, 2006).

The final phase is called the refreezing-phase. After the change, this phase involves stabilising the organisation in the same sense as before but in a new equilibrium. The new ways of thinking, behaviours and habits are all part of the daily business. A higher level of efficiency is reached through the new ways of working. Through this phase the organisation has to make sure that people do not go back to the old ways of working (Senior and Fleming, 2006). However, in today’s business, organisations are continuously transforming and the refreezing-phase is very short as organisations have to face the challenge of change at all times (Krüger et al., 2009). Krüger et al. (2009) describes the refreezing as an ongoing process of developing continuously.

The three-step model might be seen as a way to simplify a very complex situation, where in reality, things are interdependent and can’t be simplified to a simple process. However, this way of viewing a change project makes it easier for management and leaders to get a overview of the project. In order to drive a project of this magnitude, leaders needs to be vary of the drivers and restrainers.

3.2.3 Resistance to Change

To be able to successfully carry out a digital strategy, it is important to understand that resistance in the organisation will arise as a consequence. Commonly, disagreement grows concerning the future state of both the organisation and business environment (Kim and Mauborgne, 2003; Mohr et al., 2009; Atkinson and Atkinson, 2005; Maurer, 2010). Managing a change means that you have to deal with resistance. In a change project where resistance is not identified, dealt with and ultimately overcome will never succeed (Cacaci, 2006). This will result in delays and costly failures. Being open and viewing resistance in a constructive way is central to successful change management (Doppler and Lauterburg, 2008). Coghlan (1993) emphasise the importance of viewing resistance from the employee’s perspective rather than the more common perspective of the change promoter.

To be able to analyse the reason of resistance, both formal and informal factors needs to be considered. Furthermore, it is inevitable not to view the resistance from a holistic perspective. Soft factors are in particular often overlooked and not considered, where they in practice are critical if a change project will be successful. These two factors in a change project is often
illustrated by a "Change-Iceberg" (See figure: 8). The change-iceberg is a way to define the formal and informal aspects of the organisation. The formal aspects are on top of the iceberg and lies above the water-line, whereas the informal aspects lie below. The formal aspects are often easy to identify, these aspects are often structures, processes, competences and objectives (Kaune 2004). The informal aspects, which lies under the water, illustrates that they are not that easy to identify. Furthermore, the informal aspects can be divided into three different levels that affects the resistance.

![Change Iceberg](image)

The organisational level is the first, this occurs because of inertia and routines in the structures, current power-relationships and allocation of resources (Robbins and Finley 1997). Moreover, the culture, both organisational and leadership, may impact the outcome of the change project. Paton and McCalman (2008) points out that culture cannot be ignored in change management.

The second level is the group, this considers the social norms, group-dynamics and group-cohesiveness that impacts the result of a change project (Carnall 2007).

The third level takes the individuals perspective, this is often viewed as the most important part of a change project (Calish and Gamache 1981). This level considers attitudes, emotions and feelings. Additionally, previous changes have a large impact on attitudes and personality factors (Carnall 2007). Every transformation also creates fear among employees, which can be of different nature such as: shift in power, financial losses, becoming redundant, failure and the unknown (Mohr et al. 2009; Robbins and Finley 1997). Furthermore, people that are affected of the change often need to learn new set of skills and being transferred between teams which means that they have to change their old habits and patterns. Psychology plays a large part in
change management as people tends to stick to behaviours and processes that they are familiar with and causes resistance to change (Karp, 2006).

3.2.4 Critical Success Factors of Change Management

"Critical success factors of change management” is a common term for researchers and practitioners to use. It constitutes a limited list of factors, conditions and characteristics that affect, directly or indirectly, the transformation of the organisation (Greif et al., 2004). A DBS increases the importance of a successful organisational transformation and a need to understand these success-factors. It constitutes a special type of transformation and the success-factors that is important to a DBS must be identified.

Many researchers and institutions have tried to explain and identify these factors and the most common one is the eight step to successful change Kotter et al. (1995) created, one of the most renowned change management researchers. Kotter et al. (1995) identified eight steps, if handled correctly as well as executed in the right order, will lead to successful change.

The first step involves creating a sense of urgency within the firm. The current organisational status has to be questioned and people need to be helped out of their current behaviours. This step is often underestimated by leaders (Kotter et al., 1995). Another error is that organisations are afraid to perform the change and become crippled by the risks they are facing. Information of the change has to be communicated extensively and dramatically across the organisation as to why the change is needed. This step is important to create motivated people in the organisation that knows why the change is necessary and what has to be done.

The second step is forming a powerful guiding coalition. This should constitute of a sufficiently
large enough team that is committed to the change. Furthermore, the guiding coalition works outside of the boundaries of the organisation and is the driver of the change project. The coalition needs to be credible and authentic, with the correct expertise and leadership to drive the change. It is also important that the coalition have enough informal and formal power in the organisation (Kotter et al., 1995).

The third step implies creating a vision that can lead the change. The vision needs to be simple and clear as well as explains the future desired state. Additionally, strategies need to be developed to realise the vision (Kotter et al., 1995).

The fourth step is communication of the vision and strategies. The ways of working and the behaviour needs to be taught by the guiding coalition through example and consistency in the behaviour is crucial. Kotter et al. (1995) points out that the vision and strategy must be clearly communicated and every possible communication channel should be used.

The fifth step is to encourage others to act on the vision. Things that demote the vision and strategy needs to be removed, such as systems and structures. Furthermore, dealing with employees that resist the change is also crucial. It is also important to encourage employees that are taking risks and support new activities, ideas and actions.

The sixth step is to create wins on short-term basis and also plan for these. Improvements needs to be defined and visible to the organisation. Change projects are often a long process, in order to maintain and gain positive feelings around the change it is important to celebrate short-term successes. It is also important to reward people that have contributed to the change.

The seventh step is to claim improvements and to keep producing change. The previous successes increases credibility and the possibility for further change. As in the previous step, systems and structures that demotes the change needs to be further removed. This step lays weight on not declaring victory too early.

The last step is to keep the new approaches as well as connect the changes to the organisation’s culture. In order to do this managers needs to anchor changes to corporate success. The new ways of working and behaviours have to become every day business and shared values in the organisation.

This framework is the most common and accepted in the studies of critical success-factors and will be a way to analyse how firms successfully implement a DBS in their organisation.

3.2.5 Business Models

The implementation of a DBS in the organisation might have extensive impact on how the firm does business. This is commonly referred to as the business model (Zott and Amit, 2013). Within the organisation, different components can be identified that delivers to the firms value proposition. Matt et al. (2015) and Olanrewaju and Willmott (2013) have revealed the extensive changes to the value proposition and the firm’s entire business models when implementing a DBS. By viewing the different aspects of a firm’s business models, I hope to be able to outline more thoroughly how it is affected by the implementation of the DBS.
Several researchers argue that innovation of the business model can create value in itself. This is certainly true for a firm on the journey of organisational change (Zott and Amit, 2013). The organisational change includes changes in processes, organisational structures, human capital and the products as well. The extensive changes in the organisation also requires firms to innovate the way it does business. Zott and Amit (2012) claims that the importance of business model innovation is substantial in current business setting to increase revenue and means to achieve competitive advantage of the firm. Previously, firms turned to processes and products to achieve similar effects but the business model has become a more popular tool for value creation. This can be explained by the substantial investments and time required to perform a product or process improvement along with the uncertainty of the outcome in comparison to a business model innovation (Zott and Amit, 2012).

The claim is confirmed by a global survey by the Economist Intelligence Unit (2010) that enlightens the value of business model innovation. The study reveals that a majority of European senior managers prefers business model innovation over product and process innovation. Furthermore, studies indicate that the old view of business models as only involving the organisation is outdated (Zott and Amit, 2013). Zott et al. (2011) explains how researchers found new dynamics of the business model following the introduction of e-businesses. This involves, creating partnerships with other firms and ecosystems in which several other firms participate along with customers and other stakeholders in the industry (Zott et al., 2011). In a digital environment and in the context of a DBS, the organisations way of creating value changes with its activities, Zott and Amit (2017) mention how lock-in effects and switching costs will require participants to participate in a business model ecosystem.

Although researchers are certain a DBS will change the business models of firms, the definition of it is not coherent. Business model is a concept of research that is under developed. Where there are no common view of what a business model should consist of (Morris et al., 2005; Osterwalder et al., 2005; Schweizer, 2005). Zott and Amit (2013) literature has viewed business models in several different ways, such as a statement, description, representation, an architecture a conceptual tool or model, method, pattern and set. They also found that the business model is studied without any explicit definition of it. Furthermore, the general thinking of business models has changed during the recent years. Achtenhagen et al. (2013) states that a fundamental change of business models have moved from what a business model is towards how it can be used. Researchers seem to agree that a business model could be said to be a certain firm’s way of doing business (Osterwalder and Pigneur, 2010) (Rajala and Westerlund, 2008) (Teece, 2010) (Casadesus-Masanell and Ricart, 2010). Osterwalder et al. (2005) describes it as "a business model is the blueprint of how the company does business", business models are made up of components or modules that are breakable into parts. Furthermore, Shafer et al. (2005) identify that a business model contains up to 20 different components. This is often referred to as the business model canvas and is a commonly accepted way of viewing the business model on.

The Business Model Canvas

The component based view is the far most common and using the so called business model
canvas developed by Osterwalder and Pigneur (2010) is what provides much of the basic foundation in current business model research. The framework consists of 9 different components that are deemed as building blocks for the firm’s business models. These are (Osterwalder and Pigneur, 2010):

*Customer Segments* defines the different groups of people or organisations that the firm aims to deliver their products or services to. These may be grouped into separate distinctions with similar needs, behaviours or other characteristics. These segments should be identified and the firm should recognise which to serve and which to ignore.

*Value Propositions* defines the products or services that the firm intends to serve the specific customer segment with and creates the specific value. The value proposition is what customers evaluate when they compare two businesses to one another. This is a package including both services and products that the firm offers to its customers.

*Channels* defines how the firm reaches its customers. It includes how it communicates, distributes and sells the value proposition. This includes customer support and the connection the customer has to the firm after purchase as well.

*Customer Relationships* defines, as the name reveals, the firm’s relationship to each specific customer segment. The relationship can be both a personal and automated relationship, it aims to retain and acquire customers as well as increasing sales.

*Revenue Streams* is the income streams the firm receives from each customer segment. These can be of two different types, either recurring or transaction based. The way a firm charges its customer segments and how much it can charge is often an important part of the firms business model.

*Key Resources* defines the assets needed to deliver to the specific business model. The key resources is what the firm needs to use in order to create and deliver to the specific value proposition. These resources can be tangible or intangible assets such as, financial or human capital as well as assets acquired from key partners in the business model.

*Key Activities* is what the firm does in order to deliver to the value proposition, reach different markets, maintain customers and earn income. These activities differ depending on the nature of the business, for a hospital one of the key activity is treatment and for a management consultancy firm it includes problem solving.

*Key Partnerships* defines the network of partners and suppliers needed for the business model. Partnerships can help firms to optimise or reduce risks in their business model, it is also a popular tool for firms to acquire resources.

*Cost Structure* are the costs associated with the business model. These are the most important costs that incur when the business model is in operation, namely, the cost incurred to deliver to the value proposition, maintaining customer relationship and similar

The components seem to have many similarities with the changes that a DBS creates, previously outlined in the DBS section. The realignment of the business models and the creation of new is an important aspect when implementing the DBS and the business model canvas provides
a good frame to analyse which components of the business models that is impacted when implementing a DBS. The research is also a basis for much of the business model literature regarding digital businesses (Gassmann et al., 2014; Sun et al., 2012; Turber et al., 2014; Chan 2015) and is the reason why it will be used throughout this thesis.
4 Method

4.1 Research Approach

The approach of this project is an inductive and qualitative approach. I chose the exploratory approach since the research aim is to discover patterns rather than confirming expected patterns. Interpretivism was used as the research paradigm for this project. The paradigm was adopted since the aim of the research was to utilise my findings to create theories and/or assumptions applicable to MedTech firms [Collis and Hussey 2013]. Furthermore, the literature is reviewed to identify frameworks suitable for MedTech firms to construct an appropriate DBS. In addition, the literature will help to analyse the findings from the interviews. The findings consists of individual accounts of experiences from people in their respective area of expertise. In these findings, it is important that I account for variation and subjective interpretations from both the interviewees and me as an interviewer.

The research was carried out as an explanatory case study. Hence, I use literature to investigate and explain the context where the study is conducted [Collis and Hussey 2013]. The analysis was performed as a case study, where the case study tries to identify patterns from similarities and differences between cases of experienced people in the industry. The study is used to apply a suitable framework to a MedTech firm to confirm its relevance. Case studies are viable for my research, since I am following the interpretivism paradigm and want to receive in-depth knowledge of the topic under investigation [Collis and Hussey 2013].

4.2 Research Process

The thesis was executed in a parallel manner which can be divided into three different processes. The first part included a literature review being conducted continuously, during the entire project, both prior and after the empirical data gathering. The second part included the semi-structured interviews with professionals working with digital strategies in consultancy firms towards MedTech or in general and professionals in MedTech firms working with digitalisation of their business. Finally, an analysis was based on the conducted literature review and findings from the interviews.

![Figure 10: Research process](image)
4.2.1 Literature Review

The aim of the literature review was to find existing frameworks to use in a DBS to help me analyse the findings from the interviews conducted. This will help me understand and complement existing frameworks and identify possible important areas that these do not involve. KTH’s own online library Primo was used in collecting relevant literature to review. In addition, Google Scholar along with some complementary Google searches were also made to complete the review. This involved finding relevant company information and company reports on the matter of a DBS. The goal of the study varied throughout the course of the thesis and can be divided into the following three stages:

At the start of the project the literature review was mainly focused on understanding the various topics that the thesis could cover. This meant that I had to read up on topics such as MedTech and business strategies to get an understanding of what should be included in the thesis and how the research questions should be formulated.

In the process of data-gathering the review involved complementing the topics mentioned by the interviewees and also extending my own knowledge further. The literature review was made continuous to ensure that the foundation the analysis should be based on was sufficient to cover topics mentioned in interviews.

The post data-gathering and analysis stage involved finalising the review to conduct analysis on and to establish an understanding of how the findings related to other researchers. This was done to identify patterns in the findings as well as to draw educated conclusions from them. The findings were based on information from several sources including journals, books and business presses.

4.2.2 Empirical Data Gathering

The purpose of the empirical data gathering together with the literature was to be able to answer the formulated research questions. The gathering process was divided into specific phases. The first part involved defining the frame that allowed me to identify interviewees fit to help me answer my research questions. The second part was the interviews after finding a sufficient amount of candidates to interview. When the collection of data was completed, the analysis and conclusion was initiated.

