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Improving Research- and Innovation Collaboration between Healthcare Organizations and Business Actors

A Case Study at Sahlgrenska University Hospital

Master's thesis in Management and Economics of Innovation

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SUMMARY

When the need for more efficient ways to deliver healthcare increases due to factors such as demographic changes or government pressure to cut costs, research and innovation within healthcare become more and more important to meet these challenges. The Covid-19 pandemic has further highlighted the need for research and innovation when new diseases emerge. However, the complexity surrounding the healthcare sector makes research- and innovation sometimes complicated. There are significant gains if the healthcare organizations and other actors in the ecosystem collaborate in order to overcome the complexity of innovation within healthcare. Nevertheless, collaborative research- and innovation initiatives within healthcare are often argued to be underutilized. Some difficulties often brought up are the issues regarding how the actors can meet each other, how rules and regulations affect opportunities to collaborate, and how the organizational setting of healthcare organizations differs from the business actors, further complicating co-creation. Therefore, the purpose of this thesis is to provide insights into barriers, facilitators, and potential improvement for research- and innovation collaboration between healthcare and business actors, with a focus on the healthcare providers perspective.

The research approach used was a qualitative single-case study at Sahlgrenska University Hospital. Empirical data was collected through interviews with employees at Sahlgrenska University Hospital as well as different actors within the healthcare innovation ecosystem. The data were then analyzed in relation to a theoretical framework based on the notion of open innovation and four levels of analysis: socio-political, inter-organizational, organizational, and intra-organizational. Findings show that barriers and facilitators exist on different levels and these need to be managed to improve collaborative initiatives. While the barriers existing at a socio-political level with for example different laws heavily influencing what is allowed to do, these barriers cannot be removed but rather needs to be handled, so the influence of them are reduced. On the other levels, healthcare organizations have better opportunities to remove barriers, including finding clearer entry points and forums to meet, changing the organizational culture, managing the ambidexterity problem, and utilizing support functions. Lastly, it was identified that tensions exist between research and other innovation activities and that the size of companies affect opportunities to engage in collaborative activities with the healthcare sector.

Keywords: healthcare innovations, public-private innovation, open innovation, innovation barriers, ambidexterity, absorptive capacity

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List of Abbreviations

CTU - Clinical Trials Unit

FoUUI - Research & Development, Education and Innovation

NIH - “Not Invented Here”

MDR - Medical Device Regulation

OI - Open Innovation

SU - Sahlgrenska University Hospital

VGR - Region Västra Götaland

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1 Introduction

Research and innovation within healthcare has the possibility to improve services and reduce costs resulting in benefits to society (Sørensen and Torfing, 2012). It could be new pharmaceuticals, medical devices, processes, or treatment methods that enhance patient care (Norberg et al., 2018). Innovations are one vital factor in succeeding with the Swedish government's strategy for the nation to become leading within life science (Ministry of Enterprise and Innovation, 2019). In the light of the prevailing COVID-19 pandemic, the need to improve healthcare and spur innovations has become even more evident. The pandemic has shown how crucial research and innovation are to fight diseases and viruses. This has contributed to increased government spending on research and innovation to be better prepared for future crises (Ministry of Enterprise and Innovation, 2021).

Public organizations can possess three different kinds of roles in the context of innovation, one where the innovation happens completely internally in the public organization, and two that involve interaction and collaboration with private organizations (Engström, 2019). The first role is when the public organization works with innovation internally and this role is a presumption of being able to work with the other two roles. The second role is when the public organization uses its demand to signal needs which drives innovation within the private sector. The last role, that despite its high potential is considered the most challenging for a public organization to take, is when a public organization acts as a co-creator of new solutions. Bommert (2010) also highlights the potential of this third role and claims that the co-creation of innovation ensures that the development process takes advantage of both public and private organizations' innovation assets in terms of creativity, resources, and knowledge. Therefore, bringing together multiple actors enables a better understanding and assessment of the problems and challenges, resulting in the most promising innovation being developed and selected (Sørensen & Torfing, 2012).

