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Factors influencing adoption of healthcare technology in the Norwegian health care system

An exploratory case study

Master's thesis in Science in Entrepreneurship
Supervisor: Jørgen Veisdal

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Norwegian University of
Science and Technology

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Abstract

Healthcare technology has received increased attention over the past decades as an area that is considered to be central to be able to meet the need of providing more efficient healthcare services of better quality when facing the growing challenges in healthcare. However, the adoption and diffusion of healthcare technology is lagging behind. The purpose of the study has therefore been to explore and evaluate factors that influence adoption of new healthcare technology in healthcare organizations. To answer the purpose, the following research question was formulated:

RQ: *What factors influence the organizational adoption of healthcare technology?*

To fulfil the purpose of the study, a exploratory case study was conducted with a qualitative approach. To get a multi-faced view on adoption of healthcare technology the study explored the perceptions of different stakeholders surrounding the phenomenon. The empirical data was gathered through eight semi-structured interviews with three developers from startups developing healthcare technology, three managers in healthcare organizations and two healthcare providers that use healthcare technology. The findings from the empirical data were analyzed and compared to existing literature on adoption of innovations in organizations.

The insight gained from the study has provided more understanding of adoption of healthcare technology in organizations. The main findings suggest that an innovation's high compatability and low complexity with the organization's existing system would influence adoption positively. On the other hand, adoption is hindered by healthcare organisations' low level of acceptance to test innovations, influencing the adoption negatively because the potential benefits of the innovation is not visible for the potential adopters. The organization's hierarchical structure both related to the decision-making process and communication between the different stakeholders also inhibited adoption, as well the conservative norms and culture among healthcare providers. Most prominently, it was found that the current criteria, requirements and evidence use in the decision-making process are not fit for startup companies developing healthcare technology because they are measured on the same basis as equipment that is already certified and approved. This creates a *"chicken-and-egg problem"* because the certification process and required clinical tests are very resource consuming, whereas the startups do not get the resources and financial means unless an organization is willing to invest.

Sammendrag

Helseteknologi har fått økt oppmerksomhet de siste tiårene og anses for å være sentralt for å tilby mer effektive helsetjenester av bedre kvalitet i møte med de økende utfordringene i helsevesenet. Likevel viser det seg at adopsjon og spredning av helseteknologi henger etter. Formålet med studien har derfor vært å utforske og evaluere faktorer som påvirker adopsjon av helseteknologi i helseorganisasjoner. For å svare på dette formålet ble følgende forskningsspørsmål formulert:

RQ: Hvilke faktorer påvirker organisatorisk adopsjon av helseteknologi?

For å besvare dette spørsmålet ble det utført et eksploratorisk studie ved bruk av kvalitativ metode. Synet til ulike interessenter rundt adopsjon av helseteknologi ble inkludert i studiet for å få et flersidig syn på fenomenet. Empirisk data ble samlet inn gjennom åtte semistrukturerte intervjuer med tre utviklere fra oppstartsbedrifter som utvikler helseteknologi, tre ledere i helseorganisasjoner og to brukere av helseteknologi med helsefaglig bakgrunn. Funnene fra de empiriske dataene ble analysert og sammenlignet med eksisterende litteratur innenfor adopsjon av innovasjoner i organisasjoner.

Studiet har bidratt med mer innsikt og forståelse av adopsjon av helseteknologi i organisasjoner. De viktigste funnene antyder at en innovasjon som er kompatibel med organisasjonens eksisterende system og har lav kompleksitet vil påvirke adopsjonen positivt. På den andre siden blir adopsjon hindret av helsevesenets lave aksept for å teste innovasjoner, og dette påvirker adopsjon negativt fordi de potensielle fordelene med innovasjonen ikke er synlig for potensielle brukere. Videre, så vil organisasjonens hierarkiske struktur, både knyttet til beslutningsprosessen og kommunikasjonen mellom de forskjellige interessentene, også hindre adopsjon. Adopsjon blir også negativt påvirket av de konservative normene og kulturen blant helsepersonell. Det mest fremtredende funnet er at de gjeldende kriteriene og kravene i beslutningsprosessen ikke passer for oppstartsbedrifter som utvikler helseteknologi, fordi de måles på samme grunnlag som utstyr som allerede er sertifisert og godkjent. Dette skaper et *"høna-og-egget problem"* fordi sertifiseringsprosessen og de kliniske testene som kreves er svært ressurskrevende, men oppstartene får ikke de nødvendige ressursene og økonomiske midlene med mindre en organisasjon er villig til å investere.

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1 | Introduction

"*The impact of digital technologies in health and long-term care can be a triple win: improved quality of life, increased efficiency of health and long-term care, market growth and industry development. Research and innovation will be crucial in this regard.*" (European Commission 2020, p. 18).

1.1 Problem Context and Motivation

Technology plays an important role in today's society. The digital transformation, or *digitization*, is about using technology to improve, simplify and innovate (Bryhni 2021). Digitization requires technological diffusion and innovation, and it can be used to offer better services and increase efficiency across all sectors of society, which will facilitate increased value creation (ibid.). The importance of digitization across all areas of the economy and society has been highlighted by the global COVID-19 pandemic (European Commission 2020). The outbreak has affected our lives and economies, and has tested our social resilience and changed our way of living. However, one of the biggest test has been on our healthcare system. And if it is one thing this global pandemic has shown, it is that our healthcare system was not designed to deal with such a crisis (Deloitte SAS 2020). Among many views on how the world will unfold after this crisis, one is on how technology will take the center stage, driving solutions in areas such as healthcare technology (Deloitte Development LLC 2020).

Before COVID-19, the healthcare system was already facing challenges of dealing with a growing number of health issues related to chronic and lifestyle diseases and an aging population. Additionally, the healthcare system is also facing the challenge of staying up-to-date in an environment in which medical information, technologies and relationship with other healthcare systems are in constant flux (Cohen et al. 2004; Länsisalmi et al. 2006). Many nations are also experiencing a shortage of skilled nursing staff because of recruitment and retention challenges in the nursing workforce (ibid.). According to projections made by Helsedirektoratet 2014, the number of healthcare providers who are trained is not in line with the increasing need, and Norway will experience an undercoverage of almost 57.000 full-time equivalent (FTE) in 2035. To meet the need of providing more efficient healthcare services of better quality, innovation has become a critical capability in healthcare (Länsisalmi et al. 2006). Additionally, progress in medicine and technology provide attractive opportunities for new medical practices (Jadad and Delamothe 2004; Länsisalmi et al. 2006;).

Healthcare technology has received increased attention over the past decades. This area is considered to be central to be able to meet the challenges of demographic development in healthcare (Helsedirektoratet 2012). Even though medical treatment has advanced over the years, the delivery of the treatment are often inefficient, ineffective, and consumer unfriendly (Herzlinger 2006). Diffusion of technology innovations can therefore be a driver to be able to provide high-quality healthcare services in a more efficient way (European Commission 2020). In 2001, the Institute of Medicine stated in their report *Crossing the Quality Chasm: A New Health System for the 21st Century*, that the underinvestment in information technology in healthcare led to a number of quality issues. Information about the patient is often not available to those who need it when it is needed, and as a result, patients do not get the care they need (Medicine 2001; Bates 2002). Despite the rapid pace of advancement in healthcare technology (Varabyova et al. 2017), it seems like similar issues still remain 20 years later. This challenge can be solved by innovative solutions that involves all areas of health care, from its delivery to consumers, its technology, and its business models (Herzlinger 2006). However, compared to use and implementation of technology seen in other industries, the implementation of healthcare technology is lagging behind.

There are entrepreneurial companies and public agencies that stands in the forefront of developing new solutions to improve procedures and current practices of care. These healthcare innovations can potentially help minimize complications, reduce duplicative tests, and improve outcomes (Varabyova et al. 2017). Moreover, innovators of healthcare technology are developing products and services that will be critical to the future of health (Deloitte Center For Health Solutions 2020). However, there is a tension between the societal needs for the best available treatment and the high cost that is often associated with innovations (Varabyova et al. 2017). Deloitte Center For Health Solutions 2020 found a rapid increase in 2018 and 2019 of venture capitalists, certain private equity investors, and corporate venture funds that invested in developers of healthcare products, services and solutions. However, despite the investments and opportunity for healthcare innovators to succeed, too many efforts fail (Herzlinger 2006). This may be due to, as Gourville 2006 stated, *"Many innovations fail because consumers irrationally overvalue the old and companies irrationally overvalue the new."* (ibid., p. 99). Additionally, whether and when a healthcare institution acquires new healthcare technologies is affected by a variety of factors, making the decision within healthcare institution unusually complex (Teplensky et al. 1995). According to Greer 1996, hospitals are characterized by the existence of multiple decision systems with different perspectives. As medical technologies can play multiple roles in a hospital and affect different parts of the system, the interest of several decision-makers are prompted, who all bring different decision criteria (ibid.). Therefore, it is crucial to understand the determinants of adoption in healthcare organizations, as this can contribute to achieve more effective

policy initiatives at the system level and to establish more effective approach at the level of healthcare providers (Varabyova et al. 2017).

1.2 Research Context

The research on adoption in organizations has a long history in social sciences (Damanpour 1991; Varabyova et al. 2017). The study by Coleman, Katz, and Menzel 1957 investigating adoption of a new drug by physicians, made the it central within the field of healthcare (Rogers 2003). Several studies investigating adoption of different innovations have been published since then, as this is a vast field to cover. The study in this master thesis will not be able to cover even one per-mille of the field, but will make its contributions. The aim of this sub-chapter is to set the scope for the study.

1.2.1 The Norwegian health care system

The Norwegian health care system is divided into primary health care services ('primærhelsetjenesten') and specialist health care services ('spesialisthelsetjenesten'). The primary health care service provides day-to-day health care within the local community. This include services like home nursing, general practitioners, dentist, chiropractors and healthcare services from similar healcare providers. It also includes institutions such as nursing homes, residential centers etc.. The municipalities in Norway are responsible for the primary health care services. The context of this master thesis revolves mostly around the specialist health care service, so a broader description of the primary health care service will therefore not be given.

The specialist health care service includes health care services provided by somatic and psychiatric hospitals, privately practicing specialists, rehabilitation institutions etc., and services like laboratory and X-ray activities, prehospital services and others. The specialist health care service is owned and founded by the state of Norway, which has the overall responsibility for ensuring that the population receives the necessary specialist health services. See Figure 1.1 for a simplified illustration on how the specialist health care service is organized.
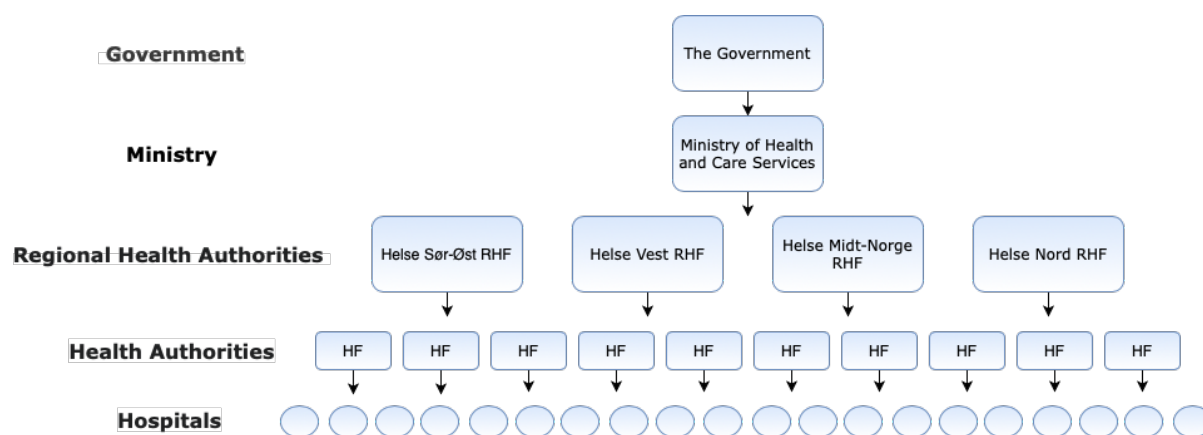
Figure 1.1: A simplified illustration on how the specialist health care service is organized.

The overall managerial and budgetary responsibility is with the Government and the Ministry of Health and Care Services. There are four Regional Health Authorities ('Regionalt helseforetak' (RHF)) in Norway owned by the state. Each RHF is led by a board and a chairman. The RHFs are responsible of providing specialist health care services in each of Norway's four regions. The RHFs are also in control of subsidiary health enterprises or health authorities ('helseforetak' (HF)). The HFs are in charge of the actual performance, which usually consists of one or more hospitals with associated obligations. Each HF is led by a board and a chief executive officer (CEO). There are a few privately run hospitals and health clinics, in which some of them are non-profit organizations, in addition to the public hospitals. The hospitals are led by a CEO or director, in addition to having one leader, or a leader group, at each organizational level in the hospital.

Department for medical devices

There is a department for medical devices ('Medisinsk-teknisk avdeling' (MTA)) within each HF. They have the overall responsibility for the medical devices at the hospitals. This includes procurement, operation and maintenance, calibration, emergency repairs, system management, and proper disposal. MTA follows a legislation governed by The Norwegian Medicines Agency ('Legemiddelverket'), which is in charge of overseeing the development, testing, and commercialization of pharmaceuticals and medical technical devices.

1.2.2 Stakeholders

Every organization consists of different stakeholders (Johnson et al. 2011). According to ibid., the organization and stakeholders are interdependent. An organization should therefore strive to meet the expectations of different stakeholders, as the stakeholders in their turn will be interested and contribute to the organization's performance (ibid.). This is also true when it comes to stakehold-

ers in healthcare organizations, as the performance can be measured based on the quality of the services delivered by the different stakeholders . Developers of healthcare technology, in their turn, can contribute developing innovations that can improve and provide more efficient healthcare services of better quality. Innovations can be in the form of a product, service or process (Edquist 2001). Clegg, Kornberger, and Pitsis 2015 states that the different stakeholders are an important force when it comes to innovation adoption and diffusion in organizations, as they either adopt or reject innovations. According to Johnson et al. 2011, identifying the stakeholders can lead to an increased understating when investigating adoption of innovations in an organization. In the context of innovation adoption in healthcare, the different stakeholders that are involved in the adoption process is illustrated in Figure 1.2.
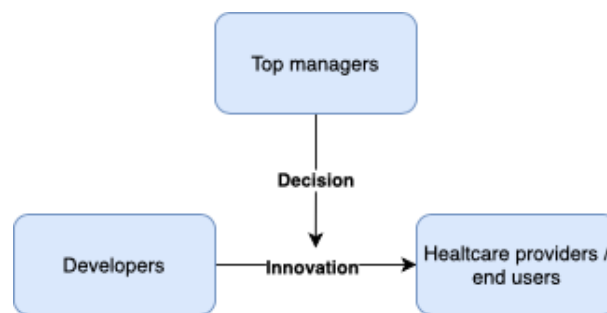
Figure 1.2: Stakeholders in the adoption process in healthcare organizations.

Many healthcare innovations are developed by startup companies, represented as *developers* in the figure. The users of an innovation can either be *healthcare providers* or other individuals, depending on the intended use of the innovation. Finally, the decision to reject or adopt an innovation is often done by the *top managers* in the organization, e.g. a top manager at one of the illustrated levels in Figure 1.1.

1.3 Purpose of the study

The objective of this master thesis is to explore and evaluate factors that influence adoption of healthcare technology. In general, researches have studied the determinants of the decision to adopt over a long time across variety of disciplines in social science (Tornatzky and Klein 1990; Damanpour 1991; Varabyova et al. 2017). Because of the above-mentioned challenges that the healthcare sector is facing, adoption of healthcare technology in specific is a relevant and meaningful field to explore. The purpose of the thesis is outlined below:

"To explore the factors that influence adoption of healthcare technology by investigating different perceptions of different stakeholders."

The aim of this investigation is to dvelve into different perceptions of adoption of healthcare technology through three different views: users of healthcare technology (healthcare providers), developers from startups developing healthcare technology and managers in healthcare organizations. The investigation will show how these different perceptions correspond to each other, and how they affect the phenomenon of healthcare technology adoption. This will hopefully provide insight about what factors that influence the acceptance and resistance of healthcare technology. This can be useful for managers as well as developers of healthcare technology, and can be used to further investigate the drivers and barriers of successful adoption.

