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Organizational Barriers to the Adoption of New Digital Technologies in Public Healthcare

A Case of Citizen-initiated Remote Monitoring at Sahlgrenska University Hospital

Master's thesis in the Master Degree Program Management and Economics of Innovation

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SUMMARY

Swedish healthcare is facing a huge increase in demand for care due to demographic changes in the nation. With the number of healthcare workers not increasing at the same pace, there is an imminent issue that will keep getting worse over time. In order to help solve this problem, adoption of digital technologies and more efficient ways of working are needed. However, in public healthcare, different barriers exist which hinder the adoption of digital technologies in different ways. Significant additional value could be attained if these barriers are identified and overcome.

The aim of this study is to identify organizational barriers to adoption of digital technologies in Public Healthcare in Sweden, and provide recommendations to help overcome them. The research approach used in this study is a qualitative study of a single case organization, Sahlgrenska University Hospital. Academic literature was identified and analyzed, and empirical data was collected through semi-structured interviews with employees at the case organization, as well as individuals from Region Västra Götaland. The empirical data was then contrasted and analyzed in relation to the academic literature.

The findings show several organizational barriers that affect the organization. These barriers cover a wide range of issues; the absence of a clear career path for innovation, limitations in value realization regarding the Innovation Platform, short-term savings having precedence over long-term innovation effects, insufficient information diffusion and collaboration, the dilemma of research evidence, complex and unclear decision paths, and varying visions and priorities of managers. To be able to overcome the barriers and foster a more innovative culture, improving the adoption of digital technologies, some recommendations have been proposed. First, establishing a defined career path within the organization for working with innovation could improve the innovation culture, by creating a more structured way of working with innovation. Further, creating an environment for facilitating more collaboration between healthcare workers and developers of new technologies and solutions is of importance. This would ensure solutions meet the users' needs and are more user-friendly, hence improving adoption and easing implementation. Creating an innovation culture throughout the organization that mirrors the high importance the top management has on innovation is of huge importance, in order to align the organization. Establishing an innovation forum including information sharing, collaboration, joint problem-solving, and examples of successful innovation projects could help facilitate this. Also, aligning all levels of management on the importance of innovation in the organization is also crucial, since department managers have a high influence on their operation, and hence how much focus is on innovation.

By addressing the identified barriers and working within the organization to overcome them, the adoption of new technologies and solutions has great potential to improve. This would improve responsiveness within public healthcare, making it more susceptible toward new and improved technologies and solutions, which would improve patient care and thereby increase societal value.

Keywords: telemedicine, remote monitoring, mHealth, health data, organizational barriers, public healthcare, digital technologies, adoption, implementation

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1. Introduction

The following chapter describes the background of the study and why it is important. Further, the problem discussion is presented, followed by the aim, limitations, and research question.

1.1 Background

Sweden has an aging population, meaning that a higher percentage of the population will be older in the future relative to the population of working-age citizens (SCB, 2022a). Further, the Public Health Agency of Sweden predicts that future demand for healthcare will grow (Folkhälsomyndigheten, 2022). Also, there is currently a shortage of healthcare workers, which is expected to persist or worsen in the future (SCB, 2020). This indicates that in the future, fewer healthcare workers need to provide care for a larger number of citizens. Due to these difficulties, the role of healthcare workers, as well as their methods and tools, likely need to adapt and change.

Digitalization and digital technologies play large roles in the Swedish healthcare sector, by creating new possibilities as well as new expectations and needs from citizens (SKR, 2021). With changing expectations and needs, the healthcare must also change (SKR, 2021). Digital technologies and solutions enable new ways of working and give patients a larger influence over their own healthcare, as well as contribute to a more accessible healthcare with higher medical quality and reduced costs (McKinsey, 2016). Systematic use of digital technology in healthcare can come with numerous advantages. For instance, the use of advanced analytical tools helps doctors diagnose patients and create individualized care programs and improved access to patient data (McKinsey, 2016). This allows for the effectivization of care processes and avoids mistreatment, and patients can get new tools for self-care for treating existing conditions as well as for preventative care (McKinsey, 2016). Although digitalization and digital technologies have the potential to improve healthcare, many actors have difficulties adopting these technologies in an efficient way.

With demographical changes and a lack of healthcare workers, new technologies are needed in order to be able to provide good healthcare to everyone (Läkartidningen, 2014). A concept that could help cope with the increased future healthcare demand is telemedicine. Telemedicine lets doctors monitor patients remotely using different monitoring tools, increasing the self-care of citizens (HRSA, 2022). There are a few different remote patient monitoring (RPM) devices, for example: blood pressure (BP) monitors, pacemakers, and glucose meters (HRSA, 2022). Remote monitoring is categorized into three categories; ordained, recommended, and citizen-initiated (SKR, 2021). Ordained means physicians decide that the patient needs to remote monitor themselves, recommended means physicians recommend that the patient should remote

monitor themselves, and citizen-initiated, means that the patient or just a citizen decides to remote monitor themselves. By being able to monitor patients remotely, many positive effects can be found, such as less transportation and fewer travels for patients, decreased number of costly physical meetings, and increased patient coverage geographically (HRSA, 2022).

The market for consumer goods with integrated sensors, such as smartwatches, is growing quickly, and is forecasted to continue growing at a fast pace (Statista, 2022). In a report covering 19 out of the 21 Swedish regions, it is stated that the use of ordained and recommended remote monitoring will be expanded (SLIT, 2022). As of now, many regions have made it possible for patients to monitor diseases such as diabetes, and COPD (chronic obstructive pulmonary disease), and are planning to expand the self-monitoring into other diseases and diagnoses such as Parkinson, IBD, and others. However, there is no plan to implement citizen-initiated remote monitoring, even though the citizens to some extent already have the means (sensors and watches) to do it. The use of telemedicine today is often for specific diagnoses with the use of specific equipment, but multiple Swedish regions have expressed the need for a more general system to handle data from patients independent of diagnosis or equipment (SKR, 2021).

Many actors in the healthcare industry have difficulties adopting digital technologies in a good way due to different kinds of barriers (Alvarado et al., 2017). There have been many studies exploring barriers to adoption of digital technologies, but many studies are conducted in countries with quite different healthcare systems than Sweden, see for instance, Dixon (2007), Luciano et al. (2020), and Wall et al. (2022). For example, many articles that are focusing on implementation and barriers to adoption of telemedicine are conducted in developing countries, where the main focus and barriers lie within lacking infrastructure and technology (Sagaro et al., 2020; Doodoo et al., 2021). The main barriers that are raised are related to internet connection and the availability of equipment. However, in Sweden where this study will be conducted, these barriers can be seen as non-existent. For example, 83% of Sweden's population had access to and could use the internet already in 2009 (Reisdorf, 2011), and internet access is predicted to reach 98% by 2025 (Swedish Ministry of Enterprise and Innovation, 2016). Having access to the internet means that current interactive telemedicine solutions such as remote video and communication meetings can be held (Carter, 2014).

Furthermore, Dunn et al. (2018) describe the current healthcare system as reactive, meaning patients seek care when symptoms have clearly arisen. However, with the use of telemedicine, healthcare could become more proactive through remote monitoring by continuously evaluating patient data even before symptoms arise, thereby possibly changing this paradigm (Asthana et al., 2017). Proactive monitoring can avoid serious diseases and better maintain the patient's well-being (Asthana et al., 2017). Also, the proactive approach can allow for increased patient focus, which Luxford et al. (2011)

explain can lead to better care. Hence, adoption of telemedicine could lead to improved, more proactive, and patient focused care. Barriers to adoption are therefore relevant to study.

This study will focus on organizational barriers. As defined by Lluch (2011) this involves five different categories: *Structure of healthcare organizations*; representing how team members or tiers of care are organized and how they coordinate and work together. *Tasks*; representing how work is organized. *People policies*; representing healthcare workers' accountability, training, and career development. *Incentives*; representing reward systems to influence individuals' behavior, both in monetary means but also development opportunities, recognition, and job satisfaction. *Information and decision processes*; representing how information is shared and how decision processes are structured.

Further, throughout this study, the main categories; *Structural*, *Managerial*, and *Individual & Cultural* have been used to differentiate between and capture the different vertical levels of the organization. *Structural* includes aspects on an overall organizational level, *Managerial* includes aspects on a managerial level, mainly on the level of department managers, and *Individual & Cultural* includes aspects on an individual level, mainly healthcare workers, and cultural includes the overall culture in the organization.

1.2 Aim

This Master Thesis aims to find and study organizational barriers to why new digital technologies are seldom adopted at a competitive pace in public healthcare, and specifically at Sahlgrenska University Hospital.

1.3 Limitations

A limitation made is to generally process and study literature published after 2010. This is due to the rapidly changing environment around digital technologies, making older literature less relevant. However, an evaluation of relevance and fit will be made, so that older, yet very relevant literature is included.

A limitation is made to only study organizational barriers. Because of this, apparent barriers such as for example legal barriers and technical barriers are excluded. These barriers are obvious and also highly studied by other researchers (Stanberry, 2006; Cohen et al., 2020; Nittari et al., 2020; Sagaro et al., 2020; Dadoo et al., 2021).

During the initial interviews it was found that budgets and reimbursement can be a barrier to new digital technologies because of limitations in the budget; however, because budgets are dependent on politicians, aspects such as financial incentives were disregarded in the empirical research.

Telemedicine includes several different aspects, for example; remote monitoring of patients, storage and forwarding of data, and digital meetings with patients. This study is limited to only studying remote monitoring of patients.

1.4 Specification of issue under investigation

Many actors in the healthcare industry have difficulties adopting digital technologies in a good way due to different kinds of barriers (Alvarado et al., 2017). These barriers can in different ways hinder the development of the healthcare sector. However, if these hindrances are overcome, it will lead to higher quality and less expensive care, as a result (Christodoulakis et al., 2017).

The issue of internet connectivity and availability of equipment is non-existent in Sweden, but still, the adoption of new digital technologies, including telemedicine, in Swedish Public National Healthcare is slow. In a report made by the Swedish Social Welfare Board (2019) they highlight the problem of *Inadequate changes within the organization at implementation*. Derived from that statement, a hypothesis is that organizational barriers may pose a major challenge in the Swedish market and are therefore vital to study.

Furthermore, few studies regarding remote monitoring in Sweden seem to have been conducted when reviewing existing literature. It is, therefore, necessary to study the organizational barriers in the Swedish healthcare sector since barriers may differ compared to previously studied countries. A case study of the large Swedish public hospital Sahlgrenska University Hospital is therefore conducted.

Barriers may differ depending on the type of actor, for example private or public, hospital or primary care etc. A large part of the Swedish healthcare sector is comprised of public national hospitals, whereby this is an interesting part of the sector to study. This results in the following research question:

- What organizational barriers exist in the adoption of citizen-initiated remote monitoring in public national hospitals?
 - o How can the barriers be overcome?

2. Literature Review

In this section, a literature review is conducted to explore what previous research have found. First, a chapter describing the healthcare industry. Second, a chapter on digitalization in the healthcare industry. Third, a chapter on telemedicine in Sweden. Fourth, a chapter describing organizational barriers. Lastly, a chapter on how to overcome these barriers.

2.1 The Healthcare Industry in General

Over the last few years, the healthcare industry has experienced the emergence of a new type of actor; digital tech companies, such as Apple, Google, IBM, and Microsoft (Powles & Hodson, 2017). These giants see potential in various fields of the global healthcare industry, often with the use of data-driven tools and techniques such as Artificial Intelligence and Machine Learning (Powles & Hodson, 2017). DeepMind, a subsidiary of the Google conglomerate Alphabet, has for instance initiated a collaborative project with the Royal Free London NHS Foundation Trust, to work with acute kidney injury (Powles & Hodson, 2017). Further, the Google conglomerate Alphabet had already in the first half of 2022 invested \$1,7 billion into different healthcare initiatives, the highest investment by any tech giant (The Economist, 2022). This shows how the healthcare sector is evolving, with new capital-heavy actors entering the sector, possibly changing the narrative.

The healthcare industry is characterized to a large extent by reactive care, meaning care is given when symptoms have arisen (Marcusson et al., 2019; Waldman & Terzic, 2019; Wehde, 2019). Waldman & Terzic (2019) describe how new technology and solutions give opportunities to provide proactive care, to prevent diseases before they arise. Wehde (2019) argues that a fundamental shift will reshape the healthcare industry with healthcare moving away from the clinic-centered care model toward a more seamless continuum care, with focus on prevention and early detection. Wehde (2019) describes how this shift is crucial to combat the issue of costs rising at an unsustainable rate, partly due to the fast evolution of medicine and science which drives prices up. Waldman & Terzic (2019) describe how proactive healthcare extends past individual patients to the entire population, independent of geography, and optimizes health across the lifespan. Proactive prevention will thereby maximize the returns of society and create the greatest benefits for the most amount of people globally (Waldman & Terzic, 2019). Prevention has also proved to be a very cost-effective approach to improve the health of the population (Waldman & Terzic, 2019).

2.2 Digitalization in the Healthcare Industry in General

Fast-paced technological progress during the 21st century has allowed for a high level of digitalization throughout many industries. However, digitalization in the healthcare industry is still at an early stage and has not seen the rapid development of many other industries (Gastaldi & Corso, 2012; Hansen et al., 2019; Wehde, 2019; Burmann et al., 2021; Östlund, 2021). There may be several reasons for this. Wehde (2019) describes how healthcare is highly regulated, capital intensive, and has high educational requirements. Gastaldi & Corso (2012) describe how many healthcare actors do not prioritize digitalization as a source of innovation, and also that hospitals fail to adequately analyze the organizational changes that would be required to realize the benefits of digitalization. Hansen et al. (2019) describe how physicians can exert a negative attitude toward digitalization, especially when technology would limit or replace their activities. Hansen et al. (2019) argue that this is especially problematic because physicians miss the opportunity to contribute with their experience, actively participating and enhancing new technologies, to achieve higher quality care for patients. Burmann et al. (2021) describe a lack of noticeable time-saving and insufficient digital literacy as dominant factors. Also, insufficient system interoperability was identified as a major obstacle (Burmann et al., 2021).

Glauner et al. (2021) describe that the transformation of the healthcare industry is still at the very beginning, with new radical technologies such as Big Data, Artificial Intelligence, Robotics, and Telemedicine starting to be implemented in health sciences and the clinical setting. Hansen et al. (2019) argue that many digital technologies have been successfully applied in clinical studies but that the effect on the overall healthcare system is limited so far. Hansen et al. (2019) describe how healthcare actors are struggling to keep rising costs under control while having only modest clinical improvements, but argue that digitalization using technologies like Artificial Intelligence and Machine Learning might address this issue. Further, the digitalization of the healthcare industry is considered the most effective approach to improving quality while simultaneously reducing costs (Gastaldi & Corso, 2012). Compared to tangible technological items such as physical equipment, digital investments are typically cheaper and have a shorter payback time, which can reduce healthcare costs by 7 to 11 percent (Moro Visconti & Morea, 2020).

Digitalization of the healthcare industry also offers opportunities to have the capability of exploiting current assets while also having the capability to shift away and explore new and better ways of providing value (Gastaldi & Corso, 2012). Also, digital healthcare is a major driver of innovation, growth, and competitiveness (Moro Visconti & Morea, 2020). Glauner et al. (2021) argue that digital technologies will accelerate the pace of knowledge gaining and lead to an extended range of possibilities and services within the healthcare industry. Further, Glauner et al. (2021) argue that the rapid digital development of both scientific findings and clinical structures will lead to a shift in the view of healthcare workers and patients, with changed patient interactions and changed ways of working for physicians. Digitalization therefore has the potential to fundamentally redefine the understanding of healthcare (Glauner et al., 2021).