The Swedish life science ecosystem consists of universities, companies, and public organizations aiming to promote the society's health (SWElife, n.d.). There are approximately 3000 companies within the Swedish life science ecosystem who provide 42 000 jobs and account for significant export earnings (Ministry of Enterprise and Innovation, 2019). These companies have a crucial role in the development of innovations within the healthcare industry. However, employees in the private sector consider public organizations as bureaucratic and characterized by slow-moving, inertia, and well-defined rules (Sørensen & Torfing, 2012). According to Bommert (2010), those characteristics impact innovation processes negatively. One example is that it is sometimes difficult to know what is allowed to do for public employees in collaboration with public organizations (The National Board of Health and Welfare, 2018). Norberg et al. (2018) describe this problem as a fear of making something wrong and illegal.

Qvillberg and Ekdahl (2020) have identified a lack of overview of the West Sweden healthcare innovation system. This finding aligns with The National Board of Health and Welfare's (2019)

discovery that it is difficult to navigate in the innovation system. Therefore, when approaching a hospital with an idea for research or innovation, it is difficult for companies to find the way to the right department (Qvillberg & Ekdahl, 2020). Instead, they are tossed around the organization until they hopefully, find the right department. Even when companies find the right department, there sometimes occurs a mismatch in expectations from both sides. Engström (2019) describes that one underlying factor for this is the differences in driving forces for innovation between private and public organizations, where the private ones seek profit and competitive advantage, and the public sector aims to fulfil demands from society. The author further explains that these differences result in different approaches to innovations and the lack of a common language. Similarly, Norberg et al. (2018) argue that it is challenging to create a joint vision when private and public healthcare actors collaborate, primarily due to both parties' inability to understand the other's organizational structure, decision paths, and prerequisites.

The problems relating to the research- and innovation collaboration between public and private healthcare organizations have been investigated by several researchers. Silvander and Hagén (2015) investigated innovation in collaboration between the public and private organizations and found that collaboration with external actors is not as common as collaboration with internal actors for public healthcare organizations. However, they present how the healthcare actors that are collaborating externally are more successful in their innovation work, showing potential for improvement. Further, they found that external actors are not considered as important collaboration partners and that ideas originating from outside the organization are less common and regarded less important than internal ideas. The fact that external ideas are considered less important while collaboration with external actors is concluded to be a successful strategy makes it a relevant subject to further investigate. Qvillberg and Ekdahl (2020) explored this kind of collaboration from the private organization's perspective and therefore, this study will investigate innovation- and research collaboration between healthcare organizations and private organizations from a public healthcare perspective.

1.1 Aim and Research Questions

The purpose of this research project is to investigate how the collaboration for innovation and research between public healthcare organizations in Sweden and the private sector can be improved. The focus will be on how public healthcare organizations can become better collaborating partners in the interaction with private companies in research and innovation development. The report will present barriers and facilitators within the healthcare organizations as well as provide recommendations of how the collaboration can be improved. In order to accomplish the aim of the study the following research questions was formulated:

- *What barriers and facilitators exist to a successful collaboration between healthcare organizations and private companies?*
- *How can the collaboration between healthcare organizations and private companies be improved?*

1.2 Delimitations

Due to time constraints and the extent of the subject area of collaboration between healthcare and business actors it has been necessary to delimit the research scope to focus on a specific issue. Therefore, this study primarily focuses on innovations where business actors contact healthcare to get help with innovations or research. However, it also includes other interactions that might occur such as when healthcare organizations reach out to private organizations with an already identified problem. Since this issue previously has been explored with a focus on the perspective of private organizations, this report primarily examines the problem from the healthcare organization's perspective.

2 Theoretical Framework

The theoretical framework consists of two parts. The first one discusses innovation within a healthcare context and introduces the concept of Open Innovation. The second part is divided into four levels of analysis where barriers and facilitators for collaborative initiatives are discussed in relation to these levels.

2.1 Innovation Within Healthcare

Within the healthcare sector, it is important to fulfil the needs of patients while at the same time living up to requirements from governments related to, for example, cutting costs and improving quality (Länsisalmi et al., 2006). Further, demographic changes increase the need for new and more effective ways of treatment (Wass & Vimarlund, 2016). To meet these challenges within the healthcare sector, an innovative capability is becoming increasingly important (Exton, 2010; Länsisalmi et al., 2006; Norberg et al., 2018b). For example, Dias and Escoval (2012) claim that “Facing these challenges, evidence suggests that health systems can no longer afford the current fragmentation and low innovation capacity” (p. 1).