1.4 Research question

As pointed out in the introduction, the healthcare sector is facing various of challenges. To face these challenges, adoption and diffusion of service and technology innovations in the healthcare sector is needed (Länsisalmi et al. 2006). Simultaneously, there are many startups developing solutions and innovations for the healthcare industry. However, some healthcare providers believe that technology will interfere with their ways of working, while others believe that it provides more opportunities to interact with patients and welcome new innovations (Safi, Thiessen, and Schmailzl 2018). As a result, a majority of startups developing healthcare technology face difficulties and do not survive because the adoption and diffusion is not optimal. In response to this, the master thesis aims to provide an understanding of the adoption of healthcare technology by identifying the factors influencing the organizational adoption of healthcare technology. The following research question has been formulated:

RQ: What factors influence the organizational adoption of healthcare technology?

The research question seeks to discover factors influencing the acceptance and rejection of healthcare technology by examine different perceptions of different stakeholders surrounding this phenomenon.

1.5 Contribution

With the collected data based on three different views on adoption of healthcare technology, this study will provide insight about the different stakeholders' previous experiences and provide a better understanding of adoption of healthcare technology. This insight will be valuable for understanding the process of adoption, as well as the dynamic between the stakeholders during this process. By identifying what factors influencing the acceptance and resistance of healthcare technology, this will

also provide managers, users and developers with useful information regarding development, adoption and implementation of healthcare technology. Similarly, it can contribute to a broader understanding of decision making in healthcare organisations, which is useful for startups or other developers of healthcare technology. Furthermore, the findings in this thesis can contribute to the extension of the existing literature on decision making and adoption of innovations in healthcare organizations or lead to further studies.

1.6   Outline of master thesis

Chapter 1 have set the context and addressed the challenges of the chosen research field, as well as explained the research context of the study. This has been followed by the purpose, research question and contribution of the master thesis. Chapter 2 will present relevant theory to the context of this study and will form a theoretical background and research framework. In Chapter 3, the research design will be presented and outline the process of how the empirical data in the thesis have been acquired. Limitations and weaknesses of the chosen methodology will be addressed. Chapter 4 will present and analyse the empirical findings of the exploratory case study. Chapter 5 will discuss the findings and analysis in relation to the existing theory with the aim to answer the RQ and fulfill the purpose of the thesis. A conclusion that summarises the findings and answers the RQ will be presented in Chapter 6. Lastly, Chapter 7 will present implications and suggestions for further research.

2 | Theoretical Foundation

In a systematic review of the literature on diffusion, spread and sustainability of innovations in health service delivery and organizations, Greenhalgh et al. 2004 asserted that *"there is not, nor there will be, a consensus on terminology in the field of innovation studies".* In other words, this chapter will not be able to cover the broad variety of innovation studies. However, the key concepts of innovation and diffusion research that are used as the theoretical foundation in this thesis will be introduced. This will contribute to the reader's understanding of innovation adoption and diffusion of innovation.

First, a brief introduction on innovation adoption and diffusion of innovation research will be given. Then, relevant key concepts of organizational innovation adoption based on Rogers' Diffusion of Innovation Theory will be presented. The theoretical foundation will not be based on Rogers' theory alone, but will also be based one more recent reviews and studies by other scholars that have contributed to further understanding of organizational adoption. Lastly, a short presentation of other theoretical frameworks will be given before a conceptual framework is presented.

2.1 Innovation Adoption Research and Diffusion of Innovation Research

"An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. [..] The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation." (Rogers 2003, p. 11)

The well know term "innovation" appeared as early as the fifteenth century, derived from the Latin noun "innovatus" (Hargadon 2003). The term has been defined in a many ways, and most of the widely used definitions focus on novelty and newness (Johannessen, Olsen, and Lumpkin 2001). The famous economist Joseph Schumpeter (1934) defined innovation as new combinations of new or existing knowledge, resources, products, methods or other factors (Schumpeter 1934). The management guru Peter Drucker (1985) described innovation as "a specific tool of entrepreneurship", creating opportunities and success thorough change of businesses and services (Drucker 1995; Johannessen, Olsen, and Lumpkin 2001; Shah, Z. Gao, and Mittal 2014). For an organization, an innovation can be defined as a new device, system, policy, program, process, product, or service that is internally generated or purchased by the adopting organization (Duncan, Holbek 1973; Daft 1982; Damanpour Evan

1984; Damanpour 1991). The intended contribution from the innovation is to improve the organization's effectiveness and competitiveness by creating new conditions or opportunitites in the external environment (Drucker 1995; Damanpour and Wischnevsky 2006)

There exists a considerable amount of innovation research across multiple disciplines such as management, economics, education, sociology, information technology, organizational studies and others. The research has given significant insight into the antecedents of adoption of innovations in organizations (Pichlak 2016), as well as the innovation adoption process (Damanpour and Wischnevsky 2006). As a result, several theories and models have been developed trying to explain which factors that influence individual and organizational innovation adoption (Moore and Benbasat 1991; Wisdom et al. 2014; Chor et al. 2015). Similarly, the study of innovation diffusion has a long history as a multi-disciplinary field (Rogers 2003; Fichman 2000). It has received much attention as it can help to understand and forecast the adoption of innovations. Many have contributed to this field of research, which may be traced back to the French scholar Gabriel Tarde. Tarde witnessed many new inventions at the beginning of the twentieth century, and his observations led to discoveries about the diffusion of innovations (Rogers 2003). In his book *The Laws of Imitations* (1903), he introduced the idea that imitation (adoption) follows a S-shaped curve, the role of individuals' socioeconomic status, and the importance of opinion leadership as part of diffusion. His discoveries made a big impact on the field of research, and seminal contributions have been made to further explain the diffusion of innovations with contributions from sociologists, communication researchers, economists, organizational researchers, IT researchers, and many others (Fichman 2000). Similar to the quote about that it does not exist one single theory in the field of innovation studies, the same can be said about diffusion of innovations theories. However, Everett Rogers book *Diffusion of Innovations* (1962) is the closets the field has come to such as theory (ibid.).

2.2   Diffusion of Innovations

According to Rogers 2003, the diffusion process describes how, over time, new ideas, goods or services spreads through a social system or population. He defines diffusion as *"..the process in which an innovation is communicated through certain channels over time among the members of a social system."* (ibid., p. 5). The main elements of diffusion are: *(1) the innovation, (2) communication channels, (3) time* and *(4) the social system.*

2.2.1 The Innovation

Rogers defined five characteristics of an innovation that helps to understand the different rates of adoption. These characteristics are: relative advantage, compatibility, complexity, trialability and observability. Robert et al. 2009 states in their systematic literature review that several case studies confirm the enduring applicability of Rogers' original characteristics as a way of generally consider which features of an innovations that will affect the adoption.

- **Relative advantage** is about whether an innovation is perceived as better than the solution or system it replaces (Rogers 2003). It is the subjective perceptive that matters, not the objective. Relative advantage can be measured in economic terms, effectiveness, status or incentives associated with the new technology. The higher perceived relative advantage, the faster the adoption and implementation will take place. However, studies on technological innovations in healthcare have shown that relative advantage alone does not guarantee widespread adoption (e.g. Fitzgerald et al. 2002; Greenhalgh et al. 2004; Robert et al. 2009). Other studies also found that perceived relative advantage is more important in later stages of the innovation process (Frambach and Schillewaert 2002).

- **Compatibility** is about whether an innovation is perceived as compatible with current values, experiences and needs (Rogers 2003). This involves the values and norms of the social system, such as culture and structure. If the members of the social system finds the innovation to be compatible with current practice, the innovation will be adopted more rapidly. Several studies of organizational adoption in different disciplines have shown that perceived compatibility influence the adoption decision (Frambach and Schillewaert 2002). In an exploratory study on critical factors affecting the decision to adopt cloud computing in Taiwan hospitals, compatibility was proven to be one of the key factors (Lian, Yen, and Wang 2014).

- **Complexity** is about whether an innovation is perceived as difficult to understand or use (Rogers 2003). If an innovation does not require much development of new skills or knowledge, it will be adopted more rapidly. According to ibid., complexity is less important than relative advantage and compatibility. Complexity have been closely examined in the healthcare context and empirical results have not been consistent (F. Gao and Sunyaev 2019). However, previous studies on IT (Information Technology) and IS (Information System) have shown that low complexity affects the adoption positively (Chang et al. 2007; Lian, Yen, and Wang 2014).

- **Trialability** is the degree to which it is possible to experiment and test an innovation prior to adoption (Rogers 2003). The risk and uncertainty associated with the innovation will be reduced if the innovation is trialable. This leads to that the innovation will be adopted and as-

similated more easily (Plsek 2003; Greenhalgh et al. 2004). However, if the innovation is less tri-
alable, the adopting organization can not be sure about whether the innovation will contribute
to organizational performance and success (Damanpour and Schneider 2009).

- **Observability** is the degree to which the the result of the innovation are visible to others (Rogers
2003). ibid. further explains that innovations that easily can be observed will stimulate discus-
sion. This has been confirmed in a study by Safi, Thiessen, and Schmailzl 2018 on adoption
of new technologies in health care, where the opportunity to observe technology-related ad-
vantages affected health professionals' acceptance of the innovation. However, other research
have found that observability did not have a significant impact on adoption decision or imple-
mentation (Pichlak 2016).

2.2.2 Communication Channels

According to Rogers 2003, the essence of the diffusion process is *"..the information exchange by which
one individual communicates a new idea to one or several others."* (ibid., p. 17). In other words, there
must be some kind of communication between the potential adopters for an innovation to spread.
This part of the diffusion process involves an innovation, an adopting unit that has knowledge or ex-
perience with the innovation, a unit that has no knowledge of the innovation, and a communication
channel (ibid.). A communication channel is the means used to get information from one individ-
ual to another, and how the innovation is communicated is a consequence of how the individuals
in the social system shares the information with each other. Individuals in the social system com-
municate with one another via communication channels such as mass media and/or interpersonal
channels (Mahajan, Muller, and Bass 1990). Examples of mass media are such as TV, internet, radio
and social media. Interpersonal communication channels involves exchanging information face-to-
face or word-of-mouth. Research suggests that adopters respond to mass media channel during the
knowledge stage, while word-of-mouth is more important at the decision stage (Rogers 2003; Fich-
man 2000). However, mass media media and interpersonal channels are mostly discussed at the
individual level, not the organizational (Lundblad 2003), where it is more relevant to discuss commu-
nication through professional associations, professional journals or regulatory requirements.

An organization can have both internal and external communication (Damanpour 1991). Internal
communication reflects the level of communication among organizational units or groups. This is
measured by e.g. number of of contacts (face-to-face and others) between people at the same and
different levels (Aiken et al. 1980 in ibid.), number of committees and meetings (Aiken and Hage
1971; Kim 1980 in ibid.) and the degree to which units share decisions (Hull and Hage 1982 in ibid.).
External communication refers to a company's ability to stay in touch with and monitor its task en-

vironment (Damanpour 1991). It is commonly measured by the involvement and participation of the members of an organization in extra-organizational professional activities. Studies have highlighted the fact that this is equally important for all members of the organization, not just executives alone(Corwin 1975 in ibid.). Organizations that make greater investments in a wide array of information sources and communication channels, like seminars, courses or professional association, should be more likely to adopt innovations (Nilakanta and Scamell 1990 in Fichman 2000.) Additionally, Rogers 2003 distinguished between *heterogeneous* and *homogeneous* flows of communication. Communication is more effective if it takes place between homogeneous individuals, compared to communication between heterogeneous individuals. Homophily is the degree to which two or more individuals have similar characteristics, such as education, beliefs, status and other attributes (ibid.).

2.2.3 Time

Time is an crucial dimension of the diffusion process. It is an important element of the above mentioned communication process and the innovation-decision process and the innovation adoption process that will now be elaborated (ibid.).

The Innovation-Decision Process

Rogers has described the innovation-decision process both at an individual level and organizational level. At the individual level, he describes it as *"the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision."* (ibid., p. 20). In other words, before an individual can come to a decision to adopt or reject an innovation, they have to gain some understanding of the innovation before they develop a favorable or unfavorable attitude towards it (Sun et al. 2018). Rogers 2003 conceptualized five main steps in this process:

- **Knowledge** occurs when the innovation is exposed to an individual or other decision-making unit for the first time and the individual or other decision-making unit gains some understanding of it (ibid.)

- **Persuasion** occurs when an individual or other decision-making unit forms an opinion about the innovation, either favorable or unfavorable (ibid.)

- **Decision** occurs when an individual or other decision-making unit engages in activities that leads to adoption or rejection of the innovation (ibid.)

- **Implementation** occurs when an individual or other decision-making unit start to use the in-

novation (ibid.)

- **Confirmation** occurs when an individual or other decision-making unit seeks reinforcement of the decision, and may end up reverse the decision if being exposed to contrary messages about it (ibid.)

In a organization, however, an individual may have little or no say in the innovation-decision process. Rogers therefore states that the innovation-decision process is usually more complicated when an innovation decision is made by an organization or system (ibid.; Lundblad 2003). The decision maker, or decision makers, in the organization will establish attitudes, opinions, belief, and views regarding the innovations' potential utility in the organization (Sun et al. 2018). For example, a top manager's motivation can be based on the opportunity to improve the performance in the organization with total quality management programs (Westphal, Gulati, and Shortell 1997). However, Yan et al. 2009 states that it is necessary to consider the perception of all stakeholders, and it is about using the knowledge to develop and offer innovations that the stakeholders want. Additionally, it has been addressed by recent literature that decision making can be enhanced by including multiple stakeholders (Turner et al. 2017). Moreover, the decision making process in an organization is also affected by how the organization is structured (Ghodeswar and Vaidyanathan 2007). For example, adoption decisions might happen more frequently in decentralized organizations than centralized ones (ibid.). Organizational structure will be explained further in section 2.2.4. Rogers distinguishes between four types of innovation-decisions in organizations:

- **Optional innovation decisions:** The decision on adoption or rejection is at the individual level, independent of the other members of the system/organization (Rogers 2003).

- **Collective innovation decisions:** The decisions on adoption or rejection is made through consensus among system/organization members (ibid.)

- **Authority innovation decisions:** The decisions on adoption or rejection is made by a few individuals in the system/organization who have power, status or technical expertise (ibid.)

- **Contingent innovation decisions:** The decision on adoption or rejection can only be made after a previous innovation-decision, meaning that a member of a system/organization can only adopt or reject an innovation after the system's/organization's innovation decision (ibid.). For example, a doctor can only decide to adopt or reject a new medical equipment after the hospital has decided to adopt and purchased the equipment.

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Organizational Innovation Adoption Process

According to Damanpour and Wischnevsky 2006, the difference between the current and future states of an organization can be a consequence of adopting innovations. The organizational innovation process have been traced and studied by diffusion scholars since the mid-1970s (Rogers 2003). It is often described by two main stages, namely the *initiation stage* and the *implementation stage*, both stages having associated sub-stages (ibid.; Zaltman, Duncan, and Holbek 1973; Damanpour and Wischnevsky 2006). The decision to adopt occurs between the initiation and the implementation stage (Rogers 2003; Frambach and Schillewaert 2002). This is illustrated in Figure 2.1.
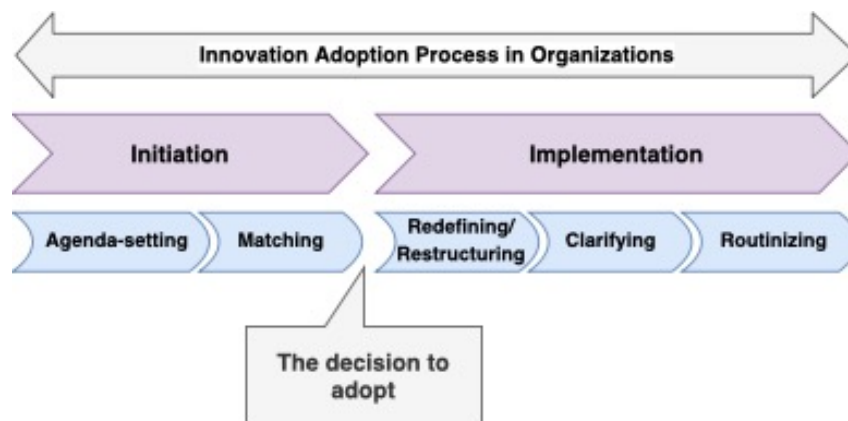
Figure 2.1: Stages in the organizational innovation adoption process. Adapted from Rogers 2003.