Digitalization, technical advancements in devices, advancements in broadband and satellite technology resulting in an increasing number of connected users, and also a healthcare model shifting to a more patient-centric design, have all allowed for the introduction of telemedicine (Bhavnani et al., 2016; Moro Visconti & Morea, 2020). Moro Visconti & Morea (2020) describe how this allows for the transformation of non-acute hospitalized patients into home patients, reducing time spent hospitalized, thereby saving time and resources. Bhavnani et al. (2016) describe how using telemedicine changes healthcare delivery from a health-systems-generated approach to a remote and patient-generated approach, which the authors argue creates great opportunities to increase patient engagement, reduce healthcare costs, and improve outcomes. By monitoring and continuously evaluating patient data before symptoms arise, telemedicine can make healthcare more proactive, which can avoid serious diseases and help maintain patients' well-being (Asthana et al., 2017). Luxford et al. (2011) also describe how this proactive approach can allow for increased patient focus, which can lead to better care. Moro Visconti & Morea (2020) describe that telemedicine has enormous potential to improve healthcare by enhancing effectiveness, efficiency, accessibility, safety, and personalization.

2.3 Telemedicine in Sweden

In Sweden, telemedicine gained attention in the 1990s, to address patient demands for improved healthcare while also trying to keep costs down (Petersson, 2011). During the mid 1990s, the government emphasized the transformative potential of telemedicine, at a time when healthcare was moving towards patient-centered care (Petersson, 2011). Another important factor accentuated by the government regarding telemedicine was the way it could offer increasingly scarce specialist resources to the entire country (Petersson, 2011). During the 2000s, telemedicine for home-based treatment of chronically ill patients, web-based psychiatric treatment, and computerized clinical decision support systems (CDSS) to aid telephone triage was introduced (Glock et al., 2021). In the 2010s digital consultations were introduced, and commercial app-based actors complementing primary care were established in 2016 (Blix & Jeansson, 2019). These actors have grown rapidly since and were further catalyzed by the Coronavirus pandemic (Blix & Jeansson, 2019). Although telemedicine has existed since the 1990s, adoption is, as previously described, slow and non-widespread. Ordinated and recommended remote monitoring initiatives exist for some diseases, but citizen-initiated remote monitoring does not yet exist in the Swedish National Public Healthcare. Alvarado et al. (2017) describe how this is due to different kinds of barriers, which in different ways hinder development.

2.4 Organizational Barriers to Adoption of digital technologies in the Healthcare Sector

In this section, different barriers to adoption of digital technologies are presented, categorized into Structural Barriers, Managerial Barriers, and Individual & Cultural Barriers. First on a higher level in the healthcare sector, and then going more into depth on telemedicine. Important to note however is that many barriers are interrelated.

2.4.1 Structural Barriers

Structural Barriers are divided into three sub-categories; *Teamwork & Collaboration*, *Processes & Routines*, and *Financial Incentives*.

2.4.1.1 Teamwork & Collaboration

Lack of teamwork is identified as a barrier to new technologies (Lluch, 2011; Konttila et al., 2019). New technologies influence teamwork because responsibilities and team dynamics change (Konttila et al., 2019). Also, the structure of healthcare organizational systems does not encourage teamwork including different levels of the organizational system (Lluch, 2011). Further, Lluch (2011) argues that the use of digital technologies has led to even larger inefficiencies in the cooperation between organizational units. Teamwork and cooperation between healthcare professionals require information sharing (Lluch, 2011). The introduction of new digital technologies can lead to changes in information sharing and decision processes, impacting healthcare workers with a heavier workload, which creates resistance towards these innovations (Lluch, 2011).

Lack of collaboration between developers and physicians is identified as a barrier to adoption of digital technologies (Cresswell & Sheikh, 2013; Gleason, 2015). Cresswell & Sheikh (2013) describe that this can lead to a solution that may not fit the users' needs. They also highlight that the complexity of a system can become too high, which decreases the usability of the technology for the end user. However, the authors also describe the opposite, that the technology might not include important features, limiting the technology's possibility to meet the users' needs. This is also something Smuck et al. (2021) raise in a case of wearables regarding telemedicine, that the focus of the technology must lay on the end-user experience. The authors explain how a barrier to usage of the technology can be that physicians do not get relevant data from the sensors or that it is difficult to gain access to the data. Further, Gleason (2015) describes how different remote monitoring tools, for example, stethoscopes, sleep analyzers, and cardiac monitors, capture different types of data that are structured in different ways. Due to a lack of collaboration between developers and physicians, this data can be structured and presented in ways that may not fit with how physicians can actually use

the data. Data overload of different inputs from the devices can therefore arise and affect physicians' adoption (Gleason, 2015).

2.4.1.2 Processes & Routines

The implementation of digital technologies often requires changes in work processes and routines, which can become a barrier to adoption (Landaeta et al., 2008; Lluch, 2011; Iyanna et al., 2022). New digital technologies can change healthcare workers' workflow, increasing time spent on tasks, introducing tedious documentation requirements, and creating challenges integrating paper and online records (Iyanna et al., 2022). The implementation of telemedicine requires significant changes to existing workflows, which therefore can influence the efficiency of implementation of the technology and act as a barrier (Kruse et al., 2018; Sagaro et al., 2020). Kruse et al. (2018) describe how healthcare workers have to invest time in training for new workflows and techniques, which is identified as a barrier to adoption.

Healthcare is becoming more patient-focused, and because of that processes may need to change. Sustaining a process-oriented approach can act as a barrier to adoption, and there is a need for shifting to a patient-oriented approach, with healthcare episodes being the focus, instead of viewing tasks separately and missing the overall picture (Lluch, 2011).

As healthcare shifts more towards digital solutions, the work of a physician moves away from patient meetings and towards more administrative tasks, which proves to be a barrier towards implementation and change, since physicians often prefer patient interactions (Cresswell & Sheikh, 2013). Also, in telemedicine specifically, there is a perception of telemedicine not being personal care due to less personal communication, which further acts as a barrier due to a preference for personal communication (Kruse et al., 2018). This is also argued by Mohammadzadeh & Safdari (2014), who describes how a decrease in face-to-face communication between doctors and patients is a barrier to adoption of telemedicine.

2.4.1.3 Financial Incentives

Lack of financial incentives for healthcare actors adopting new technology is identified as a barrier (Kruse et al., 2016; Gleiss & Lewandowski, 2021). Gleiss & Lewandowski (2021) describe how there is a general lack of external financial incentives for implementation and use of new digital technologies. However, Kruse et al. (2016) argue that there may exist financial incentives on a national or local level but that despite this the initial cost may be too large, therefore acting as a barrier. For healthcare workers, lack of financial incentives is identified as a barrier, due to healthcare workers'

inadequate compensation (Lluch, 2011; Lin et al., 2012; Lavallee et al., 2020). Healthcare workers can feel that the extra effort of adopting a new technology is not reflected in their income, leading to feelings of inequality (Lin et al., 2012).

In the adoption of telemedicine, lack of financial incentives is identified as a barrier (Tanriverdi & Iacono, 1998; Al-Samarraie et al., 2020; Lavallee et al., 2020; Sagaro et al., 2020). Implementation and maintenance of telemedicine is costly, and a lack of adequate financial funding is therefore a barrier to adoption (Al-Samarraie et al., 2020). Tanriverdi & Iacono (1998) argue that standard healthcare financing models, for example, fee-for-service and capitated models, are problematic and not suitable for telemedicine. Lavallee et al. (2020) also describe that current payment models do not support telemedicine, and that the lack of reimbursement mechanisms and supporting healthcare policy hinders the technology. Sagaro et al. (2020) describe that there is no reliable reimbursement system for telemedicine. Al-Samarraie et al. (2020) argue that there are several reasons: a lack of sponsorship, a lack of feasibility studies, and a lack of capital expenditure. The lack of stable funding and sponsorship has been seen as the main cause of failure in many telemedicine projects (Al-Samarraie et al., 2020).

2.4.2 Managerial Barriers

Managerial Barriers are presented under *Management Support & Leadership*.

2.4.2.1 Management Support & Leadership

A lack of management support has been identified as a barrier to adoption of digital technologies (Callen et al., 2008; Lluch, 2011; Konttila et al., 2019; Bidmead & McShane, 2021; Kruszyńska-Fischbach et al., 2022). Kruszyńska-Fischbach et al. (2022) describe how constant change makes ownership and responsibility unclear, leading to a lack of management support and therefore being a barrier to adoption of new digital technologies. Further, a lack of support from management in integrating the new technology into the healthcare workers' daily practice, their professional role, and service delivery affects the adoption negatively (Lluch, 2011). Another difficulty identified by Bidmead and McShane (2021) is that although top-management support may be present and satisfactory, this may not always trickle down to the middle and lower-level management, and therefore hinders adoption.

A lack of leadership is identified as a barrier to adoption of digital technologies (Laukka et al., 2020; Fernando & Purva, 2023). Laukka et al. (2020) describe how leaders are not always aware of what their role is in the implementation or who is responsible. With rapid changes and advances in healthcare technology, the role of a leader has expanded, with leaders having to possess new knowledge and skills, thereby affecting their ability to lead (Laukka et al., 2020; Fernando & Purva, 2023). Fernando & Purva (2023)

describe that the traditional role of leaders is not suitable for the implementation of digital technologies due to a rapidly changing environment within healthcare. Also, leaders may not be able to prioritize leading in an implementation project due to them having to prioritize other health services (Laukka et al., 2020).

Lack of leadership is identified as a barrier to the success of implementation of telemedicine solutions (Stumpf et al., 2002; Carter, 2014). Stumpf et al. (2002) point out the need of a project coordinator who has knowledge and a holistic view of the project, I.e., knowledge within the technology, but also what the healthcare workers need. If the leadership is not defined and shared between members in the project, the project will have difficulties to form (Stumpf et al., 2002).

2.4.3 Individual & Cultural Barriers

Individual & Cultural Barriers are divided into three sub-categories; *Healthcare Workers' Resistance to Change*, *Buy-in*, and *Competence & Training*.

2.4.3.1 Healthcare Workers' Resistance to Change

Resistance to change is a major barrier to the adoption of digital technologies in healthcare (Kan & Parry, 2004; Landaeta et al., 2008; Lluch, 2011; Amarantou et al., 2018; Kulkov et al., 2021). Kulkov et al. (2021) describe how adherence to old, long-established values and standards forms a barrier to implementing and adopting new technologies. Landaeta et al. (2008) elaborate on this and describe that resistance to change can arise because healthcare workers perceive the current systems and processes as efficient, and therefore do not see the value in implementing or adopting new technology. This is further exemplified and strengthened by Lluch (2011) who describes that new technologies which change the previously manual processes using pen and paper to computer systems affect healthcare workers. These changes can be perceived negatively by healthcare workers, as systems can be seen as slow without previous user experience and the same tasks can therefore take more time to complete (LeTourneau, 2004; Lluch, 2011). When the technology demands extra work or is not seen as part of the principal work, resistance to change increases (Konttila et al., 2019). Also, the individual healthcare worker often evaluates if they possess the right skills to be able to make the transition without slowing down their work and becoming inefficient (LeTourneau, 2004). If the healthcare worker perceives their skills as inadequate, embarrassment and fear may arise, and the worker would more likely resist the change (LeTourneau, 2004).

Healthcare workers' previous experiences and confidence using technology influence their attitude towards using new technology, but also the ability to learn to use new technology (Konttila et al., 2019). Little previous experience and confidence can lead

to resistance to change (Konttila et al., 2019). In adoption of telemedicine, healthcare workers were identified having low confidence in the accuracy of the technology and that it would be easy to use, leading to resistance to change (Tanriverdi & Iacono, 1998). Also, healthcare workers not participating and being involved in decision-making regarding changes lead to resistance to change (Kan & Parry, 2004; LeTourneau, 2004; Amarantou et al., 2018). When healthcare workers feel as though they are uninformed and unable to leave their input on the development of the change, they are less accepting and understanding of why it is needed and therefore resist adoption (LeTourneau, 2004).

Amarantou et al. (2018) argue that healthcare workers perceive change as a process that disrupts and makes them lose control over how they work. This perception makes the healthcare workers more likely to resist change, since experiencing these negative emotions wants to be avoided (Amarantou et al., 2018). Letourneau (2004) elaborates further on this and describes how healthcare workers often feel a lack of familiarity when proposed with change, which can lead to negative emotions around being perceived as uninformed or incompetent. Resistance to change can therefore arise as the healthcare workers would rather do what they know best and focus on what they are an expert at, which they are often accustomed to (LeTourneau, 2004). The perception from healthcare workers of how beneficial a change would be to themselves, the patients, and the hospital also affects resistance to change (Lin et al., 2012; Amarantou et al., 2018). In the adoption of telemedicine, healthcare workers tend to be nervous and anxious, resulting in a negative attitude toward the technology and therefore resistance to change (Sagaro et al., 2020). Further, Al-Samarraie et al. (2020) describe how some healthcare workers were overwhelmed when telemedicine projects were introduced.

2.4.3.2 Buy-in

Lack of buy-in is identified as a barrier to adoption of telemedicine (Stumpf et al., 2002; Dodoo et al., 2021). Stumpf et al. (2002) argue that endorsement from local healthcare workers is an absolute requirement for adoption. If local healthcare workers are insufficiently empowered in the process, thereby having lacking buy-in, the adoption will be left to fend for itself without support and therefore risk cancellation (Stumpf et al., 2002). Further, Dodoo et al. (2021) describe how lack of help and engagement from stakeholders and medicinal institutions affect physicians' initial buy-in into telemedicine since they see the technology as a hindrance or something not worthy of their time. The authors continue by stating how lack of management and consultation, leads to low motivation for healthcare workers to use the technology. Furthermore, Jannett et al. (2003) highlights the point that lack of buy-in is a barrier to adoption, and that this barrier arises because pressure from the outside is the reason to implement telemedicine, and not that it is based on clearly articulated needs. In other words, telemedicine should be implemented when a clear need is shown, and not just be

implemented because of the sake of implementing something new. If telemedicine is not based on actual needs, the equipment could be used in a bad way or be abandoned (Jannett et al., 2003).

Simblett et al. (2018) describe that lack of buy-in for telemedicine can arise over time, with healthcare workers becoming bored, having to put more effort into the work over time, or if the technology does not meet expectations. Lack of trust and motivation between doctors and patients in telemedicine is also identified as a barrier to adoption (Al-Samarraie et al., 2020). Also, if doctors and patients can't see the potential benefits of telemedicine, the adoption of the technology will be limited (Al-Samarraie et al., 2020).

2.4.3.3 Competence & Training

Lack of competence and training is identified as a barrier to adoption of digital technologies (Lluch, 2011; Konttila et al., 2019). Lluch (2011) describes how healthcare workers' lack of knowledge regarding new digital technologies is a major barrier and that healthcare workers can feel the need for training to be able to adopt the new technology. However, Konttila et al. (2019) argue that many healthcare workers have a negative attitude toward technology education, finding it pointless due to poorly understood benefits, time-consuming, and inadequately resourced, creating even larger barriers.