However, innovation within healthcare is a complex issue due to several reasons. First, innovation within healthcare can come in many different forms, including for example MedTech products and pharmaceuticals as well as new approaches to patient care (Hyrkäs et al., 2020). Further, innovation within the public sector, such as the healthcare sector requires careful consideration of resources as healthcare organizations are expected to effectively manage public funds. Bommert (2010) describes how this might affect public organizations in how they work with innovation as they might be scared of getting an image that they are gambling with public money. Additionally, when discussing innovation within the healthcare sector, it is important to notice that the user of the innovation, such as the patient or staff, differs from the innovation customer that is the health organization (Gabriel et al., 2017), further increasing the complexity of innovation within healthcare.

To handle the complexity and issues related to innovation within the healthcare sector, it is suggested that a key in innovation processes is the combination and utilization of knowledge across sectors and departments (Dias & Escoval, 2012). In many cases, the best ideas may not come from the own organization but from other, often unexpected, sources (Chesbrough & Crowther, 2006). Within the healthcare sector, this means that many innovative ideas might arise from the private sector, and that the healthcare sector will benefit from increased collaboration with external actors (Silvander & Hagén, 2015). Further, Larisch et al. (2016) present how it also might be hard for people within the healthcare sector to see what their industry could look like, which makes external actors important as they can look at the healthcare sector through a different lens.

2.1.1 Collaboration and Open Innovation Within Healthcare

Collaborating with external actors and making use of both internal and external knowledge when working with innovation are covered in the concept of open innovation (OI) (Wass & Vimarlund, 2016). The notion of collaboration and OI is widely recognized as a successful approach to innovation (Chesbrough, 2003). However, the public and healthcare sector is lagging behind in this respect, with limited engagement in OI efforts (Wass & Vimarlund, 2016). Therefore, the healthcare sector can benefit from more involvement in collaborative innovation and different OI initiatives. Bommert (2010) explains how such initiatives help improve quality and creativity, by utilizing all available innovation assets, such as knowledge or resources. This is important as the market competition and bureaucracy present in the public sector often fails to do so (Sørensen & Torfing, 2012). Within the field of OI, ideas originating from outside the organization are considered as important as internal ideas and traditional ways of working with innovation (Chesbrough, 2003). By opening up the innovation process to ideas from external sources, the dispersed innovation assets inside and outside the organization can be used in the best way (Bommert, 2010).

Gabriel et al. (2017) explain how OI initiatives can help overcome several challenges within the healthcare sector. To begin with, it can help utilize resources in a more efficient way, improving speed and lowering costs related to innovation. Further, it can help inform innovation processes to better target and give an understanding of the health system and needs. Larisch et al. (2016) explain how the users of healthcare innovations such as the healthcare professionals are often not involved in the innovation processes, leading to a situation where the needs are not sufficiently addressed due to a lack of clinical expertise. Therefore, if OI approaches were used to a greater extent, such problems could be reduced. For example, one area where cross-sector collaboration processes could be beneficial is within the field of digital technologies and AI (Hollmark et al., 2015; Mikhaylov et al., 2018) where business actors have the specific technical competence while the healthcare employees know the most about patient needs.

OI can come in several different forms and Gassmann and Enkel (2004) suggest three core processes in OI: the inbound, the outbound and the coupled form. In the inbound form, the company in focus opens up internal innovation processes to integrate external knowledge. The outbound process is about opening up the organization's boundaries and leveraging the knowledge by letting it flow outside the organization to external actors. In the coupled form, the inbound and outbound form is combined meaning that there is an exchange in both ways between the actors.

2.2 Barriers and Facilitators for Open Innovation Within Healthcare

Several authors have investigated barriers and drivers for OI within the public sector. Previously, the level of analysis has often been at the organizational level with focus on the firm or a business unit (Bogers et al., 2017; West et al., 2014). However, over time it has been acknowledged that more levels of analysis are needed and that the analysis also should include for example individuals, ecosystems, and national innovation systems (West et al., 2014). The

authors highlight the potential of gaining more insights by combining several levels of analysis. Looking at the Swedish healthcare context, this is also suggested by Norberg et al. (2018), claiming that a system perspective is important as hindrances for collaboration can occur at different levels in the system, such as department-, organizational- or policy level. Due to the importance of several levels of analysis, an adaptation of the framework suggested by West et al. (2006) and developed by e.g. Bogers et al. (2017) and Smith et al., (2019) will be used. This means classifying and looking at determinants of OI within healthcare and the public sector both within the focal organization, between organizations involved in the OI initiatives as well as the broader socio-political environment. The levels of analysis are presented in table 1 and illustrated in figure 1.