As the figure shows, according to Rogers 2003 the organization recognizes a need or a problem, becomes aware of an innovation, forms an attitude towards it, and evaluates its suitability during the initiation stage (ibid.; Frambach and Schillewaert 2002; Damanpour and Wischnevsky 2006). This stage consists of the two sub-stages *agenda-setting* and *matching*. It is in the agenda-setting stage that the organization starts to search for an innovation to solve a problem after identifying a need or a problem. According to Omachonu and Einspruch 2010, healthcare organizations often rely on technology that already exists. In the matching stage, the organization will match the problem with the innovation to determine if it fits the organization's needs to solve the problem. If it does not, this can lead to rejection and the innovation process will be terminated prior to implementation stage (Rogers 2003). If it does fit, this can lead to the decision to adopt the innovation and the organization is moving on to the implementation stage. This stage consists of all actions related to the organization purchasing and making use of the innovation until it becomes a routine feature of the organization (ibid.; Damanpour and Wischnevsky 2006). The acceptance and assimilation of the innovation now becomes crucial, as complete adoption is yet not ensured (Frambach and Schillewaert 2002). The implementation stage consists of the three sub-stages *redefining/restructuring, clarifying* and *routinizing*. In the redefining/restructuring stage, the organization becomes more familiar with

the innovation. The innovation can also be re-invented or modified to fit the organization better. Addiotionally, there can also be a restructuring of the organization itself so it better accommodates the innovation (Rogers 2003). In the clarifying stage, the innovation becomes clearer to the organization's members, and it becomes part of the organizational structure. Lastly, in the routinizing stage, the innovation becomes a part of the routines and activities in the organization and loses its separate identity (ibid.).

To summarize, the innovation adoption process in organization can be seen as a two-part adoption decision process. There must be a decision about making the innovation available to the organization, before the social system in the organization decides on how to and whether to actually use the innovation (Fichman 2000). Additionally, most innovation studies have concentrated on the fact that when the focus is the formal organizational decision to adopt, it is the perceptions of leaders and key decision makers that matter (ibid.). This is in line with how Rogers 2003 described authority innovation decisions. Moreover, Fichman 2000 raised the question whether one should consider an innovation to be adopted *after* some threshold level of actual use was reached. He further argued that *"..the latter stages of technology assimilation from formal adoption to full institutionalization become especially worthy of focused study."* (ibid., p. 22).

2.2.4 Social System

As Rogers 2003 stated, diffusion of innovation is a process among members of a social system. An innovation will not automatically diffuse among potential adopters, as adoption is a social enterprise reliant on interpersonal influence and opinion leadership (ibid.). The social system in an organization can be described as the organizational climate, where the members who are exposed to the same organizational structure have shared perceptions (Ghodeswar and Vaidyanathan 2007). Opportunities for innovations arise from the organizational climate if the members recognise the desirability of an innovation and efforts towards adopting and implementing the innovation are supported (Nystrom, Ramamurthy, and Wilson 2002). Notably, the organizational members' behaviour and perception can be a crucial factor in adoption of technological innovation (Ghodeswar and Vaidyanathan 2007). Rogers 2003 argued that diffusion of innovations relies on the social structure, the norms and individual's roles in the social system (ibid.). This is supported by the institutional theory, which points out that organizational decisions are not only driven by goals of efficiency, but also by the social and cultural factors within the system (Oliveira and Martins 2010).

Social Structure

Structure exists within the social system because not all units are identical in their behaviour, and the social structure says something about the pattern of the units in a system (Rogers 2003). This can for example be the hierarchy of an organization, or a communication structure that says something about who talks to whom within the system. According to institutional theory, institutional environments are crucial in shaping organizational structure and actions (Scott 2013; Oliveira and Martins 2010). The social structure has a systemic effect that can affect the adoption of innovation (Rogers 2003). According to Wisdom et al. 2014, Trisha Greenhalgh et al. 2004, Frambach and Schillewaert 2002 and Fichman 2000, a too formalized and centralized organizational structure is negatively associated with adoption. Furthermore, heavy organizational coordination requirements or strong interdependencies across various adopters may also result in inconsistent adoption (Gallivan 2001; Wisdom et al. 2014). The same goes for lack of formal research infrastructure and resources to maintain operations (Solomons and Spross 2011; Trisha Greenhalgh et al. 2004). The structure also say something about the role of different stakeholders that are present within the social system (Thornton, Ocasio, and Lounsbury 2015). Moreover, the organizational structure can lead the attention of decision-makers towards specific issues and conclusively affect decisions (Ocasio 1997).

System Norms

Rogers 2003 described norms as *"..the established behavior patterns for the members of a social system."* (ibid., p. 27). The norms of a system can be a barrier to change, as they serve as a guide or a standard on tolerable behavior for the members of a social system (ibid.). There can be e.g. local, national, religious, cultural or organizational norms. According to Wisdom et al. 2014, the norms, values and culture in an organization are critical in relation to pre-adoption and adoption. In other words, the innovation has to be compatible with both the organization's and potential adopters' norms, values and perceived needs (Robert et al. 2009). Some scholars argue that innovation perceptions are constructed by the norms in the social system, meaning that they are driven by group norms and the attitudes and behaviors of co-workers toward the innovation (Fichman 2000). Furthermore, several theoretical frameworks have found various organizational culture variables to have a positive association with adoption, for example a problem-solving culture, adaptability to suit organizational needs, compatibility with practice norms, and evidence of practice efficacy (Trisha Greenhalgh et al. 2004; Glanz, Rimer, and Viswanath 2008; Solomons and Spross 2011; Wisdom et al. 2014). Similarly, Gustafson et al. 2003 found that an innovation that matches an organization's existing norms, like values, strategies, goals and ways of working is more likely to be assimilated. Another aspect is interorganizational norms, that are set by interorganizational communication, collaboration and com-

petition (Trisha Greenhalgh et al. 2004). Several interorganizational studies, which have examined organizations' innovativeness in relation to the influence of other organizations (ibid.), have found that interorganizational norms plays a key role in spreading ideas among organizations (Abrahamson 1991).

Roles in the social system

Some individuals play a certain role in the social system, and their role affects the diffusion of innovations (Rogers 2003). The two specific roles defined by ibid. are *opinion leaders* and *change agents*. The actions of opinion leaders and change agents can accelerate diffusion if potential adopters view them as being similar to themselves (Fichman 2000).

In an organization, opinion leaders are individuals who influence the attitudes and beliefs of their colleagues with respect to implementing an innovation (Rogers 2003; Trisha Greenhalgh et al. 2004; Damschroder et al. 2009). They may facilitate or inhibit diffusion, however, many of the facilitators are active in promoting and seeking for innovations (Fitzgerald et al. 2002). However, there have been disappointing results if opinion leaders have been engaged in planned change efforts (Trisha Greenhalgh et al. 2004). Locock et al. 2001 identified in their study on the role of opinion leaders that they may be more or less influential at different stages of the innovation process in regard to organizational and team processes. However, they further argued that the interaction between individual opinion leaders and the collective process of negotiating a change and reorienting professional norms remains poorly understood. Yet, many have studied the role of the opinion leaders, also distinguishing different types of opinion leaders, e.g. 'expert', 'political', 'peer', 'monomorphic' or 'polymorphic' (Fitzgerald et al. 2002).

Change agents are individuals who influence others' innovation decisions, either in the direction to obtain the adoption of new ideas, or in the attempt to slow down diffusion and prevent the adoption (Rogers 2003). They are critical when establishing a climate for creating, implementing, and sustaining change (Gustafson et al. 2003). In health care organizations, change agents are most effective if they have status, prestige, persistence, political influence and access to resources (ibid.). Other scholars have also argued that they have greater impact if they are perceived as experts, yet share common characteristics and goals with the other members of the social system (Brownson, Fielding, and Maylahn 2009), or if they are selected for their homophily and credibility with the potential adopters of the innovation (Trisha Greenhalgh et al. 2004). Additionally, they will be more effective if they communicate the needs and perspective of the users to the developers of the innovation (Rogers 2003; Trisha Greenhalgh et al. 2004). Some scholars also talk about external change agents that are introduced to the organization, e.g. a hired consultant of a facilitator from a corporate or regional office

(Damschroder et al. 2009).

Another role worth mentioning are *champions*. Champions are *"..individuals who dedicate themselves to supporting, marketing, and 'driving through an implementation', overcoming indifference or resistance that the intervention may provoke in an organization."* (ibid., p. 11). They believe so strongly in the innovation that they are willing to risk their informal status and reputation (Maidique 1980) and challenge the status quo within an organization and promote new ways of making decisions (Brownson, Fielding, and Maylahn 2009). They differ from opinion leaders by actively supporting the innovation during implementation (Damschroder et al. 2009)). In a review by Trisha Greenhalgh et al. 2004, champions were considered to be key determinants of organizational innovation. Similarly, Robert et al. 2009 found in their literature review on organizational factors influencing technology adoption and assimilation that the presence of champions successfully explained the motivation of adoption and implementation of different innovations in hospitals. However, other studies have suggested that champions are most important during the early stages of a project (adoption) and less important during implementation (Locock et al. 2001). Moreover, the champions' tactics may not make any difference in changing the behaviour of others in the social system or improve adoption, even though there are good personal relationships in the system (Locke 2001)

2.3 Other Theoretical Frameworks

Rogers' DOI theory is the most commonly applied adoption theory across the field of research. However, Fichman 2000 argues that Rogers' DOI theory may not apply equally well to all kinds of innovations in all contexts, because of the absence of newness in combination with the fact that the model was mostly synthesized on innovation studies looking at how individuals adopted simpler innovations. With that said, almost all subsequent studies have combined his model with one or more additional construct (Ukobitz 2020). Some of the most used subsequent studies are: the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh and Davis 2000), the Technology Acceptance Model (TAM) (Davis 1985), the Theory of Planned Behaviour (TPB) (Ajzen 1991), the Technology Organization Environment model (TOE) (Tornatzky and Klein 1990). UTAUT, TPB and TAM are decision models that emphasize adoption at the individual level (Oliveira and Martins 2010; Ukobitz 2020). However, as it has been pointed out in this chapter, the adoption process at the organizational level differ from the adoption process at the individual level. The TOE model, however, reviews organizational decision-making and adoption. Tornatzky and Klein 1990 proposed the TOE model to explain an organization's technological innovation decision making behavior through three contextual levels. Each contextual level has associated determinants, as illustrated in Figure 2.2.
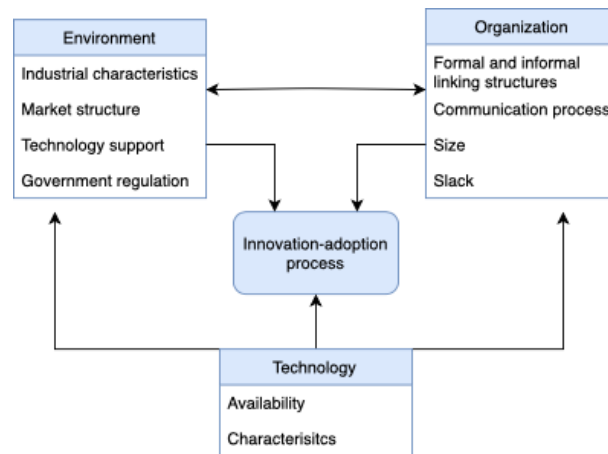
Figure 2.2: Technology, organization, and environment framework (Tornatzky and Klein 1990)

The two categories technology (innovation) and organization in the TOE framework are parallel to what Rogers states in his model. Additionally, ibid. includes another component, the environmental context. This category encompasses the arena in which a firm or organization conducts its business, the industry, partners, competitors, the macroeconomic context, and the regulatory environment (Oliveira and Martins 2010; Sun et al. 2018). According to Oliveira and Martins 2010, DOI and TOE are the most widely used theories in research on the innovation process at the organizational level, very often used in studies on IT adoption in organizations. However, the TOE framework is mainly used in quantitative studies (ibid.), whereas Rogers 2003 bases his assumptions on rational behavior (ibid.).

Furthermore, there are two main approaches of adoption research at the organizational level: the process approach and the factor approach (Pichlak 2016). Studies using the process approach investigates a broad class of events critical to the innovation adoption process, where the process vary from two to six or more stages (e.g. Frambach and Schillewaert 2002; Damanpour and Wischnevsky 2006; Hameed, Counsell, and Swift 2012). Studies doing the factor approach have typically conceived the innovation adoption as a multidimensional phenomenon (e.g. Damanpour 1991; Nystrom, Ramamurthy, and Wilson 2002; Pichlak 2016), and have investigated the determinants influencing adoption (e.g. Wisdom et al. 2014; Chor et al. 2015; Pichlak 2016). In other words, some studies have contributed with more insights into the innovation adoption process, while others have contributed with insight on what it is influenced by. In regards to the latter, the study of Chor et al. 2015, building on the theoretical framework by Wisdom et al. 2014, identified 27 adoption predictors that influenced the adoption at four contextual levels, namely external system, organization, innovation and individual (staff or client). Similarly, Pichlak 2016 suggests a conceptual framework discussing 19 determinants of adoption, categorized over five contextual levels. However, ibid. uses both the process and factor approach in her work, simultaneously considering the steps of the innovation adoption process in relation to the determinants of adoption. Figure 2.3 illustrates her suggested framework.
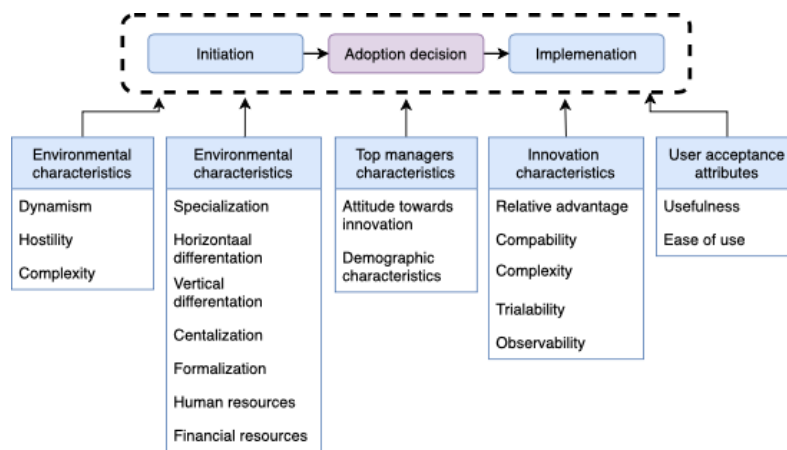
Figure 2.3: Conceptual framework for the determinants of the innovation adoption process. (Pichlak 2016)

The innovation process is considered at the organizational level similar to Rogers' DOI theory, as a sequence of stages proceeding from; initiation, adoption decision and implementation (Pichlak 2016). The contextual levels are: environmental characteristics, organizational characteristics, top manager characteristics, innovation characteristics and user acceptance attributes. The contextual factors are based on theoretical frameworks (e.g. resource-based view (RBV), DOI and TAM), or other contextual factors that have been recognized by other researcher investigating organizational innovation adoption (e.g. Frambach and Schillewaert 2002; Damanpour 1991; Damanpour and Wischnevsky 2006; Hameed and Counsell 2012). Research show that not all factors affect the innovation adoption process with the same strength, they however have variable degrees of influence on subsequent stages (Pichlak 2016).

2.4 Conceptual framework

Rogers' theory has played an extensive role in shaping the basic concepts, terminology and scope of field of the diffusion theory, and is the most cited theory for innovation processes (Tusiime and Byrne 2011). However, it has also been criticized for a number of reasons. In relation to organizational adoption, DOI theory focuses too much on voluntary adoption decisions, which is often not the case in organizations (Bayer and Melone 1989; Avgerou 2001 in ibid.). It lacks interactions related to culture, power or politics within the social system (Bayer and Melone 1989 in ibid.). In terms of how the innovation is perceived by an organization, DOI theory does not incorporate the culture, the technological frames of reference, or how the change agent and organization view the world (Du Plooy 1998; Avgerou 2010 in ibid.). Finally, DOI theory may be regarded as 'overly optimistic', and does not go into as much detail on why innovations are rejected, as it does on why they are adopted (Bayer and Melone 1989 in ibid.). Nevertheless, scholars have still combined Rogers' DOI theory with additional

constructs or contextual levels when conducting research on adoption of innovations, proving its relevance and impact. If the above mentioned criticisms are taken into account, Rogers' DOI theory is applicable for studying organizational innovation adoption, because of its well-developed concepts that has led to a large body of empirical results (ibid.).

A research framework is used to give theoretical basis for the empirical data analysis and to validate whether prior findings are in line with the interviews conducted in this study. As this study will empirically examine how different stakeholders perceive the adoption process in organizations, key elements from Rogers' DOI theory will be applied in combination with prior findings from the above mentioned literature investigating innovation adoption in organizations. This is to avoid potential shortcomings that could have arisen if the analysis was build on a single adoption framework. Similarly to Pichlak 2016, the focus will be on identifying factors that influence the adoption process based on contextual factors throughout the steps of the innovation adoption process. However, as startup companies are facing challenges during the decision making process, the focus will mainly be on the innovation decision process and the initiation stage, not focusing too much on the implementation stage. The applied research framework can be seen in Figure 2.4.

Figure 2.4: Applied research framework

Innovation-Organization Fit: The study will investigate the stakeholders' perception of innovations in the organizational context. Attributes from the DOI theory is used when valuing the characteristics of innovations.