Constructing Sample

To construct the sample I divided potential candidates into two different sub-groups, namely, professionals employed in MedTech companies that have previously been or are currently working with digital transformation processes and professionals working in consultancy firms specialised in DBS and preferably specialising in healthcare. The first group was seen as crucial to understand the specifics of transforming a MedTech company and how they work in their specific setting of stakeholders and regulations. The second group was deemed important to gain a more overhead view of a DBS. It would also help me get a more comprehensive understanding of transforming MedTech companies as consultants have been involved in several
cases and can identify similarities among them.

**Approaching Interviewees**

To receive contact information of each candidate of the companies I used company websites, newspaper articles as well as friends that knew professionals working with these types of questions, which turned out to be very valuable in the process of receiving sufficient amount of interviews. The general process was to reach out to the most senior candidate working at the relevant department that could either be interviewed or help me to get in contact with an expert at the firm. This was done since I was mostly interested of the managerial aspects of a DBS which more senior employees often have experience from. When I had identified a relevant candidate, I contacted them either by email or in some cases by phone when necessary (See section 9 for email template). Out of the 21 interview requests sent out, 20 was contacted by email and 1 by phone. Of the total 21 requests, 18 replied and 11 accepted to interview with me. The acceptance rate was roughly 53%.

The interviewees that accepted are presented in the table below. As illustrated, the interviewees have different backgrounds which provides both a deeper and wider understanding of the subject at hand.

<table>
<thead>
<tr>
<th>Reference name</th>
<th>Company</th>
<th>Role</th>
<th>Interview Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Management Consultancy</td>
<td>Manager Digitalisation &amp; IoT</td>
<td>In person</td>
</tr>
<tr>
<td>B</td>
<td>IT Consultancy</td>
<td>Manager Healthcare</td>
<td>In person</td>
</tr>
<tr>
<td>C</td>
<td>MedTech</td>
<td>Manager</td>
<td>In person</td>
</tr>
<tr>
<td>D</td>
<td>Management Consultancy</td>
<td>Digital Transformation</td>
<td>In person</td>
</tr>
<tr>
<td>E</td>
<td>Management Consultancy</td>
<td>Associate Digitalisation</td>
<td>In person</td>
</tr>
<tr>
<td>F</td>
<td>Management Consultancy</td>
<td>Manager Digitalisation</td>
<td>In person</td>
</tr>
<tr>
<td>G</td>
<td>MedTech</td>
<td>Product Development</td>
<td>In person</td>
</tr>
<tr>
<td>H</td>
<td>Management Consultancy</td>
<td>Director Healthcare</td>
<td>In person</td>
</tr>
<tr>
<td>I</td>
<td>Management Consultancy</td>
<td>Expert Healthcare</td>
<td>In person</td>
</tr>
<tr>
<td>J</td>
<td>Management Consultancy</td>
<td>Digital Strategy</td>
<td>In person</td>
</tr>
<tr>
<td>K</td>
<td>IT Consultancy</td>
<td>Chief Architect</td>
<td>By phone</td>
</tr>
</tbody>
</table>

*Figure 11: Research process*

**Conducting Interviews**

The interviews were mostly conducted in person as most of the interviewees are based in Stockholm, which allowed me to visit their offices. This was seen as the best way to collect data since it allows for better interaction and less misinterpretations between the interviewer and the interviewee. I tried to arrange face-to-face meetings as far as I could, by keeping an open schedule and being flexible to late changes. The interviews took approximately 60 minutes each, the vast fields of experience from the interviewees allowed a more nuanced picture of
digital strategies. With consultants having vast experience from several cases and MedTech professionals provides the deeper specific understanding from a single case. Professionals working as consultants with experience from the healthcare sector was the main target of interviews, however, I realised that it was good to also include consultants without healthcare experience since this enabled analysis of differences between the MedTech industry to others. With that said, the similarities are much more common.

The interviewees were semi-structured, which followed a theme of questions (See section 4). I prepared the questions prior to the interviews to fit my research and the subjects that are relevant to this thesis. However, most questions were open and did not really point them in any certain direction from the start, letting them point out the subjects of discussion, which most of the times were in line with the prepared questions. Follow-up questions were introduced to answers that were not fully clear or needed elaboration. Since the companies were different and professionals had vast backgrounds, semi-structured interviews was chosen in accordance with Blomkvist and Hallin (2014). Furthermore, semi-structured interviews was also chosen to let the professionals help me highlight the important areas of a DBS. This was confirmed since they steered the conversations both into areas I on beforehand had identified as well as new areas that I had not identified.

The findings from the interviews were compared to current literature to confirm or reject that theory are in line with the arguments made by the interviewees. All commonalities or divergence to current literature are highlighted and presented under the analysis chapter. According to Cohen and Bailey (1997), by keeping an open mind and being objective during the interviews the reliability increases. This was something I kept in mind during the interviews to ensure not being biased. Additionally, I waited to analyse the findings until after the last interview in order to not let the earlier interviews flaw the later ones. Cohen and Bailey (1997) highlights the importance of this, so that the interviewer does not try to confirm the findings from the first interviews.

4.2.3 Data Processing and Analysing

All interviews were recorded with the permission of the interviewees, this was made so I would not make any misinterpretations or lose data from any interview. All interviews were then transcribed and any irrelevant noise was removed.

When the transcribing was done, a summary of the interviews was made. I removed any redundant topics not relevant to this thesis. I continued to divide all summaries into different topics and outlined what each interviewee mentioned on each specific topic. These topics reflected the categories included in this thesis, namely, the business model, change management and competitive advantage. Each category was then further detailed on the separate topics included under each category to get a better comprehension of each interviewees opinion on the subject.

Two interviewees mentioned explicitly that I needed to make their responses anonymous and protect certain firm interests, even though I mentioned at the beginning of each interviews that
they would be anonymous. Many interviewees still did not detail out specific firm cases but rather explained them on a more general basis. This was not seen as a problem since its not the specific firm they have worked on that is of interest, rather other general aspects that appeared during their working experience. It is also worth noting that not all interviewees could answer on all specific questions I had. The interviewees had different experience and backgrounds from both digital strategies as well as MedTech and restricted them from answering all types of questions I had. As declared in the beginning of the thesis, this was intended to provide me with both a broad and deep understanding of the aspects in digital strategies both in general and MedTech in particular. To be able to have these differences between interviewees I developed interview questions both regarding those with management consultancy experience and those with MedTech experience to be able to interview both. To ensure the anonymity throughout this thesis I have labeled each respective interviewee with "Interviewee A" or similar. Each interviewees' background and experience can be found in the table under this section. I have chosen to outline the interviewees experience and background to give the reader a better understanding from which perspective the respective quote comes from, a MedTech or consultant perspective. All interviews were conducted in Swedish to not let any language barrier limit the responses in the answers and restrict the interviewees from delivering their full view on each topic. Thus, the quotes given in this thesis are translated by me as an author.

4.3 Reliability and Validity

An important aspect of conducting research is that it is valid and carried out in the best possible way. This can be done by ensuring that the reliability and validity of the project is upheld. A short description of reliability is: "making sure the research is performed the right way" (Blomkvist and Hallin, 2014). Whilst validity is to ensure that the research addresses the right thing (Collis and Hussey, 2013). By combining both high reliability and validity the probability that the research can be replicated increases, which means that the work can be replicated and similar results found (Collis and Hussey, 2013).

To maintain a high validity and reliability throughout the project, I will apply William Michael Trochim (2007) and split into separate sub-groups. The first group involves internal validity, this addresses the causal relationship between the used variables and the results. Several problems arise in general when conducting an qualitative study in comparison with an quantitative study (Collis and Hussey, 2013). For instance, there is a risk of bias in the results since they are dependent on the researcher’s interpretations and observation. This was addressed using triangulation of theory and data, according to Heale and Forbes (2013) this increases the internal validity. By comparing the findings with the literature I ensured the internal validity. Furthermore, in line with Novotny (2016), I used data triangulation which is a powerful tool for increasing construct validity. This was done to confirm evidence through patterns to base the discussion on.

Construct Validity

Addresses how good a test corresponds to what was originally intended. A general problem
with semi-structured interviews is that they can create imperfections in the construct validity since they risk to deceive interviewees from the original question (Collis and Hussey 2013). To address this problem, I ensured that the chosen research approach was set with a clear connection between the aim of the study, research question and conclusion. In addition, by using established interview techniques, I tried to construct as objective and non-leading questions as I could. For instance, I used probes during the interviews to ensure that interviewees answered the question at hand. Additionally, the construct validity was also enhanced through the application of data triangulation.

**External Validity**

External validity investigates how the results found can be generalised and applied in broader areas (Collis and Hussey 2013). Since my thesis is geared towards MedTech companies the results will be slightly limited to that certain area. However, since a comparison of my results with research in other areas are made conclusions that are made could possibly cover other fields as well. It is also important to point out that obtaining empirical data through interviews will not create data that are statistically generalised but might be analytically generalised (Eisenhardt 1989). This means that the findings in most cases cannot be generalised to comprise a larger population.

**Reliability**

Reliability means that results must be independently repeatable. This implies that other researchers should achieve similar results if they use the same method and data as I used. Since I gathered the data through semi-structured interviews the likeliness for other researchers to obtain similar results decreases. The answers given in the interviews are not of binary nature, thus influenced by individuals’ thoughts and interpretations by the researcher, which generally makes replicating the results difficult (Collis and Hussey 2013). To remedy the decreased reliability I tried to be transparent with sources used as well as presenting the interview questions. This makes it easier for other researchers to replicate the results (Blomkvist and Hallin 2014). Additionally, according to Eisenhardt (1989) literature based on academic publications increases the reliability.

This project has been influenced and dependent on several individuals who have shared their knowledge in their respective professional areas, which is important to state. The empirical data gathered through interviews came from professionals representing their firm which increases the risk of subjective data. This bias is founded on their commitment towards their respective firm and might restrict their willingness to share certain information. This is further developed in the section 7.2 regarding limitations.

**4.4 Ethics and Sustainability**

To ensure that sufficient ethical standards have been upheld during the course of this theses, I have both, when conducting interviews and analysing findings, applied several measures to ensure that ethical standards were upheld. I also remembered to evaluate potential conflict
of interest that could exist because of my commissioner, Human Care, and because I am performing this research at KTH.

Before each interview I asked for permission to record and allowed each interviewer to be anonymous if they so wished. Material that were deemed inappropriate have been left out. Because of the informal setting of the interviews, the statements have thereof been evaluated and put into the correct context in accordance with the researcher. This thesis is conducted in cooperation with Human Care, hence, each interviewee was informed of this when the initial contact was made. A standard email was sent out, with some variations, See section 9. This was made to ensure that no conflict of interest existed between the interviewer and the commissioner. This may have impacted the acceptance rate for the interviews, but was necessary to uphold sufficient transparency during this project.

To maintain the interviewees’ integrity, I have taken extra care not to extrapolate any thoughts or conclusions that can be made from interpretations of the interviews. This involves conclusions made from answers not explicitly stated by the interviewees. Since the data is empirical and conclusions expressed on an aggregated basis, where emphasis lies on commonalities, no explicit references to interviewees will be made.

The ethical aspects of this project has been easy to deal with since the topic is not at all controversial. Most interviewees did not request anonymity, taking into account the potential loss of respondents, an adequate sample size was reached without any concern. When evaluating this thesis using the tripartite notions of sustainability (Gimenez et al., 2012), I did not identify many issues. The aspect of environmental sustainability was not addressed because of the nature of this project. However, Social and Economical sustainability is within the scope of this thesis. This project does in particular address how MedTech can solve the economical and social issues that Healthcare faces in the future. Thus, this project will help to enlighten these problems to some degree as a result from better understanding of how to apply in healthcare.
5 Analysis

This section will provide an analysis of the findings from the interviews. The subjects in the literature review will provide me with the lens for the analysis, and the subjects will be dealt with in the chronological order of the research questions. First, I will elaborate on the Change Management part of a DBS and identify certain important factors when implementing a DBS. Second, a presentation of the findings regarding whether the Business Model is a central part of the DBS and how it can be used to successfully address the strategy.

5.1 Important factors in the DBS related to Change Management

Here I present the findings from the interviews regarding important factors connected to the DBS. More specifically, this addresses the Change Management part of the DBS and concern aspects such as how DBS changes the needs of competences and ways of working as well as who should be responsible and lead the change. This section is primarily aimed to answer the research questions: What are important change management factors to consider when implementing a DBS?

5.1.1 Why Change is needed

According to the interviewees it is important realise why the given change or strategy is needed to be carried out. The firm needs a clear direction of where the strategy should take them. All interviewees mention that the DBS should not be a separate part of your business or separate from the overall business strategy of the firm. The DBS should be a part of the overall business strategy and be one way for the firm to achieve the business goal of the firm. The DBS should be a complementing tool to use, which in the future will be utterly necessary to stay competitive. The use of it can be similar to regular strategical decisions, it can help firms to improve market share, margins and overall business efficiency. These are the more incremental parts of the DBS and is not often so radical to the entire business from an outside perspective, although it still affects much of the internal composition of an organisation. The other side of the DBS can be more radical to the firm where entire new business models are created and the firm changes business and products entirely. Whether the firm chooses to continue on its current path or completely change is up to the firm and ultimately the management. In the decision making process, several factors have to be accounted for, which I will go through in this analysis section.

Currently, many firms realise the need of a digital business or the use of digital technology in the organisation and want to become more digital. This pressure often comes from external parts of the firm such as: customers, owners or competitors in the industry. This often scares management of firms that are afraid of losing current market position and not being competitive in the future. What makes firms fail with their digital initiative is that they do not have any clear purpose with it, or even less knows what being more digital is. One problem many
The interviewees bring up is that firms start with their digital initiative without realising its consequences for their business. They start with a cool technical solution and hand it out to their R&D department and let them come up with a new technological solution. This is entirely wrong and will never be successful. Firms and particularly management should instead evaluate its current business position, understand its market and identify a future position where the firm should be. The firm needs to understand how the strategy affects current business models or if it’s necessary to create new. Moreover, firms can identify particular needs of customers to create specific use-cases, or from an internal perspective identifying internal efficiency needs. The DBS should then be an element of the firm’s entire business strategy in order to realise this future position. The DBS can be a major factor or a minor influence to the firm’s entire strategy. No strategy is wrong as long as it’s based on a proper evaluation of current and future position. The future position can involve more advanced products with the implementation of IoT, where firms can collect data from their current analogue products. In Human Care’s case, it could mean that their rollators can be provided with a GPS to be able to locate customers or a fall indicator that could indicate whether their customer have fallen to reduce more severe injuries from falling. Another strategy could be to entirely change their offering to instead move to another part of the entire value chain they’re currently in and stop producing current products. This is a more radical change and highly unlikely but can still be valid.