Table 1

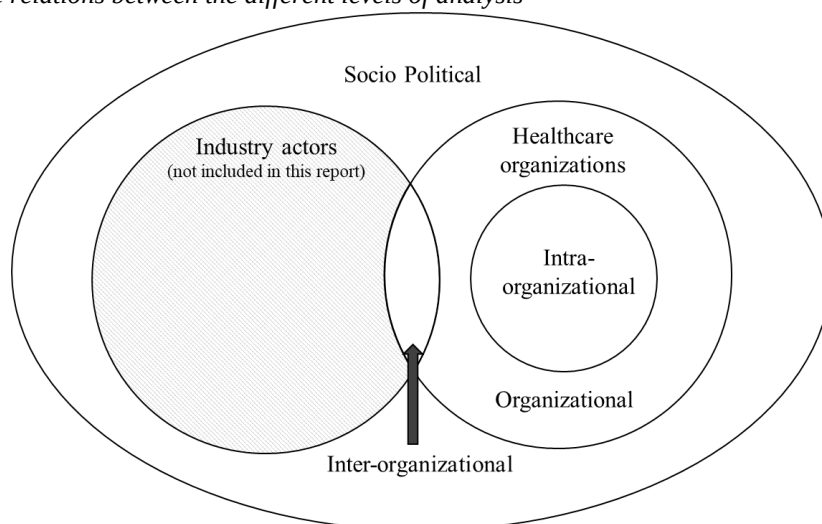
Level of analysis in public-private collaboration

Level of analysis	Description	Example of subjects
Socio-political	Barriers relating to the surrounding environment	Policy and regulations, innovation ecosystem
Inter-organizational	Barriers relating to the interaction between two actors	Entry points, relations, coordination, negotiation
Organizational	Barriers relating to the whole organization	Ambidexterity, absorptive capacity, culture
Intra-organizational	Barriers relating to sublevels of the organization, such as departments or individuals	Individuals, managers, not-invented-here syndrome

Note: An adaption of Smith et al. (2019) “Categorization of barriers to open innovation”

Figure 1

Illustration of the relations between the different levels of analysis



2.2.1 Socio-Political Factors

There are several external factors originating from the socio-political landscape that are affecting how the healthcare sectors can work together with private actors for innovation. Larisch et al. (2016) argue that there is a need to deepen the understanding of this socio-

economic context to be able to take important factors into consideration when working with innovation. The healthcare sector, as part of the public sector, is heavily controlled, and different laws and regulations affect what is allowed to do when the healthcare sector wants to collaborate with private businesses in OI initiatives, something that may limit the possibilities to engage in OI (Kankanhalli et al., 2017). Löfgren Willeus and Hedefjäll (2019) explain that a lack of knowledge about what you are allowed to do is a hindrance that may lead to no collaboration at all being undertaken. However, as the potential of open innovation efforts within the healthcare sector is clear, there is an apparent need to find a balance and manage to collaborate within the regulatory framework of, for example, clinical trials, public procurement legislation and collaboration rules.

2.2.1.1 Legislation Regarding Clinical Trials and MedTech Products

One area where private businesses and the healthcare sector interact in the field of innovation is clinical trials that often are sponsored by industry actors. The aim of a clinical trial is to investigate or verify the clinical effects of the product and the process is heavily regulated, including the need for permission from the Swedish Medical Products Agency and other approvals (Swedish Medical Products Agency, 2022). Apart from clinical trials that often regard pharmaceuticals, new regulations were recently imposed by the European Union (EU) on medical devices to improve the safety of these products as well as the consistency of regulations across the EU member states (Ben-Menahem et al., 2020). The regulation that took effect in 2020 and is called the Medical Device Regulation (MDR) increases the focus on evaluating clinical benefits also on medical devices, and adds to the previous requirements of safety and performance of such products (Wilkinson & van Boxtel, 2020). This new MDR directive will change the development cycles of these devices, when clinical trials and other validations are needed to a larger extent, also increasing the development costs and time of development (Ben-Menahem et al., 2020).