Dodoo et al. (2021) describe that physicians are lacking knowledge within telemedicine and its applications and that this poses a barrier to implementation. Sagaro et al. (2020) strengthen this point by implying that technically challenged staff is a critical barrier. This knowledge gap in how to use the technology leads to unstandardized ways of using the applications and systems, and big changes within the workflow, which can lead to a non-efficient work-structure (Dodoo et al., 2021; Sagaro et al., 2020). Therefore, the quality and equality may vary in the service, which can influence the success of the implementation of telemedicine (Dodoo et al., 2021).

Another aspect of implementing telemedicine is that new knowledge is needed, with users of the technology, the physicians, requiring a higher degree of IT competence, which reduces the autonomy of the physicians, and telemedicine is becoming a "threat" (Sagaro et al., 2020; Dodoo et al., 2021). The lack of training and education of IT can decrease the confidence of the users, but also the lack of knowledge of how to find your way and navigate in the health technology leads to resistance (Al-Samarraie et al., 2020; Dodoo et al., 2021). A lack of training programs on telemedicine for healthcare workers was also identified, which could be because of a lack of widespread dissemination of information regarding telemedicine (Al-Samarraie et al., 2020).

2.5 Overcoming Organizational Barriers to Adoption of digital technologies in the Healthcare Sector

In this section, how to overcome the barriers is presented, using the same structure of Structural Barriers, Managerial Barriers, and Individual & Cultural Barriers.

2.5.1 Structural Barriers

Structural Barriers are divided into three sub-categories; *Teamwork & Collaboration, Processes & Routines,* and *Financial Incentives.*

2.5.1.1 Teamwork & Collaboration

Lluch (2011) argues that team-based care strategies are vital for successful implementation of new technologies. Teamwork between different organizational units is necessary and effective ways of coordinating this in the organization need to be found to overcome inefficiencies (Lluch, 2011). Konttila et al. (2019) argue that with new technologies changing healthcare workers' responsibilities and team dynamics, collegial support is crucial to positively influence values and nurture the climate for teamwork.

The lack of collaboration between stakeholders such as physicians, nurses, management, and technical staff leads to barriers to adoption of new digital technologies. However, Kho et al. (2020) explain how strategic planning can solve the collaboration problem between the different stakeholders. The authors explain that collaboration is a major success factor in implementation and adoption of a new technology and that regular ongoing meetings have a big impact during the planning stage. Further, for a technology to fit the physicians' needs, collaboration between developers and users is crucial (Cresswell & Sheikh, 2013). This type of collaboration is also crucial for overcoming the issue of collecting and structuring data in a way that does not fit how the physician can use it (Gleason, 2015). The data should be structured in a way that makes sense to the physician (Gleason, 2015).

2.5.1.2 Processes & Routines

The increased workload for individuals when implementing a new technology or system into their daily work can be seen as disruptive, when staff and organizations try to make sense of how it works (Cresswell & Sheikh, 2013). The authors state that it is of great importance to create time and ease the burden of other workloads for the staff, to enable them to familiarize themselves with the technology. Kruse et al. (2018)

describe how changes in existing workflows require healthcare workers to invest time into training on the new workflows and techniques for the change to work well. Another aspect Cresswell & Sheikh (2013) describe is the timing of the implementation, an introduction of a new technology could go smoother if there are no other major happenings in the organization, i.e., the staff have more time to understand the technology.

An important point argued by Bidmead & McShane (2021) is that stakeholders involved in change must thoroughly understand the existing processes and practices to be able to change them in a good way. What healthcare workers routinely do may not always be the same as how the work is described in flow charts or descriptions, and time must therefore be put on pilot projects to allow for a deep understanding of the actual processes and practices and then be able to make viable and sustaining changes (Bidmead & McShane, 2021).

2.5.1.3 Financial incentives

Lluch (2011) argues that the issue of healthcare workers not being adequately compensated should be overcome by implementing a broadly composed reward system, including direct monetary compensation, benefits packages, and bonus incentive plans. Lluch (2011) also argues for other non-monetary rewards such as career development opportunities and more intrinsic motivation from job satisfaction. This broad reward system can result in faster adoption (Lluch, 2011). Further, Sagaro et al. (2020) argue that governments should invite other stakeholders, for example nongovernmental organizations, to overcome the issue of lacking financials in the initial phase. To overcome the issue of non-suitable financing models, Tanriverdi & Iacono (1998) argue that new business models need to be developed.

2.5.2 Managerial Barriers

Managerial Barriers are presented under *Management Support & Leadership*.

2.5.2.1 Management Support & Leadership

Konttila et al. (2019) describe that a supportive manager can reduce the uncertainty healthcare workers may feel regarding changes, thereby improving the adoption. Kruszyńska-Fischbach et al. (2022) describe how managers can take the role of *Innovator* and highly endorse the new technology, thereby motivating and encouraging others. This can be done by a single manager, as a social opinion leader, or a group, spreading information on the benefits and success of a solution (Kruszyńska-Fischbach et al., 2022). Kruszyńska-Fischbach et al. (2022) argue that this type of endorsement is

often essential to successful adoption. Bidmead & McShane (2021) argue that it is not enough for managers to simply provide the necessary equipment and then expect changes to happen naturally, managers should instead be involved in the process and initiate smaller step changes to allow for a gradual rollout. Also, management support can improve the adoption of digital technologies by encouraging healthcare workers to see the changes as long-term investments (Bidmead & McShane, 2021). To overcome the difficulty of management support not trickling down to middle and lower-level management, it is vital for organizations to ensure that all levels of management are aligned, and that support is present throughout the whole organization (Bidmead & McShane, 2021).

Laukka et al. (2020) describe that lack of leadership can be overcome by providing leaders with support and training to raise the competence regarding digital technologies, and thereby the ability for the leaders to support others. The leader should also communicate clear visions and goals regarding the implementation, establish a governance structure, and provide training for healthcare workers (Laukka et al., 2020). It is also important for the leader to follow up after some time, to make sure that adoption is going as planned (Laukka et al., 2020). Also, scholars argue that management should have a transformational leadership style, including enthusiasm, participation, opinion leadership, and vision, and that this is critical for creating an environment where employees are motivated (Kumar, 2013; Weintraub & McKee, 2019; Fernando & Purva, 2023). Kumar (2013) describes how a transformational leadership style engages and involves healthcare workers, providing a sense of ownership of the implemented technology and thereby improving adoption. Fernando and Purva (2023) emphasize the importance of flexibility and adaptability towards new ideas, curiosity, change-oriented, and open-mindedness as some important traits for a leader to possess in today's rapidly changing environment.

2.5.3 Individual & Cultural Barriers

Individual & Cultural Barriers are divided into three sub-categories; *Healthcare Workers' Resistance to Change*, *Buy-in*, and *Competence & Training*.

2.5.3.1 Health Care Workers' Resistance to Change

Tanriverdi and Iacono (1998) argue that to overcome resistance to change, healthcare workers need to be convinced that the new technology would be easy to use and accurate. Also, healthcare workers need to be convinced that the new technology would not disrupt their daily routine (Tanriverdi & Iacono, 1998). Konttila et al. (2019) elaborate on this and argue that the emphasis should be on how the technology can improve the daily work. Amarantou et al. (2018) argue that improvements should be communicated to healthcare workers, because the more beneficial a change is perceived

the less resistance is shown. Further, ownership of change through being part of the decision-making process tends to lead to much less resistance from healthcare workers (LeTourneau, 2004; Amarantou et al., 2018). Also, awareness of negative emotions from resistance to change can help in going through and handling changes better, which is especially important in healthcare, where changes are occurring often to improve the quality of care (Amarantou et al., 2018).

To improve healthcare workers' willingness to use new technology, thereby lowering the resistance, it is important to allow sufficient time and resources to adapt (Konttila et al., 2019). This is also emphasized by Tanriverdi and Iacono (1998) who argue that an iterative approach with revisions, new models, and new routines can ease the change for healthcare workers, thereby leading to less resistance.

2.5.3.2 Buy-in

A new technology needs to be accepted by the users, i.e., physicians, and nurses in order to get adopted. Kho et al. (2020) describe how with increased familiarity and confidence in the system, the workers were more likely to accept the technology. Making people accept the system will increase the likelihood of buy-in and willingness to use it. Kho et al. (2020) continue by stating that ongoing meetings and evaluations of the system, where the users can state their concerns, are good ways to gain acceptance, trust, and buy-in to the technology or system.

To overcome the issue of lack of trust and motivation between doctors and patients, as well as the perceived benefits of telemedicine, increasing overall awareness through continuous information sharing is crucial (Sagaro et al., 2020). Increased overall knowledge of the benefits of telemedicine can increase the overall buy-in for the technology, thereby increasing adoption (Sagaro et al., 2020).

2.5.3.3 Competence & Training

Konttila et al. (2019) argue that learning to use new technology and devices should be integrated into the healthcare workers' daily work. Stumpf et al. (2002) argue that implementation is different across multiple sites and that each site must be viewed individually as a unique system. Competence may differ largely across multiple sites and individualized training may be necessary to reach a sufficient competence level (Stumpf et al., 2002). Konttila et al. (2019) describe how training increases safe use of technology but emphasize that the organization should carefully evaluate competency levels and developmental needs when planning training, to maximize the benefit for each individual. Al-Samarraie et al. (2020) argue that relevant training should be provided, as well as workshops, seminars, conferences, and market campaigns, to raise

competencies broadly. Also, healthcare workers should be motivated to attend various training programs through direct and indirect incentives (Al-Samarraie et al., 2020). Further, regular training over time is also required to allow for appropriate and successful use of the technology (Konttila et al., 2019).

3. Methodology

The following chapter outlines the methodology used for conducting the study, the chosen research design, and the steps for gathering empirical data. Further, a critical discussion of the research quality is made, and ethical considerations are presented.

3.1 Research Design

This study is of a qualitative, abductive approach, with the purpose of exploring and describing barriers to adoption of digital technologies in the healthcare sector. Ellram (1996) describes explorative research as a way of finding answers to questions such as “why” or “how” something is occurring.

The choice of conducting a qualitative study is based on the explorative nature of the study and that barriers to adoption of digital technologies are hard to quantify. Therefore, it is necessary to attain qualitative data and get the members of the organization’s own views on the subject to reach the aim of the study and answer the research question.

Abductive reasoning is a combination of inductive and deductive reasoning, with the aim to discover new or unexpected insights, test old theories, as well as form new theories (Wallén, 1996). This is an appropriate approach due to the study being explorative and descriptive.

The study is based on primary data collected through interviews and secondary data collected through a literature review. Research is conducted at a single case organization; Sahlgrenska University Hospital, which allows for an in-depth analysis of the studied problem (Bryman & Bell, 2019).

3.2 Case Description

In Sweden, the three independent levels of the government; national, regional, and municipal, are all involved in the healthcare system (Glenngård, 2019). The same author also describes how Sweden has a long history of strong self-government locally. Organization and provision of healthcare services are done by the 21 country councils, and at the local level, 290 municipalities are responsible for their citizens (Glenngård, 2019). There are 77 hospitals nationally, of which seven are university hospitals (Glenngård, 2019). Glenngård (2019) describes how counties are grouped into six different healthcare regions to facilitate cooperation as well as maintain a high level of advanced medical care to patients. Further, Glenngård (2019) describes how highly specialized care which requires the most advanced equipment is concentrated at the

seven university hospitals to allow for greater efficiency and higher quality care, as well as create opportunities for research and development.

Healthcare can be provided by either public or private healthcare providers, or a combination of both (Basu et al., 2012). In Sweden, the national healthcare services are provided by both public and private actors, where the private actors can either have a contract with the country council, local authority, or municipality, or act on their own (Socialstyrelsen, 2020). In Sweden, the majority of healthcare is public but about 40 percent of primary care practices are private and there are six private hospitals (Glenngård, 2019). Burström et al. (2017) describe that healthcare is a tax-funded welfare service in Sweden, meaning the healthcare system must gain legitimacy from the people in order to function. Sweden is widely known for its good care, which goes hand in hand with that Sweden is one of the countries that spend the most on healthcare, looking at cost per capita or as a share of GDP (Blixt & Jeansson, 2019). On the other hand, Sweden is ranking low in terms of quality based on patients' experience and waiting times (Blixt & Jeansson 2019).

The public national healthcare is decentralized in Sweden and is managed by either the country council, local authority, or municipality (Socialstyrelsen, 2020). By having decentralized healthcare, it is up to the different actors to manage and prioritize its resources as they seem best fit, which can lead to varying healthcare services throughout the country (Glenngård, 2019; Socialstyrelsen, 2020). However, there are some things that apply to all healthcare in Sweden, for instance, the so-called AAAQ criteria; availability, accessibility, acceptability, and quality (Regeringen, 2011). Healthcare must be available to all citizens, it must be accessible for all citizens, it must be run in an acceptable way, and it must be of good quality (Regeringen, 2011). There are also the three basic principles that apply to all healthcare providers:

“Human Dignity: all human beings have an equal entitlement to dignity and have the same rights regardless of their status in the community. Need and solidarity: those in greatest need take precedence in being treated. Cost-effectiveness: when a choice has to be made, there should be a reasonable relationship between healthcare costs and benefits measured in terms of improved health and quality of life” (Glenngård, 2019, p. 133).

3.3 Case Organization

The case organization Sahlgrenska University Hospital is Sweden's largest hospital and treats 350 000 patients every year (Sahlgrenska University Hospital, 2022). The hospital is also one of Europe's largest hospitals (Sahlgrenska University Hospital, 2022). Sahlgrenska University Hospital consists of over 17 000 employees (Sahlgrenska University Hospital, 2022). The hospital conducts highly specialized care

and the organization is also acknowledged as leading in clinical research (Sahlgrenska University Hospital, 2022). Sahlgrenska University Hospital is a part of Region Västra Götaland, which has the overall responsibility for healthcare in the region. Region Västra Götaland consists of 56 000 employees in total, of which 48 000 work within healthcare (Region Västra Götaland, 2023a). The healthcare is managed and controlled by elected politicians and two regional committees are responsible for long-term strategic work and coordination throughout the region (Region Västra Götaland, 2023b). Further, five committees are responsible for local coordination between municipalities in the region (Region Västra Götaland, 2023b).

3.4 Data Collection

Secondary data is collected through a literature review to create an understanding of the subject and evaluate what is already known in the field. Based on the background and aim of this study some overall keywords could be identified; “Telemedicine”, “Remote Monitoring”, “Digitalization”, “Organizational”, “Healthcare”, “Barriers”, “Innovation”, “Digital technologies”, “Adoption”, “Patient-generated data”, and “Implementation”. These keywords were used individually and in different combinations to form key phrases, to find relevant literature. The collection of literature was done by using the databases; *Google Scholar*, *Scopus*, and *ScienceDirect*. Further, additional keywords were identified and used during the collection of literature, for example; “mHealth”, “Health Data”, and “Wearables”. Interviewees with relevant knowledge in the field also provided recommendations on relevant literature to review. The literature was structured using the Reference Manager program *Mendeley* to allow for sorting and grouping on different subjects, which simplified and clarified later analysis.

The primary data is collected through in-depth, semi-structured interviews. This means interview questions are formed prior to the interviews, but the questions could change, and follow-up questions can be asked depending on the interviewee's responses (Gilham, 2008). By having more flexible follow-up questions, the atmosphere in the interview can become more relaxed, and the probability of getting relevant answers is higher (Virginia Tech, 2018). Further, the semi-structured approach allows for an open mind about what needs to be known, so that theories and concepts can surface from the interviewee's answers (Bryman & Bell, 2019).