When the firm has set its future ideal position and evaluated the changes needed in the organisation, it has to be actively communicated broadly in the organisation. A strategy of any kind won’t have any effect unless it’s commonly accepted in the organisation. A DBS in particular affects many areas of an organisation and the organisational acceptance is crucial for the DBS to take effect. The communication of the strategy must incorporate why the change is needed in the firm. It also raises many questions in the firm and might lead to resistance among certain employees that feel threatened by it. This resistance needs to be met and employees needs to be ensured that the new DBS is a tool to improve and help them in their everyday work. However, employees that do not want to join this journey and feel that this is entirely wrong should perhaps be helped to find new challenges in their career. To be able gain the acceptance, management must be able to answer why this strategy is needed and why sometimes the considerable change has to be done. If the ”why” behind the strategy is not strong enough, firms will struggle with the acceptance. Additionally, when the firm sets business goals it has to have a clear reason behind what the firm is going to do different in order to reach the specific goals. Similar to the why, the firm needs to understand what it is going to do fundamentally different to, for instance, becoming more efficient or improving market share. This is where the DBS will help to reach these set goals through digital tools and innovation.

The why part of the strategy provides a direction for firms with their strategy. It is necessary to be able to identify its current and future position, taking in consideration both external and internal factors. It will help the firm to understand the DBS element of the strategy and how digital tools is going to help the firm to achieve the given goal. It will also give management and employees a plan to follow to not fumble in darkness without a understanding of the end goal. Furthermore, this will help with the acceptance in the firm, to make employees understand the reason behind the change to not put up resistance against the strategy.
5.1.2 New competences

The change in competences is a major part of a DBS and is by several of the interviewees pointed out as critical for the organisation. Furthermore, the impact of it is extensive and it can lead to firms needing to educate, recruit new and/or remove old competences not necessarily needed for the new business. New competences should also be deemed as one of the more sensitive parts of the DBS. It directly involves people in the organisation, which can make them feel threatened by the new change. In comparison to many other business strategies, competences is even more important because the DBS often involves areas that the firm typically do not operate in.

"I do not view a digital business strategy as something separate rather as a natural part of the entire business strategy. "..” What differs a digital business strategy is the competence to do what is missing. Competences is one of the largest challenges and is what differs from other strategical decisions.

-Interviewee F

Changes can occur to many competences in the organisation, although a DBS more often involves utilising current competences in the firm and add new. In general, firms should identify their core competences and leverage on them and then identify what they need to achieve the future state of the DBS. Current departments does not typically change, you will still manage a sales team, product development, customer support and other necessary departments in the firm. What changes is the content in them; different experiences, skill sets and knowledge are important changes. These skills are often geared towards technological competences, understanding digitalisation and being able to communicate internally. However, it is important to emphasise that all people working in more digital environments do not need to be experts on everything and understand both digitalisation and their respective area of competence such as customer support. What you need to learn is how digitalisation affects the specific area you are working in, on top of that, firms needs new competences that understands the holistic impact of digitalisation and how they could use it, and also being able to communicate it from a business perspective. These competences should be able to identify how their business can use technologies, being able to communicate with firms that posses the technologies and knowledge, as well as what technology should be used.

"I think many firms overestimate what competitive advantage is when it comes to digitalisation. Many say that their HR is strategically important to us. To manage the employees and develop them is the most important part. It’s not the way or the tool you use that makes the difference. You can still buy a standardised HR-system that can do more than all of your systems can. Rather, differentiate yourself through how you train your employees. At the same time, yes, technology will be a competitive advantage but it will be how you use it in the organisation that is the difficult part. Technology will not be what drives competitiveness.

-Interviewee E

The extent to which the competences needs to change is dependant on the strategical decisions made. For example, if the company decides to change the way it sells products from a product
to a service, which is a common approach. This will have an impact on the sales team, how they sell the service, understanding of its mechanisms and much more. Moreover, these changes not only impacts the sales team, it also affects customer support that needs an understanding of how the new service needs support. One interviewee mentioned how car companies needs to transform their customer support when they start to implement more digital services in the cars, such as Spotify, Storytell and many more. These changes requires customer support to understand how to help customers with these services, and if they do not, they might create low customer experience and the added digital services might become a liability to the firm. Imagine the frustration of calling customer support about a malfunctioning digital application and you get to speak with a car mechanic. These types of changes in competences can often be solved through education and training and does, on the contrary, develop the people in the firm rather than requiring new employees.

Furthermore, entire new competences will be needed. First of all, one of the largest gaps that appears is the development of new products. Traditional manufacturing firms that have manufactured a pure mechanical product that are now supposed to develop digital services often have no clue on how to start. They have their specific competence in their products and adding an digital solution to it is out of their scope. That is why firms will need competences that extends their current and need the knowledge to develop digital products. This is why it’s important for firms to have internal competence that knows who to cooperate with to gain the knowledge and also uphold the development end to end.

Another issue that many mention as important is the use of data. Interviewees mention that being able to leverage on data from your products is one of the primary sources of value creation in a digital business. Firms often lack the ability to do this. Either, they do not collect the data properly or they do not analyse it. The collection of data is by one interviewee mentioned as being an easy process to set up to begin with. This is why firms often needs particular competences such as data scientists and data analysts that can create value from this source.

I also found that firms needs to understand the regulations that exists. The MedTech industry is heavily regulated, yet, this is not said to be a limiting factor for innovation. Firms needs to learn and understand regulations in order to know what is possible and how certain regulations should be dealt with. By developing the competence to understand the regulations of MedTech, firms can implement a successful DBS in their organisation. This will help firms to be in the frontier of innovation and allow them to be more innovative than competitors who lack the understanding.

Correct competence in leadership is also a crucial factor in the context of driving digital change in an organisation. The leader needs to understand how to drive digitalisation through the company to be able to make the change happen. They also needs to understand how to use it, its limitations and being able to provide a vision of what it means to the firm.

**Solving Competence Gap**

One factor that was introduced during the interviews as seemingly important was the way firms
should solve inadequacies in competences in the organisation. This question almost raised as many answers as interviews and there is clearly no certain answer to this problem. Mostly because the answer is very dependent on the specific situation that the firm is in and no general answer can be made. However, there are typically three ways, which can be drawn from the interviews, of solving this gap of competences a DBS creates. First, you can recruit competences to your firm. This is the most obvious way to solve this issue but interestingly enough not the best. Second, you can completely outsource the digital business to a second party and let them handle this part of your business. This has previously been a popular way of solving similar problems of firms, where firms outsource manufacturing and many other parts of their business. Third, you can cooperate and create partnerships with other firms that has this competence and develop a new relationship that is a part of your business but works under other boundaries and set of rules. This enables your firm to receive the competences needed from the partnership firm at the same time not necessarily recruiting directly.

All these factors was mentioned as being able to solve this inadequacy. Outsourcing was the only alternative that was not mentioned as a good solution. For a firm to be successful in their DBS and solve the gap of competences they will need to both recruit people internally as well as create a partnership and cooperate with other players. Furthermore, the recruitment in general should be limited to people with a holistic view of digitalisation and understanding of it and how to lead it. The motive of this is that in order for firms to cooperate and create the partnership needed for the DBS, they need to be able to communicate with them. Moreover, firms should not try to recruit an entire new department of engineers and attempt to build an entire new digital solution on their own. This not only risks the DBS to become a technology project and being controlled by the IT-department, which certainly will lead to failure. Several interviewees mention that you should not underestimate the power of what other firms in their respective industry can develop in comparison to you. It is important to realise what your core competences and business are and then take help from others to develop what is needed. Instead of doing it yourself, firms should use current technology that is available on the market and put a solution together from technology that already exists. One interviewee mentions the importance of understanding how to use the technology rather than creating it.

A lot of firms that wants to do it in-house loses the speed in the industry. What you can do internally with 15 engineers IBM can do with 1500 in half a year that would have taken you 15 years to do

-Interviewee E

Another problem for firms when it comes to recruiting is finding the specific competence needed. Generally, firms employing a DBS will start to compete over competence that many popular tech-firms currently employ. Additionally, these competences are scarce resources and it’s important to realise that what your firm can offer is probably not as attractive as most popular tech-firms. Some interviewees mention that firms need to address their offering to try to attract the correct competence. That is why the solution of a separate department or group is compelling. Involving the firm’s original competences, complemented with the new partnership competence. Where the culture can be slightly different and the working tasks more interesting than the original firm. This department should start out small and grow in to the original firm
involving more and more employees. The competence that the partnership brings, the creation of the separate department working outside the original firms boundaries should successively be either integrated to the original firm or let go if the competence is no longer needed, thus in the long run becomes a single enterprise, where you have transformed parts of the competences to better fit an organisation with the needs the DBS creates.

The competences of the firm shift significantly, although it does not have a significant impact on the firms core competences. Competences should rather be transformed or modified to fit the new state of the firm. On top of that, firms will need to find ways to complement current competences with people with a holistic view of digitalisation and business to bring and use technologies for specific business purposes. That way, firms can form partnerships and start to develop their business in the direction towards a more digital business.

5.1.3 New Ways of Working

During a change management project questioning the way you are working is a critical part of succeeding in the unfreezing phase in the three-step model, as previously mentioned by [Schein(1996)]. This is also an important part in a DBS and was mentioned by all the interviewees to some extent more or less in detail. Almost all of them mention that a DBS is not about technology, it is about new ways of working. In order to succeed with the DBS, firms have to change many ways of how they are doing regular business. They need to be able to adapt to the changes that digital processes creates. In particular, learn how to involve and accept digital tools in their daily work along with not fearing the digital changes in your firm, embrace them as something good.

One of MedTech firms' often internal strengths is their Know-How in engineering and production which is actually one of their weaknesses as well. MedTech firms generally have a very strong knowledge in engineering and producing products. They are very technological oriented and are not hindered technologically. However, they often view problems with a technological solution in mind. This is completely wrong in a DBS setting and rather than imagining technological solutions, firms should have the soft factors of the organisation in mind and change ways of working first.

In the interviews there were in general three topics that can be identified in a pattern. These were either brought up in more detail or briefly mentioned by some and should be seen as a way for firms to become more digital driven, increase innovation and make use of the possibilities a more digital business gives. Firstly, working more agile is seen as a very important way of working and this needs to be addressed. This reflects how other more digital firms often work; in short sprints, continuously testing their products. Secondly, working in cross-functional teams is important since the development of digital processes and products needs cooperation between several departments of the firm in order to be successful. Thirdly, working more data-driven in the firm, making decisions about internal processes, products should be based on the findings from data.

Working more agile was mentioned by almost all interviewees and should be seen as a way of
working to become more innovative and continuously test new products and innovations with customers to create products with a better market fit. Traditional companies, i.e. manufacturing that typically develops a product over a couple of years, markets it and then sell it are those that probably are going to be impacted the most of this agile way of working. The traditional way of working can often be viewed as the water-fall method, with a clear goal a set of methods that has to be worked through in order to reach the goal.

One interviewee explains the problem with changing your ways of working: A company repeats its ways of working since it has previously been successful doing it. The business leader is often the original founder of the firm or a known successor to him. Thus, the organisation do roughly the same today as they did yesterday and it’s about repetition. The ways of working are inherited from the previous person working in the position and they tend to do the same things as they always did.

Interviewees mention that working in water-fall methods should not be completely disregarded in a digital business and is sometimes still an efficient method. However, to create innovative products that is influenced by digital solutions, working methods have to be agile. To elaborate on the term agile, in this context, it involves working closer to the customers, continuously testing your new designs and innovations as well as working towards an unknown end goal. This means that when you start a new product development neither you or your customer really knows where this is going to end. To start out on a new innovative product, companies should try to identify possible use-cases for their customer. This should be done by involving them in the innovation process. The firm should then create a minimum viable product (MVP), which works end-to-end, that can be tested together with the customer. This should then lead to some form of response and a decision whether to continue with the idea by developing it further or disregarding it since it did not have the expected impact. This way of working can also be applied internally to improve processes and find internal solutions to reduce time-consuming activities. Involving the customer in the innovation and development process were by some interviewees mentioned as co-creation of value which is a interesting term mentioned in other reports regarding business models.

You have to work in a different way to become more agile and get a different power of innovation "." To better understand the customer we bring them into the innovation process  
- Interviewee D

The key to succeed with the agile ways of working is to always start out in small scale. Make the smallest solution possible and make it work end-to-end with one of your customers. When you get the result you want, scale the product, solution or innovation to the extent needed. This erases the problem of organisations starting to develop a product, releasing it three years later and then realise that the market has changed significantly since they started out. Moreover, the market factors are rapidly changing and were by most interviewees said to be accelerating even more in the future as a result of technological improvements and developments. This means that firms have to adapt even faster to new market changes than previously.

Furthermore, there is a possibility in MedTech to co-innovate with several of the stakeholders involved in the industry. Both the interviewees working in MedTech mentioned that it is
important to both involve the hospitals as well as patients in the co-innovation process. This means, both understanding the patient using the product as well as the hospitals i.e. the nurses and physicians use of the product. One of them mentioned a case where they tried to identify a particular use case for a hospital:

_It was the hospital’s decision but in other cases we usually involve the patients in the development as well, and I believe it is a must. If I would redo it, I would have pushed more to involve the patients._

- Interviewee G

Involving and understand both the hospitals and patients in the innovation process when implementing a DBS is crucial to be successful in it.

Cross-functional teams was also diligently mentioned by the interviewees. This can be seen as part of the agile working methods but since it was thoroughly mentioned by several, I deem it necessary to further elaborate on it. A cross-functional team is a team that consists of people from different backgrounds and competences. Rather than the normal way of working in silos, where IT, product development and sales work separately, cross-functional teams are meant to bring these departments closer together. This does not necessarily mean that the entire IT department should join forces with the sales department but there should exist teams in the firm that involve people from across all departments. There are several reasons for this, products and processes no longer stretch to a specific department and it’s hard to identify where a new product should be placed, who should be responsible for it and who should develop it further.

_Innovation is about building innovation-capabilities which is very important. A lot of firms do not catch up with the speed to develop new products. Firms need to work more cross-functional to foster innovation. It is necessary both for improving old products and develop new. The disruptive innovation rebuilds the business model the continuous (sustaining) improves current._

- Interviewee D

One interviewee points out how developing a new digital solution leads to problems internally in a large organisation with traditional structure of silos. Where they did not know which department should be responsible of the innovation or how the costs should be distributed as well as the income. Additionally, they did know know who should handle the business towards the customers and also how this new product should be supported.