When such regulations of products are increased, Hollmark et al. (2015) argue there is an increased need for testing and collaboration. Guerra-Bretaña and Flórez-Rendón (2018) present how OI models are one way of managing the collaboration between different stakeholders that are important to overcome the barriers related to innovation of medical devices, including healthcare providers and industry. This is also explained by Ben-Menahem et al. (2020), arguing that with the MDR, it is important for medical-device start-ups to collaborate and get knowledge about how the product will be used and the environment around the product. They also highlight the importance of involving objective clinical expertise in the development. While the MDR can give benefits for patient safety and clinical benefits, Ben-Menahem et al. explain how it increases complexity by adding additional steps in the development process, something that might harm smaller companies' ability to deliver such innovations as they do not have the same resources as the bigger players in the industry.

2.2.1.2 The Law of Public Procurement

The law of public procurement is another regulation that affects how the healthcare sector can collaborate with private companies in OI initiatives. Procurement in public organizations in

Sweden is regulated with the aim of objective and transparent procurement, allowing fair competition and to make sure the public funds are used in an effective manner (Swedish Competition Authority, n.d.). The system of public procurement is often argued to be a barrier to innovation within the healthcare sector (Hollmark et al., 2015; Larisch et al., 2016). Melander and Arvidsson (2020) argue that while public-private interactions and the possibility to combine knowledge are important for innovation, the law of public procurement limits such interaction. Waluszewski and Wagrell (2013) explain how the organizational setting of Swedish healthcare that might be an important part in an innovation through collaboration, later can be an obstacle for implementation of the same product if it does not pass through the complexity of public procurement. Similarly, Smith et al. (2019) claim that public procurement often works as a barrier transitioning from pilot projects to full implementation. Further, Waluszewski and Wagrell (2013) also present how the framing and labelling of projects are important for the ability to work with and use innovations, and that the label “research” allows for more public-private interaction. However, they add that when a successful result of such a project is reached, it might be harder to implement more widely due to evaluation criteria of the product, making public procurement potentially harming the long-term effects of a successful innovation.

One important principle of public procurement in Sweden is the principle of treating involved parties equally, and it is important to avoid corruption and conflicts of interest (the National Agency Of Public Procurement, n.d.). This is something that is argued by Melander and Arvidsson (2020) to limit interactions, and hence innovation, between public and private organizations before procurement, in order to avoid a situation of favouring one supplier in the procurement process. Also Smith et al. (2019) present how public procurement is hindering OI initiatives. However, Melander and Arvidsson (2020) also highlight that some interactions within the regulatory boundaries of public procurement are still possible but that firms want more interaction to take place in order to spur innovation.

Apart from the traditional public procurement of products in Sweden, it is also possible to do innovation procurement. According to The National Agency For Public Procurement (2015), innovation procurement is suitable when currently available solutions do not meet the needs in a satisfying way. Innovation procurement can come in different forms and has its focus on the intention to allow for, or demand new solutions. One possible way of dealing with innovation procurement is through innovation partnerships. Innovation partnerships can since 2016 be used by the procuring organization when they experience that their needs cannot be met with solutions currently available on the market, and the partnership aims to develop a solution the public organization procure if a successful solution is developed (Andersson, 2017). Despite the fact that these different kinds of innovation-friendly procurement are now possible and encouraged and could work as a driver for collaborative innovation, it is still not well known across the healthcare sector how to deal with it (Hollmark et al., 2015; Larisch et al., 2016). Also, Norberg et al. (2018) explain that it is unclear when the law of public procurement comes into effect in different situations when dealing with collaboration with the public sector, and they also argue that there is a lack of competence in the system regarding different kinds of innovation procurement. However, Hedman Rahm et al. (2019) present that it does not necessarily have to be this way, and explains how for example Region Skåne and Karolinska

University Hospital through organizational learning have become more successful in applying innovation procurement.