Initially, a purposive sampling strategy was used, starting with the organizations' understanding of members with appropriate knowledge on the subject. Purposive sampling involves selecting interview participants strategically based on their relevance to the research subject (Bryman & Bell, 2019). In parallel with the purposive sampling, it was also further expanded through snowball sampling. This strategy allows for finding additional potential respondents through recommendations from respondents in

the purposive sampling (Bryman & Bell, 2019). The sampling continued until sufficient data was acquired and theoretical saturation was met, meaning no new themes were generated from the data (Bryman & Bell, 2019).

The interviews were conducted via video call using Microsoft Teams due to time efficiency, preference, and flexibility. An interview guide (See Appendix A) was formed after a comprehensive literature review and the interviews were audio-recorded and transcribed verbatim for later analysis. Before the interviews, participants were provided with the topic, aim, and the interview questions of the study. The purpose of this was to prepare the respondents to allow for the best contribution to the study, as well as strengthen the dependability of the study (Bryman & Bell, 2019). The respondents were also informed that the interviews are anonymized and that they will not be able to be identified. They were also asked to give their consent to being audio recorded and informed that the recording would be transcribed. The language used in the interviews was Swedish, as this was the preferred language of all the interviewees. Using the interviewees' preferred language removed any potential language barrier, thereby allowing for more comfortable discussions, attaining information in a better way. It is important to note that the information provided in the interviews was translated into English, whereby some possible interpretations could have been made by the authors.

A summary of the interviews that have been conducted is presented in Table 1. In total, 18 interviews have been conducted with 21 participants. The interviewees are affiliated with either Sahlgrenska University Hospital or Region Västra Götaland, with different roles within the organizations.

Interviewee	Organization	Role	Duration (min)
1	Sahlgrenska University Hospital	Manager for Competence Center Artificial Intelligence	60
2	Sahlgrenska University Hospital	Digitalization Officer	60
3	Sahlgrenska University Hospital	Digital Development Strategist	60
4	Sahlgrenska University Hospital	Business Developer & System Specialist	
5	Sahlgrenska University Hospital	Project Lead	60
6	Sahlgrenska University Hospital	Project Lead	
7	Sahlgrenska University Hospital	Intrapreneur & Project Lead	60
8	Sahlgrenska University Hospital	Research Coordinator & Physician	60
9	Sahlgrenska University Hospital	Physician	60
10	Sahlgrenska University Hospital	IT Coordinator & Strategist	40

11	Sahlgrenska University Hospital	IT Coordinator & Strategist	
12	Sahlgrenska University Hospital	Physician (ST Innovation & Teknik residency)	60
13	Sahlgrenska University Hospital	Development Strategist	60
14	Sahlgrenska University Hospital	Physician (ST Innovation & Teknik residency)	45
15	Sahlgrenska University Hospital	Physician	60
16	Region Västra Götaland	Innovation Platform Project Lead	60
17	Region Västra Götaland	Digitalization Strategist	60
18	Region Västra Götaland	Digitalization Strategist	60
19	Region Västra Götaland	Digitalization Strategist	60
20	Region Västra Götaland	Digitalization Strategist	60
21	Private Actor	Former Sahlgrenska University Hospital employee	20

Table 1. Summary of interviews

3.5 Data Analysis

To organize and analyze the data from the interviews and enable a deep understanding of the studied problem, a thematic analysis was conducted. This method involves searching for themes in the data by looking for repetitions, indigenous typologies or categories, metaphors and analogies, and differences and similarities (Bryman & Bell, 2019). Guest et al. (2012) elaborate on this and describe that the focus is to identify and describe both implicit and explicit ideas from the data. Repetition is used as a common criterion for evaluating if a pattern can be considered a theme, both within a data source and across different data sources (Bryman & Bell, 2019). However, to be considered a theme it must also be relevant to the research questions.

The thematic analysis process was conducted in four stages, as described by Guest et al. (2012). The *first stage*, coding the data, involves, in our case, coding based on patterns relevant to barriers to adoption of digital technologies. To guide the coding process, the interview questions in the semi-structured interviews were of an explorative nature. In the *second stage*, the codes generated initial themes for various barriers found in the data. This involved comparing how frequently factors were raised, identifying co-occurrence in the data, as well as identifying relationships between the initial themes. In the *third stage*, the initial themes were reviewed by evaluating consistency and rigor. This then resulted in the final themes. Lastly, in the *fourth stage*, the final themes were defined and named with regard to existing literature, to allow for

comparison. Differences and similarities between the final themes and existing literature could then be analyzed and compared, which is presented in the *Discussion*.

3.6 Research Quality

Bryman & Bell (2019) describe reliability, replicability, and analytical generalization (also referred to as validity) as three of the most important criteria for evaluating research. Reliability is about whether the results of a study are repeatable and consistent (Bryman & Bell, 2019). Replicability is closely related to reliability but is instead characterized by if the process of the research can be replicated, therefore being able to be made again by another researcher (Bryman & Bell, 2019). Finally, analytical generalization, often seen as the most important criterion, concerns the integrity of the conclusions that are generated from a study (Bryman & Bell, 2019).

3.6.1 Reliability

A factor that may affect the reliability of the study negatively is the risk of bias from the interviewees. Since the interviewees are working for the studied organization, answers that would leave the organization in a negative light might expose the interviewee. The interviewee may therefore be unwilling to answer some of the questions and important information might be withheld. To mitigate this, the interviewees were anonymized, with the purpose of being able to answer questions more freely. To further ensure reliability in this study, good practice is followed, and data collection was made until theoretical saturation was satisfyingly met.

3.6.2 Replicability

Although the need for replicability is more common in quantitative research, it is also highly relevant in qualitative research (Bryman & Bell, 2019). This study researches a single case organization, which influences the outcome of the study. If this study would be replicated at a later stage, it may include other organizations or parties, and thereby may have a different outcome. The studied organization is seen as a representative public national hospital, and the outcome of a replicated study with another case organization in the form of a large public Swedish hospital can probably lead to quite similar outcomes. However, it is not likely to be similar in the entire national healthcare sector. To allow for a high degree of replicability, the processes are described and documented in detail, allowing readers and future researchers wanting to replicate the study to understand exactly what has been done and in what way.

3.6.3 Analytical Generalization

An aspect that is also important to discuss regarding the research quality is analytical generalization, also referred to as transferability, similar to external validity in quantitative research (Bryman & Bell, 2019). Several aspects may affect the integrity of this study's conclusions. For instance, as discussed above, although the selected case organization can be identified as representative of national public hospitals, this single case study is not likely to provide a representation for the entire national healthcare sector, also including public and private primary care, public and private dental care, and private hospitals. Therefore, any potential results or conclusions made regarding the entire healthcare sector should be seen as indications. Apart from this, to allow for a high degree of integrity in the study overall, the collected primary data is triangulated with previous research, in the form of secondary data from the literature review.

3.7 Ethical Considerations

Bryman & Bell (2019) describe issues involving confidentiality and anonymity as major ethical difficulties in research. Due to the qualitative nature of this study, with the use of interviews, this is especially important to address. This was done by informing the interviewees about the topic and aim of the subject, the interviewee's role in the study, and that the interviewees and their answers will be confidential. Further, interviewees were asked to consent to be audio-recorded and informed that the recording will be transcribed.

The Swedish Research Council (VR, 2021), lists four different personal ethics in order to remain professional integrity; Reliability, Honesty, Respect, and Accountability. Firstly, reliability means that the research must be of quality which can be done by having a fitting and proper design and methodology. Secondly, throughout the entire research, honesty is a must, where reporting and communication must be transparent, unbiased, and fair. Thirdly, there has to be respect towards everyone involved in the research, everything from colleagues to the society and environment. Fourth and last, is the accountability for the research. The researchers have to be accountable for the study.

4. Empirical Findings

In this chapter, data collected from the semi-structured interviews will be presented. The interviewees are individuals who possess high knowledge about the organization (SU), telemedicine, or both.

Presented below in Table 2 are the 19 barriers identified from the empirical findings. These have been categorized into seven sub-categories and three main categories. The 19 barriers are described further in this chapter under its subsequent title.

Category (3)	Sub-category (7)	Barriers (19)
Structural	Organization	Lack of resources Balancing innovation and producing healthcare Complex and unclear decision paths Insufficient innovation support Need for driven and motivated individuals Lack of information diffusion Complexity of broad implementation No clear innovation career path
	Standardization & Evidence	Lack of clear benefit and value Standardization and validation Lack of research evidence
	Processes & Routines	New ways of working Lack of clear innovation processes
	Teamwork & Collaboration	Lack of collaboration
Managerial	Management Support & Leadership	Lack of clear support and guidance Different visions and priorities
Individual & Cultural	Individual	Resistance to change Physicians' authority, autonomy & responsibility
	Culture	Insufficient innovation culture

Table 2. Summary of categorized barriers from the empirical data

4.1 Structural Barriers

The main category *Structural* is divided into four sub-categories; *Organization*, *Standardization & Evidence*, *Processes & Routines*, and *Teamwork & Collaboration*

4.1.1 Organization

The sub-category *Organization* is divided into eight barriers; *Lack of Resources*, *Balancing Innovation and producing Innovation*, *Complex and unclear Decision Paths*, *Insufficient Innovation Support*, *Need for Driven and Motivated Individuals*, *Lack of*

4.1.1.1 Lack of Resources

A lack of resources was identified by several respondents as a major barrier, in the form of time, healthcare staff, and funds. Many interviewees described lack of time as hindering innovation opportunities. One interviewee described it as *“The healthcare is overwhelmed by the main care responsibilities that are more urgent”*. Other respondents also described how healthcare workers generally have no spare time to work with innovation. This is further discussed under *Balancing Innovation and Producing Healthcare*.

One respondent described that although healthcare workers may not be opposed to using new technology, a lack of time can lead to the workers being stressed and therefore feeling that they cannot start using new technologies due to, for instance, the time it takes to understand and learn a new technology. Therefore, what can be thought of as resistance towards new technologies may in some cases not be because of unwillingness from the healthcare workers, but rather the issue of lack of time. A respondent raised an example regarding how healthcare workers are educated on new solutions. There is currently an approach where ‘super users’, a certain designated person in different departments, are educated first so that this individual then can share this knowledge throughout the department to act as an information carrier towards their colleagues. However, the respondent described how there are huge difficulties to find the time for the ‘super users’ to be educated, showcasing issues that lack of time brings.

To combat the issue of lack of time, one interviewee described how many of the digital solutions that actually provide large benefits can be quite easy solutions, and not so fancy. The interviewee raised an example of online check-in and how the implementation of that digital solution created more time for healthcare workers to work with patients instead of doing administrative work:

“These digital solutions are not getting so much attention, but they give a lot of effect”

Another respondent raised a similar point, how fundamental things outside of the healthcare production, such as scheduling of healthcare workers, also can have major effects. More efficient scheduling of healthcare workers has the potential to save huge amounts of time, while simultaneously possibly giving workers a better work-life balance. The current solution involves physicians having priority in scheduling, then nurses, and lastly assistant nurses. This means that scheduling is sub-optimized for the different roles. Changing this to instead optimize the scheduling across all roles can save huge amounts of time. However, the workers that now have priority, mainly physicians, lose this benefit of priority, leading to changes in the profession:

“This might redefine and almost municipalize the medical profession, similar to what happened to the teachers in the 1990s, which led to a devaluation of the occupation”

To be able to overcome the issue of lack of resources, one respondent described *“You must try and find ways around it. The closest manager might say no but there may be another department that is willing to pay for the time, or in some way find a solution. Then you might be able to work with it there”*.

A lack of resources was described as affecting the success of the development of a certain new digital technology. One example of this was suggested by an interviewee in that the implementation of the digital technology was successful in hospitals that put aside time for healthcare workers to be involved in the development. However, at another hospital, the department manager said that they do not have the resources to spare, which led to unsuccessful implementation. A possible reason for this was raised by the interviewee by describing that *“The person in charge could feel worried that healthcare workers would quit if more stress would be put on them through being part of a project in an already busy and stressful environment”*. Further, the interviewee stated that once the solution was developed, the hospitals that managed to set aside time for their employees each week to go through and plan how to work with the newly implemented solution. This led to the solution being integrated into the way they work, easing adoption. On the other hand, the healthcare workers at the other hospital did not have any time set aside, which led to the new solution being an add-on to their existing way of working, thereby not being implemented in a good way, leading to limited use. This was a major factor in the different success rates of the project in the different hospitals.

Another issue where lack of staff affected an innovation project negatively was described by one of the respondents *“All was going well in the project and there was a lot of commitment from the people involved, but due to some people involved quitting, partly because of high work burden, there was nobody to lead the project forward, so it sort of stopped. The new employees replacing the others then did not have the time to familiarize themselves with the project, as they were focused on the main care production”*.

A respondent described how innovation generally involves 80% change and development in the different functions, and 20% technology, but that Sahlgrenska University Hospital generally puts most of its resources on technology, as it is extremely difficult to find time for healthcare workers to join and work with changes and development. This is further highlighted by another respondent *“Even though I have lots of funds and can pay for healthcare workers, it is very difficult for me to find people in the organization that can be involved in projects due to an overall lack of staff”*. Another respondent also described issues when trying to find staff to be involved

in projects *“There are a lot of temporary solutions and rearranging of healthcare workers’ schedules that are not ideal, so it is a major problem that we have a lack of staff”*.

One of the interviewees described how an overall lack of funds is a huge problem regarding innovation projects *“I have been in meetings where it is discussed whether a new system should be implemented, however, due to the overall lack of funds, implementing this system would mean one less ambulance in the region, or that one department may have to close”*. Another example of an issue with the overall lack of funds suggested by the interviewee is that applications to the Innovation Platform, which provide monetary resources for innovation projects, get applications regarding pure operation development projects. Normally, this should be conducted within the individual function with its own budget but due to a lack of funds, project leads often need to find funds elsewhere. Another respondent described that one possible reason for why the digitalization rate is slow in healthcare is because the IT budget is low compared to other public agencies with similar characteristics, for instance, personnel-intensive.

4.1.1.2 Balancing Innovation and Producing Healthcare

A barrier that is highly related to lack of resources in the form of time and staff is *Balancing Innovation and Producing Healthcare*. Several respondents described how department managers are under pressure to meet production demands, stay within budget and handle budget cuts, and keep their staff, while at the same time trying to meet innovation goals. This is described by one of the interviewees *“A department manager who is behind on their production will be affected by this, creating difficulties and stopping innovation”*. Further, another respondent described how department managers are unlikely to approve innovation projects requiring resources if it affects the main care production negatively. A third respondent described *“Department managers need to put aside time for healthcare workers to work with different innovation initiatives, but these might not yield anything for several years, if at all. It is difficult to manage these types of urgent care needs and long-term goals”*. A fourth respondent also described that this dilemma affects how innovation is viewed within the organization *“A large majority of departments in healthcare are highly focused on production, compared to other types of industries, and I think there is an overall feeling that innovation does not fit within the current system”*.

One respondent described how there is a tradition within the organization to build and shape managers to focus on ensuring the daily operational duties, such as scheduling and staffing, rather than working with strategic development of the department. This is described by respondents as a natural structural aspect, due to care production being the main responsibility, but it creates issues regarding short-term and long-term aspects for department managers. Another respondent described that it is easy for department

managers to discontinue innovation projects to attain short-term monetary benefits, especially in the tough financial environment the healthcare sector is in.