As highlighted, these innovations requires an understanding and collaboration from more than one department to work. Where both the innovative power of the firm and daily business are important aspects in the cross-functional team. One specific application mentioned by an interviewee, is service maintenance performed on a basis of need instead of scheduled basis. An application of this sort would improve the service in many areas, such as reduced downtime due to more predictive maintenance and proactively stopping malfunctions in products, it would also increase resource allocation and reduce the amount of unnecessary check-ups. Typically, such a cross-functional team becomes joint forces of a product team, data-analysis team and service team. Although this sounds pretty straight forward to execute, there are many
underlying issues. First of all, the service team is not used to work on a data-driven basis. Their inherited ways of working on schedule will cause resistance among the people employed in the service team. Second, it is also common for the service team to be a very independent part of the business and can in some cases be seen as an outsourced part of the organisation, this makes the cooperation between the data analysis, product team and the service team even harder. Third, this business case might be negative since the service is actually reduced and thus the revenue decreased. Additionally, service maintenance is usually an opportunity for firms to meet their customers in person which becomes a natural way for firms to show that they are present and perform services on customers’ products. It also becomes a channel of sales for other products. By not being physically present, customers may not realise the work the firm is doing to uphold sufficient service on the products and might not want to buy a service package at all. Furthermore, the firm is also losing an important sales channel to sell more products to their customers. Unfortunately, a case like this might be opposed by management and instead of working out the underlying issues the business case is completely dismissed.

There are also cases where different departments want to learn the skill instead of cooperating with the department that already has it. Instead of being an expert on everything the cross-functional team allows departments to focus on their specific working area. By joining forces with IT, a Medical Technology (MT) team in hospitals, similar to a service team, can improve their IT knowledge without actually learning IT.

*I witness my customers having MT and IT being separate. We have an application where doctors can see patient surveillance directly in their phone, so MT become dependant on WI-FI and IT infrastructures. MT understands this and managers wants us to help them to understand IT better. We certainly can help, but it’s about cooperation, MT should focus on patient safety and IT focus on the the function. Keep it that way and start talking to each other, do not work in silos!*

- Interviewee G

The third topic that was identified is creating a culture of working with data. This regards the entire culture of the firm but has a lot to do with patterns of working and changing the way people are making decisions. Digitalisation of the business means that the firm should have access to more data and both store and analyse it, the data and its analysis should boil down to correct decision making. Previously, firms could not really know whether their decision was the correct one. With the access to data, more educated decisions can be made and this has to be coordinated throughout the organisation. To connect back to the case with predictive maintenance, which in itself is a case of making decisions based on data. The concept can be further developed and data can be analysed to understand which components that most often breaks down, this can give product development the understanding on how to improve their products to make them even better.

The ways of working changes extensively depending on the initiatives a firm undertakes from its DBS. Firms needs to understand how their respective decisions impacts the departments of the organisation, how to effectively allocate costs and income that it involves and try to integrate departments into cross-functional teams to optimise the use of its internal resources and capa-
bilities. By understanding the consequences of the decisions and how to handle these, the firm can ensure that the initiative taken is not being opposed by any manager or department of the firm. This part of the change management project has to be highly regarded and successfully changing the way the firm is working is a large contributor to a successful DBS.

5.1.4 Leading Change

All organisational changes needs leaders to make them happen (Kotter et al., 1995), according to the interviewees, this plays an important part of a successful DBS. Leadership was one of the topics that had the most consent among all of the interviewees. With that being said, there were some differences that should be highlighted. Although, the question concerned who should lead, many of the interviewees found it much more easier to explain who should not. Several of them outlined that the problem many firms do with their respective DBS is to put the responsibility on the IT department and more specifically the CIO. By doing so, the firm restricts its chances of succeeding with their strategy and limits it to becoming a side project. It is important to involve the entire company in the strategy to actually make it happen. This is up to the leaders. One interviewee outlines the issues of not involving the entire firm.

If it’s on IT it only becomes technical, if it’s on market it just becomes communication, sometimes you put it on management and then it just becomes strategy. Sometimes you place it on the floor and then it gets no strategical direction.

-Interviewee D

Then it comes back to the question who should lead the change. I have found two answers that can be applied in general to this question. Many advocates the CEO as the main responsible of leading the DBS and some mention the often newly formed role Chief Digital Officer (CDO). Making your CEO responsible has its advantages but involving a CDO will help getting the change through.

The CDO in contrast to the CIO should not have the specific technical aspect in mind, he or she should understand other aspects of the firm such as processes, ways of working and customers. The leader needs to understand that a DBS is not about technology it is about change management, that is why the new role is preferable. However, most of the interviewees mentions issues of having the CDO responsible for the DBS. One issue of the CDO is that the firm does not really know where to fit the person in the organisation and the CDO’s change initiative risks either becoming a separate part of the firm. The DBS risks becoming a small group working with change questions and digital products but rarely gets any impact across the entire firm. Furthermore, the CDO can often be overrun by others in the firm when they try to push for an initiative preventing the change. It is often concluded by the interviewees that the CDO is a good role of having in your firm but that person should not be the leader of the DBS.

The other person mentioned to lead the change is the CEO. This has unanimously been mentioned by all interviewees as the potential person to lead the change. The CEO has the impact necessary to drive changes across the entire organisation as well as being more suitable to make
radical decisions in comparison to the CDO. Moreover, the CEO also have the potential to bring the management and board to agree to the change. A DBS often have an impact on the firm’s financial situation and the CEO has the vital communication channel to the board to anchor the effects of the strategy. Although, making the CEO responsible for the DBS also has its drawbacks.

One interviewee describes the issues more in detail. it’s important to find the person with the accommodated knowledge, working with a CEO is not good in all cases. In many cases the CEO knows the traditional business but finds it difficult to understand how to move over to a digital one. CEOs are good to involve in a dialogue and should preferably be involved in the managing group but should not be involved on a daily basis.

Another interviewee seems more certain of the CEO’s role and puts it; !the CEO should in some sense be the outermost responsible, he or she must be responsible that a strategy is constructed and exists, then it is a team work to make the strategy happen. Outermost the CEO with management and then an anchoring in the entire organisation. A strategy should always be anchored to the board as well and sometimes it’s the board who should be responsible. But I think that in large changes then maybe a cooperation between the board, CEO and management”.

This leads directly to the next topic, namely, involving the board in the strategy. Some interviewees mentions explicitly the importance of involving the board in the strategy and being a key to success. As previously mentioned, the DBS might have a large impact on the financial position of the firm and not anchoring this to the board might have severe consequences for the strategy. First, if the board starts to see receding results and reduced performance in the firm due to the newly introduced DBS they will start to oppose the strategy and possibly shut it down. Clearly, this will make the DBS fail as well as being much more expensive than it should have been to begin with. Second of all, by not anchoring the DBS to the board to begin with, the CEO’s reliability might be questioned, if he knew from the start that this would happen, why did he not tell the board? Unfortunately, not involving the board can potentially lead to the resigning of a CEO for implementing a successful strategy that was not anchored to it.

The last aspect important in leading change is involving the entire organisation through communication and being able to get key people involved in the strategy. The leader must be able to communicate the vision and goal of the strategy to get the entire organisation to work along the DBS. It is important to get the business managers to understand the DBS to get their respective divisions involved. Additionally, the business managers respective division then needs to work in line with the DBS and needs certain people to drive it further.

*It is important to have a communication strategy and communicator to inform and get people to join the change journey, to change something can be a tough process.*

-Interviewee B

To conclude the area of leadership, organisations needs a clear leader that should drive the initiative and should preferably be the CEO. He or she needs to be supported by the board
along with the rest of the management. A CDO can be a good idea to add to the management roster to be able to understand how to handle the digitalisation internally in the firm. The CDO should support the CEO in the decision making and also be the one responsible for the day-to-day business of the DBS. Furthermore, the DBS needs to communicate further down in the organisation and involve its entity. This way, the firm ensures that the DBS is not being opposed in the organisation.

5.1.5 Building Success

Building success around the DBS is important to get the entire firm to realise that what they are doing is working and their efforts actually matter. Throughout the interviews, many spoke about ways to highlight successes of the DBS. Which is one of Kotter et al. (1995) step in his critical success factors in a change management project. As outlined before, a change project can be a long and tough process for a firm and in order to make the work bearable, the firm needs to work in shorter stages and towards milestones. I found that there are in general two common ways to build success. The first is to show success-cases that the DBS has led to and what has been done. Success-cases will show the other employees, not directly involved in the current project, what the initiative can do and build up positivity around the DBS. The other is to continuously measure and evaluate the progress of the strategy. This way, the firm can ensure that what they are doing is in line with the DBS and that they are delivering accordingly. By both measuring and building success-cases, the firm can build momentum around the initiative and make it easier to implement it further.

One of the interviewees talked about achieving a certain acceptance in the firm that needs to be met in order for the DBS to succeed.

To reach acceptance it’s good to show success and then it’s good to have proof that you are being more innovative. You have done this change and implemented your new business model and you need to show results to get the firm with you. In other cases you need success-cases and by that way get the firm on your side. In that sense it’s good to measure to show the progress. However, that requires you to be successful

-Interviewee D

By highlighting success-cases around the DBS in the organisation, the firm’s chances of succeeding overall increases. The success-cases become a tool for the change leaders to change the culture of the firm from the inside and expanding the initiative successively into the entire firm. Rather than forcing employees to work in new ways to adapt to the new organisation, the success-cases becomes a way for them to realise that the change has positive effects.

The other way to build success is by measuring the progress of the firm regarding the DBS. This was seen by everyone with specific IT or management consultancy background to be crucial and completely necessary for the success of the DBS. If you do not measure you can never know how you are performing. Although interviewees agreed on the importance of measuring the progress, they had different opinions regarding how you should measure, whether it is easy and what to measure.
In general, the measurement should be done using key performance indicators (KPIs). These should be directly connected to reflect the overall business strategy and the DBS. The KPIs should also be of both financial character as well as reflecting soft values, such as measuring whether you are working more agile or being more innovative. The financial and more specific KPIs are often easy to measure and necessary, however, the soft KPIs can be hard to track and difficult to measure. Soft factors are also very important since they factors are needed for a successful DBS. Interviewees mention that you need both since they tend to be effectual in different stages of the implementation of the DBS.

First, the soft factors changes. This means that a firm cannot measure their strategic performance based on financial KPIs. These will confuse them since they tend to be impacted negatively in the early stages. Once the soft factors have changed and the DBS matures, the financial factors should be attended and the firm needs to see results financially. This not only to ensure that the firm delivers according to strategy but also that the financial motives behind it is correct. However, there are some problems with measuring. Almost every interviewee mentions that it’s difficult to know exactly what to measure and to concertises the KPIs being directly connected to the strategy. One interviewee had an interesting point on this matter:

_A warning with measuring and control, there is a sayings I use. It’s easy to make the measurable important but hard to make the important measurable. We can measure this and follow up on it but is it really this we should measure?_  
-Interviewee I

This highlights the issue of measuring and connecting the measurements to actually reflect your strategy’s impact.

There were some discrepancies among the interviewees whether the DBS implies new measurements and KPIs or if the firm should keep its current ones. One interviewee mentions that the KPIs should be kept since the DBS is a part of the overall business strategy and they should be in line with them on financial KPIs. On the other hand, the interviewee points out that KPIs could be added to show the effect of the strategy, how well the firm is working in a new way and if the new digital tools are being used effectively. It seems to be a good idea of keeping financial KPIs, however, one interviewee brings up a case to counter prove it. If a firm’s DBS is to move their business to provide their products as a service the firm’s KPIs cannot continue to be measured on the amount of the product sold per sales person or similar. The DBS ends might decrease the amount of the product sold and would then by the old measure be seen as ineffective. These changes in the business certainly needs the KPIs to change. It can be difficult for the firm to identify and specify these KPIs, making measuring of the DBS more difficult.

Building success in the firm is a clever strategy to turn the culture around in the firm to become more digital. By successively expanding the initiative inside the firm and build interest in the DBS through success-cases and KPIs, the firm will more easily handle resistance and increase the success chances of the DBS. Furthermore, by making people deliberately join the process of change the change management work will be much less painful. Success-cases should be
highlighted continuously during the implementation process to build momentum in the firm. When using KPIs, it is crucial to consider both hard and soft factors to consider their respective importance during the different phases of the DBS. KPIs are also a way for the firm to know that the strategy is having the effect sought after and that the initiatives taken are effectively working in reality.

5.1.6 Financial Factors

Financial factors needs to be taken into consideration during the decision making of the strategy. These factors can limit the scope of the strategy, exclude certain strategies or force you to implement a strategy. Depending on your financial situation the strategy you undertake may or may not be limited but is certainly affected by it. Some interviewees mentions the large investments connected to the DBS. Firms needs to invest in new technologies, competences and also afford to fail since the DBS often involves some kind of innovation with an uncertain goal. Testing new ideas is part of being innovative and firms needs to include failures into their calculations.

Furthermore, depending on your current business’s performance, the extent of the strategy is impacted. If your results are decreasing firms might need to change because of that. However, since the strategy needs financing continuously, firms may have to reject strategies because of insufficient funds or the strategy being too extensive in relation to the financial aspects. One preferable situation is when firms change not because they have to due to receding performance, limiting their finances. Instead, firms that present their DBS as an opportunity with a healthy stable current business being able to finance the new initiative are more likely to present a valuable DBS. Firms should also consider macro economical factors and change when times are good when they often have means to.

*When the macro economical factors are good it’s a golden opportunity for firms that are performing good to reinvest in new digital technology.*

-Interviewee K

One interviewee also points out that firms often tends to misjudge how much financing is needed for the DBS and do not distribute the resources properly. The cost and resources needed for implementing a DBS is often skewed and requires firms to increase resources employed in the later stages of the DBS. Many firms pours down the majority of resources in the early phase of the DBS trying to, for example, identify a valid use of a digital innovation in their current products. When that is done they do not fully realise the cost that arises in the work implementing the new technology and risk running out of resources as a consequence. It is, according to the interviewee, during the implementation phase the majority of costs arise, changing the organisations ways of working and recruiting the competences needed are costs that needs to be accounted for in the DBS. By not doing so, many firms tend to fail in their initiative when they run out of resources.

Another perspective to include on the financial is the potential upside of the business case. For a strategy to be accepted there has to be a proven business case connected to it. This can
seem obvious and it somewhat is, but the hard part is proving the business case, many factors are hard to measure and oftentimes the business case involve more satisfied customers, which is hard to measure. Then it’s hard to prove that the strategy is having an effect and motivate management and the board that the strategy is necessary.