2.2.1.3 The Healthcare Innovation Ecosystem

In 2006, new, stricter rules regarding collaboration between the healthcare sector and the industry were introduced (Larisch et al., 2016). These rules followed a period where the industry and healthcare organizations had closer contacts and Larisch et al. (2016) present how these restrictive collaboration rules limit the possibility of knowledge development and diffusion over borders between sectors and disciplines. They argue that the rules make it harder for healthcare professionals to make use of the knowledge in the industry, and for the industry to get the clinical knowledge needed to develop innovations addressing the right needs. While collaboration rules are needed and play an important role in avoiding misbehavior and making sure the public resources are used responsibly, they may also hamper the amount of collaboration and potential innovative outcomes resulting from such collaboration (Larisch et al., 2016).

Bommert (2010) explains that the socio-political environment surrounding the public innovation system is not enough supporting, and that innovation therefore often happens as a “one-off” in response to different events where funding is provided and risk taking becomes more allowed. One example where initiatives in the surrounding environment are missing relates to education of medical roles where teaching about innovation are missing (Larisch et al., 2016; Löfgren Willeus & Hedefjäll, 2019). However, while there exist several barriers to collaborative innovation at the socio-technical level, there can also be drivers to research- and innovation collaboration originating from initiatives at this level of analysis. One such example in the Swedish healthcare context is the life-science strategy presented by the Swedish government in 2019, where one of the focus areas is to strengthen the collaboration between actors in the healthcare system through different supporting actors and initiatives (Ministry of Enterprise and Innovation, 2019). Medtech4health and Vinnova are two examples of these supporting actors and they are working with several initiatives that are all aimed to simplify the collaboration between the healthcare sector and companies through providing knowledge, funding and financing for different strategic projects (Medtech4Health, n.d.). However, Swedish MedTech (2019) claims that further support is needed, especially for smaller companies with less resources.

2.2.2 Inter-Organizational Factors

At the inter-organizational level, barriers and drivers that are affecting the actual partnerships and interactions between the collaborating parties are discussed. Literature discussed includes both the companies’ perspective of collaborating with the healthcare organizations and how personal relationships are impacting these opportunities. Further, it is discussed what is important in order to get a collaboration relationship to work.

2.2.2.1 *Ways for Healthcare Actors and Business Actors to Meet*

To begin with, in order for an OI initiative to be possible and successful, it is crucial that the right partners find each other. Looking into the healthcare sector in western Sweden, Qvillberg and Ekdahl (2020) claim that research- and innovation collaboration between the private and healthcare sector are underutilized and that one of the factors behind this is the lack of clear entry points into the healthcare system. In their research, the companies express that it is hard to find the right person and that they often are tossed around in the system, something that can lower their interest and make them turn to other actors. Larisch et al. (2016) identified the same issue when they investigated the Stockholm healthcare innovation system. They explain that companies find it hard to know who they should turn to, and that supporting actors and initiatives are not coordinated and effective. Furthermore, West and Bogers (2014) present that one important part of engaging in OI initiatives is to enable and filter innovation from external sources in order to get the most value by identifying the best innovations. They present how different intermediaries can help balance the interests of the actors and create linkages in the value chain.

In order to succeed in this complex innovation system, Löfgren Wilteus and Hedefjäll (2019) claim that personal relationships are facilitating. Otherwise, innovations get stuck in the innovation system due to a lack of decision power within the healthcare system. The findings from Bryson et al. (2006) add to this as they explain that these prior relationships are important for gaining legitimacy and judging the trustworthiness of each other. They further claim that the more positive past experience there is of interactions, the easier coordination and the safer a collaboration will feel. It is also presented that when prior knowledge about each other does not exist, collaborations usually are initiated slower and more incremental with smaller partnerships not requiring as much trust. Charles et al. (1998) also discusses personal relationships within innovation collaboration and highlights how personal relationships are beneficial for the innovation partnership in the short term. However, they claim that it might harm partnerships over the long term if the individual leaves the organization or loses interest in working with these issues. Furthermore, the reliance on personal relationships might harm companies that lack these established relationships.