A point raised by another respondent is that the importance of innovation seems to be different at different levels:

“I feel that higher up in the organization there is high awareness and a sense of importance regarding innovation, and that it is hugely important and quite urgent to work with. But the lower you get in the organization, and the closer you get to care production, the more remote these aspects become. When choosing between care production or working with a project that potentially might not lead to anything, it is very difficult for managers to allocate resources from care production to innovation”

This is further elaborated by another interviewee from the perspective of healthcare workers. With innovation projects potentially leading to fewer submitted patients later on in time, it may require more resources now. From a healthcare worker's perspective, this is not even a discussion because many are drowning in work already.

One respondent raised that to improve the situation regarding the dilemma between innovation and producing healthcare, the Innovation Platform plays a role *“The goal is that the Innovation Platform should reimburse departments for the time their healthcare workers are working with innovation, and free up resources in that way”*.

4.1.1.3 Complex and unclear Decision Paths

A barrier that several respondents raised are issues regarding decision paths in the organization. The respondents described how decision paths are generally long, involving several different levels and stakeholders. One respondent described how this is a major issue when trying to implement something broadly *“It is a huge process involving several committees, boards, and key stakeholders, and it can therefore take forever. Because of this, many projects stay local and do not spread”*. Another respondent highlighted that this is partly due to the size of the organization *“Sometimes it seems as though it is much easier to implement new technologies in other regions, for example, region Halland, and of course there is a natural explanation for this; region Halland is very small compared to region Västra Götaland, they have much shorter decision paths”*. Another respondent described:

“Sahlgrenska University Hospital is a giant colossus of an organization so when I was trying to get something through, I could speak to several people who have their own thoughts and feelings. Some are in favor and some are against, but in the end not that much happens. There is no clear path forward and therefore it instead revolves around knowing the right people”

Other respondents also highlight that there are many deciding stakeholders, both in the organization and regionally, that need to be anchored and give their thoughts. A respondent described how in some cases the people deciding may not have any experience nor knowledge on the subject, but still, these people have a large saying regarding the continuation of the project. The decision makers' own opinions and personal thoughts may also influence the decisions *"It does not matter how amazing we believe it works in our department, on a regional level they might have different opinions"*.

Something that several respondents also raised is how it is not always clear who owns the decision. As one respondent put it *"Organizationally it should be clear, but it is not, especially not when it comes to digitalization"*. Another respondent described how frustration arises because it can often be unclear who has the authority to make a decision, which is also influenced by that there are many different informal leaders. Another example is raised by the first respondent:

"Sometimes when you forward a question to get a decision on something, it can be like a wormhole where you eventually get the question asked back to yourself"

This was further explained by another respondent who described the complex decision paths and who actually owns the decision. When working with innovation in the public sector, there are many different logics and informal leaders. Looking at the 4C-logic, Cure, involving the physicians, Care, involving the nursing care, Control, involving the governing, and Community, involving the citizens. These are four different parties who all have different views and thoughts about what is important and what should be prioritized. The respondent made a comparison:

"This is not a private company we are talking about, where there is a clear hierarchy from a CEO and down. There are instead four different 'decision-makers' ... there is this complexity that you must consider when running a project. Where does the mandate come from?"

4.1.1.4 Insufficient Innovation Support

Regarding innovation support, the respondents often mentioned the Innovation Platform, which is a way innovators can get support in different ways, i.e., funding and coaching. However, some of the interviewees still described that the support for different innovation projects was insufficient. One interviewee felt that the coaching from the Innovation Platform was not that valuable in their case. Also, the interviewee described how there was not enough support from other places either *"I can run projects and these things but there are a lot of problems on the way, for instance with*

companies, legal matters, funds, a lot of different things surrounding it. I would like more support for these types of things so I can focus on what I feel I am good at [physician work]". The interviewee also described how there was a lot of positivity around an innovation project they were running, but that there still was no support for it. Different stakeholders thought the idea was good and cheered on, but did not help to make the project progress in any way. Another aspect regarding support for new ideas is suggested by the interviewee:

"In the beginning it was really tough because there was a huge amount of criticism, there was no positivity at all ... Many people have clever ideas and want to find new ways of doing things, which of course needs to be discussed, but it is very easy for people to negatively criticize and shut down an idea rather than seeing the positive aspects, which may come down to the overall innovation culture"

4.1.1.5 Need for Driven and Motivated Individuals

In order to drive innovation in public healthcare, you need to be, as described by many respondents, 'a driven enthusiast'. Due to the cramped environment with a lack of resources, many healthcare workers do not have the time to think about, nor work with, innovation during working hours, which means that they sometimes must do it in their own spare time. One interviewee described it as *"It takes a lot of commitment from a specific individual, who has to do, for example, an application to the Innovation Platform after working hours"*. Another respondent raised that due to a lot of criticism during the beginning of the innovation process, the innovator must be driven and motivated in order to overcome this and move forward.

Another respondent raised that it can be quite high requirements for applications to both the Innovation Platform and Vinnova (national support system for innovation). For Vinnova projects, people from outside the department need to be involved, which makes it more complex, and also difficult due to a lack of time. It therefore takes a lot of commitment from an individual to begin the process and innovate. Another example was raised by another respondent, in that if the closest manager says no to a project, it may still be other ways of progressing, for example through other departments. However, this requires a lot more from the innovator. A lot of responsibility is therefore on the individual, and if that individual is not a driven and motivated person, potential innovation may not happen.

It was also raised that because of no good systematic way for innovation, projects are highly dependent on certain individuals. One respondent described *"Our unit manager was a very driven and motivated person, with good connections, and started an innovation project that progressed smoothly. However, after some time, he left his*

position, which led to the project losing its momentum”. Another respondent described it as:

“We will probably never get away from the aspect of relying on driven individuals, but we are trying to systemize the innovation process to move away from this”

Another issue with the need for driven and motivated individuals is raised by another respondent. Sometimes a driven individual cannot be found in the departments, which makes change very difficult.

4.1.1.6 Lack of Information Diffusion

Many respondents raised the problem of spreading information across the region, due to the size of VGR, with around 50 000 employees. One respondent explained how information tends to get stuck around the vicinity of the location where it is discussed and is not diffused very far. Another interviewee explained how local projects had difficulties spreading to other hospitals, and therefore new, very similar projects might be initiated, ‘inventing the wheel again’:

“Many projects are initiated, but it is very difficult to know whether there is a similar project ongoing in another hospital or not ... I believe that we are doing a lot of double work, and missing collaboration opportunities”

Another respondent described *“It is very difficult to get a picture of who does what, and it is very obvious that many do the same thing or very similar things. Learning from each other or use other peoples solutions is therefore very difficult”*. Further, another respondent described how many applications to the Innovation Platform get rejected because the same, or a very similar solution, already exists, just that the applicants do not know about it. However, Koncernstab Digitalisering (KSD), which is a function handling digitalization within VGR by gathering digital functions in one place, are already trying to locate and capture different local projects, in order to share the information to other hospitals. By getting a better overview of what is going on in the region, double work and unnecessary projects could be removed or at least reduced.

Another aspect that several respondents raised is the issue of people in the organization being unaware of innovation processes and where to get support. As one respondent put it *“I would say we have clear processes but that is not something people in general have knowledge about”*. Other respondents described how many healthcare workers do not know that the Innovation Platform exists or what they can help with. One respondent described:

“It is very few healthcare workers out in the organization that know it exists. I had never heard about it until quite recently. I get surprised when I find healthcare workers in other departments that know about it, it does not happen that often”

The respondent described how this lack of knowledge regarding the Innovation Platform could be a barrier to innovation initiated by healthcare workers, because they generally do not know how to proceed nor how to get support. Even though the Innovation Platform makes efforts to spread knowledge about itself throughout the organization, the respondent described how it is still a problem because it is difficult to reach out and spread the information all the way.

It is also described how it can be difficult to know what kind of support you can get as an innovator *“I believe that out in the organization it is difficult to know what kind of support you can get, or even that you can get support at all. Instead, many go their own way, so it can be quite unclear”*. Another respondent described:

“I have needed to create my own picture of people and functions in the organization which are interested in these types of questions [innovation]. An example is Senslab, which I did not know existed previously. These types of ‘organizations’ within the organization are not well known, so even though I was interested in health data, I did not know Senslab was working with how to attain health data”

Several respondents have raised the issue of the lack of a forum for sharing information about past and ongoing innovation projects. The respondents suggest that such a platform could help disseminate information about innovation projects throughout the organization. One respondent described:

“I have requested some kind of forum for ideas and solutions, where innovation projects are gathered. In this way, you can easily find what has been done and maybe copy the solution for your specific department. An example is that I by coincidence found that another hospital had developed a solution that would fit our needs as well, so we are now in the process of attaining this solution from them. I did not find this through the organization but instead from an external social media”

Another respondent explained how a forum to share successful projects would be a good way of spreading positive thoughts about innovation, but also to inform healthcare workers of how the process actually works, with a hands-on example *“It would be great if people who actually ran a successful project could share their experience, both what went well, and what could have been done better, but also how the supporting functions worked”*. Several respondents also described how they believe that good examples need to be spread to give more attention to innovation efforts. A respondent described *“I*

think we need to see some good examples; ‘We worked in this way, which led to these great results’”.

4.1.1.7 Complexity of Broad Implementation

The interviewees have described how small projects, often in the form of so-called “pilots” or “pioneers” are relatively easy to start and implement. However, when trying to implement a digital technology on a broader scale, so-called broad implementation, the difficulty and complexity increase a lot. One interviewee described *“To make a broad implementation and actually integrate it into the daily work is a quite complex and difficult process. We have lots of departments and there are a lot of areas to cover, so I think a generic solution working for all of them is very difficult to accomplish in a good way ... To get a good process flow in all different departments, it needs to be highly configurable”*. Another issue with broad implementation is described by another interviewee where one unit might want a new technology, but the sister unit may not want it, which creates difficulties in the department, with different technologies and ways of working being present simultaneously. Broad implementation regionally across different hospitals is even more difficult:

“It is even more difficult implementing something regionally, because different hospitals work very differently ... Even though the same health record system is used, the hospitals use it in very different ways. Therefore, something that works at one hospital might not work in a good way at another hospital”

Another respondent described that when it comes to broad implementation, there are a lot of different deciding stakeholders that need to be involved, and that it therefore can take an extreme amount of time to get it approved and actually start implementing it.

One way of facilitating for easier broad implementation is to do the implementation gradually. This can be done by starting at one hospital and gradually extending it to the other hospitals in the region once it has been tested and evaluated. It is also important to coordinate the diffusion of a new technology. This can be done through collaboration between departments from different places in the region *“There are regional structures called Coordination Councils, where department managers from the same medical area gather for discussions and coordinate regional collaborations”*. Another aspect raised by another respondent is how ‘change leaders’ can be used as ambassadors for facilitating change in departments and be pioneers. The respondent continued *“When you then reach the broad implementation stage ... they [change leaders] can support the others in the department”*. However, the respondent described how the organization should work more with this to better support broad implementations of new technologies.

4.1.1.8 No clear Innovation Career Path

At Sahlgrenska University Hospital, there is a Resident Program called ST Innovation & Teknik for physicians with a focus on innovation, where 20% of the physicians' time is put aside for working with innovation. Due to this split focus, with less time spent on pure medical aspects, the residency is prolonged with the equivalent time spent on innovation. Physicians who take part in this program will therefore become a specialized physician later in time compared to physicians who go the traditional resident track. Several respondents view this program as a great initiative to integrate innovation into the organization. However, there is still no clear innovation career path after the residency. As one respondent described:

“There is no clear career path after this residency program ... It is not easy for me to understand how I could continue to work with this [innovation], if I would even be able to work with it at all”

The respondent described how the lack of a clear career path may affect the number of applicants to this program, as there is a “ ... *surprisingly low interest and not many applicants per spot, even though Sahlgrenska University Hospital is very big.*”. Further, some respondents compare it to research, which has a clear career path “*We have not reached a point where there is a clear career path working with innovation in the same way that healthcare workers can get a doctorate*”. Another respondent continued “*Within research, there is an established path for a clinical career, where it is clear what happens, and there are many examples of physicians doing this*”. Several respondents described how a clearer career path for innovation would lead to more enthusiasm regarding innovation and make it a more attractive area, thereby accelerating digitalization in the organization.

A respondent described that the organization obviously wants to make use of the innovation knowledge and experience that physicians who have completed the ST Innovation & Teknik program have acquired. However, it is up to the individual department managers to allocate their limited resources and actually make it happen. So the respondent described how it is largely a question for the individual manager, where time has to be put aside for this type of work.

4.1.2 Standardization & Evidence

The sub-category *Standardization & Evidence* is divided into three barriers; *Lack of clear Benefit and Value*, *Standardization and Validation*, and *Lack of Research Evidence*.

4.1.2.1 Lack of clear Benefit and Value

One interviewee described how when pushing out something new it is of great importance to highlight the actual value it would give to the specific departments. Otherwise, it may be difficult for healthcare workers to understand why it is even implemented and therefore they may not adopt it and use it. The interviewee described:

“I think we can be better at describing and talking about it [new digital technologies] in another way. Instead of describing it as a system we should describe the actual benefits and value it creates for the healthcare workers”

Another respondent continued to describe how some departments may not understand the value of digitalization and using new technologies, and may see it as them doing it for someone else and not for their own benefit. Because working with innovation could burden their staff, while having the experience of no added value, it can be seen as a waste of time.

Another aspect raised by the interviewee was that projects could in many cases be evaluated in a better way after completion, because this is done to a various degree currently. More could be done to evaluate how much value a new technology added to the healthcare production in saved time, resources, etc. The interviewee described how this could showcase the benefits and value better to employees, and therefore influence future projects positively. Another interviewee elaborated on this and raised the importance of following up after an implementation of telemedicine, to highlight and document the results it has produced. The interviewee continued by stating that it is important to have the right people doing the evaluation, and that they need to have both statistical knowledge, but also have a medical perspective, in order to interpret and analyze the data in a good way. However, there is generally a lack of people with this skill set, making it difficult to do a proper follow-up, leading to less or poorer shown value.

Some interviewees also raised that there may not be enough benefits and value of telemedicine to get a widespread implementation of the technology. One interviewee argued that there needs to be a strong connection between the need for the technology and the value it provides, to ease the adoption. For telemedicine, the interviewee described how this generally might not be strong enough *“But apparently, the incentive for both the patients as well as the healthcare is not large enough for it to naturally spread”*. However, another interviewee described how telemedicine have the potential to give huge benefits and value in some cases:

“For instance, in the case of green cataract there is a huge need [for hospital visits] and we are behind every year. If we were to get a part of these patients self-monitored instead, we would get a huge gain in the care production”

One interviewee described how a telemedicine technology was rejected by the physicians at a department, but that one nurse with the backing of the manager and

organization started using the technology. The interviewee continued to explain how then all the nurses started using this, and after a while, the physicians also became interested, after the value was shown *“It takes a certain someone with a lot of knowledge and mandate, in order to show the benefits and value to other healthcare workers, in order to push it into the daily operations”*.