5.1.7 Does size matter?

This question has two answers to it. Size does and does not matter for a DBS. Interviewees answered almost unanimous to this question. The size does not matter for the firms overall strategy, the questions it faces are generally the same. The strategy, should not take into account the size of the firm. It have the same possibilities as any other firm in the same industry has. However, what differs is during the implementation phase of the DBS and the more internal challenges it needs to solve. A large business, often old, has more cemented ways of working than a smaller firm. It stands against tougher cultural and structural changes which can be hard to change. Furthermore, a larger firm often needs to see quicker proof of progress in terms of financial results to be allowed to continue with the change, which in itself can be very time consuming and fills no intrinsic value on its own. On the other hand, a small firm can faster innovate itself and be more flexible in the ways it does work. Moreover, a smaller firm does not need to continuously prove the progress in financial terms, being small has the advantage of it being easy to communicate internally among employees. By asking around, it’s easy to identify whether you have changed the way you work. The challenges they see internally are often lack of competences in the firm. A small firm generally do not have the competence to perform the change, not the least the digital competence necessary for a DBS. They have to take competences inadequacies, as previously mentioned, as a larger part of their DBS and address how they should solve them.

Finally, another aspect that impacts the implementation phase of the DBS is the financial aspects. In the previous section, I brought up the implications of the firm’s financial standings and how it impacts the DBS. For a small firm, the financial standings are often more fragile than for a larger firm. The small firm does more rarely have a current business that can finance an entire digital initiative to change. That is why smaller firms initiate higher risk when they implement the DBS, standing less chances of survival if they fail. Since failure is a large part of a successful DBS this is something smaller firms needs to consider and take into account.

The size of the firm does not affect the possibilities of the DBS, it affects the challenges the respective firm faces. By understanding your current situation and which certain challenges needs to be addressed given the size, there are no major differences that affects the DBS and the outcome of it.

5.2 DBS relation to the Business Model Framework

I will in this section present how the business model can be included to identify a valid DBS. The analysis will use the business model canvas framework by Osterwalder and Pigneur (2010). Here, the answers of the interviewees on the respective components included in the business.
model framework will be outlined. This will help me to answer research question two to identify how the business model framework is being impacted by the implementation of the DBS. This framework is meant to help firms address the different aspects of how it does business, with the implementation of digital technology the effects on the business model can be extensive. That is why the hypothesis of the business model as being an integral part of the DBS was developed. This section aims to answer the second research question: How does DBS affect a MedTech firm’s business models?

5.2.1 Comments on the Business Model

During the interviews, I did not explicitly ask the interviewees about their thoughts on the business model canvas or similar related to the DBS. Instead, I asked them to identify components in the DBS to see if they would mention the business model to some extent. Whether they did or did not, I continued to ask about the specific components of this particular business model framework to get their objective input on the components without the framework in mind. This way, I hope to more objectively gain an understanding of the business models relation to the DBS. With that in mind, two of the interviewees directly mentioned that they employ the business model canvas when they develop a DBS and the rest did not mention any specific business model framework at all. However, many of these components were identified by all interviewees as important parts of a DBS which is why the hypothesis still remains.

Key Partnerships

Partnerships was one of the topics that seemed to be one of the most important when it comes to DBS. All interviewees mentioned to some extent that partnerships was often necessary in the strategy. To be able to develop many digital solutions partnerships are required. As previously mentioned in the competences section, firms should not try to build all competences by themselves, instead they should use existing firms’ knowledge and partner up with them. There are some elements in partnerships that needs to be regarded. First, it’s not always good to enter a partnership. Sometimes if the competence you seek to obtain is identified as a key competence of your firm in the future it might be better to develop in on your own. Second, when a firm enter a partnership the firm needs to realise that the partnership needs to be a win-win situation, where there is not only one part taking advantage of the other. If a firm wishes to acquire certain knowledge from another firm, it needs to be able to offer something back. Finally, before entering any partnership the firm should have identified valid use-cases and a specific reason to why the specific partnership is needed.

Identification of future key competences needs to be made restrictively, several interviewees have witnessed firms identify key competences and refused to enter partnerships because they wanted to do it by themselves. This has often been the development of certain systems or technologies that existed at the time but the firm believed it could do it better themselves. However, that specific technology or system had nothing to do with a future key competence and the firm saw itself being overrun by the established firms and in the end resulted in loss of momentum and money in its development-process. Moreover, the technology is not the key
competence and future competitive advantage for the firm, it is how they learn how to use them. This issue seems to be more common for larger companies that seems to overestimate their ability to deliver these kinds of solutions rather than collaborating with others.

*I tried to establish collaboration with two firms that had one of their own (business-systems). I tried to exchange partnerships with them but the telecom company I worked for wanted to build it by themselves and be in the front seat. That was a mistake. It is not this equipment that is the primary interface it is a sub-function of the entirety. Now the competing firm have developed their own competing solutions.*

-Interviewee I

Another interviewee also addresses the topic; "many large firms concludes that they want to do it by themselves from the start, unfortunately they get stuck in the technology track. If you partner up with one of the large firms i.e IBM, GE, PTC then 80% of the work is already done. You should be careful internally not to let IT control the DBS. They will often tell you that the solution is not perfect and they can do it better on their own. I have seen firms where IT is working on an digital solution whilst meeting with other people in the firm that run their own project with a hired consultant that tell me that they will never use the solution IT will present".

However, another interviewee outlines the risks of entering a partnership:

*If it’s an immature product and you want to test it, it’s good to cooperate with a partner that has come further in that specific area. If you are convinced this will be the core in the future it can be a good idea to buy the capability, you do not want to build too much capability and create dependence to partners but it’s often a quicker way to market*

-Interviewee J

When trying to enter a partnership the firm needs to be able to offer the partnering firm something in return for their competence or resource. Otherwise, the partner will not see any benefit of the partnership and not choose to enter. The partnership needs to be a win-win situation where both parties gain something from it. Firms also has to be cautious not to end up in an unbalanced partnership. Partnerships can be good to begin with but one party might take over and the partnership could in the long run become a threat to ones business.

It is also important to identify why you should enter the specific partnership. Firms should not seek partnership for the sake of it, they need a clear purpose and often a certain use-case. The partnerships should be seen as tools for firms to achieve the desired end product. Since a DBS involve vast use of technologies and analysis tools, the partnership allows quick access to these to create the end product. When a specific use-case has been identified the firm should see what is needed to provide the solution and identify partnerships necessary to achieve this.

Other partners that can be valid are the potential customers’ other suppliers. Where firms can join forces to create a better complete integrated solution for the customers, which commonly is referred to as an eco-system in this context. Where all parties contribute to a complete solution and firms can join to extend the eco-system by providing new solutions to it.

Interviewees also mention that the customers should and can be a part of a partnership to
find potential solutions and use-cases for them. The digital solutions should in general be
customer-centric and all firms and solutions connected to customers should be considered a
potential partner. Furthermore, firms need to consider their go-to market participants. In
order to provide a new delivery solution or way of selling, firms might need to address their
logistics partner and if they cannot deliver in accordance with the demands of the new solution,
they might need to change partner or help them develop to the desired state. For example, if a
firm wants to develop an on-demand service for their products, where products are delivered on
a daily demand basis, they cannot keep their current wholesale logistics partner which currently
cannot deliver accordingly. Thus, firms need to overview their go-to market participants as
well.

Key Activities

When it comes to key activities in the DBS, this matter was not as much mentioned as other
parts of the business model framework. Although it is still an important part of the DBS, I
may conclude that it is not as much affected by it. In general, the firm’s key activities stays
the same regardless of the DBS since the aim is to focus on your core competences and that
often involves delivering similar activities as before. For instance, a transportation firm will
most likely have transportation as its key activity even after the implementation of the DBS.
Firms do, on the other hand, need to identify their key activities and understand what they
are in order to improve and deliver them in a better way. If the firm does not understand what
its key activity is, then it does not understand its own business.

One interviewee mentioned a case, not directly related to DBS, where firms delivering ice back
in the days when the freezer did not exist. Once the freezer was common in households these
firms ceased to exist because there was no demand for ice. However, these firms key activities
was not ice, it was delivery much like the services we see today such as UPS, DHL and similar.
They had all the infrastructure necessary for a regular delivery firm of today, had they just
realised this, some of them would probably still be operational today. The same goes for firms
developing a DBS, they need to understand their key activities, how this deliver to the value
proposition and which of these activities can be improved or removed by the DBS. The digital
processes allow optimisation and automation of current processes which can improve the value
proposition of the firm. Interviewees also mention cases when the value proposition completely
changes through a DBS and then it is crucial to understand the key activities that should
deliver to this value proposition.

What is also worth noticing when it comes to key activities is that improving these activities
can be directly internal and do not necessarily have to contribute to any noticeable changes for
the customers. Improving internal processes with digital technology can aim to reduce internal
costs without affecting the offer to customers. One can view key activities on a two dimensional
axis, where one represents improvements of internal operations and the other customer facing
activities. The first will only affect the firm itself, whereas the customer facing affects both the
firm and the customer experience of the firm’s products or services. Several interviewees have
explained the benefits of addressing both of these dimensions in your DBS.

I split digitalisation, one that is customer-centeric and one that is more operations and inter-
nal digitisation. Either create new digital channels instead of writing and include automatic self-service. Whilst automatising back-end processes and supply chains is more internal, the interesting part is when you include both. Digital disruptors are good at both axes, but their biggest advantage is that they combine both.

-Interviewee E

**Figure 12: Key Activities Dimensions**

**Key Activities**

**Key Resources**

The key resources of the DBS involve the resources needed to deliver the value proposition. Since the DBS can change and extend the firms need of competences, the DBS will require the key resources to sometimes change or broaden from its current state. As previously outlined under section 5.1.2 about new competences, it is important for the firm to identify what resources is needed to deliver in line with the DBS. Depending on the decision in the DBS, what is needed to be done and what the change means, the key resources in the business model is affected. For example, if one part of the strategy is to implement automated service maintenance where service is done based on needs. Then, the firm will have to identify the resources required to deliver this automated service, which most likely will involve the service maintenance team currently performing the service. This team must be extended with an additional team that understands the analysing of data and also resources to deliver the additional sensors mounted on the equipment and the software program that should deliver the data to the firm. A small digital change or initiative to the firm’s overall strategy can have large impacts on the firms integral parts delivering to that particular strategy. This goes further to the change management questions that needs to be dealt with and addressed as a consequence of the organisational changes required to execute the strategy.

The key resources needs to be identified and is often extended as a consequence of a DBS.
Firms need to be aware of the impact of the strategical decisions on the integral parts of the organisation as well as how they should address the issues that arise in the change management work.

**Customer Segments**

In a DBS, customer segments needs to be considered. All interviewees mentions that customers needs to be involved in the development process of products and new innovations. That is why firms needs to understand its customers in order to identify the specific customer segments’ needs. By doing so, firms may be able to develop certain collaborations with the customer segments to find innovations particularly fit for them. Being innovative and finding new solutions for customers involve understanding the customer journey and by that also the different segments that exists in the firm’s market. Customer segments was not the topic most extensively discussed it still plays its part in a DBS. However, one interviewee elaborates on this topic further.

*For me it’s obvious, if you are in the management of a firm and are thinking about what to do in this area. Then you have to do an analysis and you have to look at your customers, segments and similar and break it down to understand the logic in each customer group and observe what is possible and envision what my products could be tomorrow for this customer group.*

The interviewee then adds on the potential of completely wiping out your current customer segments and finding completely new for your firm, depending on what you want to do with your strategy:

*But there are firms that have taken a step back; we are in this niche and work with these products and tomorrow the world will look completely different and identify a completely new business.*

-Interviewee H

The DBS requires the firm to make a decision, either identify their current customer segments and develop products for them or completely disregard current customer segments and groups and start a new business.

Finding a good partner to innovate with is crucial. The healthcare in Sweden, i.e elderly care and hospitals, are often the largest customers of MedTech firms. These needs to be involved in the innovation process as mentioned but there are some aspects that needs to be taken into account when cooperating with hospitals and elderly care. In Sweden, hospitals and elderly care are either privately held or held by a county. This affects their ability to cooperate and being innovative.

Interviewees with experience from the healthcare sector were asked whether they found privately or county held businesses to be more innovative and digital than the other. The answer varied a bit, where most thought that privately held were more digital and willing to innovate whereas some mentioned that there is no larger difference between the two, and there exists private organisations that are reactionary around this area. However, from one aspect there exists a major difference and that is governmental procurement that affect the county held organisations. It can restrict their possibility to purchase new innovative solutions. The procurement
requires these organisations to have a frame to use when they evaluate products, constructing this frame can be a slow process, while their ability to purchase them in the long run is almost the same, it might affect their short term ability. That is why establishing Co-innovation with private actors for faster innovation is a good idea.

On the other hand, a slow evaluation process is not necessarily negative but has to be considered when developing a partner to Co-innovate with. Ultimately, publicly held actors needs to be involved as well, because it is such a large part of the entire market, initiating a cooperation with a public partner can be a way to establish the required frame for these actors to evaluate and purchase your particular innovation earlier than competitors. It is necessary for MedTech firms to involve both types in their innovation process in order be able to handle the requirements from the different parties.

Customer Relationship

This is probably the most crucial part of a DBS and is the one that is affected the most. First of all, the customer relationship is important because the customers are needed in the development process of innovation and products in a DBS. Without the customer, the firm looses out on the possibility of Co-creation which is completely necessary. Moreover, the firm’s ability to serve the customer also increases. This can be done through better interaction with the customer through new automated services and other possibilities for customers to serve themselves. On the other hand, the DBS involves a risk with the customer relationship. New technologies and innovations might be insufficient in the beginning and suffer from child diseases which might affect customer relationship negatively. Firms have to find ways on how to prevent these negative events from happening.

By involving the customers in the creation process, firms will be better able to understand what the customers needs and develop products that they actually want. The problem with many traditional firms is that they tend to not involve the customers in the process and sit on their own developing products that they believe the customer wants. To clarify, involving the customer does not only mean that firms should ask the customers what they want because in many cases they do not know themselves. I have heard several times mentioned by the interviewees referring to Steve Job’s statement “Customers do not know what they want until they see it”. Since almost all interviewees have mentioned this, it seems to be a crucial part of the Co-creation process, to incorporate your customers but not really listen to them.

The way the interviewees explains how you should involve the customers is to observe them. By understanding their journey, a firm can potentially identify their needs and challenges and find a solution to that particular need. Firms should not focus on the technology or product part, instead find a problem and solve it with an applicable product solution and technology. Customers are often stuck in the track of its current relationships with their product supplier and find it hard to see any potential innovation, interviewing customers can help but this often leads to incremental input and some minor improvement to current products. One interviewee mentioned one certain case where a customer had been interviewed and was going to give valuable input, this highlights the issue quite well:
Make them think new, if you get to do exactly what you want, what would that be? I have one case with a nurse where the interviewer really tried to inspire, the nurse said: "Now I got it! I want to move the PC from that corner to this." That was in her world innovation, it would ease the nurse’s work but was not what we were looking for.