Due to the above mentioned problems, the findings from Larisch et al. (2019) show how Swedish companies have moved their interactions with the healthcare sector in terms of research and innovation, for example clinical trials, abroad because the Swedish market has been unresponsive and slow. Similar issues as mentioned above have also been identified in healthcare systems outside Sweden. For example, Gabriel et al. (2017) express that actors outside the healthcare system have difficulties getting in touch with healthcare organizations and thereby may not be able to access the resources needed to best meet the innovation needs in the system, such as information and data. Related, both Larisch et al. (2019) as well as Qvillberg and Ekdahl (2020) present that forums and arenas for actors in the system to meet and explore collaboration opportunities are missing. According to Swedish Medtech (2019), smaller companies are especially in need of a platform to meet the healthcare sector. Related to this, Alaläkkölä et al. (2021) explain how the needs and motivations of the companies differ when collaborating with healthcare organizations. While smaller companies have larger needs

to receive feedback and validation from clinicians on ideas and needs to do early phase tests, larger companies often aims for more long-term agreements.

2.2.2.2 Setting up Collaborations

Norberg et al. (2018) explain that despite a trend towards a more positive attitude to collaboration between public and private parties in the healthcare sector, historical factors are affecting how it actually works in practice. They claim that public-private partnerships are easier in theory than in practice. One example of such a historical factor is that traditionally, the public and private actors acted more as buyers and sellers of already developed solutions and this mindset might work as a barrier to a more collaborative and open approach of the relationships. Sørensen and Torfing (2012) also highlight how the lack of a tradition to work together in these collaborative and interacting ways with innovation can work as a barrier to participate in such initiatives. The established culture of “we” and “you” are argued by Norberg et al. (2018) to hamper the ability to formulate a common goal, something that is further complicated by the fact that the actors have different incentives when joining a collaborative research- or innovation effort.

Due to these inhibiting factors, several things are considered important for public-private collaboration and partnerships to work out. Brinkerhoff (2002) suggests that mutuality, trust and respect are important, but that it does not necessarily mean that the power relation needs to be equal among the partners. Elaborating on the area of trust, Westergren and Holmström (2012) explain that lack of trust is one of the most commonly mentioned reasons for collaboration or OI not working out, but that despite the importance, it is hard to build trust. Munksgaard et al. (2012) argue that building the trust needed is extra problematic in partnerships between private and public actors due to the principles of free competition that public procurement is built on. The findings from Westergren and Holmström (2012) show that dialogue, availability and visibility are important factors to create and keep trust. Munksgaard et al. (2012) agree with this, also advocating an open dialogue about potential tensions and further highlights the importance of addressing such issues both before and during a collaboration project.

Additionally, Brinkerhoff (2002) presents that one success factor of these relationships is that a common purpose is agreed upon but that it is also important that each organization maintains its core values through the partnership. Bryson et al. (2006) add to this, explaining that agreeing on a common purpose also is a way to reduce power imbalances, something they present as a common source of mistrust between the collaborating partners. Agreeing on a common purpose and deciding on the goals of the project is partly done in the negotiating of contracts and Bryson et al. claim that a participatory process involving all the important stakeholders are facilitating in this regard. However, Smith et al. (2019) present how the process of negotiating agreements is not always easy in OI initiatives between public and private actors, especially if the actors have not collaborated before.

While it is important that the actors understand each other, this might not always be easy. Munksgaard et al. (2012) present five areas where tensions between the public and private

might become apparent. These are different and sometimes incompatible interests, different time-horizons, divergent risk-behavior, different incentives for taking part in the project and incompatible understandings of innovation. Further, Gabriel et al. (2017) explain that there is often a gap in the understanding of needs, as the healthcare innovators are so distanced from the healthcare organizations and clinicians that know the needs. Related to this issue, Davey et al. (2011) present how it is often difficult for companies to formulate the clinical value proposition in comparison to currently available solutions.

2.2.3 Organizational Factors

At the organizational level, it is discussed how OI relates to organizational characteristics. Topics include the ambidexterity problem, absorptive capacity as well as organizational culture within the healthcare sector and its effect on the innovation process.

2.2.3.1 The Ambidexterity Problem

For organizations to be successful and endure in the long run, they need to be able to exploit their current assets while exploring new ideas and technologies (Chen, 2017; March, 1991; O'Reilly & Tushman, 2011). Birkinshaw and Gibson (2004) argue that it is difficult to find the right balance between exploration and exploitation. They claim that if organizations focus too much on exploitation, it might be beneficial in the short term while there is a risk it will be at the expense of future operations. March (1991) explains that different abilities are needed for the different logics. Exploitation is associated with refinement, production, efficiency and execution. In contrast, exploration relates to terms such as search, experimentation, flexibility and innovation. Smith and Tushman (2005) argue that these two different logics create challenges for the organization and the management. As this topic has not been widely explored within the healthcare settings (Foglia et al., 2019), this report will draw upon literature from other settings.