Organizational Innovation Decision Process: The study will investigate the stakeholders' perception of decision making in organizations and their innovation awareness (knowledge and initiation). This context will use elements from the DOI theory as well as evidence-use in decision making (e.g. Brownson, Fielding, and Maylahn 2009; Solomons and Spross 2011; Turner et al. 2017).

Organization as a social system: The study will investigate the stakeholders' perception of the organization in relation to adoption of innovation. This is to provide insight into how different organiza-

tional elements affects the innovation adoption process. The elements are based on the DOI theory, which later have been further investigated and addressed by numerous of authors (e.g. Locock et al. 2001; Damanpour and Schneider 2009; Robert et al. 2009; Oliveira and Martins 2010).

3 | Method

This chapter will explain the chosen methodology used in this master thesis. An exploratory case study has been conducted to answer the research questions and purpose of the study. According to Yin 2014, this kind of research can be seen as an iterative process consisting of several steps. The first step was to plan the research and case study design. Second, the data was collected through semi-structured interviews, where the informants came from three different categories, namely the healthcare providers, developers and managers. Next, the data was analyzed before the findings of the analysis were discussed with the purpose of answering the RQ of the study. In order to maintain trustworthiness, the chosen methodological choices have been deliberated to identify limitations. The research design and process will be elaborated through the following sub-chapters.

3.1 Research Design

According to Flick 2015, research design is a systematic plan for a research project. Similarly, Yin 2014 describes it as a plan where the purpose is to go from a set of questions to a set of answers. In other words, your research design should help you in the process of deciding on what data to collect, how to collect it and how to analyze your findings. Furthermore, the objective is also to assure that the collected data contend with the purpose of the study and addresses the chosen research questions (ibid.).

3.1.1 Qualitative Research

The purpose of this master thesis is to explore and evaluate factors that influence adoption of healthcare technology. Triangulation will be used to get a multi-faced view of this phenomenon. The case study will explore the perceptions of the different stakeholders influencing the adoption of innovations. According to Yin 2014, a qualitative research method is suitable when investigating individual's perceptions and *how* something takes place or happens. This method is often used to discover new elements of a situation and to uncover diversity and nuances (Flick 2015). Whereas a quantitative research method is more suitable when dealing with numbers (ibid.), this study will capture different dimensions around the same situation by exploring it through others. Qualitative studies are advantageous because it is easier to apprehend individuals' interpersonal thoughts and subjec-

tive experiences when the individuals can express themselves through own words (Graebner, Martin, and Roundy 2012). Additionally, in-depth interviews can disclose unique findings and collect a large amount of data despite having few informants (Dalland 2007).

3.1.2   Exploratory Case Study

Since the objective of this study was to gain contextual knowledge about a so-called "real world problem" and answering "real world research questions" (Robson and McCartan 2016), an exploratory case study was chosen. According to Nargundkar 2020, if one do not know enough about something to formulate a conclusive study, an exploratory case study is a good choice. Whereas conclusive research aims to identify final solutions to an existing research problem, exploratory research give rise to alternative options for a solution (Sandhusen 2000). An exploratory approach is also advantageous when studying a phenomenon that is somewhat unrecognized, because it gives room to explore the phenomenon in depth and create a further understanding of how the context has affected it (Yin 2014). Additionally, ibid. states that case studies in general are applicable when exploring *how* and *why* within a process or situation. He further defines exploratory case studies as a way to define questions and hypotheses for developing consecutive studies. Similarly, Sandhusen 2000 states that exploratory case studies create room for further research.

The case of this exploratory study will look at adoption of healthcare technology in the Norwegian health care system in general, not adoption of one specific innovation. This will, according to Yin 2014, allow a researcher to explore the current situation through a single case. As the adoption of healthcare technology is a complex process that is influenced by several stakeholders, the experiences and perceptions of the different stakeholders may prove to be relevant for the subject of study. In other words, the narrative of each stakeholder will lead the research. According to Zellermayer 1997, individuals create narrative descriptions about experiences for themselves and others, as well as narratives to make sense of the behavior of others.

An exploratory approach provides the researcher with a high degree of flexibility and independence with regard to the research design as well as the data collection (Mills, Durepos, and Wiebe 2009). This approach was found to be suitable as the research is driven by interest, and the research objectives and data requirements are not clearly defined. However, Nargundkar 2020 have stated that *"an exploratory study may not have as rigorous as methodology as it is used in conclusive studies, and sample sizes may be smaller. But it helps to do the exploratory study as methodically as possible, if it is going to be used for major decisions about the way we are going to conduct our next study"* (ibid., p. 37). Meaning that it is important to have a clear purpose of your research and plan your research design well, even though the approach is not made out of predetermined steps. By conducting a exploratory

case study, the author wished to explore adoption of healthcare technology as a phenomenon. Doing so to gain knowledge about how and why decisions were made, how the actors in the social system acted and how it affected the context. The author believes that this approach will contribute with useful knowledge in this nascent field of research.

3.1.3 Empirical Setting and Selection of Informants

The search mainly focused on adoption of healthcare technology in the Norwegian health care system. To get a multi-faced view of the phenomenon as well as for the purpose of triangulation, the author wanted informants that could contribute with different perspectives of the phenomenon depending on their role in the social system. At least two stakeholders from each category were interviewed. All informants were anonymized. In order to find the most suitable people to interview for the data acquisition process, the following selection criteria were chosen:

- **Developers of healthcare technology:** Individuals working, or previously working, in startups developing healthcare technology. Preferably representing startups that have reached different stages in the commercialization process.

- **Users of healthcare technology:** Healthcare providers or other users of healthcare technology that works in healthcare organizations.

- **Managers in healthcare organizations:** Individuals having a leader position in an healthcare organizations. Preferably having a say in the decision process at some level, or at least being close to individuals who has it and by that having a deeper understanding and insight in that process.

In the process of searching for potential informants, the personal network of the author was used. As a student at NTNU School of Entrepreneurship, as well as having experience from working in different startups developing healthcare technology, relevant informants were identified. Figure 3.1 illustrates an overview of the different informants from the different stakeholder categories.
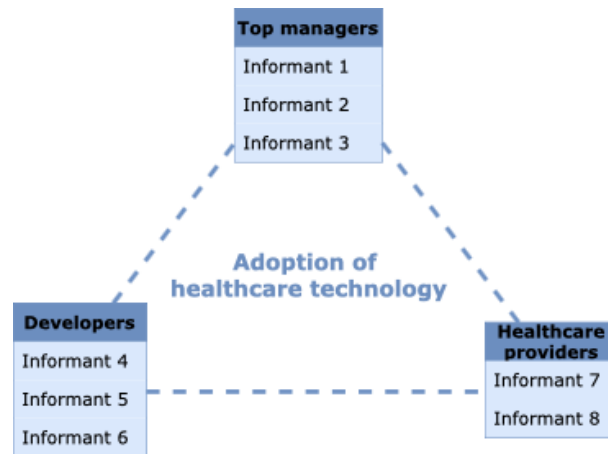
Figure 3.1: Overview of informants.

3.2 Empirical Data Acquisition

The data acquisition took place between March and April 2021. The data was provided through semi-structured interviews, which according to Eisenhardt 1989 is a commonly used method for data collection in case studies. The targeted subjects for the interviews consisted of people who represented the three different stakeholder categories as illustrated in Figure 3.1. The use of multiple sources was done to triangulate the data and get a broader understanding of the field of topic and to improve the quality of the research (Yin 2014). By doing so, the data came from different stakeholders in the social system offering different views and perceptions on the same topic. The potential informants were contacted by e-mail and agreed on when the interview were going to take place. The selected informants are presented in Table 3.1.

Table 3.1: Summary of the informants position and workplace

Fictonal Names	Position	Workplace
Jack	Former CEO	Alpha (startup)
Bill	CEO	Beta (startup)
Andrew	CEO	Gamma (startup)
Kate	CEO/Director	Private Hospital
Otto	Head of ICT	Health Authority A
Thea	Former Head of Development	Health Authority B
Nico	Attending physician cardiologist	Hospital C
Carl	Attending physician gastroenterologist	Hospital D

The names of the informants, as well as the names of the startup companies are fictional to maintain privacy. The position of the managers and healthcare providers are correct, but their exact workplace is not shared. The information about their background, as well as the descriptions of the startups, is also limited to maintain privacy. Jack was the former CEO and founder of Alpha, a startup company

founded in 2017. Alpha was acquired in 2020 and is no longer active. Bill is the CEO and founder of Beta, a startup company founded in 2006 and still active. Andrew is the CEO and founder of Gamma, a startup founded in 2015 and still active. He previously worked as a pediatrician. Kate is the CEO at a private (non-profit) hospital. Otto is working as head of ICT at one of the health authorities in Norway. Thea previously worked as head of development in one of the health authorities in Norway. Non of the managers have background as healthcare providers. Nico is working as a attending physician at a hospital and was also co-founder of Alpha. However, the data acquisition is based on his profession. Lastly, Carl is also working at a hospital as a attending physician. None of the healthcare providers or managers are working at the same health authority or hospital.

3.2.1 Interviews

The interview guides for the different stakeholder categories were designed to cover the same theoretical foundation, but the questions were asked from an angle that suited the informant's background. The interview guides can be seen in Appendix A. The informants were asked to introduce themselves, where they worked and what they worked with. The rest of the questions were open-ended to give room to personal reflections, and leading questions were avoided to ensure not to influence the answers (Flick 2015). The informants were asked about their own experiences with healthcare technology (innovations), including development, adoption, implementation and use. As well as own thoughts about innovations, their impression of the decision-making process and dynamics with other stakeholders in the social system.

The author of this master thesis was solely responsible for conducting the interviews. All interviews were conducted over video, except one where the author and informant met face to face. All interviews lasted from 60 to 90 minutes and were audio recorded and afterwards transcribed. Prior to the interviews, the informants were informed about the purpose of the study, that it would be recorded and that the findings could be published. Although the majority of the interviews were conducted via video, the author experienced that the informants participated actively and that the actors established a good contact through the screen. However, conducting the interviews alone can give rise to challenges. The author both needs to control and be engaged in the interview and at the same time be able to notice underlying messages through observation of behaviour (Eisenhardt and Graebner 2007, Neergaard and Ulhøi 2007). All things considered, a rich set of data was collected, covering multiple aspects and perspectives on the field of research.

3.3 Analysis of Data

The analysis in this master thesis is following grounded theory, proposed by Glaser and A. L. Strauss 1967, and the "Gioia-method" is used as an inspiration when coding the interviews (Gioia, Corley, and Hamilton 2013). Grounded theory is a research method often applied in qualitative research within disciplines like medical sociology, nursing and healthcare, social science, information systems and more (Bryant and Charmaz 2007). This method offers a compromise between extreme empiricism and complete relativism to be able to analyze and address the meanings, concepts and interpretive realities of actors in a social setting (Suddaby 2006; Glaser and A. L. Strauss 1967). The analyze will follow the ground theory's two key concepts: the data will be collected and analyzed simultaneously (constant comparison) and the arising theory will set the stage for which data to collect next (theoretical sampling). The "Gioia-method" is a systematic approach that is designed to bring "qualitative rigor" to the result of inductive research (Gioia, Corley, and Hamilton 2013). The analysis consists of three steps, which will be further elaborated in the next sub-chapter. However, the process was not strictly following the method, as the author's understanding of the theory developed along the way during the iterations. Each interview were transcribed using oTranscribe and then coded in NVivo.

3.3.1 Coding of Data

Step 1: Identifying first-order codes

When going through the transcribed interviews, the process started with so-called "open coding" (Locke 2001). Statements and impressions regarding adoption and use of new healthcare technology were identified and categorized to establish first-order codes. The aim of this process is to identify common and consistent remarks, issues, events or other topics described by the informants (Corley and Gioia 2004). After coding the interviews, 53 different first-order codes were established, each describing perceptions, experiences or behaviour of situations. Example of first-order codes are: "statements about decision makers' assessments", "healthcare providers' experience with new healthcare technology", "statements about innovations in healthcare by healthcare providers", "statements about innovations in healthcare by managers" "descriptions of the social system in healthcare organizations", "managers' statements about adopting or implementing innovations" or "statements about key individuals helping startups". Some of the first order codes were also based on some of the elements in Rogers' DOI theory or other parts of the theoretical foundation, as this was know for the author, e.g. "compability", "complexity" or "relative advantage". The transcripts of the interviews were read multiple times until all the relevant material was coded.

Step 2: Creating second-order categories

In the second step, the aim was to reduce the number of first-order codes by looking for similarities and differences and sort them into second-order categories. This is similar to what A. Strauss and Corbin 1998 calls axial coding, where the second-order categories are meant to be more theoretically relevant categories (Gioia, Corley, and Hamilton 2013). Examples of second-order categories are: "stakeholders' perception", "innovation characteristics", "types of innovation-decision" or "norms and culture". These categories were based on literature and following the research framework used in this case study. The first order codes, e.g. "complexity", "compatability" and "relative advantage" was classified into the category "innovation characteristics", Or, "statements about innovations in healthcare by healthcare providers" and "statements about innovations in healthcare by managers" were classified into "stakeholders' perception".

Step 3: Creating aggregate theoretical categories

The final step in the "Gioia-method" was to go from the theoretical second-order categories to larger, but fewer, aggregate theoretical categories (ibid.). This was done by seeking for more generic theoretical terms that could pinpoint the most relevant theoretical concepts, following the theoretical background and research framework. The second-order categories were combined into 3 aggregate theoretical categories, as presented in the applied theoretical framework in Figure 2.4.

3.4   Reflections and Limitations

According to Yin 2014, qualitative case study research is challenging because the research design and data collection process is not following strict routines or practices. Moreover, the method has been criticised for providing little basis for scientific generalization. The author of this study had no experience in conducting an exploratory case study prior to this thesis, nor to conduct semi-structural interviews. This might have affected the quality of the study. However, the author did prepare by attending classes on academic research in addition to having almost weekly guidance from the supervisor throughout the research period. Another criticism on qualitative research, according to ibid. and Bryman 2016, is based on the fact that a subjective interpretation of the data can contribute to the results being angled in a way that confirms the researcher's original assumptions. To increase the validation of the data, a multi-faced view of the phenomenon was ensured by doing a triangulation when choosing the informants, i.e. interviewing stakeholders representing three different 'groups' experiencing adoption of healthcare technology. This increased the validation by obtaining data through different views and examine the consistency of the findings. However, there were no other sources of data other than semi-structured interviews, which again can reduce the validation of the study.

Because of limitations associated with being only one researcher, the sample size of each group of

stakeholders was small. The author could have conducted a more profound study on one group of actors, but a more broader view of this complex phenomenon was desirable. The findings might not be presentable for a larger population a when having small sample size (Yin 2014). However, a total of eight interviews have been conducted, revealing a sustainable amount of empirical information. It can still be discussed if the results of this study are applicable in similar empirical situations. In order to gain a more comprehensive view of the phenomenon, more than two to three actors from each group could have been preferable. Nevertheless, the author still believes that this study can give rise to consecutive studies and further research, but questions whether the study is large enough to contribute with any new theory (ibid.). More informants could have been included in the study to enhance the validity.

There are some limitations associated with using interviews to gather data. The questions can be badly formulated, which creates misunderstandings, or formulated in a way making the informant saying something it believes the interviewer wants to hear. Some of these limitations were minimized by the use of semi-structured interviews and open-ended questions. Semi-structured interview gives the respondent the freedom of formulating their own answers (Bryman 2016). Additionally, the researcher also have the opportunity to ask follow-up questions on the spot when the interviews are semi-structured (ibid.).

The author has tried to provide a detailed overview of the data acquisition process to strengthen the study's reliability, allowing others to replicate the study using the same method (Yin 2014). This has been done by mapping out all steps in the process. This includes the dialog with the informants, how the interview guide were designed and how the interviews were conducted.

Another limitation is that the coding and analyzing of the data was done by the author alone. The validity of the analysis could have been strengthened by having another opinion when coding the transcribed interviews, creating the theoretical categories and interpreting the findings. On the other hand, it can also be advantageous that the findings are perceived in the same manner. Additionally, the findings, as well as the interview guide, were originally in Norwegian. When the author has translated the collected data into English language, this might have affected the result of the study. The author could have given the respondents the opportunity to go through and correct any misunderstandings in the translated material before it was used in the thesis, but this was not done because of time constraints.