-Interviewee H

Other interviewees mention similar scenarios to this. They further stress that you need to understand them and their needs. However, when a potential solution is found to a particular problem the user to this often disregards the idea and says it wont work. By then allowing them try the innovation for a month and come back later, they will often ask you how they could do their work without it before. This is what the Co-creation process is about. Furthermore, if the innovation needs some kind of adjustments or was not good at all it can be thrown away or reworked to better fit the needs of the user. This process is applied so that firms do not develop products not fit to the potential user. By reworking and working in short sprints firms can test their innovations and ideas to find a solution optimal for their user. That is why customer relationship is so important in the DBS. Again, here firms should find potential use-cases and evaluate each use-case idea together with the customer to see if it has a potential application in reality and go through with those that gets good response.

Digital innovation also enables firms to innovate their services to customers, increasing their reach and level of service provided. This is often done by an AI assisting in customer support decreasing customer support ques. It also allows customer to improve their self service, where firms provide tools through digital applications that customers can use to improve their ability to serve themselves. The innovation process in this type of application also needs to be taken into great consideration. One interviewee brought up a case where a firm had put up a team consisting of several PhD students that would create an application. The application allowed their customers to self service themselves to the extent that they would not need the firm’s support again. The application was very advanced and worked very well in theory, the problem was that the service personnel of the customers was not able to use it nor understand it. The interviewee mentioned that several of these service personnel could not even read and it was difficult just to send out simple instructions in writing for them to use. This is a typical case of where the firm looses the connection to reality and develop something clever in theory that will never work in practice.

Another issue firms needs to handle is negative events connected to the changes of the DBS which can impact the customer relationship negatively. The implementation of new technology in products and the use of new processes and similar will create problems for both the firm and its customers. The firm will, if not correctly prepared, struggle with the customers’ issues that arise during a digital change trying to adopt to it. The firm has to be prepared for new types of customer support issues and similar to not dissatisfy them and create a negativity around the firm and potentially ruin current customer relationship for future potential Co-innovation.

Customer relationship is one of the most crucial factors in a DBS, where firms have great potential to create products of innovation and form relationships with customers to strengthen
their standing on the market. On the contrary, bad management of your customer relationship impacts your firm’s future potential of Co-innovation with customers and can punish it negatively.

**Channels**

Digital innovations through the DBS enables new channels of communication and sales of products to the customer. A quite straight forward “digital innovation” is the use of e-commerce and selling products online. This is a very old way of using digital innovation in your firm but a perfect concrete example of what it can be. The sales channels can also be extended to incorporate an application or similar to communicate the firms value proposition further to the customer. However, digital processes can create a problem for firms and actually make them lose current sales channels. This is often attributable to physical sales channels as the amount of actual on site visits to customers decreases. Less physical presence can also decrease customers’ willingness to purchase other services from the firm.

Going back to the case of improving service maintenance to be predictive and performed on a needs basis rather than schedule. A change like this can affect the natural sales channels of the firm and result in reduced revenue. The physical contact of the service maintenance on a scheduled basis is often a natural potential opportunity for firms to sell more products and get input on them. This is a sales channel that should not be underestimated and firms needs to solve this missing opportunity and create something else instead. Another aspect of this is that customers are not aware that firms are actively monitoring their products and might not be willing to purchase further service agreements since they are not aware of the continuous monitoring. Firms can turn this around by communicating through the new channels and tell customers that the products are being monitored, even-though nothing has been done, communicate to customers that their products works fine and their systems are healthy.

**Value proposition**

The DBS has the potential to reshape the firm’s entire value proposition, but in many cases it either involves maintaining the same as before or refining current value proposition. The strategy is a tool to improve the activities creating and ultimately leading to the value proposition not necessarily changing it. Interviewees have mentioned cases where the value proposition stays the same, is improved or completely changed. All these approaches are valid in a DBS and the firm should understand what the impact on the organisation is.

One interviewee mentions that the firm should not change the value proposition too much and hope for something completely new in its DBS, unless they have done it before successfully. Other interviewees mention that the firm needs to evaluate its current position and decide whether it should maintain current course and improve it or completely change and create something new. The most common approach mentioned by interviewees is that the firm should evaluate both options in their DBS. Whilst they should evaluate both options, the most common and easy way to approach the DBS is to maintain and keep the core competences and business the firm is currently doing. If the firm decides to keep its value proposition, the aim of the DBS should be to improve it or make the processes leading to it more efficient.
Another common approach that can change the value proposition but not change the products of the firm is to move to delivering a service or solution instead of a product. Many firms today see their value proposition as selling a product, instead, digital technology allows firms to deliver their products in new types of ways, more like a service or solution to a certain problem. For example, a tire manufacturing firm sells tires to customers that needs them. Instead, one interviewer elaborates on a case with a tire manufacturer; the tire manufacturer sold their tires as a transportation solution, always ensuring that the customer has a well functioning safe tire on their vehicle, by being able to monitor them. This new service also allowed the tire manufacture to improve fuel consumption compared to competitors. Ultimately, the value proposition of the company became a fuel saving service as well as a safety service, providing better and safer tiers.

This part of the business model will affect how the firm is working to deliver to it. It can either mean that the firm changes processes delivering to current value proposition or changing the value proposition and changing the processes delivering to it entirely. Making changes to the value proposition will have consequences for the following change management work of the firm and understanding what the changes in or to the value proposition implies will ease the change management work that follows.

**Revenue**

Considering the revenue streams of the firm is very interesting in a DBS, digital technology allows firms to change the way its customers pays in many ways. Changing the revenue stream can seem quite trivial, paying on a monthly basis or for the possession of a product should not matter that much to a firm. In fact it does, digital technology create streams of data which unlocks new ways for firms to receive payments for their products, services or solutions. A popular way for firms selling products is regular asset sales, where firms sell the ownership of a product, such as retail firms. These firms are the ones that will be affected the most when utilising digital technology in products.

One issue interviewees mention is the problem of changing the revenue stream for the organisation. One popular way of changing the revenue is to charge customers based on the extent they use the product. Considering the car tire case again, it could be charging based on how far they have driven on the tire and customers pay for the amount of miles they have driven and the tire manufacturer will always provide a well functioning tire to drive on. A similar application of this type of revenue is the case company Human Care’s product, the roof lift, where they have suggested to charge customers based on the number of lifts. The services often increase the value proposition but it can be difficult for firms to motivate why they should charge a higher price. Firms needs other ways to motivate customers why they should pay a higher price for a certain service. In the tire case this could mean that the firm motivate their products as a service of lowering fuel consumption for example. This also has impacts on the organisation’s product development department, sales and support as previously mentioned.

Another issue brought up in interviews when changing the revenue stream is that it might impact the overall business goal. If your previous goal was to sell number of tires per year and now it is not the tire itself that is relevant for the revenue. This can take some time for the
firm to turn around and can involve a lot of uncertainty for the firm. This again, connects back to the change management work of the firm and requires it to involve the entire management to not raise resistance against the strategy.

The last thing that the DBS impacts when it comes to revenue is the firm’s internal costs. The DBS enables removing of processes and activities which ultimately leads to reduced costs in the firm internally. These can be more or less difficult to identify but is on the same time a necessary factor to consider. Both cost reduction and new revenue streams are equally important, but firms often miss this opportunity in their DBS and rather look at new revenue streams.

Cost

There are several costs associated with a DBS. I have previously gone through the financial aspects of a DBS and these should be located to the business model. These can be costs arising from the staffing of the strategy, where the cost of recruiting, new technology and similar needs to be identified to understand the cost aspects. Furthermore, the cost part of the strategy in the business model will act as an underlying part in the decision making process whether the strategy should and can be executed. For a strategy to be accepted, the firm have to have sufficient financial ability in order for the strategy to be carried out completely. Depending on the strategy, the cost aspect in the business model will change to different extent and this will be a determining factor whether it is feasible or not. One can think of the financial aspects of the firm as a limiting factor of the strategy and the cost in the business model will give the understanding of if the strategy fits in the firm’s specific financial frame. Without the costs in mind, the firm acts in blindness and risks of undertaking strategies that cannot be fully executed. This was one of the mistakes that leads to unsuccessful strategies that interviewees identified.
6 General Discussion

In this section I present a discussion and analysis that connects my findings to the sub-questions. I outline cross-sectional findings and discuss them in relation to literature and my theoretical framework.

6.1 Change Management of the DBS

Here, I discuss the change management aspect of the DBS and how it relates to current literature and the different areas that connects them.

6.1.1 Characteristics of a DBS

The characteristics of the DBS was often mentioned in the interviews, although it was not by all completely outspoken, connections to the characteristics framework can easily be made. First of all, a DBS involves a lot of planning and a clear strategy. Analysing a DBS through Balogun and Hailey (2008) framework reveals a DBS’s typical characteristics. Looking at the speed of change in a DBS, most of the interviewees mention that it needs to be implemented incrementally. Many of them witness that it is hard to make a large digital change through a big bang disruption in the firm. The reason behind this is said to be that the strategy needs to be slowly implemented and employees takes time adopting to the new ways of doing business.

One interviewee says the following:

If it is a large change I believe more on pilot, think about growing it inwards out. It is very hard to do something big bang over the entire firm. Work more experimentally in short sprints and gradually involve more people and let people come and work in that way, make open-houses and let people look at your success ”..” If you try to force this on everyone this will immediately meet resistance.

-Interviewee E

However, one of the interviewee is certain that a DBS can be both big bang and incremental in the firm, the firm just needs to have different approaches.

Be clear on where you are going and what has been decided about how the future will look, be thorough with working in sprints. If more big bang, prepare people to land in it. do not think you can do it from day one, if you decide to do it today maybe the change happens after summer. People must mature in to the strategy, more meetings, communications so you get the organisation with you.

-Interviewee H

The extent of the change can be both transformational and a realignment of the business. Although, most of the interviewees indicate that it is more of a digital transformation rather than an alignment. A digital change initiative requires firms to execute larger changes in the business which has more transformational impact on it rather than minor changes. This is subject to the extent of the strategy, but regardless of the strategy affecting a small part of the
business, it will still require changes in the entire organisation. That is why a DBS more leans towards being a transformation.

Furthermore, the description of an incremental transformation, an evolution, given in the framework is quite similar to the description of a DBS during the interviews. "Transformational change implemented gradually through interrelated initiatives; likely to be proactive change undertaken in anticipation of the need for future change"

It can be concluded that a DBS has many characteristics of an evolution according to Balogun and Hailey (2008) framework. Moreover, most of the interviewees mention the toughness of doing a DBS big bang and it is important to understand this limitation. Firms should be cautious and react early rather than react late since big bang changes is a difficult option.

**Resistance to Change in the DBS**

In line with current literature, there is a clear connection with the implementation of the DBS and resistance that occur in the organisation. This is necessary for a DBS to be implemented successfully. Interviewees have identified several factors in a change project similar to Kaune (2004), where both formal and informal factors are relevant. The DBS also strikes and raises resistance on all the three levels namely, organisational, group and individual level. Much like Cacaci (2006) concludes, interviewees also highlights the importance of dealing with resistance to be successful in your DBS.

There are some resistance factors that were more frequently mentioned during the interviews than others. Most of all, the competences and responsibilities were the topics that were extensively elaborated on. This might be due to the formal aspect and easy identification because of their concrete character but many mentioned that these topics are the two that differs the most from other strategies and change management decisions. The competences becomes more important since firms enter new areas that they have not been present in before and leadership since there is no clear leader whom should lead the change.

Furthermore, as Paton and McCalman (2008) mentions, the culture of the firm cannot be ignored. Which is mentioned as an important factor of the DBS as well. This goes back to firms working in new agile ways, involving the customers in the innovation process and other aspects mentioned in the analysis.

The group layer of the DBS should not be ignored either, working in a digital environment require teams to change and the dynamic and cohesion is dramatically impacted. This is foremost attributable to the cross-functional teams that needs to be constructed.

The individual level was also frequently mentioned, where interviewees brought up the importance of receiving acceptance in the firm among the employees on an individual level and which Calish and Gamache (1981) points out as being the most important aspect of a change management project. Much like theory and literature, several factors on an individual level was brought up during interviews. One of the subjects, also mentioned in literature, was the changed skill-set as well as transferring of teams required by employees being part of a DBS (Kaune 2004). The emotional aspects needs to be considered as well, where fear of each individuals’ position in the new organisation is a major concern. All these factors was mentioned.
as needed to be overcome in the interviews. The acceptance in the firm and bringing positivity around the DBS with the employees was seen as crucial in order for the DBS to be successful and confirms the idea that the individual level is the most important part in a change management project.

**Success Factors in DBSs**

The change management part of the DBS is by the interviewees considered the most critical factor as well as the part where firms must address most resources into the strategy. During the interviews several key factors have been mentioned to be critical to contribute to its success. These factors have many similarities to those mentioned by Kotter et al. (1995) and a comparison between the critical success factors in a DBS and the eight step-model described by Kotter et al. (1995) will be made.

The first step in the model involves establishing a sense of urgency. Putting this in relation to digitalisation, many firms are already in this stage. As interviewees mention, many managers of firms are afraid of digitalisation and want to know what it is and how it affects their respective firm. They also notice other firms in their respective industry taking steps towards a more digital business. The sense of urgency already exists in most of firms and if it already doesn’t it should be easy for managers to motivate the needs of the change. One interviewee explains the current stress in firms today:

*There is an enormous digitalisation stress but it’s not unjustified, a survey from an IoT organisation indicates that 80% of swedes are unsatisfied with the public sector’s current digital services. The pressure from consumers is tremendously high, especially in the public sector.*

-Interviewee K

Forming a powerful guiding coalition is the second step of the model. Interviewees answered quite unanimously to this and said that the coalition must consist of the CEO and preferably with the support of the board. In addition, the coalition needs to consist of the entire management that initiates the change in their respective division or department of the firm. The importance and the need of a powerful coalition constructed by Kotter et al. (1995) is confirmed by interviewees who mention that many firms do it fundamentally wrong when they construct a group of leaders to the DBS, which results in failure. The reason behind this is that the coalition is not powerful enough and do not have the influence in the firm necessary to drive the change throughout the entire organisation.

The third step and fourth step, creating a vision and communicating the vision, relates to the section why firms should change. This was also mentioned as an important area and refers to bringing the entire firm to accept the given strategy and intentional plan. Firms need to create a strong reason behind the change and sequentially communicate it to the organisation.

The fifth step has to do with giving employees the tools to start change and adopt to the strategy and the new ways of working. Furthermore I believe this coincide well with the sixth step, planning and creating short-term wins. Where empowering others to act on the vision can be seen as the small group starting to work on the digitalisation initiatives and supposed to build the success-cases that was mentioned as necessary for the firm to build up momentum.
and grow the DBS. Along with measuring the strategy to create the short term wins, this step has a clear position in a successful DBS.