Further, one interviewee gave an example of how some telemedicine solutions easily show benefits:

“Instead of keeping an eye on the patients’ values [medical data] at the hospital, they can instead be sent home to monitor themselves. Here you can clearly see the value, because if you discharge a patient, you see an empty bed”

However, regarding citizen-initiated remote monitoring, the interviewee described how patients not being admitted at the hospital from the beginning, the clear value with the ‘empty bed’ is not present, and therefore the value is more abstract and difficult to show. The interviewee described how this may affect the adoption of citizen-initiated remote monitoring negatively.

4.1.2.2 Standardization and Validation

For telemedicine, tools that in different ways monitor patient data remotely are needed. An issue raised by some respondents is the need to validate these tools *“It is a challenge regarding how to validate these tools and trust the data, to be able to use it for medical decisions for the patients”*. The respondent further described how there needs to be a standardized process for this, and also how patient data is acquired. The respondents give an example of the problem:

“In the case of measuring blood pressure, how do we validate this? How do we know that the patients are doing it correctly? For example, did the patient rest before taking the blood pressure? There are so many different aspects to consider”

The respondent further stated that physicians need to be able to trust the data they are given, in order to give accurate medical advice. In other words, there needs to be standardized ways and easy descriptions, so that the measurement made by the patient is accurate. Another respondent raised another issue regarding errors with tools and validation of patient data, especially when conducting it at a large scale with citizens monitoring themselves *“There is a statistical difficulty around this. All the tools have some margin of error, leading to false positives ... The consequence of this can lead to displacement of patients with actual issues, and waste of resources”*. Another respondent described how there is a dilemma, on one hand, citizens could find medical

issues otherwise missed, but on the other hand, more false positives would presumably arise, wasting already scarce resources.

4.1.2.3 Lack of Research Evidence

Several respondents described that a lack of research evidence is a barrier to adoption of new digital technologies. One respondent described:

“It is often discussed in healthcare that it needs to be based on evidence, which we often come across ... A new technology with a new way of working should be clinically proven in research, showing that it is smarter to use than something else. This can be pushed to the point of absurdity”

The respondent continued to describe how even if common sense says that the new technology is better, there may be opposition due to no research evidence. The respondent described how this potentially can be something healthcare workers can fall back on and blame if they do not want to use new technologies for some reason.

Several respondents described that a lack of research evidence is especially a problem regarding telemedicine, because there is overall very little research evidence due to difficulties generating it. One respondent described how there is currently an ongoing mapping of research evidence on telemedicine, which concludes that there is not really much evidence existing currently. Many studies are too small or have different errors. Another respondent described that while some research evidence exists regarding telemedicine, which shows how the technology is likely to free up time and resources, there are still a lot of hypotheses and uncertainties. Another aspect raised is the fact that technological development is moving fast. At the same time, creating evidence takes a lot of time, which leads to research evidence generally lagging behind. Further, another interviewee described how this is an issue regarding telemedicine:

“Wearables can collect huge amounts of different data, but it is very little that we know have any value at all ... What does this pulse variation mean, or your VO2 Max [maximal oxygen consumption], or a potential atrial fibrillation?”

Another respondent elaborated on this *“We need to know what to do in different instances. If we do not have research evidence and guidelines, we do not know how to act in different instances, so I think it revolves around clinical praxis”*. An additional respondent explained this further and described that if there is no evidence about the process or technology working, healthcare workers will be less likely to use it. The interviewee raised some questions *“What is the value? Will it only be an add-on? Can we find patients earlier so that they will not have to be admitted later when they are worse? Will this make us more efficient and speed up our daily work?”*. The respondent

continued *“We need more evidence, we need to have more information about how this works”*.

4.1.3 Processes & Routines

The sub-category *Processes & Routines* is divided into two barriers; *New ways of Working*, and *Lack of clear Innovation Processes*.

4.1.3.1 New ways of Working

The majority of the respondents raised that new ways of working, which new digital technologies often bring, is a barrier to adoption. One respondent described *“If someone comes up with a new way of working, it will clinch with the current way of doing it, both in terms of tradition but also what current guidelines say”*. Many respondents describe how we as humans are habitual people that generally do not like changes, but several also raised issues that apply more specifically to healthcare. One respondent described *“We see that the technologies and systems that have been implemented do not always have a user pattern that reflects how we work within healthcare, this is quite a large challenge”*. Another respondent described how generally there is a large scepticism against new ways of working within healthcare. If healthcare workers are used to working in a certain way that they think works well, they tend to be quite negative towards a new solution, disregarding any positive aspects of it. An example is described, where products used in telemedicine to monitor patients at home met resistance. These products had a larger variation compared to the equipment and tools in the hospital, but even though they still work very well for many patients, they might not work for every single one. The respondent described how it is then easy to get hung up on this small number of patients where it does not work and therefore disregard the entire solution. The respondent continued and described how this can be due to the basic reason *“When you are working in a certain way and see that it is working well and you are satisfied with it, then you do not want to change it”*.

Another aspect an interviewee raised was that healthcare workers may not feel safe with new technology if they are not quite sure how it works *“If you as a healthcare worker are feeling a bit unsure of how to use the technology, or feel that you cannot really trust the technology, you will not use it”*. The interviewee continued and described that this ‘problem’ arises due to the healthcare workers wanting to give the best possible care to the best of their extent, and do not want to risk any mistakes affecting the patients’ treatment negatively.

According to an interviewee, many digital solutions, especially telemedicine, are fostering fewer physical meetings between patients and healthcare workers. This creates a big change in how physicians work, which has always been physically close to the patients. The interviewee continued by stating how most healthcare workers want

to meet their patients, due to many factors, for example, they want to actually see the patient in front of them in order to give them the best treatment, they are social and want the interaction, and a possible factor is that they want the confirmation and praise from the patient. All of these factors increases the barriers to move towards more digital solutions, as the healthcare workers doing the work want to see the patients physically.

One respondent described how there are two main aspects of healthcare. The first is that it should be patient-centered, meaning care should be formed after patients' needs. The second is that the healthcare should be standardized, and work should be conducted in the same way independent of healthcare worker, location, etc. The respondent described:

"I think these two aspects are slight opposites, at least in how we work today, so I think it will be an obvious problem we will face ... I think how it is designed today is quite rigid. It is not resource efficient in my opinion. It creates a least standard which is good, but there is no consideration of new aspects that could give better value ... I think these rigid structures prevent innovative thinking, while at the same time, the purpose of it is to maintain quality to avoid doing worse"

The respondent continued and raised an example of physical visit schedules for specific diseases. The standard guideline might say that patients need to visit the hospital every three months, but this might not fit for everyone, so some patients might need to come every month for example. The respondent described how this could be difficult because *"This is not how it should be done according to the guideline"*. Further, it then requires a deviation from praxis, which can be a barrier. It can also be a barrier toward even thinking of new ways of working. The respondent concluded *"If it is stipulated how to work, this prevents working in another way, independent of if the new way is better or worse"*.

One interviewee raised an example of a telemedicine solution, which worked great and was an upgrade to how they used to do it before. The solution made the healthcare workers do the work faster, which saved them time, however, at a point when it got more stressful at the hospitals, the healthcare workers fell back into old habits:

"During a stressful phase [at the hospital], the healthcare workers fell back into their old habits and routines, even though the new digital technology was better"

The same interviewee stated that it is only natural for humans to fall into old habits, but that organizations within healthcare need to be better at removing and closing down the option to use the old solutions, forcing the healthcare workers to adopt the new digital technology. However, another interviewee builds further upon the idea of closing down and removing old solutions, and raised a problem regarding this *"It is difficult to*

remove a way of working that has been done in a very manual way, 'nobody will see if I go sit in my room and do it the old way', meaning that it is up to every healthcare worker to change".

Another aspect raised by one respondent is regarding evidence for how to work *"In healthcare, a lot revolves around evidence. My feeling is that many people demand evidence for new ways of working even if there is no evidence for the way work is being done at the moment"*. The respondent raised an example of how patients in their department come for physical visits when their prescriptions run out after twelve months. There is no evidence supporting this schedule and it has rather been established over time from convenience. The respondent described that if instead potentially moving from this schedule to a more on-demand structure, many people demand evidence that this would be better, which likely would take many years of research. The respondent concluded *"So I think this is an aspect that is holding back a bit, that people are afraid that it would be worse than it is right now, even if you do not really know how good that is"*.

4.1.3.2 Lack of clear Innovation Processes

Some respondents described how there are no general processes regarding innovation for innovators to follow. One respondent described how many innovation projects instead are driven by individuals going their own way. Another respondent elaborated on this and described how there often is no pre-determined path for innovators to follow, which makes innovation more difficult. A third respondent described how there is no clear structure and that it is unknown where to turn as an innovator. A fourth respondent described how it is more about getting to know the right people to be able to move forward with innovation projects.

Even though some respondents stated that there are generally no clear innovation processes, another respondent raised that *"There is a clear process to innovate, but this is not something the majority of healthcare workers know about"*. However, the interviewee described how there can be differences between big projects and small project *"When talking about big projects, it is more clear what the processes are, but when looking from the perspective of a small project, it is often more individually driven, with no clear paths"*. Another respondent described how the innovation Platform provides support along the innovation process, including defined steps from start to broad implementation.

4.1.4 Teamwork & Collaboration

The sub-category *Teamwork & Collaboration* consists of one barrier; *Lack of Collaboration*.

4.1.4.1 Lack of Collaboration

Many respondents described how important collaboration and communication are between developers and healthcare workers when developing a new technology or solution. One respondent described how there generally in healthcare is very little collaboration between healthcare workers and developers. Even though there are some driven healthcare workers that are collaborating with developers, the vast majority do not. The interviewee raised that there is a problem with it being too divided between developers and healthcare workers, and that it is too little contact between them. Further, the interviewee described how there are no arenas to meet and collaborate with developers naturally. It is instead more isolated and collaboration generally only occurs when it has been planned for in projects etc. The interviewee also raised that if the collaboration is not good between the people who will use the technology in their work and the developers, it is more likely that the way of using it will not fit with the current culture or way they work. Another respondent described how it is crucial to understand the different departments' operations to be able to deliver a solution that fits their individual needs. The respondent described how healthcare workers must be involved in the development and that otherwise the results are often not great:

“If healthcare workers from the departments are not involved in the development, we are developing on a whim, and it is very rare that we succeed with that”

The respondent continued and described how healthcare workers still may not always be involved for different reasons. It could be a lack of resources or that corners are being cut. A standard solution could then be developed instead, which has not been adapted to specific departments or their way of working, therefore leading to a bad solution that healthcare workers do not want to use. Another respondent also described *“There are times when the development has not been done in close collaboration with the users, and then it usually shows afterward that processes and work flows do not match with the way users work, or in the way we had wished”*.

Another aspect raised by one respondent described as affecting innovation projects negatively, is that healthcare workers sometimes do not participate in the development to the same degree as planned, due to for instance a lack of time, or that it is underestimated by project leads or department managers how much healthcare workers actually need to participate in the development.

One example an interviewee raised that highlights the importance of collaboration and allowing for it, is the failure and success of a new technology in two different hospitals. The interviewee explained how in one hospital, healthcare workers were a part of the development and gave their input. In that hospital, the solution was implemented more smoothly and fit into the way they worked. While at the other hospital, the collaboration

was not there, which led to that the solution did not fit, thereby hindering the implementation.

Interviewees also raised problems with improving functionality within existing solutions, which makes the adoption and implementation of technology more difficult. One interviewee explained that, when a solution has recently been pushed out, it might not have the best function, and it is therefore vital to listen to feedback from the end-users to improve it. However, the distance from the end-users to the people in charge of the solution can be long. It is described that many solutions are procured from external parties, and that end-users have to bring up feedback to their project lead, who in turn speak to Koncernstab Digitalisering, who in turn speak to the supplier in order to give the end-users' feedback to developers. The end-users' feedback therefore gets filtered through several instances, which can skew the feedback, leading to the changes or improvements not being what the end-user actually wanted. This makes it less likely for people to address their concerns and feedback, leading to less collaboration and tougher implementation.

4.2 Managerial Barriers

The main category *Managerial* consists of one sub-category; *Management Support & Leadership*.

4.2.1 Management Support & Leadership

The sub-category *Management Support & Leadership* is divided into two barriers; *Lack of clear Support and Guidance*, and *Different Visions and Priorities*.

4.2.1.1 Lack of clear Support and Guidance

Several respondents described a lack of clear support and guidance from managers as a barrier. One respondent described how there have been issues in innovation projects due to a lack of management support *"We have had examples of projects where they had received quite a lot of funding and where department managers stood behind it, but when it was close to implementation, this support from the department managers was no longer there"*. Another respondent described how it is crucial that the manager guides and shows clear visions of how they should move forward with innovation projects *"I believe that it is a question for the managers. If the manager put up the right demands ... not only in words but also in actions, showing that they support this"*. An example of how important this is was raised by another respondent, who described how during a project the department manager told the innovator that he/she would give all necessary support *"I have a very good manager right now and if something goes wrong, I know that he/she will back me up and stand behind me. With the manager backing me,*

I get a lot of free room to innovate ... But it is built on mutual trust". According to the interviewee, this support was priceless.

Another aspect that several respondents described was in what way department managers support or do not support decisions from higher up in the organization. One respondent described:

"Historically we have not been that great at working with innovation and working at that pace. I feel that it is so very easy to say no and not have to implement something, even if the hospital board say that it should be done. There are always both department managers and other individuals that still can choose to go another way. It is as though people do not follow the hierarchy in the same way as in a private organization"

Another respondent continued and described how even though goals are set by the hospital board, for instance, a certain percentage of digital patient meetings, some departments do not take part in this at all, because the department manager can feel that it does not fit for them, which other respondents described as well. Also, if the department manager instead supports the goal, sometimes the physicians do not. The respondent described *"The department managers argue, 'We cannot decide how the physicians work, it must be up to them' and then they do not support or apply the goal to their department"*.

One respondent described how there is often a strong local autonomy in healthcare, which makes change more difficult. However, with clear support and guidance, the respondent believes that this could help overcome this strong autonomy, thereby supporting change. Another respondent raised an example regarding the implementation of digital patient meetings. For one of the departments where the implementation had worked great, it was clear that the manager had been very supportive of the technology and adamant that everyone must try it and then use it regularly. In this way, the department reached a high rate of digital patient meetings. In other departments the success was not as good, with one reason for this being described by the respondent *"We have some managers that say, 'I cannot decide what methods healthcare workers use'"*.

Another respondent described how support from the department manager is crucial for innovation driven by healthcare workers to take place. The department manager must set aside time for healthcare workers to work with innovation, and also approve of projects. The respondent also described that it is vital for department managers to have innovation high on the agenda, but that this might not be the case at the moment in many departments. The respondent continued *"If it is something we know, it is that the manager is the largest enabler, but also the largest barrier for this type of work [innovation]"*. However, not being clear as a manager and not giving the necessary support for innovation can be explained by what one interviewee described *"You back*

away from innovation because you do not want to risk the entire department going under". The respondent referred this back to a lack of resources, and that department managers have a main objective of providing care.

4.2.1.2 Different Visions and Priorities

Several interviewees raised that there are issues regarding differences in managers' visions and priorities. Many interviewees highlighted that the success of implementing digital technologies is highly dependent on the manager's vision and curiosity. One interviewee explained how some departments are very far ahead regarding digitalization due to their manager's positive vision and beliefs in digital technologies. The interviewee also raised the opposite example, that if the manager is less curious or not so interested in digital technology, this will hinder innovation within that department *"The department manager has a lot of room to form the department in the way he or she wants, meaning that it is of great importance to have the right manager"*. Another interviewee built on this further and described how managers who are not that interested in technology, will not prioritize technology on their agenda.