4 | Empirical Findings and Analysis

This chapter will present the findings from the conducted interviews. The findings will be presented and analyzed simultaneously. The research model is used as the structure to present the findings using the main categories: "Innovation-Organization Fit", "Organizational Innovation Decision Process" and "Organization as a social system". However, the subheadings are not strictly following the sub-categories that can be seen in the research model. It must be emphasized that the findings were sorted following the coding presented in the previous chapter. However, because this thesis is heavily reliant on narratives, it seemed more natural to present the findings in the order in which the stakeholders told their stories rather than strictly dividing them into the sub-categories. Based on the narratives from this exploratory case study, the aim of this chapter is to shed the light on the RQ.

RQ: What factors influence the organizational adoption of healthcare technology?

If certain elements, aspects or circumstances are empathised by multiple informants, it will be considered as an important factor.

4.1 Innovation-Organization Fit

Characteristic factors affecting stakeholders' perception

Individuals perceive innovations differently, and this is also the case for healthcare providers. For example, Nico commented that *"You may get the impression that healthcare providers are a bit conservative, and it is [true] to a certain extent, but I think people are relatively willing to change."*. Thea also mentioned that the healthcare system is often criticized for having *"too much resistance among individual groups within the health care system to use new things"*, adding however that *"I do not think that is true."*. The developers stated that they received nearly entirely positive feedback from users, and perceived healthcare providers in general as positive to innovations. On the other hand, Carl stated that *"We are quite skeptical of new things [innovations] if you cannot prove that this, how this works well in relation to clinical examinations."*. Nonetheless, Nico and Carl both stressed that it is important that the innovation have clinical relevance. Clinical relevance, or clinical significance, refers to whether a treatment has a real, tactile, and noticeable effect on daily life (Kazdin 1999). Nico explained that:

"It does not help if it [the innovation] is the world's finest and smartest, it must have relevance. This must mean that the treatment becomes better. Ideally, you have to be able to refer to studies and practice. At least common sense, that if you use this equipment, the treatment will be better." - Nico

Similarly, Carl looks at innovations as pioneering work where one has *"the opportunity to take better and more accurate samples, and thus improve the treatment.".* Moreover, he said that *"I am very fond of research, very fond of development and innovation"*, but he also put a significant value on clinical research, *"but it must be quality assured"* as he considers that *"many innovations lack it".* Nico further explained that by *better*, he refers to two factors that are important for the healthcare service. First, the equipment must provide improved quality of care (QOC). QOC relates to the interaction between health care providers and patients, and how the inputs from the health system are transformed into health outcomes (Hanefeld, Powell-Jackson, and Balabanova 2017). The second factor that Nico mentioned is that the equipment should preferably also improve the efficiency of the treatment or service and ensure better resource utilization. Furthermore, he added that *"it [the equipment] must be robust. And lastly, there is of course the user interface.".* He further explained that the reason why existing technology is not replaced may be because it is so robust. And even though *"it also has its artifacts and problems"*, the healthcare providers are so familiar with it, *"it is so embedded in the health care provider's consciousness.".*

Carl questioned whether efficiency is used more as a buzz-word in relation to organizational innovations. His skepticism comes from reading about an innovation project related to ICT. According to him, there was no prove that the ICT project had improved the efficiency, *"and then I think that..then we have spent a lot of money.".* Nico had a similar experience from when the hospital were going to implement a new communication system, which he refers to as a 'scandal'. Furthermore, Carl also described another experience with a project where the hospital was going to implement a new system showing information about the patients, *"The project went on for many years, and there was absolutely nothing of it, and the nurses who were in that project, they ended up in the administration afterwards.".* However, the managers had a different view on this. For example, Thea explained that *"there are other organizational benefits from an innovation in addition to the specific solution"*, before she added *"an individual [in the organization] will not necessarily see that".* This view is echoed by Kate when describing a situation in which they were going to introduce a new ICT tool to improve clinical, patient, and service logistics.

"..the doctors do not understand why. Then you have to convince them that the advantage of doing so is that the laboratory that has taken samples from the patient knows that you are responsible. If they see something special, they know who to call directly. So if you are going to get something back, you have to give something." - Kate

Kate further explained that, from a clinician's standpoint, the focus is mostly on medical technical devices and its development. Adding that they might no see the whole picture because they are more interested in their own specialised disciplines, *"there are very many who are concerned with the heart, lungs and so on"*. When asking the healthcare providers about their perception of innovations, a common feature of the findings was that they spoke more often about medical equipment in that context. This became quite evident when speaking with Carl, who mostly mentioned equipment used in gastroenterology when questioned about medical technological innovations. For example, *"Yes, I can start with what we usual use in gastroenterology, it's endoscopes." (...) So in that sense, I am very positive to being ahead, both in terms of development and use of new equipment and for the best to help patients. To improve diagnostics and treatment.".*

Innovation fit

Findings suggest that the managers place more emphasis on logistics and infrastructure when talking about innovations. For example, Kate said that *"We decided very early on that IT and organizational development are very closely linked together. You have to manage the work processes and you have to look at the patient flow.",* further stating saying that *"And we decided very early on that we should look at the patient as a whole through the hospital.".* However, both the managers and healthcare providers shares the view that it is important that innovations can be standardized and implemented in the existing system. For example, Nico mentioned that, *"If it is a new type of monitor signal thing, there should not be another screen. We have a lot of screens. You have to get this integrated into what exists.".* Both Nico and Kate stressed the fact that the information has to be transferred to the patient's record. Kate exemplified this by saying that:

> *"If they [developers of healthcare technology] come up with something that takes some measurements of a patient, then that measurement is not worth that much if it is only on one instrument, because you have to get it over to the patient record or operating system or somewhere that allows people to see this the information." -*
>
> *Kate*

Kate also argued *"what may be difficult for a startup is to understand where in the chain this belongs".* Andrew, with his background as a clinician and entrepreneur, confirmed the previously stated assertions. For example, he said that *"Developers must consider how their technology might help to more efficient and high-quality healthcare services, because that is what healthcare providers care about",* and further added *"and I think that is a huge challenge for those who come with a pure technical background".* Additionally, he emphasized how important it is to be flexible when presenting something 'extra' that will add to a clinician's daily routine, because *"that extra thing is very often downgraded.".*

Building on clinician's daily routine and how innovations fit in the existing system, Nico mentioned an innovation in which he is familiar with and has conducted a validation study on. Despite positive clinical results, he discussed a variety of problems of its actual implementation. E.g. that the [innovation] is going to be put inside the patient, it has to be disconnected when the patient is moved around, as well as basic maintenance. *"So the point is, coming up with a monitor or something that is so revolutionary that it requires a huge effort can be challenging."*, he concluded. According to Otto, Kate and Thea, this can also be a challenge even though the innovation is not cutting-edge technology. Kate explained that is was opposition in the organization when they changed over from an old system to using mobile technology, *"to say that we should go for mobile technology was..there were so many who were red in the face."*. Also, Thea mentioned challenges related to using web cameras and video consultations due to Covid-19. Thea said *"it is simple technology that provides obvious benefits, however, even that was challenging to implement"*, further stating that *"it is new technology for them, even though it is not revolutionary."*. Based on a similar experience, Otto emphasizes that developers must satisfy many requirements, especially that it should be easy to use.

4.2   Organizational Innovation-Decision Process

Knowledge and renewal among healthcare providers

In terms of information regarding innovations, Carl addressed that *"there has been a restriction on information that we get, we must seek it much more actively ourselves"*. According to him, suppliers are not visiting the hospitals as often. Carl also mentioned that the healthcare providers *"used to be invited to seminars and conventions"*, and *"it was a good opportunity for us to gain insight into what they were doing, insight into current technology and what they are working on."*. The developers also highlighted the importance of making themselves visible among their users, describing it as being similar to a 'door-to-door sales job', a term also used by Nico. Bill explained that they decided not to pay for marketing, but instead focused on media like newspaper, television, LinkedIn, Facebook etc., *"our strategy was that for every [product] we sold, we called the local newspaper, and then they made cases about the local heroes"*, referring to local heroes as individuals that supported the innovation. In regard to getting in touch with potential adopters, Bill explained that *"first we tried e-mail, but no one in the healthcare system reads emails"*, adding *"we started standing in the lobby of these large conferences with [their product] and a large folder and gave out information"*. This was a way to meet with decision makers and spread the name.

Searching for innovations

Kate described how the hospital started to look for solutions that would fit their needs after identifying improvements related to the ICT system, explaining that *"we decided to go for proven technology"* to reduce the risks associated with implementing it. Otto, on the other hand, expressed his disappointment with the lack of acceptability for testing innovative solutions. He argued *"we must to a much greater extent dare to think about it in the short term with MVP."*. In terms of development and testing, Otto stated that the members of the organization expect new solutions to work immediately, however *"my brain does not work like that, I can not, in such a large structure, understand how this can be optimal, without trying anything and failing."*. He further described the system as *"very order-performing oriented"* and *"traditional"*, both within the RHFs and HFs, because they expect a supplier to deliver a *"cut-and-dried solution, or at least very close, before we dare to try anything."*. This was confirmed by Kate, saying that they knew it would require much more effort to go for a solution from a startup because it is not *"in a portfolio"*.

When it comes to procurement of medical equipment, Nico and Carl described that the requests often come from the healthcare provider themselves, based on professional assessments or needs or the impovement of the technology. It also depends on the costs of the requested equipment whether the decision is done at the hospital, or raised to a higher level, e.g. to the board and CEO of the HF. Another problem assessed by both Nico and Carl is that there is too little money is allocated for the purchase of equipment in general, because the majority is used for renewal and maintenance of existing equipment. Nico explained:

> *..there is a list, a prioritized list of acquisitions, where the department managers, who are under the clinic managers, sit and argue a about getting their wishes. (...) Then you have a prioritized list, which is much longer than what you have money for, and then it is bought from the and down." - Nico*

However, it is rarely any requests for completely new equipment or innovations from the healthcare providers. In terms of renewal using technology, Otto mentioned that *"we [working in IT] are not very good at making the opportunities visible [for the clinicians], and the clinicians are too bad at thinking about renewal."*. He also claimed that there *"is a fairly low degree of interest in renewal"* among the clinicians. He further stated that *"what we are doing now is that there are demands from the management"*, adding however that *"essentially, we want the answer to come from the bottom up."*.

The decision-making process

When the managers were asked to elaborate on the decision-making process, they had similar descriptions. Thea explained *"In the public sector, it is often the managers who have decision-making re-*

sponsibility. It depends on where in the system you are, how much decision-making power you have.". Similarly, Otto says *"If you stick to the rules, then everything will ultimately be decided by the director, or someone high, high above me.".* This is confirmed by Kate, *"Yes, nothing would have gone through if I had not said yes. I am the main decision maker.".*

It is evident that this frustrates the developers. For example, Jack said *"You are looking for the person who can say 'we see the value in this, we listen to the nurses and doctors, we want to use this here'. I never found that person.".* He further explained that they tried several times to arrange a meeting with the director at the hospital, *"but they wouldn't, they moved it.".* Similar, Andrew said *"It is not straight forward, you can not just go to someone who is in charge of buying. (...) That communication [with decision makers] is quite difficult get hold of.".* Bill also explained how a product manager at a hospital would like to use their product, *"but she can not take us in unless they [the board] approves us.".* He further argued that *"there is a error in the system, because it cannot be the case that there is one person at the top who makes all decisions, it must be an inter-political, interdisciplinary group, and also inter-geographical.".* Jack had similar frustrations *"Someone who do not care about the details of the features or quality of the product are the ones making a decision based on a spreadsheet.".* Similarly, Andrew said that *"Those at the top are doing calculations, while [the users] will make other assessments. They want to use equipment that provides a better offer. (...) And some are concerned about the guidelines of the treatment.".* Bill explained the misalignment between the users interest and decision makers interest:

"And what we very often see is that the users of our technology, they are usually non-academics. While the use is determined by academics or people with high competence in given areas. And it is not always those with the highest competence who see the challenge of solving a problem, in the same way as the users." - Bill

Both Otto and Thea understand that decision process can be difficult for the developers to understand. For example, Otto said that *"It's a good sauce, I understand that the they [developers] are unsure. (...) It is a very hierarchical decision-making culture, when in the end, it is the directors who give their orders. It's a very naive way to do it.".* Nico and Carl also expressed their frustration about this matter. For example, Carl addressed that it is a challenge that the decisions *"are not taken by the professionals, but they are taken by the administration",* adding *"but if you could say as a professional that 'now we do this and this', you would also have support from a professional standpoint, not only from an administrative standpoint.".*

Evidence based decision making

An issue pointed out by the developers is the process the innovation has to go through when being evaluated. *"It is governed by bureaucracy, rules and laws, making the process so insanely slow."*, Jack stressed. He further explained:

"They are limited by laws and regulations at the hospital that are governed by someone else. When the Norwegian Medicines Agency is based in Oslo and has to make a decision about whether something can be tested at [the hospital], those in Oslo only have the incentive to not approve something that may have some form of risk." - Jack

Jack also mentioned how all the regulatory requirements at the hospital made it worse *"You get an extremely heavy process where the part of the hospital that deals with ICT and computer technology sets a list of requirements that is very theoretical [following] laws and regulations, and then it is considered how much the price should apply in the offer, how much should the product features apply, and then you have a tiny bit where doctors and nurses get to say what they actually mean."*. Similar, Andrew stated that *"you do not know exactly what to do"* and that *"you need to formally and informally convince someone."*.

They also experienced that there was no list of requirements fit for evaluating new technology from startups. Instead, they had to meet the requirements from the list MTA uses when approving medical technical devices for competitive tender. The problem with this, according to all of the developers is that these requirements are fit for equipment that is already fully tested, certified, approved and ready for sale. Jack described it as a chicken-and-egg problem, *"you must have equipment that is fully approved and ready for sale, and you should actually have that in place before you test it."*. The process of getting the innovation certified and approved requires clinical research over time that is described as very time and resource consuming by the developers. For example, Andrew addressed that *"The challenge with certification and authorizations is capital and expertise. We have spent so much time and effort trying to figure it out."*. He also described how the requirements for clinical test could vary among decision makers and health professionals, *"some say they need to see a clinical study, but [then saying] 'It's too small, I want to look at it and have it my hands and test on 10 patients myself.'"*. Bill explained how they have been lucky having partners in research and development within the professional field they operate in, which have made it possible to test their product. However, as these test are done internally to confirm that they have done the development process correctly, they can not be used as evidence, *"[we] have to have an external, independent partner who say 'yes, what you do works'"*. Despite having really good results on their internal test, they have not received support from the hospitals, *"We do not have clinical studies (...), they [the hospitals] do not want to participate*

in clinical studies.". Bill further described that the opposition came from one decision maker, simply not liking their method. The combination of resource consuming certification and authorization processes and difficulties related to conducting clinical studies makes it very challenging for the startups to prove the innovation's relevance and evidence.

The developers also point out that this is an advantage for the large medical device companies. Bill stated that *"they [the large companies] know what they are going through, and they have completely different access to the channels.".* Jack argued that a big company with a lot of resources can deal with a slow and costly process, *"but as a startup you are dependent on making early sales to prove that what you are doing has a value, which allows you to finance it further".*

4.3   Organization as a social system

Structure and leadership

The developers cited that the structure in healthcare organizations, especially in the health authorities and hospitals, could effect adoption negatively. For example, Bill explained that Beta have had most successful adoption within primærhelsetjenesten because they experienced that health institutions led by municipalities had a shorter distance from the user to the decision maker. Conversely, this is not the case within the hospitals, *"the hospitals are extremely hierarchical, and the road to the top is long"*, Bill stated. Additionally, the adoption decision is influenced by professionals at different management levels within the hospital before the final decision is made by one or very few people at the top. Bill commented that *"the decision-making process is very long, and there isn't always a desire to try new methods."*, and that it was most commonly seen among men *"over the age of 65"*. This is confirmed by Otto when talking about how the structure affects the decision makers *"they are quite far from both the clinicians, the developers and yeah"*, and also how it affects the decision process *"the structures we have around us cause the decisions to be lifted up, up, up"*. He also commented on how the organizational structure affects him as head of ICT *"there are at least enough people [in the different management levels above him] for me to be paralyzed"*, further saying that *"it is important to be able to move away from the hierarchical structure.".*

While several of the informants mentioned that the organizational structure itself had a negative influence on adoption, Kate and Thea also emphasized that the very concept of leadership is one of the things that has to be changed to create room for innovation and change. As a leader of an organization you have a responsibility, *"but some are better at making room for development than others*, Thea stressed. It necessitates a thorough understanding of available resources and how they should be distributed. Kate explained the current situation:

"But in hospitals today..there is nothing wrong with professionals if they want to lead, if they want to spend time on it. But according to the old structure, the best professionals should be the leaders. However, being a leader is something else. On a bed post, there are 70-80 employees, but only one leader. (...) This structure was one of the first things I changed. (...) You have to work with the concept of leadership. The health service has a lot to gain from doing something about it." - Kate

Many health organizations have made it a priority to modify how innovation processes are carried out, both in terms of management and structure. The idea is to get closer to the patients' and professionals' needs. But several informants believe that the focus is lost along the way. Otto for example outlined *"we somehow lose the perspective we had, where clinicians and patients are at the very core of what we do"*, and this is because of the strict structure of the organization and the way the management is working. He further explained this by saying that:

"..we think in boxers and structures, and owners' meeting here and owners' meeting there, and steering group there. And in the end, we have just created a new, slightly different system, which is so far from the clinicians and patients, I believe and fear." - Otto

Carl shared his concerns about this, saying that *"Organizational things are often more valued in the Norwegian health care system than professional things."*. He explains that *"I almost get the impression that innovation projects are flagged as much for people who are to be relocated, as it is for people who really want and have the competence to develop things. (...) So who is applying? Well, someone with administrative competence, not someone with professional competence."*.