The last two steps include consolidating improvements and institutionalising new approaches was not frequently mentioned by interviewees. Declaring victory too early was not seen or mentioned as a problem for firms in general. However, connecting the new changes and create a culture around it was a quite common topic. This revolved, creating a culture around making decisions driven by data, working in different ways and establishing a culture that fosters innovation.

The eight-step model developed by Kotter et al. (1995) has a clear place in a DBS and can be used to identify if the firm takes the correct actions to succeed in its strategy. Furthermore, there is a clear linkage between the important success factors mentioned by interviewees and those brought up by Kotter. This strengthen the belief of relevance in both Kotter’s work as well as my finding during the interviews and change management being an important aspect of a DBS.

6.2 The Business Model Framework in a DBS

Here, I will discuss the business models relation to both a DBS and how it affects the change management work of the firm. I will also discuss Osterwalder and Pigneur (2010) business model framework and elaborate on the different components relationship to a DBS.

The Business Model in the DBS

The business model framework, clearly, plays a part in the formulation of a DBS. As many researchers of DBSs have found out, there is a clear connection with changes in the business models and the DBS of the firm [Matt et al., 2015; Downes and Nunes, 2013]. As Gilchrist (2017a) concluded, the involvement of the business model is an integral part of the DBS and is affected by the implementation of a DBS. Matt et al. (2015) findings regarding the changes in value creating, which is a component of the business model, further strengthens my findings.

All components are more or less important in a DBS as outlined in the analysis. First, the components relationship to the DBS is dependent on the DBS employed. A DBS, can take different approaches where, either the strategy is external or of internal purpose. If the strategy is external then the customer components, i.e. customer segments, customer relationship and channels are the most important to consider in the business model. On the other hand, if the DBS is internal, the solution and value it creates do not directly involve the customer. Then firms should foremost overview its key activities, key resources.

Furthermore, when the customer is involved all interviewees mention that the process should start from the customer’s perspective and then work towards a solution from there. That is why the components customer segments, customer relationships and channels should be the initial components to consider in the business model.
When partnerships was mentioned in interviews it was explained that partnerships are extremely important in a DBS. However, a firm should not start with investigating partnerships before they have involved customers and identified a specific use-case or application of digital technology in products. Either way, when a firm acts on an external DBS they should always start with the customers and identify their needs and together with them develop products and innovations for them. This means that the partnerships becomes a tool for firms to use in order to deliver digital products.

Furthermore, the key activities and resources needed also has to be identified after customer needs, which further strengthens the theory that the customer components are the starting point of business model changes in a DBS. There are, however, DBSs where the customer is not involved entirely and the innovation aims at improving firms efficiency and performance internally. These changes do not involve co-creation with the customer and would turn towards improving current activities and processes. If this is the case then there is a clear correlation of changes between key activities and key resources with the revenue, costs and value Proposition. All components are still relevant in an entire business model but a DBS changes the way these interact with each other and a clear correlation between the components exists depending on the strategy.

The Business Model's role in Change Management

During the interviews and the writing of this report, an unexpected correlation with the business model and the change management part of the DBS appeared. These two parts of a DBS clearly affect one other, where the cause is the business model and the effect is on the change management. From the figure 13 I have outlined a framework of the DBS in three separate components. These three components are not uncorrelated and affects each other in a top-down fashion. First, the firm sets the strategy, scope and objectives of it. This will impact different parts of the business models. These changes needs to be thoroughly gone through for each component, how does this strategy impact customers, internal processes, activities and partnerships of the firm. Furthermore, does this strategy impact the value proposition etc. These changes then impacts the change management of the firm, which became apparent during the interviews. A DBS can be of different extent and this impacts the business models depending of the extent. Clearly, a large change impacts the business models more than a small. This correlation also holds for the change management aspect of the DBS, where larger business model changes increases the change management work. Some parts of the change management work always have to be done in a DBS but if, for example, the firm is going to deliver a predictive maintenance service. Then it has to focus on how the firm should bring the service department to work closer to the firm’s other departments. It also needs to focus more on the service employees ways of working and help them learn how to work on a predictive data-driven basis rather than on schedule.

Additionally, the firm will often need to establish an entire new department of data analysis that can create this predictive maintenance service which they will have to focus on how to integrate into the firm. Other changes impacts the change management aspects as well, such
as changing revenue streams or changing products to services, which has major impacts on the
customer support and the sales team. These correlations was found during the conducting of
this thesis but was from the start not a part of general theory or even a hypothesis. That
is why I cannot elaborate much deeper on this subject but should be of interest for further
study.

6.3 Proposed Author Framework of DBS and Business Model re-
work

This framework describes the general process of the DBS, where the firm should evaluate the
strategy and its position in the future based on the factors mentioned under the analysis section
5.1.1. The strategy should then find its way down to the firm’s business models and give an
overview of how the strategy changes the business models of the firm or if entirely new are
created. The changes in business models affects the change management work for the firm.
The extent of the changes in the business models will also determine the extent of changes
in the change management work. This is further discussed in the section 6.2. The pyramid
also symbolises the work related to each part of the DBS, where the change management work
consists of the largest part of a DBS and highlights its importance. The framework identified
has some similarities to the one presented by Matt et al. (2015), where the authors develop two
perspectives of the DBS, one being the strategic planning of the strategy and which resources to
allocate. The second overviews the development and implementation process of the DBS. This
perspective involves four dimensions which have some similarities to my findings. However,
my framework makes a distinct connection to the firm’s business models as well as connecting
it to change management. In line with Olanrewaju and Willmott (2013) my findings relate
well to their findings in their so called improvement cycle. Their improvement cycle outline...
the importance of continuously improve customer experience, products, services distribution and marketing and sales, these are all elements that are identified in the change management work as being needed to be realigned. As [Gilchrist (2017b)] have identified, the business model clearly has its role in the DBS and the findings related to the changes in the business models can be confirmed by his findings.

6.4 Human Care

6.4.1 Case company: Human Care

*Human Care is the commissioner of this project and I deemed it interesting to elaborate on their digital progress and put it into the perspective given by my findings. This section will give an introduction to the firm as well as an elaboration on their progress from meetings I have had with management.*

Human Care is a MedTech firm operating in Sweden, US, Canada, Australia and Netherlands. They act as a distributor in the MedTech supply chain (see Figure 2) and distribute a diverse set of products. Human Care is headquartered in Sweden with 22 people employed and approx. 95 globally ([Human Care, 2016](#)). The company had sales of 300 mSEK in 2016 which, together with the number of employees, classifies the company as a SME along with 95% of the approx. 25,000 MedTech companies in Europe ([MedTech Europe, 2015](#) [Human Care, 2016](#)). Human Care’s manufacturing is outsourced to second parties. Theses manufacturers are located in over 30 countries mainly in Asia and Sweden. They are responsible of providing products on an order basis.

**Products and Services**

Human Care provides products with different functionality, however the general theme of their products is to improve mobility for people with reduced mobile functionality as well as help personnel in healthcare to reduce injury from lifting. The firm currently has four products that they sell:

- The so called *Rollator* is an aid for people finding it difficult to walk on their own. It helps foremost seniors in their everyday life, making them more independent and mobile.

- The *Lifting Solutions* act as lifting help for healthcare professionals reducing the amount of heavy lifts that they have to carry out. This equipment can either be roof mounted using rails or mounted on wheels on the floor. Either-way, the product is used to reduce injuries on personnel from heavy lifting and reduce pain experienced by patients through reduced point pressure.

- The *Healthcare Beds* are used for patients and residents in senior care. Human Care’s bed is a bit different from regular hospital beds. The *Healthcare Beds* is electric and have the ability to be lowered to floor level, with the intent of reducing fall injuries, which causes healthcare costs as well as pain for the patients.
• The *Convertible Chair* is a no-lifting multifunctional device that helps healthcare professionals to more efficiently and effectively perform patient handling practices, such as transfer, re-position, transport and early mobilisation of patients, resulting in improved patient safety, reduced work related injuries and reducing patient length of stay.

In addition to their products, Human Care also provide services to customers. The company provides education and training of how to use their products and also workshops. They also offer service to help architects, contractors and planners when integrating their products. Furthermore, Human Care provide annual service, installation and marketing of their products.

**Human Care’s Digitalisation Progress related to findings**

Human Care wishes digitise their products to improve care given to patients by their customers i.e. hospitals and elderly care. This should be done through connected products which are able to transmit data to help hospitals and elderly care as well as Human Care to get a better understanding of its products and patients. Furthermore, Human Care view the implementation of a DBS as a way for them to detect and service defects in their products to increase their services towards customers. Ultimately, the company views the DBS as a way to change its entire business model and the way it can generate revenue from its products. For example, the Product Manager mentioned the use of new revenue models charging customers by the extent they use the product during my first interview with him.

Although Human Care are certain that they want a more digital business, they are unaware of how to achieve this. This is a common problem for similar companies facing digitalisation, where competences, relevant resources and experience is absent. Currently, the company does not have any IT department or any dedicated department to implement or develop a digital business strategy which causes a problem. Their current status is that the Product Manager is assigned as responsible for addressing the development of a DBS in the company with the CEO being fully aware of the importance of a successful development for the company’s future survival and competitiveness. The company has previously made attempts at developing connected products and services but only made it halfway struggling with the strategy and execution and have not fully developed a complete digital product.

Human Care faces challenges many of the interviewees mentioned. They lack a clear strategy and more importantly a terminal goal of their initiative. The issue can foremost be located to lack of competence in the leadership regarding digitalisation. Where none in the current management have any previous experience of digital businesses or driving digital changes in an organisation. This means that Human Care fails at the first important step of a DBS, namely, creating a strong reason why the change is needed and where it should end.

They have not thought of the implications a DBS have for their products either. Human Care have realised that the change can enable them to receive data from the products and that it can come to use, but have not considered how it can be used and created a specific plan on utilising data. The implications are many on a business model level and can change the revenue stream, service maintenance of products and much more. The firm has to understand these
implications and make educated decisions regarding them.

In addition, they have considered a technological approach of creating a more digital business, which is, by the interviewees, regarded as completely wrong. They have started to develop their roof lift and made it able to deliver data, currently not wireless. They have also developed an online application where their customers can view the status of their products. The problem they currently regard as being the largest is how they should make the roof lift wireless. Although this is a relevant issue, they face much larger issues. First, they have not regarded the change management aspects of creating a more digital business. They have completely disregarded the need of competences needed for these products. Where, primarily, the customer support is not ready for a change of this extent. The customer support does not know how to answers issues regarding the online application created. Moreover, if the application would break down and require Human Care to fix the IT aspect of the application, this cannot be done. The firm has no IT competence in the organisation since the development of the application was outsourced and currently not a present partner of the firm. This can possibly lead to dissatisfied customers and a bad customer relationship, which is necessary to be successful in a DBS. Additionally, the changing ways of working and creating cross-functional teams have not even been thought of. Being innovative and changing the way the firm does work has not been a part of the current initiative and must be included to create a successful strategy.

**How can Human Care use a DBS to improve their products?**

The answer and conclusion to this question, will be a recommendation for Human Care going forward with their digital initiative. For Human Care to develop a successful DBS and reach the goals with the strategy initially given, they need to take one step back from its current progress. The firm have already started to develop a solution without a clear strategy in mind or a connection to their current strategy. The questions raised during my meetings with the firm indicates that they have, as many interviewees have mentioned is incorrect, started to view this issue as a technological solution rather than a process involving the entire organisation. Furthermore, they do not realise the consequences and issues that will be created with the implementation of digital technology in their products and how they should use the data created from it. Moreover, the impact it will have on the organisation and the knowledge to lead this type of change is not present at all.

My recommendation for Human Care is to evaluate its current position, where they want to be in the future and why they want to with or how they should change their products. To do this, they will need someone who understands digitalisation and its impact on the organisation and products to support the management in their decision making. Also, the firm needs to understand current regulations and should preferably get professional advice on MedTech regulations. Once the firm understands where it want to be and what they want to do with their digital initiative they need to map out how this will impact the organisation. The impact should be mapped through the business model framework, previously outlined, which can help to identify what is needed, which areas will be mostly impacted and help to understand which parts needs to be primarily turned to in the change management work. The strategy should then be communicated across the firm to make employees aware of the strategy as well as
prepare them for the upcoming changes. The reason behind the change needs to be sufficiently strong to get employees to agree to the changes.

In order to develop these innovations Human Care should start out in small scale. Identify one of their current customer that are open to be involved in the development of the new products and are open to new innovations. Identify their needs, how this fits to the given strategy and how this aligns with their desired future state. Find use-cases for the customer and valid applications for digital technology in their products. Partner up with firms that can provide the technology to build the solution in the products to create a MVP to test an end-to-end solution with the customer.

Human Care should simultaneously start to attend the change management work of the firm. Firstly, they need to create a small team that should start working on the digital project that are addressed to find these new product solutions and can create the success-cases necessary. The team should preferably consist of people from different departments as well as new competencies that understand the digital aspects of the products. Once this team mature they need to involve more and more people of the firm and slowly turn people around to work more agile and cross-functional in the entire firm growing the initiative further. They need to effectively deal with resistance that arise during the change and take care of employees that oppose the initiative.

When a valid product has been found, be ready to scale it up on the market once its ready. At this point the internal change management needs to have come quite far and Human Care has to be ready to deal with data processing, analysing and having the correct infrastructure in place. The sales team needs to understand the new products as well as having a support team who knows the implication of the new products to solve potential issues that arise.

Although this is quite far away and is more of a long-term target. In short-term, they need to evaluate the current position, the future direction of the firm and start small scale to develop innovations with customers and find potential partnerships to create use-cases that can be tested and evaluated.
7 Conclusion

In this section I present the conclusions and answers to the research question formulated in the beginning of this thesis. The full answer to the research question is represented by the sub-research questions. These answers are based on the empirical findings as well as the literature review. Finally, the thesis is then summed up with a limitation of the project as well as suggestions for research areas going forward.

7.1 Connecting to Research Question

The aim of this thesis has been to identify factors that impacts the business model and change management when an organisation implements a DBS and how firms in the MedTech industry can apply it in their organisation. This research has been carried out through 11 interviews with professionals in management consulting and MedTech. To achieve the aim of this research, I created a main research question.

What are important aspects to consider when MedTech firms implement Digital Business Strategies?

To answer the main research questions I created two sub research questions. Below is my suggested answers to the sub research questions.

Sub Research Question 1: What are important change management factors to consider when implementing a DBS?