With the great importance of the managers' vision and priorities, another problem arises which one interviewee explained:

"One of our largest challenges within healthcare is changes in management. Department managers have a large mandate over what is done in their department. If there then is a change of management, with the new manager opposing the ideas of the old manager, there is nothing saying the new manager must continue what the old manager did. This can be a huge frustration ... If a project is running and there is a new manager that does not believe in it, they can say 'We should not do this, do not use your time for this, it does not sound safe, shut it down', and then you might have put years of time on something the new management does not support"

Another respondent raised an example where a project was running, but after a change of management, the support for the project was no longer there due to other priorities from the department manager. The respondent described how therefore changes in management can have large effects on innovation projects' success. It is described how it is a huge problem that there is no real structure regarding support for current innovation projects after changes in management. Instead, it is in many cases highly dependent on the visions and priorities of one individual. The respondent raised a way of overcoming this issue, by setting up agreements for projects. For instance, that a certain amount of resources should be allocated to a project over a certain period of time, independent of who the manager is. In this way, a new manager cannot shut down a project in the same way. However, the respondent also raised how this can have negative effects. These kinds of agreements might make it more difficult to attract new

managers because they would have less influence over the operation and future of the department. More is being inherited from the previous manager, which is not always wanted. Due to this, a present manager might not want to set up these agreements because it would affect the next manager.

4.3 Individual & Cultural Barriers

The main category *Individual & Cultural* is divided into two sub-categories; *Individual* and *Culture*.

4.3.1 Individual

The sub-category *Individual* is divided into two barriers; *Resistance to Change*, and *Physicians' Authority, Autonomy & Responsibility*.

4.3.1.1 Resistance to Change

Many other barriers raised in the *Empirical Findings* can lead to resistance to change, which is only natural since many of the barriers create some resistance for people to change. However, in this section, aspects with high relevance to resistance to change will be raised.

One respondent described an example of a technology being implemented that was missing crucial functionality that the previous solution had. This led to users experiencing the new technology as inadequate and there was resistance towards it. The implementation was therefore challenging and the respondent described how new solutions not having the same standard as the old solution is a major bump in the digitalization journey. Another respondent also described that many solutions are not very user-friendly, which also influences the resistance towards new technologies negatively, which leads to healthcare workers feeling that they are doing unnecessary work that could have been solved by a more user-friendly design. The first respondent raised that often, users can be satisfied with a very simplified solution with less focus on design etc, and that one idea is that some systems can be developed in-house, to allow for more flexibility. The respondent raised that this has been done with some systems before, but however that these developing resources are scarce because it is not the main approach right now, because systems are often procured instead.

Some respondents described how there could generally be negative experiences towards new solutions due to previous solutions not working in a good way, sometimes even obstructing work. One respondent described “*A solution may look good when sitting around the table, but the end user may not have been involved and had their say*”. This experience of previous bad solutions influences individuals' trust negatively, creating more resistance to change. Another respondent described how healthcare

workers have experienced different cyclical trends which have come and gone over the years. A new solution may therefore be viewed as a new trend that will pass over time, thereby increasing resistance to change and the unwillingness to adopt it.

Another aspect raised is regarding goals set for the entire hospital. An example is the goal of a certain percentage of digital patient meetings. The respondent described *“When we are talking to the departments out in the organization, some describe how they cannot reach this because they might not have patient groups that match what is needed for a digital meeting”*. The respondent described how a lack of confidence for the decision-makers can arise because the goals are not adapted to the different departments or operations. The respondent described *“You might not understand why these goals have been set, and they might not even be related to any evidence, so it can feel as though they are plucked out of thin air”*. The respondent described how the organization should work closer to the departments and end-users in these types of questions, to build trust in order to reduce the resistance from healthcare workers.

One respondent raised how there can be large resistance toward citizen-initiated remote monitoring in the organization. The respondent described how managers can view it as outside the healthcare’s responsibility, because individuals may not have a diagnosis or medical issue, but rather be healthy individuals that want to monitor themselves. This can raise a feeling that a solution like this would lead to a vast amount of nervous individuals crowding the already under-resourced healthcare, often unnecessarily. The respondent also raised that physicians may also oppose this type of citizen-initiated remote monitoring *“I feel that there is a strong sense of ‘We [physicians] want to ordinate individuals when to do this [monitor themselves], we do not want individuals coming up with it on their own’”*.

Another aspect described by one respondent was how physicians can have an old prestige mentality, described as a “patriarchal structure”, which originates from the traditional view of the profession. Also, because many physicians have worked in the organization for a long time, they are used to a certain way. These aspects create increased resistance to change. However, the respondent explained how this could be reduced over time, since the same mentality does not exist to the same degree amongst the younger, newly examined physicians. Also, they are not used to certain ways of working, which makes it easier for them to adapt to new technologies and ways of working.

One respondent explained how there is always resistance to change when implementing a new way of working or a new technology that takes time to learn. The interviewee states that it is only natural to not want to change, and that in healthcare, it is even tougher due to the lack of time and stress in the working environment. The respondent described *“The organization is under a lot of pressure, it is difficult to make time and still be able to finish other tasks. If you are to learn something new at a time like this, without knowing that the result will give a very positive effect to the department, then*

it will be difficult to change as an individual". The interviewee questions whether everyone in the department should learn the new technology, or that only a few selected should focus on this initially, in order to make a smoother transition and implementation.

4.3.1.2 Physicians' Authority, Autonomy & Responsibility

Many respondents described how physicians as a profession have large influence and authority, and that this can pose as a barrier. One respondent described that hospitals are not only led by managers but that physicians are a strong group as well. This complicates things compared to traditional organizations. Several respondents described that physicians can oppose new digital technologies for different reasons, for instance, a lack of research evidence or general unwillingness. One respondent described that physicians are responsible for the decisions they make regarding patients, and that the system is structured around this with licenses to practice. This naturally gives physicians a large say in their work. Due to physicians being responsible for patients, they decide to a large extent what methods and technologies to use. One respondent described *"Someone not being a physician cannot say to a physician how to work, they cannot interfere with that"*.

Another respondent elaborated further on this and stated that physicians can lose their license to practice if mistakes were to happen. Therefore, physicians might be a bit hesitant to try new technologies, and therefore use their authority to say no. One respondent raised an example *"There are many algorithms that have been proven to be just as good as physicians, but they are not used, because whose fault would it be and where should the responsibility lay if something goes wrong?"*. The interviewee continued by describing that it is things like this that slow down the innovation rate in the healthcare sector.

Several respondents described how physicians, as part of their profession, also have high power and autonomy. They are used to being able to decide how to do their work. A few respondents raised that implementation of new technologies can change the power and autonomy possessed by physicians. In the example of telemedicine, a new solution can lead to power moving away from the physicians towards the patients, at least that is how physicians can experience it. If power would move toward the patient with the use of telemedicine, giving physicians a feeling of losing power, resistance is likely to arise. One respondent described *"You do not want to lose this power or feel that that you are being undermined"*. However, this may be overcome by keeping this in mind when developing a new solution, as one respondent described:

"Technology should be developed to support physicians' autonomy and decision making, instead of creating more work or removing the physician from the decision-making processes. This is not a technical question but rather a

question of design of how to develop the solution ... I believe that this is an important factor for successful implementation”

4.3.2 Culture

The sub-category *Culture* consists of one barrier; *Insufficient Innovation Culture*.

4.3.2.1 Insufficient Innovation Culture

Some respondents described that the innovation culture within the organization can be insufficient. One respondent described how healthcare still has quite a conservative culture even if this has started to change. Managers higher up in the organization generally have innovation high on the agenda but the issue is rather how to spread this view throughout the organization. The respondent described how one reason for this is that the main focus is on producing care and that there is an overall lack of resources. The respondent described how there is a sense that innovation therefore does not fit. Many respondents described that there are initiatives aimed at improving the innovation culture within the organization, for instance, the ST Innovation & Teknik program and a new similar program aimed at other healthcare workers, but that these are still small with limited reach. Another respondent raised that innovations within healthcare have traditionally originated from the healthcare itself and not from patient needs. This approach has shown to not be that productive and it has not led to a great amount of innovation efforts. The respondent instead described how the thinking should change to be more patient-centric “*What the patients will see as valuable will give us [the healthcare] value as well*”.

Another aspect one respondent raised was a clash in cultures. The interviewee explained how physicians are trained to never make mistakes, because mistakes can have huge consequences for patients. This makes physicians very focused on doing things right the first time. On the other hand, the interviewee also described how with innovation it can be desirable to ‘fail fast’, to dare make mistakes and learn from them, to be able to progress.

An example of how the innovation culture can still be insufficient was described by a few respondents in the reoccurring feeling that innovators that were described as energetic, driven, and grass-rooted, had to ‘fight the system’, and that they were faced with bureaucracy, showcasing a feeling of ‘us vs them’. Another interviewee described about how very innovative companies have a lot of space for innovation in their work, they have planned for it and set aside time. However, looking at healthcare, the environment is much tougher and is already pushed to its limits. People are working double shifts, meaning there is no time to take a step back to reflect and think, which is important when working with innovation. All this makes it tougher for people to think about innovation. The interviewee continued by describing that even though it is tough,

it is not impossible to change the environment. Another respondent continued and described how the innovative culture could be changed, and raised the residency ST Innovation & Teknik. The interviewee explained how when introducing more and more people to innovation, the more it will spread. In the beginning, there will only be a few people with this way of thinking, but after some time, a critical mass will be reached, which likely will change the environment. The interviewee also described innovation education within the hospital and mentioned how other professions than physicians will have the opportunity to be educated on innovation, to further improve the innovation culture within the organization.

5. Discussion

In this chapter, the discussion in which the empirical findings are put in relation to the academic literature is presented. The public healthcare is a complex system where barriers seldom exist in isolation, but rather coexist and affect one another. Throughout this chapter, it is raised how several of the barriers interrelate and influence each other in different ways. This is visualized in Figure 1.

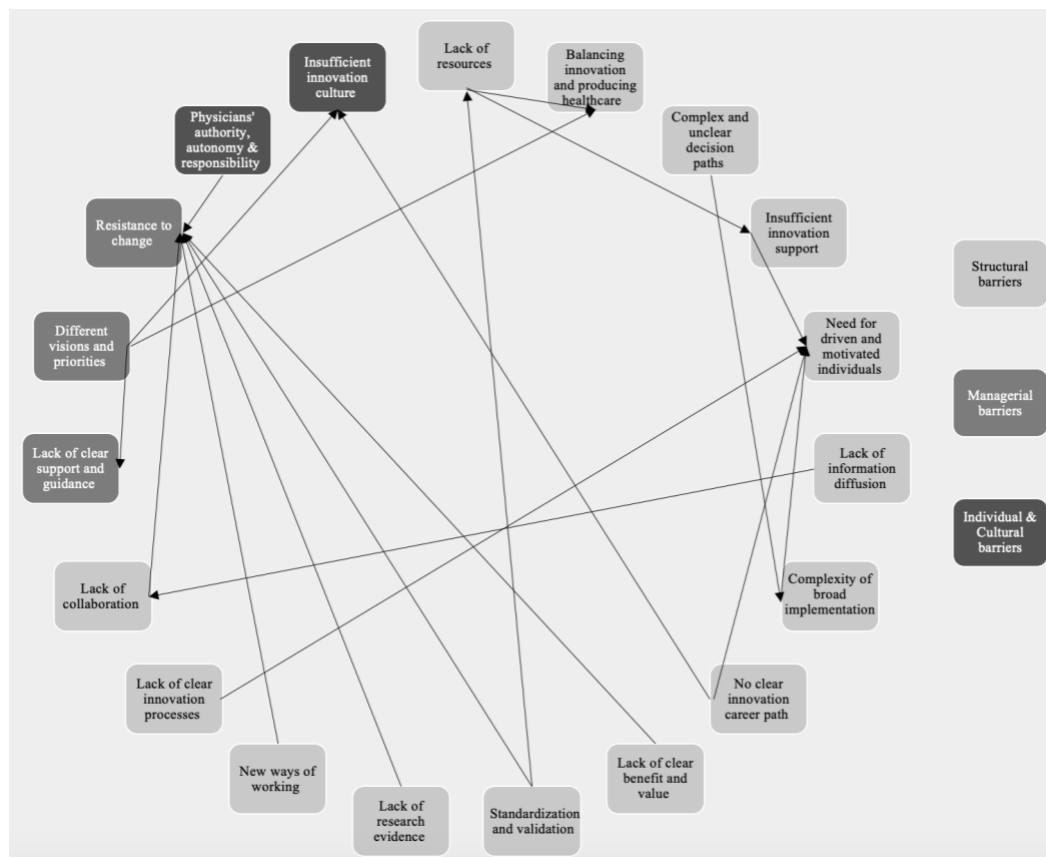


Figure 1. Visualization of barrier interrelations

5.1 The Innovation Culture is Hampered by Insufficient Innovation Career Opportunities

The empirical findings show that the organization is working to create a better, more innovative culture by introducing, for example, ST Innovation & Teknik, and is soon to implement an innovation program for other occupations than physicians in healthcare as well. However, the lack of a clear career path after one has gone through the ST Innovation & Teknik program may lead to resistance to apply to the residency, since this program prolongs the time to completion without any clear reward, except improved knowledge regarding innovation. Also, in the empirical findings, it is raised that higher management have a goal and vision to make use of the improved innovation knowledge of individuals that have completed the ST Innovation & Teknik program.

However, as of now, it is up to the individual department managers to do so. Bidmead and McShane (2021) states how it is important to have a structured approach where all levels of management are aligned, and support is present throughout the whole organization. However, the current unstructured approach indicates that there may be large differences throughout the organization regarding how these resources will be used. The value of the ST Innovation & Teknik program may therefore not be captured to the full extent.

Also, even though this initiative has been created, the success of improving the innovation culture throughout the organization may be limited since there is no clear career path after it. This also implies that currently, mainly individuals with a very high interest in innovation may be willing to choose this ST program. Creating a more natural innovation career path to follow after the residency could increase the interest in the ST Innovation & Teknik program and also innovation overall, thereby spreading the interest in innovation better throughout the organization and improving the innovation culture. A more clear career path within the field of innovation may also raise the interest of individuals that are not currently very interested in innovation, therefore positively affecting the innovation culture to a larger extent, compared to people that are already very interested in innovation.

5.2 The Positive Effects of the Innovation Platform may not be Captured to the Full Extent

Even though there are initiatives for overcoming some of the barriers to adoption, some issues are still apparent. For innovation projects that are run in collaboration with the Innovation Platform, the healthcare department involved can be monetarily compensated. The department is therefore not affected negatively in monetary terms regarding the innovation project. However, from the empirical findings it was raised that lack of staff is a barrier, and that it is difficult for departments to set aside time for healthcare workers to be involved in innovation projects, as they are needed in the daily operation. This indicates that even though the Innovation Platform can support innovation projects monetarily, there may not be enough healthcare workers that are able to take part in innovation projects. This may therefore limit the positive effects of this monetary support.

Another aspect that was raised in the empirical findings is how there are clear innovation processes when running a project in collaboration with the Innovation Platform. However, the requirements for running an innovation project in collaboration with the Innovation Platform can be quite high, regarding the potential value of a broad implementation, degree of innovation etc. Therefore, many projects do not qualify for support from the Innovation Platform. It was raised by several respondents that apart from when running a project with the Innovation Platform, there are no clear innovation processes. Therefore, for many projects, the way forward needs to be found by the

individual or individuals innovating. This implies that there are difficulties running innovation projects outside of the Innovation Platform and that barriers for innovators can be quite large, and therefore affect these innovation projects negatively.