Social climate and inter-organizational environment

Bill also pointed out that the social climate is polarized among the regional health authorities, making it appear as if the RHFs do not collaborate to reach an agreement when new medical devices are to be approved. This is also commented by Carl, when sharing his experience from a cooperation between two RHFs, *"I wonder if it is a form of competition since it is different [use of equipment] from [a RHF] to [another RHF]?"*, further stating *"And a total lack of control from the ministry in relation to this"*. Jack also described a similar experience with a project they participated in. Additionally, disagreements among decision makers make it more challenging for innovations to spread among the different health authorities, according to Bill. He noted that *"I know she [a decision maker] liked our method and equipment, and that was reason enough that he [another decision maker] did not like it"*, further adding that *"they simply use very ugly words about each other."*.

Kate believes that each hospital also has a different degree of maturity when it comes to adoption of innovations. She said that *"It is difficult to say whether they [the hospitals] don't want to, don't have*

time or don't believe in it.". When they were going to implement the new ICT solution, Kate said that *"to work closely with the ICT department at [the RHF] was important. But we also knew that we had to get the other hospitals involved."*. That is, both the adopting organization and the startup are dependent on the organizations working together to achieve successful adoption.

Otto questioned if a centralized organizational structure inhibits adoptions, he said *"I wonder what kind of signal is sent from the central committee to [the RHF]"*, further wondering *"what makes some people high up in the system to make the choices they make"*. Similarly, Kate believes that a less bureaucratic structure can contribute to more innovation. She stressed that a public healthcare service is essential. However, *"if the innovation process is run by only major, public actors, it can take significantly longer."*. She therefore believes that one should open up for different organizational forms, e.g. public or private hospitals. She summarized this by saying that:

"I still want it to be a public healthcare service, but I believe that it is not contradictions of each other. I just want more suppliers to be allowed to join, then I think we will be able to move. There is always someone, hopefully, who has a good idea. And the good ideas can come from the public as well as from the private. But I think there will be a competition, and I believe that is good." - Kate

Building an innovation friendly culture

Thea stressed the importance of communication in in relation to technological development and innovation. Implementation of new technologies, either in the form om products or services will impact the individuals working in the organization. Thea emphasised the importance of internal communication and anchoring within the management of the organization, saying that *"When you are going to introduce a new technology into healthcare, you need to have good plans and you need to involve the right people at the right time and spend extremely much time on communication."*. Thea also suggested that the developers should be more involved in this process. Developers must *"include employees and managers, as well as communicate the utility value, to reduce resistance within the organization"*, she said. Similarly, Otto also mentioned the need for co-development, but stressed that the system *"is rigged for the opposite"*, and that *"it is exceptional that we put developers together with clinicians, we think that is scary"*. However, several of the informants stressed that the issue also lies within the culture and norms. Both Otto and Thea argued that it is about changing clinical practice by making technological renewal a part of this. For example, Otto commented that *"so a part of this is to look at what professional development is, to actually look at the use of technology. Can it be a part of professional development? In the past, this has probably been a 'no' for many, but it must be a 'yes'"*. Nico confirmed that *"there is extremely little knowledge about these development processes among health professionals, so they have no understanding of how this actually takes place"*.

This may be due to a lack of interest or knowledge, but several of the informants say that it is due to a lack of resources. For example, Carl is concerned of healthcare practitioners participating in innovation projects because *"it leads resources to be taken from day-to-day operations."*. All informants agreed that lack of time and capacity is a challenge. This also affects the developers, because do not have access to professional resources during the development of the technology. Bill stressed that *"it is very difficult to get resources in the health care system to set aside time to look at new solutions."*. Carl also commented that *"you have to be sure that you have the muscle to develop this well enough."*. Moreover, Jack said that he would like the hospitals to *"facilitate entrepreneurs who are willing to sacrifice both time and money."*. Similarly, Kate, Otto, Thea and Nico agrees that better resource management is needed to be able to make other processes more efficient. Thea argued that:

> *"They [managers] must argue why it is right to spend time on it, use resources, what benefits we can get from using new solutions. It is a culture that must be developed, where the value around thinking new and being innovative must be acknowledged." - Thea*

Important role players

Another finding that stood out was all statements about individuals who actively supported innovations. All the developers had similar stories about people who was a crucial part of their success. Jack illustrated this by saying that *"had it not been for some doctors inside who fought to get us in, we would not even have been in the hospital"*, further stating that *"when you start making technology you have to find someone inside who will work with you, or else you are screwed."*. Similarly, Bill said *"and then, again, we found a person who took it [their product] in and started to spread the message."*. However, there is no guarantee that a startup will succeed even if they find such people. Bill explained how one of their supporters have tried for nine years to convince a colleague, who has decision-making power, to test their product. Even though their supporter is a specialist withing the field, the decision maker has not changed his mind, *"he [their supported] keeps saying, 'If a doctor says no, then it's no'."*. Bill and Jack also discussed that some fear the loss of status if they support innovations. Bill explained that they found key people who were interested, but who were scared that others would find out. Jack also stated that *"they basically have everything to lose by taking a chance on something, and they would not gain anything either if something they took a chance on actually worked and was put to use"*, further stating that *"they have a very limited type of [reward], they have no reason to take a greater risk."*. Otto also shared that he has tried to be a counterpart to this, however *"it is much more dangerous for me personally in this job to have that attitude, it would have been a lot smoother for me to be a regular employee."*. He also commented that *"The easiest thing to do is to find someone who says 'no'. (...) And it's much harder to find those who dare to stop that list of questions and say 'yes'"*.

Both Kate and Thea emphasised that finding individuals that is interested in using new solutions within the organization is key. Thea stated *"Find them internally, (...), build structures around them and give them room for maneuver."* . Similarly, Kate said that *"You have to have someone who is passionate about something, otherwise you wont make it"*, and added that *"if you find one or two of them, you have something to build on."*. She explained how these individuals were useful during the implementation of the new ICT tool.

"Some people are more technically minded than others. We have some doctors who are more like front runners who think it is exciting and see the possibilities and potential. Then we often use them in workshops to help us facilitate and bring out [the needs] from the others. (...) Then you get a good dialogue and good ideas." - Kate

However, Thea points out that the risk is that you will find someone who goes in front and drives the development, but who goes too far in front and does not get the organization involved.

5 | Discussion

The findings from the empirical analysis will be discussed in light of the existing literature presented in Chapter 2. The research model is used as the structure to sort the findings into the main categories and subsequent categories. In order to be able to more easily discuss the findings, reference will often be made to the entire group of stakeholders, e.g. "the healthcare providers", "the top managers" or "the developers". Clear disagreement within a specific group will be addressed.

5.1 Innovation-Organisation Fit

Stakeholders' perception of innovations

Extant literature suggested that the different stakeholders of an organization have different interests and perspectives which can determine their attitude towards innovations. (Johnson et al. 2011). The literature further emphasises that despite having conflicting views, the stakeholders have a common desire to improve the performance of the organization (ibid.). It was evident that the healthcare providers and managers had different perspectives when evaluating innovations, clearly affected by their profession and role in the organization, as existing theoretical predictions have occasionally justified (Fichman 2000). The healthcare providers mostly focused on innovations related to medical technical devices and the usefulness and usability of this, whereas the managers mostly focused on innovations related to information technology systems and how it would fit in the existing system. However, despite evaluating innovations differently, both the healthcare providers and managers evaluations can be interpreted as a common desire to improve the organization's performance. Nonetheless, it is reason to question how the different perceptions and evaluations among the stakeholders' affects adoption of healthcare technology.

Innovation characteristics

As presented, Rogers argued that the adoption rate was reliant on the characteristics of an innovation. It would be more rapidly adopted if the innovation was perceived as having a greater relative advantage, compability, triability and observability and less complexity (Rogers 2003). However, in the extant literature on innovation adoption in organisations, much attention have been given to

the research on environmental and organizational conditions for adoption (Damanpour and Wischnevsky 2006). Recent calls have therefore been made to further investigate how the adoption is influenced by the characteristics of the innovation as well (Damanpour and Schneider 2009). With that said, researchers have also argued that one can not look at the characteristics of an innovation alone, nor the environmental and organizational conditions alone, but rather describe it as a innovation-organization combination (Fichman 2000).

As this study did not focus on any innovations in particular, there was not possible to draw any conclusions about how the specifics characteristics actually influenced the adoption as they were not measured. However, the findings revealed which characteristics were valued by the the healthcare providers and managers. For example, the healthcare providers emphasising that an innovation's relative advantage was crucial, *"the opportunity to take better and more accurate samples, and thus improve the treatment"* (Carl). However, extant literature on healthcare adoption has found that even if potential adopters measures an innovation to have high relative advantage, it does not guarantee adoption (Fitzgerald et al. 2002; Glanz, Rimer, and Viswanath 2008). In the case of the managers, they were more concerned about an innovation's compatibility and how it would fit with the existing norms and structure of the organization. Accordingly, this was important because innovations were closely linked with *"organizational development"*, and *"is not worth that much"* unless it was compatible with current practice. The request for a highly compatible innovation seems to be closely linked to its low complexity. Healthcare providers would be less interested in an innovation if it *"requires a huge effort"* to replace what they are already using (Nico, Andrew). One might argue that it does not take much before something is perceived as complex, as this was even the case for web cameras, *"even though it is not revolutionary [technology]"* (Thea). Thus, an innovation that is perceived as having a high complexity, would automatically lower its compatibility because it does not fit in the existing routines and requires more of the healthcare providers' knowledge and skills. This might also explain why the managers emphasises compatibility so much, as they know that the innovation has to be adopted by the individuals in the organization. Interestingly, looking back at the story Nico told about an innovation that had proven its relative advantage with positive clinical results, the findings also suggest that as long as it is not compatible with current practice, knowledge and skills, the innovation would not adopted. Suggesting that compatibility and complexity could more important that relative advantage. However, a study investigating a service innovation in the National Health Service in England found that successful implementation and diffusion was not guaranteed despite having high relative advantage, high compatibility as well as it was easy to adapt and possible to refine and modify (May et al. 2003; Robert et al. 2009).

When it comes to an innovation's observability, the finding of this study suggest that the healthcare

providers perception of an innovation can be a reliant on whether the results of the innovation are visible or not. For instance, it seemed like Carl and Nico had a hard time accepting ICT related innovations (communication system or system showing information about the patients) because they did not see any results or experienced any improvements, which is consistent with prior research (Rogers 2003; Safi, Thiessen, and Schmailzl 2018). Similar description was done by the managers, expressing their frustration over how healthcare providers did not see the benefits of innovations in relation to organizational performance unless it had reference to their own work or interest. Viewed in the context of extant literature, the managers' view answers to the literature stating that healthcare providers have been quicker to adopt innovations within medical technical devices, procedures and treatments, compared to innovations in communications and network (Gupta 2008; Omachonu and Einspruch 2010). A reason for this according to the same literature, is that healthcare has been a service always performed locally and in person. Similarly described by Otto as *"an inherent urge to look at and touch the patient"*. From another perspective, previous literature looking at information technology innovations in healthcare suggests that it can be difficult to measure benefits like increased efficiencies in patient and specimen movement when measuring performance outcomes (Bates 2002), or that there are no direct measures of the economic and societal effects when adoption 'administrative' innovations (Westphal, Gulati, and Shortell 1997). Both arguments can be supported by the findings of this study. However, focusing on the latter, one can argue that the degree of observability influenced Nico's and Carl's perceptions. The findings did not address how this influenced adoption, but previous research have found that observability does not have significant impact on neither initiation, adoption decision or implementation. (Pichlak 2016).

As previously mentioned, innovations that are less trialable are less likely to be adopted by organizations (Rogers 2003; Plsek 2003; Trisha Greenhalgh et al. 2004; Damanpour and Schneider 2009). To support change efforts in health care organizations, organizations should create room for innovations to be testes (Pichlak 2016). According to the findings of this study, there is a low level of acceptance for testing new ideas among the hospitals. Kate for instance described how she found it inhibiting to have to go through *"that heavy road"* of *"testing, purchasing, approvals and integration and all that"*, and rather chose to go for proven technology (mobile technology). This appears to be one of the most significant problems that hospitals face when meeting with entrepreneurs who are offering new products or services. As a contrary, Otto emphasised the need to not only *"think about [development and testing] in the short term with MVP"*, but also dare to fail when trying out new solutions. Trying out innovations on a small scale will reduce the risk of failing because it can be kept to a level that is tolerable for the organizations (Plsek 2003). Viewing this in relation to observability, successful results of small scale testing could in turn strengthen the acceptance of adoption. In the context of

startups developing healthcare technology, one could argue that the trialability of an innovation is very dependant on the organization being able to create the opportunity to test it.

5.2 Organizational Innovation-Decision Process

Innovation awareness

Before an individual or decision-making unit decides to reject or adopt an innovation, the innovation must be exposed to the individual or decision-making unit (Rogers 2003). In the DOI theory, this is defined as the *knowledge* stage at the individual level, or happens during the *initiation* stage in the organizational innovation adoption process. This was represented as *innovation awareness* in this study, covering how innovations are exposed to the members of healthcare organizations at different levels.

Knowledge

Extant literature have highlighted that healthcare organizations should devote significantly more time and effort to social networking in health care, as it is critical to the goal of spreading innovation (Plsek 2003). The way knowledge is acquired and dispersed throughout an organization has been refereed to the organisation's structural dimension (Solomons and Spross 2011). That is, new knowledge is not communicated among the members of the organization unless the organisation is aware of its structural dimensions (ibid.). Knowledge can spread through internal or external communication channels, i.e. communication among the member of the organisation or participation in extra-organizational professional activities (e.g. seminars) (Damanpour 1991). It was addressed by Carl that healthcare providers had to seek information about innovation *"much more actively ourselves"*, and that were not invited to *"seminars and conventions"* as often as before or that health technology companies did not visit the hospitals as much as they used to. This had previously been a good opportunity for the healthcare providers to gain insight into current technology and what health technology companies were working on, which is in line with previous research predictions about that organizations that make greater investments in information sources and communication channels like external seminars could increase the likelihood of adoption (Nilakanta and Scamell 1990 in Fichman 2000). However, it most be noted that Carl refereed to companies that could use *"quite a lot of money"* on promoting their equipment. Startup companies, however, often do not have the financial resources to do that. Bill explained how they decided to not spend money on marketing, instead used mass media channels like social media or newspapers, or stood in the lobby of conferences hoping their name would spread through interpersonal channels among healthcare professionals

and decision-makers. These findings are in line with how Rogers 2003 suggested that diffusion of innovations happens through both mass media and interpersonal communication channels. Bill's description of having success with mass media channels because *"people read the old newspaper"* are also in line with literature suggesting that adopters respond to mass media channels during the knowledge stage (Fichman 2000). One notion is however that this was related to a setting with less hierarchical structure, where the media coverage could easily be spread to *"the mayor and councilor in the neighboring municipality"*. Confirming that these communication channels might not be as relevant in the organizational context (Lundblad 2003). The findings did not provide any information about managers views on communication through mass media channels. Neither of the other informants confirmed or denied Carl's notion about being invited to less seminars and conventions, or that 'sellers' from MTD companies visited less often. However, combining this with the developers describing the current situation being similar to a *"door-to-door sales job"*, the findings imply that it is important for all the members in the organization to participate in extra-organizational, professional activities to become aware of innovations, which is in line with previous literature (Corwin 1975 in Damanpour 1991).