Based on the empirical data collected, I found that a DBS changes the set-up of the firm on many levels. First of all, the firm has to realise why it should change and where it wants to be in the future to successfully drive the change in the organisation. Once this is in place the firm can crystallise the different impacts in the organisation. The extent of the impact is subject to the factor ”why change”.

One implication is that current competences of the organisation needs to change to be adapted to a more digital organisation. This means changing competences in current departments as well as the potential creation of new departments and roles in the firm. These can be, but are not limited to, data scientist, data analysts and digitalisation experts in the management. Furthermore, the current competences in the organisation needs to change. The requirements on the employees changes and the DBS often leads to the creation of new products or services in the firm. Current sales team might need to change in order to sell a service instead of a product. Moreover, the customer support team needs to be able to support digital products and applications, which will require their competences to also include or be complemented by people who can support these types of services. Additionally, MedTech firms needs to develop their competence of understanding how digital initiatives can consider the regulations of the industry. I conclude that the competences in a more digital organisation changes both current as well as creating new competences that did not exist in the organisation prior to the implementation to a DBS.
I find that the DBS changes the ways of working in the organisation which can create a big impact on it. The impact is of course dependent on the current ways of working in the firm. Most of all, firms needs to start working more agile. This means working in short sprints, developing prototypes and continuously test and evaluate them. Furthermore, the firm should work in more cross-functional teams sharing the different competences breaking up the often traditional ways of working in silos. Digital strategies require cooperation between different departments and constructing teams consisting of people from each department is necessary to bring them closer together. This means that teams should consist of competences from different parts of the organisation in order to achieve synergies between them and not require people in the firm to learn skills from all business areas.

Firms should also start to involve their customers in its innovation process and maintaining a good customer relationship to develop this is crucial. Customers holds a key to future success and firms needs to learn how to involve them in their product development process. This is especially necessary in MedTech where this both involves hospitals as well as patients. By including both, the firm can find use cases in two dimensions, which is an advantage compared to many other industries.

Including partners in your strategy is also necessary. A firm, independent of size, will not be able to uphold all the necessary parts of a business utilising digital technology and will need to include partners in order to deliver a complete service or product. By realising and limiting your firm to doing what you are good at, complemented with creating partnerships with firms that can help you achieve your desired product or service is very important to not be overrun by other actors on the market. This is particularly important for larger firms, who often want to do everything on their own.

Finally, leading change is necessary to both create a DBS that is competitive as well as being able to drive the change and successfully execute it in the organisation. The impact on the firm comes from management needing to create a clear leader for the DBS, this should often be the CEO of the firm. However, the CEO needs to be supported by his or her entire management and needs a person in the management who understands digitalisation and can act as an advisor to help find the correct direction of the strategy and for example, find the partnerships needed for the products or services being developed. This knowledge is something often needed to be recruited to fill the gap, either as a full-time employee or in the form of a consultant.

**Sub Research Question 2: How does a DBS affect a MedTech firm’s business models?**

Whether the business model is affected by the DBS, the answer is clearly yes. Some interviewees mentioned this during the interviews but this conclusion can be drawn from analysing all the interviewees different responses and summarising the components mentioned during the interviews. Many of the components in the business model framework was seen as important for the DBS and is a good instrument to use to identify how a firms different components are impacted by the DBS. This creates a clearer view of the firms different business components and helps to easier address the needs of each component.

Depending on the strategy, different components in the business model should be addressed.
A customer facing strategy should always start from the customer’s perspective and work backwards towards the firm’s internal activities and processes that deliver to the value proposition. This involves identifying activities, resources as well as partnerships necessary to deliver to customer’s needs. There should then be a co-innovation process between the customer components and the resources and activities connected to the business model. The revenue and costs associated with the business model should thereafter be looked at and the firm’s value proposition to its customer. The revenue can both include new revenue streams and cost savings from improved or removed processes and activities. The cost aspect of the business model includes the costs associated with the given strategy and can be increased number employees or investments into a new technology.

If the strategy is of pure internal purposes, then the firm should start from the resources and activities and work forward towards the impact or change in value proposition, revenue and costs. The firm must still consider customer segments, customer relationships and channels, however, this will not change or require interaction and the co-innovation between them is not required. There is, on the other hand, a connection between the other components of the business model, which is attributable to the resources and activities being correlated with the value proposition, revenue and costs of the business model.

The business model also has a clear correlation with the change management work following the strategy and the changes made in the business model will impact the following change management actions in the firm. This relationship makes it easier to identify where a firm should focus on their resources when it comes to change management. By understanding and using the business model in the DBS a firm can easier address the issues needed to be dealt with in the change management aspects of the DBS. A broad change in the business model will imply more extensive change management work while a small change will imply less.

### 7.2 Limitations

Because of this being a qualitative study, the findings of this research cannot be extended and applied to other contexts. Hence, the generalisability of my findings is quite low. Additionally, the findings are based on interviews with 11 professionals out of several thousands that work in the industry that potentially could be interviewed. These factors needs to be taken into consideration before generalising any results of this work. I have not analysed the results on a case-specific basis to not reduce reliability further. I have, on the contrary, analysed the findings on an aggregated notion. I have tried to highlight the various nuances from the interviewees to provide the reader with tools to apply the findings to his/her specific context.

During this project I have mostly studied management consultants experience from digital business strategies and some MedTech professionals. These might provide a quite narrow picture of the matter and if extended to also include other industries some other factors could be identified as well. In addition, I have only interviewed the aspects of a DBS from a management perspective and including other areas of an organisation could also provide other findings and insights.
Due to the time constraint the number of interviews had to be restricted to number and also put under a geographical constraint. This has limited the context of the thesis to improve reliability of the findings.

I have identified much variability in the answers to some of my questions and many of the findings are very individual and context specific. When extending the findings to apply for other firms, especially in other industries, one must be careful. One has to keep in mind an important aspect is that each interviewee are very dependent on the specific cases they have had and the issues and success-factors they have identified throughout their career.

I have taken measures to ensure that their thoughts and opinions from the interviewees are presented as correctly and precise as possible. I have, recorded, transcribed and summarised the findings so that they are available in writing and audio. The analysed data can therefore be seen as reliable. I cannot, however, ensure the reliability in the answers provided. The largest limitation of the study lies in this aspect. All data consists of individual accounts of events and experiences. These might be flawed and affected by recollection of events as well as distortion biases. Recall biases have most likely affected me as an author as well. Even though precautions like recording and transcribing followed up by a summary was done this factor cannot be overlooked. Social desirability is also a possible flaw in the information given to me. Where interviewees might have felt like I evaluated their knowledge as a consultant or professional and answered to questions they were not completely sure of to not look bad.

Finally, the answers given in a semi-structured interview are flawed by the discourse of the interview as well as by the context and order of the questions raised. In addition, discussing interviewees specific cases might have restricted them from answering honestly. Some questions can be considered sensitive and this risks being distorted when discussing firm specific cases. I have, prior to the interview, declared the interviewees should remain anonymous in their statements to not reveal any specific secrets or sensitive firm information. Because of this, the answers are deemed honest and precise. This improves the reliability in the findings, especially in the aspect where firms often fail in their strategy which is the most sensitive information.

7.3 Future Research

During this thesis I have discovered several areas where this research could be extended

- I find that there is an interrelationship between the business model framework and the change management. An interesting area of research could be to further investigate the relationship between the business model components and how these affects the change management work.

- To continue the work on the financial aspects of the DBS, other researchers could view how financial factors restricts or enables the scope of a DBS. This thesis have showed that financial factors have a clear impact on the DBS, researchers should more thoroughly investigate these factors.
• Further research should be done behind the motive of a DBS, where the researchers could look into the different factors that should drive a DBS. The why behind the strategy is crucial and it is welcome if other researchers could identify what is a good motive behind a DBS.

• I find that there are both important internal and external factors that needs to be taken into consideration in the DBS. Other researchers could look into which of these factors contribute to success and if there are other important aspects not mentioned in this study.

• The characteristics of a DBS was discussed and should be researched further. I have suggested general characteristics of a DBS but this area could be investigated further and a comparison between different characteristics in a DBS could be made to better understand if big-bang or incremental transformations is better than the other.

• The business model framework suggested in this thesis should be more thoroughly investigated and the theory of their respective correlation should be attended. Researchers should see if the theory of the correlation between the components hold for the internal and external strategies.

• I identify that there is a need to better understand the different capabilities required for the firm to change the firm to become more digital. This involves identifying the competences needed and what is preferred in the different departments of the firm.

• I find that there are several ways for firms to solve the competence gap when transforming into a digital business. Researcher should investigate when the different ways of solving the competence gap fits best. When is it more suitable to employ and build up an organisation and when to enter partnerships.
8 References


9 Appendix

9.1 Email Template

In Swedish:

Hej XXX,


Stort tack för Er tid.

Med Vänlig Hälsning, Christofer Tärnell

In English:

Hi XXX,

My name is Christofer Tärnell and I’m studying my final year of the Industrial Engineering and Management program at the Royal Institute of Technology (KTH) in Stockholm. I am currently writing my degree project on behalf of Human Care regarding digital transformation strategies and IoT. More specifically, I want to investigate how Medical Technology companies can lever on IoT using digital transformation strategies. This will then be compared to current digital transformation strategies and how a Medical Technology digital strategy would differ in comparison. I also hope to facilitate for other Medical Technology companies as well as consultancy firms by helping them with best practices to increase their chances of developing a successful business in a digital environment.

Because you work in a very successful firm, YYY, your input would be extremely interesting and influential for me. I therefore wonder if you could consider to interview with me? I understand that you have a busy schedule, but your participation would facilitate and significantly improve the quality of my work. Furthermore, you will of course be able to take part of my results and have the option to be completely anonymous if you wish.

Thank you very much for your time.
9.2 Interview Questions

In Swedish:

Tidigare Erfarenheter
1. Vad har du för tidigare erfarenheter av digitaliseringsstrategier och IoT?
2. Har du tidigare arbetat med Medicinteknikbolag?

Strategi
1. Vad är de viktigaste komponenterna i en digitaliseringsstrategi?
   (a) Strategins omfattning
   (b) Produkter
   (c) Kunder
   (d) Partnerskap
   (e) Regleringar
2. Hur bör strategin implementeras?
   (a) Delmål
   (b) Slutmål
3. Bör man mäta progressen av strategin?
4. Hur ska ansvar av digitaliseringsstrategin fördelas?
   (a) Vem är ansvarig?
   (b) Bör någon specifik avdelning vara ansvarig?
5. Hur kan företag använda sig av olika intressenter inom deras industri, exempelvis kunder, tillverkare med flera i sin strategi?
6. Borde företag se över sin affärsmodell i strategin?
   (a) Om ja, när och hur?
   (b) Om nej, varför inte?
7. Finns det något område där företag oftast misslyckas i sin implementation av strategin?
8. Bör strategin skilja sig beroende på företagets storlek?

Kapabiliteter
1. Vad är viktigt för företag som ska digitaliseras när det kommer till:
(a) Kompetenser?
(b) Resurser?
(c) Någon annan signifikant aspekt?

2. Är finansiella aspekter en viktig del?

3. Hur borde företag lösa frånvaro av kompetenser, resurser eller liknande som är nödvändiga för strategin?

**Externa Faktorer**

1. Vilka externa faktorer är viktiga att tänka på när man digitaliserar ett bolag?

2. Finns det några för- eller nackdelar att tänka på vid timingen av genomförandet av strategin?

3. Finns det någon generell gemensam anledning till varför bolagen vill digitaliseras?

**MedTech**

1. Vilka utgick ni ifrån när ni utvecklar produkter?

2. Hur bör företag samarbeta med sjukhus/kunder för att driva processen?

3. Är regleringar på marknaden en stor faktor?

4. Påverkas era nuvarande produkter av digitalisering?
   (a) Hur?

5. Vad är sjukhus generella inställning till digitalisering?

6. Vad är ert mål med digitaliseringen?
   (a) Kortsiktigt?
   (b) Långsiktigt?

7. Hur involveras patienter i digitaliseringsprocessen?

8. Samarbetar ni med några andra företag för att tillhandahålla tjänsterna i era produkter?

9. Har ni stöt på några problem i er digitalisering?

10. Använder ni och lagrar data från era produkter?
    (a) Säljer ni vidare eller till era kunder?
    (b) Har några användningsområden uppstått som ni inte tänkt på från början?

11. Har sättet ni säljer produkter på ändrats med digitalisering?

12. Kan du identifiera några specifika kompetenser som är nödvändiga för att lyckas med er digitala verksamhet?

13. Har behoven av kompetens ändrats i och med er digitalisering?

14. Vad skulle du säga krävs för att vara ansvarig för att driva ett digitalt bolag?
Translated version:

Previous Experience

1. What are your previous experiences of digital business strategies and IoT?
2. Have you previously worked with MedTech firms?

Strategy

1. What are the most important components in a business strategy?
   (a) Scope of the strategy
   (b) Products
   (c) Customers
   (d) Partnerships
   (e) Regulations
2. How should the strategy be implemented?
   (a) Partially
   (b) Terminal goal
3. Do you need to measure the progress?
4. How should the responsibility be distributed?
   (a) Who should be responsible of what?
   (b) Should any specific department be responsible?
5. How can firms use different stakeholders in their industry, i.e. customers, suppliers, manufacturers etc., in their strategy?
6. Should firms revise their business model?
   (a) If yes, then when?
   (b) If no, why not?
7. Are there any specific areas where firms typically fail in their strategy?
8. 1. Should the strategy differ depending on the firm’s size?

Capabilities

1. What is important for firms that are digitizing when it comes to:
   (a) Competences?
   (b) Resources?
   (c) Any other significant aspect?
2. Are financial aspects important?
3. How should firms solve absence of competences and resources?

**External Factors**

1. Which external factors are important to consider when you digitise a firm?
2. Are there any pros and/or cons to consider to the timing of the strategy?
3. Are there any common reason why firms want to digitise?

**MedTech**

1. Who did you consider when developing the products?
2. How should firms cooperate with hospitals and customers to drive the process?
3. Are regulations an important factor to consider?
4. Are your products affected by digitisation?
   (a) How?
5. What are hospitals general opinion on digitalisation?
6. What is your goal with the digitalisation?
   (a) Short-term?
   (b) Long-term?
7. How is the patient involved in the digitalisation process?
8. Do you cooperate with other firms to provide your products or services?
9. Have you met any barriers in your digitalisation process?
10. Do you use and/or store the data from your patients?
    (a) Sell it to your customers?
    (b) Have you found any usage area not considered from the beginning?
11. Have the way you sell you products changed with digitalisation?
12. Can you identify any specific competence needed for your digitalisation?
13. Have the needs of competences changed with digitisation of your business?
14. What would you say is required to be responsible to drive a digital firm like yours?