Further, this also highlights that there is a need for driven and motivated individuals, which was raised in the empirical findings. To proceed with innovation projects even though there are unclear innovation processes, innovators must be driven and motivated to find a path forward. Further, the insufficient innovation support also strengthens this, since an innovator must work through negativity and criticism. This indicates that when the innovator is not very driven and motivated, innovation projects may be aborted or not started at all, since there is no clear path to follow and that the support is insufficient. It can therefore pose as a structural issue that the organization should be aware of and try to work away from, to instead create an environment where less dependency lay on individuals.

5.3 Healthcare Workers must be Supported regarding New ways of Working

An aspect from the empirical findings is that digital technologies, especially telemedicine, is changing how physicians and patient interact, i.e., a new way of working. Physicians have traditionally met patients face-to-face, but digital technologies and telemedicine leads to a shift towards fewer physical meetings. This is a challenge because, as the empirical findings show, many healthcare workers prefer to meet patients face-to-face. This is in line with what Mohammadzadeh & Safdari (2014) describe regarding how a decrease in face-to-face communication between physicians and patients acts as a barrier to the adoption of telemedicine. Further, it is also in line with the views of Kruse et al. (2018), which describe how telemedicine is not seen as personal care due to less personal communication. To address these challenges and bridge this gap, the organization could incorporate personal communication into new digital solutions, support healthcare workers in adapting to a new way of interacting, and highlight the value that digital solutions bring to improve patient care.

An aspect that was raised by Lin et al, (2012) is that a lack of financial incentives can be a barrier toward new technologies, which may bring extra effort. However, it is raised in the empirical findings that many people working in public healthcare are there because they want to help people, and not for personal financial gain. This somewhat contradicts the literature and indicates that healthcare workers may not oppose new technologies due to a lack of financial incentives, as long as the new technology is beneficial for the patients.

5.4 A Tough Environment shifts the focus from Long-term Investments toward Short-term Savings

In the empirical findings, a major barrier raised is the dilemma of balancing innovation and producing healthcare, which is influenced by a lack of resources. Department managers are faced with pressure to meet targets on care production, while staying within budget constraints, and also navigating budget cuts. The aspect of urgent care needs and long-term innovation effects are contradicting, with innovation initiatives being time-consuming and having uncertain outcomes. These aspects create a very challenging environment, where working with innovation can be difficult to prioritize, and the empirical findings indicate that producing healthcare often takes precedence over innovation. This implies that innovation does not currently align well with the current healthcare system, where the main focus and goals are on producing healthcare. To allow for a more favorable environment for innovation, a cultural shift may be needed, to make innovation a more integrated part of the organization.

5.5 An Innovation Forum could give several Positive Effects

An aspect that is raised as a barrier in the empirical findings is a lack of information diffusion, for instance regarding how there are difficulties knowing what is being done regarding innovation throughout the organization, which could lead to double work and missed collaboration opportunities. The fact that many applications to the Innovation Platform are being rejected due to similar solutions already existing is a clear example of this issue. Respondents raised how there is a lack of a forum for sharing information and experiences related to innovation projects. This could be a main factor influencing information diffusion negatively in the organization. As was raised in the empirical findings, a centralized forum for innovation projects would make it easier to find solutions that are relevant for specific departments. The example where a suitable solution from another hospital was discovered through social media highlights the need for a forum. Having information regarding innovation projects gathered could also allow healthcare workers to learn from real examples and gain an understanding of innovation processes. This could allow for learning effective means of innovating, as well as gaining knowledge on supporting functions, such as the Innovation Platform. Sharing successful innovation projects in such a forum was raised in the empirical findings as important for showcasing successful results of innovation projects. This could serve as inspiration for healthcare workers and motivate them to explore innovation further. Therefore, an innovation forum could overcome some issues regarding a lack of information diffusion, thereby likely decreasing the amount of double work, improving collaboration efforts, and positively influencing the innovation culture within the organization.

5.6 The Dilemma of Research Evidence

The empirical findings suggest that physicians usually require research evidence before they adopt new technologies and methods of working. However, it has been discussed that in order to assess evidence a project must first be initiated, which presents a dilemma. Healthcare based on evidence is crucial for delivering effective healthcare with patient safety in focus, and physicians want to be assured that new technologies would give their patients positive outcomes. This structural approach of healthcare is therefore challenged when innovation projects need to be started to generate evidence. In many instances, it may therefore be risk and uncertainty involved in initiatives regarding new technologies and solutions due to no evidence beforehand. This creates a very challenging situation for the organization, and healthcare as a whole, because on the one hand, physicians want evidence to ensure the quality of care and their patients' safety. On the other hand, with innovation, it must be acknowledged that there will be some degree of risk and uncertainty, which is inevitable.

Further, in the empirical findings, it was raised that in some instances, claiming that evidence is needed before adoption can be an easy way of saying no to new technologies. Healthcare workers not wanting to use something can thereby easily blame a lack of evidence. This could pose an issue in the organization, as evidence is a structural part of healthcare and is difficult, if not impossible to change. This could also be further negatively affected due to physicians' having high power and authority. It is therefore difficult for department managers to decide that physicians must adopt a new technology for instance, as the physicians are in charge of their way of working. However, even if this structural issue most likely cannot be changed, the organization may be able to reduce physicians' resistance in other ways. As was raised in the empirical findings, emphasis should be put on highlighting the value of a new technology or new solution, and how it could have positive effects. This is in line with Konttila et al. (2019) who describe that it is important to show how the new technology would improve the healthcare workers' daily work.

5.7 Resistance to Change can be tackled through Collaboration and Participation

Also, it is raised in the empirical findings, that it is important to involve healthcare workers in the development, and that implementations of digital technologies were highly dependent on healthcare workers' input during the formation of the solution. In this way, they can understand the value the new technology or solution brings, and also form it to fit their way of working, which would reduce the resistance from healthcare workers. This is strengthened by the literature, where Cresswell & Sheikh (2013) describe how if there is a lack of collaboration in the development, it could lead to the solution not fitting the users' needs. Further, Dodoo et al. (2021) and Stumpf et al.

(2002) explain how a lack of buy-in from healthcare workers is a barrier to adoption of new technologies, since the healthcare workers might see the technology as a hindrance or not worthy of their time if they have not contributed to it. Hence, collaboration between healthcare workers and developers, i.e., the participation of healthcare workers in the development of new technologies, can be identified as a vital factor for success, and is also important for reducing the resistance to change, which in turn would reduce the negative effect regarding the dilemma of evidence.

Another aspect regarding lack of collaboration between healthcare workers and developers described in the empirical findings is that lack of collaboration could arise as a result of a lack of resources, both in the form of time and staff, and also that there is no natural way for healthcare workers to meet developers. Healthcare workers have a very full schedule and are working isolated from developers, so even if they had an innovation they wanted to start working on, their time is limited and they might not know how to proceed due to unclear processes. Even though there is a lack of resources, which is difficult for the organization to influence, the organization can focus on creating an environment where healthcare workers and developers can meet and collaborate. This could also spread awareness regarding innovation throughout the organization, and lead to an improved innovation culture.

5.8 Visions and Priorities of Managers form Innovation in the Organization

Managers' different visions and priorities is raised in the empirical findings as influencing the adoption of digital technologies. A department manager with low interest and curiosity for innovation could largely hinder innovation within the department, which is further affected by how department managers have a lot of room to form the department, as was raised in the empirical findings. Literature strengthens this claim and explain how managers must be curious, open-minded, and adaptable towards new ideas in order to be successful in a rapidly changing environment (Fernando & Purva, 2023). Managers' different visions and priorities can also be identified to affect the dilemma of balancing innovation and producing healthcare. A manager less curious and interested in innovation could focus all effort on producing healthcare, disregarding innovation. This is in line with Laukka et al. (2020), who describe that managers may not be able to prioritize innovation projects due to them having to prioritize other health services. Furthermore, a manager with a low priority for innovation in their department will be less likely to provide clear support and guidance for innovation projects. This could be a major issue since it was raised in the empirical findings that the support of the manager is vital for the success of innovation projects. As stated by one of the respondents, a manager is the largest enabler, but can also be the largest barrier for innovation in the organization. This could also affect the innovation culture within the department negatively, and in extension the entire

organization, since innovation is not prioritized by the manager. Kruszyńska-Fischbach et al. (2022) describe how managers can take the role of *Innovator* and highly endorse the new technology, thereby motivating and encouraging others. Managers can therefore be identified as having a large influence on others, and are therefore likely to have quite a substantial effect on the overall view of innovation.

5.9 Potentially valuable Innovation Projects often stay Local

It was raised in the empirical findings that an issue in the organization is complex and unclear decision paths. Because of the organization's size and also that decision-making is more unclear due to several parties being involved, innovation projects can be difficult to broadly implement. Local projects are described as quite easy to run in terms of decision-making, because the decisions can be made in the specific department or close to it. However, when considering broad implementation, for instance in the entire region, the complexity is much larger. This is also further affected since different hospitals in the region can work in quite different ways. Many innovation projects therefore stay local and do not spread. This could be a major issue for the organization and healthcare in the region, since many projects regarding new technologies and solution could be very valuable throughout the organization and the entire region, but at the moment only stay local. A lot of value could therefore be lost due to the complexity and difficulty of implementing something broadly. This can also be related to the need for driven and motivated individuals, as it may require such an individual to push through these difficulties to reach a point of broad implementation. The organization should therefore consider if the decision paths could be evaluated to pinpoint potential improvements that could be made to facilitate for easier broad implementations, as this has the potential to give value that currently may not be captured.

5.10 Unvalidated Tools and Resource Deficiencies can influence the Adoption of New Technologies negatively

From the empirical findings it is stated that tools used for self-monitoring purposes needs to be validated and standardized in order for physicians to be able to reliably use the data it provides. The lack of standardization and validation can affect both lack of resources and resistance to change. Firstly, using tools that has not been validated or have large variation, might bring healthy citizens without any health issues into the hospital, so-called false positives. This does not only claim already scarce resources at the hospital in form of staff and time, but it also creates unnecessary worry for the individual in question. Due to the healthcare's already very limited resources, a technology that may demand increased use of resources may meet huge resistance, as the healthcare may not be willing to take this risk, even though there is potential for

long-term gain. The situation with very limited resources in healthcare may therefore be a large hindrance towards new technologies, due to additional resources often being required, and the hindrance may be especially large when there is high uncertainty in the long-term value it would bring. This uncertainty together with questions of usability and trust creates resistance to change, not only from the organization but also from individual healthcare workers, who have to be able to trust the technology to adopt it.

6. Conclusions

In this study, barriers to adoption of digital technologies have been investigated at the case organization Sahlgrenska University Hospital. Several organizational barriers have been identified to affect the organization. These barriers cover a wide range of issues; the absence of a clear career path for innovation, limitations in value realization regarding the Innovation Platform, short-term savings having precedence over long-term innovation effects, insufficient information diffusion and collaboration, the dilemma of research evidence, complex and unclear decision paths, and varying visions and priorities of managers.

To be able to overcome the barriers and foster a more innovative culture, improving the adoption of digital technologies, some recommendations have been proposed. First, establishing a defined career path within the organization for working with innovation could improve the innovation culture, by creating a more structured way of working with innovation. It could also create an incentive for healthcare workers to join the ST Innovation & Teknik residency program and future innovation programs, and after, have opportunities to work with innovation. Further, creating an environment for facilitating more collaboration between healthcare workers and developers of new technologies and solutions is of importance. This would ensure solutions meet the users' needs and are more user-friendly, hence improving adoption and easing implementation. Also, the dilemma of research evidence should be addressed to find a balance between the need for evidence in healthcare and the risks and uncertainties of innovation.

Creating an innovation culture throughout the organization that mirrors the high importance the top management has on innovation is of huge importance, in order to align the organization. Establishing an innovation forum including information sharing, collaboration, joint problem-solving, and examples of successful innovation projects could help facilitate this. This would put further emphasis on innovation within the organization, and also help overcome issues of double work and a lack of collaboration, due to current insufficiencies in information diffusion. Also, aligning all levels of management on the importance of innovation in the organization is also crucial, since department managers have a high influence on their operation and hence how much focus is on innovation.

To conclude, by addressing the identified barriers and working within the organization to overcome them, the adoption of new technologies and solutions has great potential to improve. This would improve responsiveness within public healthcare, making it more susceptible toward new and improved technologies and solutions, which would improve patient care and thereby increase societal value.

6.1 Research Contribution and Future Research

This study contributes to existing research on barriers to adoption of digital technologies in public healthcare by describing barriers that have been identified as well as the difficulties they pose. The current research on this subject in public healthcare is limited, especially in Sweden, with current research often having been conducted in other countries where healthcare may be very different. Also, current research often focuses on technical and legal aspects, but not other organizational aspects to the same extent. This study instead focuses on organizational barriers and contributes with additional valuable knowledge on this subject. In this way, additional knowledge and information surfaces, bringing value to actors in the field, hence helping improve healthcare.

The findings and recommendations can help Sahlgrenska University Hospital to understand the barriers that affect them and help overcome them, thereby improving innovation and adoption of digital technologies in the organization. Since Sahlgrenska University Hospital is identified as a representable actor in public healthcare, the findings and recommendations can also likely be generalized to apply to other public hospitals in the nation, and possibly also public hospitals in other countries with a similar healthcare system to Sweden.

Due to the rather broad focus of this study, identifying a wide variety of organizational barriers, future research could investigate these barriers more in-depth to gain a deeper understanding of the individual barriers and how they affect adoption of digital technologies in public healthcare. The descriptive nature of this study also does not entail any quantification in the form of grading or measuring the effects of different barriers. Therefore, future research with a more quantitative focus could bring additional value and complement this study. Further, investigating and comparing public and private healthcare actors could be another interesting avenue for future research. This is interesting since public and private healthcare actors work and function in different ways, and barriers to adoption of digital technologies may therefore be very different.

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Appendix A: Interview Guide

Overall Questions

- What is your role?
- Could you briefly describe what you work with?
- Have you participated in any implementation project regarding any new digital technology?
 - Where there any difficulties with this?
- How do you view implementations of innovations in the healthcare sector?

Overall Telemedicine Questions

- Proactive care versus reactive care, how would you say this will change in the healthcare sector?
 - How do you view telemedicine's role in this?
- What happens and needs to be done before implementation of a telemedicine initiative?
 - What type of collaboration needs to happen between developers and users?
- What is the culture like regarding adoption of telemedicine in the organization?
- Have you experienced any barriers in the organization in implementation or adoption of telemedicine?
 - How could these barriers be overcome in your opinion?

Specific Telemedicine Questions

Structural

- Regarding decision paths, is it clear who can decide on what?
- If a healthcare worker wants to innovate, what processes exist for this?
- How do you view the dilemma of production versus innovation?
- Does the size of the organization affect innovation negatively?
- Is there collaboration between healthcare workers and developers? Are there any difficulties with it?
- How does information diffusion in the organization work? Are there issues with it?

Managerial

- How does the department manager affect innovation?
- How would you describe innovation support from managers?

Individual & Culture

- Does the strong profession of physicians pose any issues?
- How would you describe the innovation culture in the organization?

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