Initiation

According to extant literature, many innovations in healthcare have been initiated by different stakeholders (e.g. healthcare professionals, healthcare organizations, patients, government ets.) (Omachonu and Einspruch 2010). However, some researchers argue that the innovation process in healthcare organisations are inhibited by the fact that the starting point of an innovation process may lead to death, disability, or permanent discomfort, making it more risky for both the organisation and the individuals working there (Länsisalmi et al. 2006). By the nature of this study's design, the findings relies more around startups approaching healthcare organisations after developing an innovation (based on an identified need or problem). Meaning that these findings are limited when it comes to innovations initiated by healthcare organisations. Nevertheless, the developers and managers did mention how innovations or new equipment were requested. The request for new medical technical devices mostly came from the healthcare provider themselves, based on *"professional assessments or needs"* or that the technology had improved (Carl and Nico). However, there was rarely any request for completely new equipment or innovations. Kate described how the hospital started to look for solutions that would fit their needs after identifying how the ICT system (or absence of it) could be improved. And as previously mentioned, they chose to go for mobile technology since it posed fewer risks than unproven technology. Viewed in the light of extant literature, healthcare organizations quite often rely on existing information technology in the innovation process (Omachonu and

Einspruch 2010). It was also important that *"you could share [information] across the hospital"*. This is in line with Omachonu and Einspruch 2010 stating that a health information systems would be inhibited if the information could not be readily available (ibid.). Kate statements about how they knew that it would require much more effort to go for a solution from a startup can be traced back to how managers perceive innovations having e.g. low compatibility with the current system or high complexity. This strengthens the assumption that compatibility and complexity are important factors that influence the adoption of health technology, but also that the characteristics are strongly influenced by the context.

Decision-type

All informants included in the study had similar descriptions of the decision-making culture. For instance, descriptions like *"the hospitals are extremely hierarchical, and the road to the top is long"* (Bill) which led to that the developers were unable to approach the decision-makers or *"everything will ultimately be decided by the director"* (Otto). This was confirmed by Kate stating *"I am the main decision maker"*, which is in line with extant literature stating that the decision is usually made by one, or several authority figures in the organization (Gallivan 2001). This means that the intended users have few other options rather than to adopt the innovation and make the necessary changes in order to use it in their work. Or, looking at it the other way, they can not adopt an innovation unless the organisation does it. This corresponds to contingent or authority innovation decisions as defined by Rogers. In fact, extant literature argue that authority innovation-decision is linked to the fastest rate of adoption, but also mentions that it might lead to a less effective implementation stage as the decision was not a common choice among the actual users of the innovation (Lundblad 2003). The latter was partially confirmed in this study. All the managers described similar challenges related to implementation of ICT systems. For example, implementation of web cameras due to Covid-19 (Thea, Otto) or doctors that did not see the benefits of a new ICT tool (Kate). In extant literature on adoption of ICT solutions in organisations, researches have identified two types of adoption decisions. That is, primary adoption decision made by the authority, and second adoption decision made by the individuals in the organization during the implementation stage of the innovations (Hameed, Counsell, and Swift 2012). These studies provide knowledge on how organizations can manage adoption of ICT innovations, and how to navigate from adoption-decision to fully implementation of an innovation. In other words, how organizations can increase the users' interest and acceptance of ICT innovations to assure a successful second adoption decision within the organization. As this study focused on what happens prior to adoption, there are no findings that could support or oppose that literature. However, a more interesting finding appeared in this study that contradicts what previously has been

said about authority innovation-decision being linked to the fastest rate of adoption. The statements of the developers and healthcare providers implied that authority innovation decision could be a potential factor inhibiting the adoption of innovations. Bill, for example, recounted his experience with a decision maker who didn't like their method, referring to authority innovation-decision as a *"system error"*. He believed that the decision should be made by a *"inter-political"*, *"interdisciplinary"* and *"inter-geographical"* group. Other developers explained how the healthcare providers (or users) wanted to adopt their technology, but they were not in a position to make the decision. The healthcare providers also confirmed the lack of influence in the decision process. Carl for instance claimed that the decision process would benefit from *"support from a professional standpoint"*. Recent literature has in fact highlighted that decision making can be enhanced by enabling multiple stakeholders to participate (Turner et al. 2017), but adoption might as well be hindered because the process can lead to power struggles among various professional groups (Trisha Greenhalgh et al. 2004). One might therefore argue that contingent or authority innovation decisions do not favor adoption unless the decision-making unit at the organization identifies a need for an innovation (known as market pull), but not when startups presents new innovations as a solution to a problem that was not initiated by the organization (known as technology push).

Evidence use in decision making

It became evident when talking to the healthcare providers that they lean heavily on scientifically proven evidence. For instance, Nico stated that *"you have to be able to refer to studies and practice"*. If the developers were not able to prove this, the healthcare provides would be *"quite skeptical"* (Carl). This is in line with extant literature stating that scientific evidence is highly recognized as a preferable form of knowledge in disciplines such as medicine and healthcare (Fitzgerald et al. 2002), and that evidence is used when making decisions about health-care innovation (Turner et al. 2017). Thus, a common view is that evidence must be used as the basis of practice.

However, profound finding among the developers was their experience of how current evidence use in decision making was not fit for startups developing healthcare innovations. For example, Jack testified about the *"chicken-and-egg problem"*, describing how startups had to meet up to the same requirements that are used for equipment that is already fully approved. Many of these requirements was not perceived as very relevant by the developers, or not possible to meet in that time of development. Or, simply that their innovation had to communicate with the existing technology in a new way (e.g. transfer information to the patient's record), in which the hospital, or adopting organization, had no requirements for because it had not done earlier. Therefore, one might argue that the developers were not met by suggestions for new requirements because of the nature of the existing culture

among healthcare professionals regarding evidence use within medicine and healthcare, *"limited by laws and regulations"* (Jack). Additionally, extant literature has in fact stated that, until recently, the diffusion of innovation has been considered as a linear and technical process at the individual level, and was therefore described as changes in professionals' practice in accordance with evidence-based standards (Granados et al. 1997; Trisha Greenhalgh et al. 2004). More recent researchers, however, have discovered that it also requires organizational as well as individual change (Grimshaw et al. 2004; ibid.). Accordingly, an organization that supports innovation must allow new solutions to go forward in the absence of evidence, but at the same time be persistent about requiring evidence of efficacy for evaluation (Plsek 2003). Similar expressions were made by the developers, saying that altering of evidence-based standards would speed the adoption of innovations. Extant literature have warranted that organisational leaders should consider whether the decision making environment promotes a diversity of evidence and stakeholder perspectives (Brownson, Fielding, and Maylahn 2009).

5.3   Organization as a social system

Research on innovation adoption in the organizational context have separated context into outer, societal 'predisposing' influences, inner organisational 'enabling' influences, and 'precipitating' political influences (Fitzgerald et al. 2002). The findings of this study focus more on the internal organizational context. That is, the 'hard' medium of apparent organisational structure, and the 'soft' medium of culture and working methods (Robert et al. 2009), which both have significant impact on how an organisation responds to innovations.

Structure

Structural factors that influences the adoption in organizations have been thoroughly investigated in extant literature (Pichlak 2016). Researchers have argued that the dynamics of innovation adoption are more complex in multi-professional organisations like hospitality, even stating that the healthcare context *"represents an extreme case in terms of complexity and ambiguity"* (Fitzgerald et al. 2002, p. 1445). This is largely due to the centralization and formalization of the decision-making process and communication through hierarchical structure and procedures which differentiates the professionals from the managers (Robert et al. 2009).

Notably, all the informants included in this study expressed their awareness of the hierarchical structure within the healthcare context. From the findings of this study, structural improvement measures related to the decision-making process were most prominent in interviews with the developers. As previously mentioned, the developers experienced difficulties when trying to meet with decision

makers (e.g. the director at the hospital). However, Otto also described how he could be *"paralyzed"* by all the people above him in the different levels of management. Meaning that even him, as head of ICT at one of the RHFs, had limited decision-making power. Extant literature have also have warranted that the hierarchical structure of the organisation complicated the decision-making process (Wisdom et al. 2014). Both the healthcare providers and managers mentioned how the structure affected the dynamics within the organization, creating too much distance between top management and healthcare providers. This affected both the communication and that the organization lost its focus *"where clinicians and patients are at the very core of what we do"* (Otto). Their views are consistent with predictions of previous research, claiming that hierarchical levels make communication across levels more difficult (Damanpour 1991). Similar to more recent literature, the informants addressed that change in the traditional structures could improve and simplify many of the processes related to creating more innovation acceptance (Safi, Thiessen, and Schmailzl 2018).

Inter-organisational environment

Several of the informants suggested that the Norwegian healthcare sector was too centralized. For example, Otto directly stated that the organization and governance of the Norwegian healthcare sector inhibited adoption because of the strict structures, leading to a *"slightly different system"* when ever changes were made. Kate argued that a bureaucratic structure made adoption and diffusion of innovations slower, further suggesting that one should open up for different organizational forms, combining both public and private hospitals to increase the innovativeness. Viewed in the context of extant literature, the perspectives of Otto and Kate are similar to Rogers 2003 and Trisha Greenhalgh et al. 2004, implying innovations spread more freely through decentralized systems compared to centralized systems. Jack, Bill and Carl also questioned the cooperation between the various regional health authorities. Jack and Carl had similar experiences with RHFs using different equipment or systems, causing one of them to fall behind on technology development. Moreover, Bill explained how they experienced challenges related to one decision maker in a central position allegedly not liking their method. According to Bill, this prevented others from using their innovation, and as previously mentioned, a centralized decision-making structure inhibits adoption and diffusion (Fitzgerald et al. 2002; Trisha Greenhalgh et al. 2004).

Norms, values, culture and communication

Norms, values and culture are constructs related to the 'inner setting' of an organisation (Damschroder et al. 2009). These constructs can form the members' thinking, work tasks, behaviour or attitudes toward innovations, and is therefore critical in relation to pre-adoption and adoption (Wisdom et al.

2014). Researchers have argued that changing existing norms is difficult within the healthcare sector because social comparison is important for healthcare providers, meaning that change is a group process, not an individual process (Locock et al. 2001).

The findings of this study has provided some insight on current norms and culture within the healthcare context and how it influences adoption. The statements from all the informants included in this interview addressed a culture that was heavily based on scientifically evidence and healthcare professionals staying true to their field of expertise. Additionally, Bill got an impression that it was not always a *"desire to try new methods"* among those who made the decisions either, and that it was most commonly seen among *"men over the age of 65"*. As mentioned earlier, the decision is influenced by professionals at different management levels within the hospital before the final decision is made. The managers also discussed that change of practice was needed among the healthcare providers to easier adopt and implement innovations. Following the views of Länsisalmi et al. 2006, Otto believed that including technology as a part of professional development would make the healthcare providers more open to innovations.

Previous research have also highlighted the fact that support and engagement from the leaders are positively related to innovation in healthcare organisations (ibid.; Damschroder et al. 2009; Wisdom et al. 2014), which was emphasized by both Thea and Kate. Kate mentioned that *"the old structure"* where *"the best professionals"* were leaders was not optimal because *"being a leader is something else"*. Similarly, Thea mentioned that *"some are better at making room for development than others"*. Therefore, their key outcome was that the very concept of leadership had to be change as leaders play a key role in forming the norms and values in the organization. To do so, Thea stressed the need to *"spend extremely much time on communication"*. Viewed in the context of extant literature, their views were hence that one could create more acceptance for change if the change was anchored both within the management and across management levels, and that communication of clear objectives was needed to create a common understanding and mission. Following the view of Damschroder et al. 2009 and Safi, Thiessen, and Schmailzl 2018, Thea emphasized a more effective adoption and implementation of innovations was build through clear communication of mission and goals, participation and collaboration among peers across hierarchical levels because there are leaders at all level of the organization, from executive leaders to team leaders, who have a direct or indirect influence on the process. The process can not be reliant on leadership engagement alone, as a hierarchy of top-down leadership may hinder adoption (Wisdom et al. 2014). However, it is also important to not forget Carl's impression of that *"innovation projects are flagged as much for people who are to be relocated, as it is for people who really want and have the competence to develop things"*. In light of what Thea said, this could imply that those who express an interest in engaging in innovation projects are more open to

change, whilst those who adhere to traditional culture do not.

Another interesting finding is that almost all the informants included in this study in some way addressed that co-development between startup companies and the adopting unit (e.g. hospital) could have positive impact on the adoption. According to the healthcare providers, this could ensure the quality both professionally and technically. However, because of the current norms and culture, the organisation is *"rigged for the opposite"* (Otto). Extant literature have suggested that innovations that are centrally developed are more likely to be successfully adopted if the developers are linked with the potential users at the development stage (Rogers 2003; Trisha Greenhalgh et al. 2004). This will be more effective if the culture focuses responsibility of learning on the individuals, not on the organization (Wisdom et al. 2014). However, the research on this topic seems somewhat limited to e.g. commercial IT companies or lab-based development, so it might not be applicable in the setting of startup companies, and is therefore an issue for further research. There has been a request for support systems that can connect innovators with organizations (Glanz, Rimer, and Viswanath 2008) and similar calls have been in this study. Thea believed that co-development could help the developers to include employees and managers, making it easier to *"communicate the utility value"* and *"reduce resistance within the organization"*. In other words, contribute in the process of altering the existing norms and culture.

Resources

There were also some findings about the limited resources available for technological innovations and acquisitions in general. The majority of the financial resources are used for renewal and maintenance of existing equipment, and there is a list *"which is much longer than what you have money for"* (Nico). The informants had the same impression of healthcare providers already being under pressure due to time constraints. Jack wanted the hospitals to "facilitate entrepreneurs", whereas Carl were concerned of healthcare professionals participating in innovation projects because "it leads resources to be taken from day-to-day operations." Seen from a managerial perspective, managers should argue why it is right to spend time and resource on it. Viewed in the context of extant literature, this would require resources to be allocated differently, for example that a physician must incur costs of adoption, including monetary, time, and less psychic benefits, in addition to training and fulfilling hospital criteria (Ghodeswar and Vaidyanathan 2007).

Roles

There are various people of influence inside an organization, according to Rogers 2003. Extant literature have found that opinion leaders play an active role in in the diffusion of innovations (Fitzgerald

et al. 2002; Damschroder et al. 2009. In this study, both Kate and Thea stated that it is important to identify opinion leaders in the organization and use them as a part of the strategy when introducing and to accelerate the implementing innovations. The findings, however, are limited to that extent that their influence can not be further confirmed based on the statements that were given. Research on this topic has thus far suggested that opinion leader that steps too far beyond organizational norms can make others feel excluded or unable to keep up or make themselves become excluded (Locke 2001), which was also addressed by Thea.

A more profound finding was that the developers had similar stories about how they were more or less dependant on individuals that could categorize as *champions*. This was people who *"fought to get us in"* (Jack) or *"started to spread the message"* (Bill), similar to how extant literature have described them (Greenhalgh et al. 2004; Damschroder et al. 2009). However, they has also met some individuals who were not willing to risk their informal status and reputation despite supporting their innovations. Interestingly, Otto revealed that he was willing to risk his job and reputation in order to fight for investments or changes he believed in, which qualifies him as a champion. Moreover, Bill described how one of their supporters tried to change the opinion of one of his colleagues. Viewed in the context of extant literature, change agents are most effective if they are perceived as experts, have status and yet share common characteristics and goals with the other members (Gustafson et al. 2003; Brownson, Fielding, and Maylahn 2009), this was not enough to change the colleague's opinion. It is reason to believe that this may be due to healthcare professionals being too proud to change their opinion, as implied by the supporter Bill talked about. Which might be tracked back to the fact that their culture can be perceived as a bit conservative.

6 | Conclusion

The majority of startups developing healthcare technology face difficulties when developing and trying to commercialize their innovation. In response to this, the purpose of this master thesis was to to provide an understanding of the adoption of healthcare technology by identifying the factors influencing the organizational adoption. To approach this purpose, the following research question was established:

RQ: *What factors influence the organizational adoption of healthcare technology?*

To answer this research question, an exploratory case study was conducted to examine the perceptions of different stakeholders surrounding the phenomenon adoption of healthcare technology. The conducted case study consist of of eight semi-structured interviews with three CEOs from different startups developing healthcare technology, three managers from different health authorities or hospitals, and two users of healthcare technology (physicians). The objective of these interviews was to try to identify and understand the factors influencing the adoption of innovations though empirical data. The study's research framework and theoretical context was grounded in the key elements from the Diffusion of Innovation theory (DOI) in combination with other theoretical frameworks and prior findings from literature investigating innovation adoption in organizations. To answer the research question, the findings were structured into three contexts: *Innovation-Organisation Fit, Organizational Innovation-Decision Process* and *Organization as a social system.*

Innovation-Organisation Fit: First, the healthcare providers' and managers' perception of innovation was evaluated. It was evident that the healthcare providers and managers had different perspectives when evaluating innovations, clearly affected by their profession and role in the organization. However, the results could not confirm if this was a factor influencing adoption. Still, it does raise the question how the different perceptions might affect the adoption process.

In terms of innovation characteristics, *relative advantage* was found to be an influential factor, but was mostly mentioned by the healthcare providers related to improving the treatment. *Compatibility* and *complexity* were found to be more influential factors as they were closely linked to the existing norms and structure of the organization, additionally because these were the characteristics that seemed to be most valued by the decision makers. An innovation's *observability* was found to be in-

fluential as well, but seemed more relevant in the implementation stage of the adoption process. The findings did not provide enough information to conclude whether an innovation's *trialability* was an influential factor, but did instead reveal that there is a low level of acceptance for testing new ideas or innovations in healthcare. One could therefore argue that the trialability of an innovation is dependant on the organization being able to create the opportunity to test it.

Organizational Innovation-Decision Process: The findings imply that it is important for all the members in the organisation to participate in extra-organizational or intra-organizational professional activities to become more aware and gain knowledge of innovations, as the organization's openness to change is an influential factor. Furthermore, an interesting finding appeared in this study that contradicts what previously has been stated about authority innovation-decision being linked to the fastest rate of adoption. Several of the informants in this study implied that authority innovation decision could be a potential factor inhibiting the adoption of innovations when startups presents new innovations as a solution to a problem that was not initiated by the organization. Lastly, it was evident that the decision process is heavily influenced by the use of scientifically proven evidence and a legislation governed by The Norwegian Medicines Agency. A profound finding was how this was not fit for startups developing healthcare innovations because startups had to meet up to the same requirements that is used for equipment that is already fully approved, creating a *"chicken-and-egg problem"*. Therefore, the findings suggest that that altering of evidence-based standards and regulations would influence the adoption of innovations positively.

Organization as a social system: The findings of this study imply that the hierarchical structure within the healthcare system, both related to the decision-making process and communication between the different stakeholders, inhibited adoption of innovations. Additionally, the existing norms and culture does not support change of clinical practice. The findings also implied that limited organisational resources, both in terms of financial and human resources inhibited adoption. Therefore, the findings suggest that changes in these structures and existing norms and culture, as well as allocating specific resources available for technological innovations are required to make the organization more open to change, which in turn could influence adoption positively. Lastly, an important factor was individuals in the social system who played a key role in the adoption process. The developers expressed how *champions* helped them to get in touch with the organization, and *opinion leaders* were used by managers to accelerate the implementation of innovations.

7 | Implications and Further Research

7.1 Implications for managers

The findings of the study and prior academic literature imply several important managerial considerations which might prove to be beneficial in adoption of healthcare innovations.

The implications of the findings suggest that the organization should facilitate more small-scale testing of innovations in order to make the innovation more observable and reduce the risk perceived by potential adopters, and to be able to more easily assess what effect the innovation will have on organizational performance. Additionally, organizations must allow new solutions to go forward in the absence of evidence.

Furthermore, the implications of the findings suggest that relevant stakeholders should be included in the decision-making process, e.g. managers, healthcare professionals and other staff that would be affected by the adoption. This would be beneficial both in terms of decision-making, adoption and implementation because the assessments would include organisational, social and technological matter.

As the adoption of innovations is reliant on the organizational structure and culture, it is therefore important with managerial encouragement to create a culture that promotes learning and inclusion of new technical innovation. The management must communicate clear goals and strategies during the implementation of innovations, but at the same time include stakeholders at all management levels to strengthen the relationship and communication. The organization should also open up for more collaboration with developers of healthcare technology to increase the awareness of technological development. Organizational resources must also be allocated specifically for the purpose of technological development and adoption. Lastly, the management should recognise the individuals that are fighting for innovations they believe in or those who could play a key role as leaders among their peers to overcome professional barriers and enable the adoption and diffusion of innovations.

7.2   Limitations and Agenda for further research

Due to the limited scale of this study, there are some limitations that must be addressed in future research. Because the findings are based on a particular phenomenon, the conclusions must be regarded as preliminary and may not be generalized to other situations. Additionally, the findings are a result of the researcher's subjective cognitive process, making generalizations of the results problematic.

The empirical scope is limited to the Norwegian healthcare sector, making the results less representable for countries with different healthcare systems. However, the aim of this study was to shed light on the adoption of healthcare innovations in the Norwegian healthcare system. Furthermore, the empirical data is limited by a small sample group in general, but also within each stakeholder category. Therefore, the findings may not be representable for the stakeholders in general. To address these limitation, further studies should include larger sample groups within each stakeholder category or conduct more profound studies on each group of stakeholders to make more generalizable results. Moreover, other factors related to organizational adoption of innovations were left out of this study due to the chosen theoretical framework and the study's limited scale. As the aim of this study was to identify factors influencing adoption of healthcare innovations though the perception and narratives of different stakeholders, the identified factors are not validated in other ways. To address this limitation, the identified factors should be validated using quantitative methods.

Several of the informants refer to scientific proven evidence, ethical approvals, research laws and that the department for medical devices complies with regulatory requirements and legislation governed by The Norwegian Medicines Agency. Due to the limited scale of this study, this has not been reviewed in depth by the researcher. The findings are therefore limited by the fact that they are mainly based on the statements alone. The researcher therefore strongly suggest that more research should look at how this influences the adoption of healthcare technology. Additionally, new regulatory requirements from the European Union Medical Device Regulations (EU MDR) came into force on 26Th of May 2021. Accordingly, the changes involve more stricter requirements for medical device classification and focuses on unifying the market (KAWAŁKOWSKA 2021) This has not been further reviewed in this study, but this will arguably shape the development and adoption of healthcare technology.

Finally, prior research have focused on the adoption, implementation and diffusion of innovations in healthcare organizations. However, the author of this study is left with the impression that this mostly concerns innovations that are actually adopted. The author therefore suggest that research should pay more attention to the pre-adoption period to get a broader understanding of why health-

care organizations decides to adopt, or even more important, not to adopt healthcare technology. As prior study has revealed, in contrast to the profit-oriented criteria employed in a commercial setting, adopters in healthcare use more complex criteria when evaluating the relevance and efficiency of an innovation, *"So high levels of ambiguity are created, partly, by the 'fuzzy' nature of the evidence and also by the complexity of the range of other factors which are taken into account and by the existence of multiple stakeholders"* [1445] (Fitzgerald et al. 2002). This, combined with what has been previously mention about the hierarchical structure in the decision-making process and how current criteria and requirements are not fit for startup companies developing healthcare technology, implies that more studies should be following startup companies during the development of their innovation and their encounter with potential adoptive organizations

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A | Appendix A

Om intervjuobjektet
- Fortell om deg selv og hva du jobber med

Om innovasjon / Innovativeness
- Hva er ditt generelle syn på innovasjon og ny teknologi?
- Hvorfor er ditt syn på innovasjon og ny teknologi i helsetjenesten?
    - Har du noen eksempler på en innovasjon du enten har erfaring med eller hørt om?

Development / Relationship between stakeholders
- Kan du fortelle om dine erfaringer med **utvikling av ny teknologi** i helsetjenesten?
    - Kan du fortelle om **implementering- og salgsprosessen** av [eksempel]?
        - Hva fungerer?
        - Hva fungerer ikke?
- Hva tenker du at dere som utvikler teknologi til helsetjenesten kan bidra med?
    - Har dere identifisert noen behov som mangler?
    - Har dere identifisert noe som gjør at dere lykkes?
- Når ny teknologi skal selges til og tas i bruk i helsevesenet, hva opplever dere som utviklere at skal til?
    - Hvilke vurderinger gjør dere?
    - Hva er viktig?
    - Hva er mindre viktig?
    - Hva er det som fungerer og ikke fungerer?
- Kan du fortelle om finansieringsprosessen når det kommet til utvikling av teknologi til helsetjenesten?
    - Hva fungerer?
    - Hva fungerer ikke?
- Når ny teknologi skal utvikles og tas i bruk, hvordan oppfatter du samarbeidet mellom de som skal ta det i bruk, de som tar beslutningene om at det skal kjøpes og dere som utvikler det?
    - Hva er din oppfatning av hva **brukerne** gjør?
    - Hva er din oppfatning av hva **beslutningtakerne** gjør?
    - Hva er din oppfatning av hva **utviklerne** gjør?
- Hva synes du er det viktigste når ny teknologi (i helsevesenet) skal utvikles?
    - Hva opplever du at **må vises til** for at ny teknologi skal kjøpes og tas i bruk i helsevesenet?
        - Hva synes du fungerer med dette?
        - Hva synes du ikke fungerer med dette?
- Basert på den erfaringen du har med [eget eksempel eller temaet generelt], hva synes du fungerer og hva synes du ikke fungerer i dagens system?

The Innovation Decision Process
- Hvilke vurderinger **oppfatter du at gjøres av beslutningstakere** når ny teknologi / utstyr kjøpes inn / tas i bruk i helsetjenesten?
    - Hva fungerer med dette?
    - Hva fungerer ikke med dette?
    - Hvilke vurderinger **synes du** at burde gjøres?
- Basert på din erfaring, hva skal til for at en avdeling / arbeidsplass i helsetjenesten skal være med å utvikle / teste / ta i bruk / kjøpe nytt utstyr eller ny teknologi?
- Hva er ditt generelle inntrykk av beslutningsprosessen i helsetjenesten, når det kommer til innovasjoner og ny teknologi?
- Hva kan du trekke frem som har fungert og ikke fungert, i dialog med beslutningstakere?
    - Hvem er beslutnigstakerne?
- Kan du fortelle hvordan du som utvikler opplever salgsprosessen?
    - Hva fungerer?
    - Hva fungerer ikke?
- Hva opplever du at skal til for at beslutningstakere skal stille seg positive til å kjøpe ny teknologi?

Adopters / Innovation Fit
    - Hva er ditt inntrykk av **hvordan ny teknologi påvirker helsetjenesten**?
        - Hvordan tror du det påvirker det **brukerne**?
        - Hvordan tror du påvirker det **arbeidsplassen**?
    - Hvilke vurderinger oppfatter du at **gjøres av helsepersonell** når ny teknologi / utstyr tas i bruk i helsevesenet?
- Hvordan er din oppfatning av **hva helsepersonell tenker om innovasjon og ny teknologi i helsetjenesten**?
    - Fordeler?
    - Ulemper?

Om intervjuobjektet
- Fortell om deg selv og hva du jobber med

Om innovasjon / Innovativeness
- Hva er ditt generelle syn på innovasjon og ny teknologi?
- Hvorfor er ditt syn på innovasjon og ny teknologi i helsevesenet?
    - Har du noen eksempler på en innovasjon du enten har erfaring med eller hørt om?

The Innovation Decision Process
- Kan du fortelle om dine erfaringer med **nytt utstyr som skal implementeres og tas i bruk** i helsevesenet?
    - Kan du fortelle om **anskaffelsesprosessen** av [eksempel]?
        - Hva fungerer?
        - Hva fungerer ikke?
- Hvilke vurderinger **gjøres av beslutningstakere** når ny teknologi / utstyr kjøpes inn / tas i bruk i helsetjenesten?
    - Hva fungerer med dette?
    - Hva fungerer ikke med dette?
    - Hvilke vurderinger **synes du** at burde gjøres?
- Hva skal til for at det **kjøpes og tas i bruk ny teknologi i helsevesenet**?
    - Hva er viktig?
    - Hva er mindre viktig?
    - Hva er det som fungerer og ikke fungerer?
- Basert på din erfaring, hva skal til for at en avdeling / arbeidsplass i helsetjenesten skal være med å utvikle / teste / ta i bruk / kjøpe nytt utstyr eller ny teknologi?
- Hva er ditt inntrykk av beslutningsprosessen, når det kommer til innovasjoner og ny teknologi i helsetjenesten?
- Hva kan du trekke frem som har fungert og ikke fungert, i dialogen med utviklere, beslutningstakere og helsepersonell?
- Kan du fortelle hvordan du som beslutningstaker opplever innkjøpsprosessen?

Adopters / Innovation Fit
- Hva er ditt inntrykk av **hvordan ny teknologi påvirker helsetjenesten**?
    - Hvordan tror du det påvirker det **helsepersonell**?
    - Hvordan tror du påvirker det **arbeidsplassen**?
- Hvilke vurderinger oppfatter du at **gjøres av helsepersonell** når ny teknologi / utstyr tas i bruk i helsevesenet?
- Hvordan er din oppfatning av **hva helsepersonell tenker om innovasjon og ny teknologi i helsetjenesten**?
    - Fordeler?

- Ulemper?

Development / Relationship between stakeholders
- Hva tenker du at de som utvikler teknologi til helsetjenesten kan bidra med (i anskaffelsesprosessen?)?
    - Har de identifisert noen behov som mangler?
    - Hva mener du skal til for at de lykkes?
- Hvilke vurderinger **oppfatter du at gjøres av utviklere** når ny teknologi / utstyr utvikles til bruk i helsevesenet?
    - Hva fungerer med dette?
    - Hva fungerer ikke med dette?
    - Hvilke vurderinger **synes du** at burde gjøres?
- Hvordan er din oppfatning av finansieringsprosessen når det kommet til utvikling av teknologi til helsetjenesten?
    - Hva fungerer?
    - Hva fungerer ikke?
- Når ny teknologi skal utvikles og tas i bruk, hvordan oppfatter du samarbeidet mellom de som skal ta det i bruk, de som tar beslutningene om at det skal kjøpes og dere som utvikler det?
    - Hva er din oppfatning av hva brukerne gjør?
    - Hva er din oppfatning av hva beslutningtakerne gjør?
    - Hva er din oppfatning av hva utviklerne gjør?
- Hva synes du, som beslutningstaker, er det viktigste når ny teknologi skal utvikles?
    - Hva **må vises til** for at ny teknologi skal kjøpes og tas i bruk i helsevesenet?
        - Hva synes du fungerer med dette?
        - Hva synes du ikke fungerer med dette?
    - Basert på den erfaringen du har med [eget eksempel eller temaet generelt], hva synes du fungerer og hva synes du ikke fungerer i dagens system?

Intervjuguide - Healthcare providers / Helsepersonell

Om intervjuobjektet
- Fortell om deg selv og hva du jobber med

Om innovasjon / Innovativeness
- Hva er ditt generelle syn på innovasjon og ny teknologi?
- Hva er ditt syn på innovasjon og ny teknologi i helsevesenet?
    - Har du noen eksempler på en innovasjon du enten har erfaring med eller hørt om?

Adopters / Innovation Fit
- Kan du fortelle om dine erfaringer med **bruk av nytt utstyr (ny teknologi**) på din arbeidsplass?
    - Kan du fortelle om det **første møtet** med [nytt utstyr]?
        - Hva fungerer?
        - Hva fungerer ikke?
    - Hvordan påvirket dette arbeidshverdagen din?
    - Hvordan påvirket dette arbeidsplassen din?
    - Hva skal til for at du skal ta i bruk ny teknologi på jobb?
        - Hva er viktig?
        - Hva er mindre viktig?
- Hva tenker du er fordelene med innovasjon og ny teknologi ved din arbeidsplass/i helsetjenesten?
- Hva tenker du er ulempene med innovasjon og ny teknologi ved din arbeidsplass/i helsetjenesten?

The Innovation Decision Process
- Hvilke vurderinger **oppfatter du at gjøres av beslutningstakere** når ny teknologi / utstyr utvikles til bruk i helsevesenet?
    - Hva fungerer med dette?
    - Hva fungerer ikke med dette?
    - Hvilke vurderinger **synes du** at burde gjøres?
- Hva tror du skal til for at din avdeling / arbeidsplass skal være med på utvikle / teste / ta i bruk / kjøpe nytt utstyr eller ny teknologi?
- Hva er ditt generelle inntrykk av beslutningsprosessen i helsetjenesten, når det kommer til innovasjoner og ny teknologi?

Development / Relationship between stakeholders
- Hva tenker du at de som utvikler teknologi til helsetjenesten kan bidra med?
    - Har de identifisert noen behov som mangler?
    - Hva mener du skal til for at de lykkes?

- Hvilke vurderinger **oppfatter du at gjøres av utviklere** når ny teknologi / utstyr utvikles til bruk i helsevesenet?
    - Hva fungerer med dette?
    - Hva fungerer ikke med dette?
    - Hvilke vurderinger **synes du** at burde gjøres?
- Når ny teknologi skal utvikles og tas i bruk, hvordan oppfatter du samarbeidet mellom du som skal ta det i bruk, de som tar beslutningene om at det skal kjøpes og de som utvikler det?
    - Hva er din oppfatning av hva **brukerne** gjør?
    - Hva er din oppfatning av hva **beslutningtakerne** gjør?
    - Hva er din oppfatning av hva **utviklerne** gjør?
    - Hva synes du er det viktigste når ny teknologi (i helsevesenet) skal utvikles?
    - Hva synes du det **må vises til** for at ny teknologi skal tas i bruk i helsevesenet?
- Basert på den erfaringen du har med [eget eksempel eller temaet generelt], hva synes du fungerer og hva synes du ikke fungerer i dagens system?