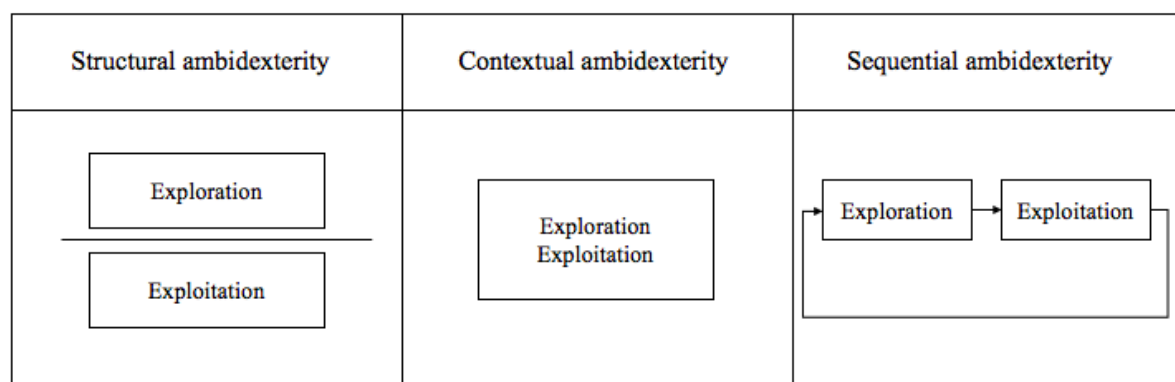
An organizations' ability to handle the challenge to both explore and exploit, is called ambidexterity (O'Reilly & Tushman, 2013). How organizations can manage the ambidexterity problem has been explored by many researchers (Birkinshaw & Gibson, 2004; Chen, 2017; O'Reilly & Tushman, 2011; W. K. Smith & Tushman, 2005). O'Reilly and Tushman (2011) explain that to successfully manage ambidexterity the management needs to communicate a compelling strategic intent striving to justify both exploration and exploitation. Strategy can facilitate decision making by working as managers' rule of thumb and thereby easing the search when facing a decision problem (Grant, 2016). Furthermore, Smith et al. (2010) argue that managing two conflicting strategies depends on the management to build commitment in the organization to an overarching vision. They further claim that the management needs to communicate the strategy in the organization to motivate and encourage the coexistence of these two conflicting strategies. Additionally, the authors claim that the management needs to articulate clear and differentiated goals to the different strategies. However, looking at public-private healthcare innovation collaboration in Sweden, direct goals and KPIs are often missing (Norberg et al., 2018a).

Previous research has concluded that there are few different ways to manage the ambidexterity problem. Birkinshaw and Gibson (2004) suggest two different approaches to manage the problem, structural separation and contextual ambidexterity. Furthermore, Chen (2017) discusses two more approaches: sequential and dynamic ambidexterity. Birkinshaw and Gibson (2004) describe structural separation as separating the exploration unit from the core business. The separation enables the exploration unit to create and use its own strategy, structure and processes (Chen, 2017). O'Reilly and Tushman (2004) findings indicate that many organizations have successfully managed both exploring and exploitation by using structural ambidexterity.

The solution of contextual ambidexterity involves that the employees are given a certain amount of free time to pursue exploratory projects of their own choosing and thereby do not need to wait for approval to search for innovations (Chen, 2017; Birkinshaw & Gibson, 2004). Since exploration and exploitation will take place within the same work unit, there are a lot of contradictions related to this solution as mentioned earlier. Searching for new knowledge and technologies, requires experimentation and learning by doing, unlike exploitation that is driven by efficiency and reducing variance (Smith & Tushman, 2005). Therefore, this approach places great responsibility on individuals to be ambidextrous.

Another mode of ambidexterity is sequential ambidexterity, which relies upon the assumption that the organizations can temporarily go back and forth between exploitation and exploration (Chen, 2017). The author indicates that this approach might be effective at the project level while more problematic on an organization level. The fourth solution to the ambidexterity problem is dynamic ambidexterity as suggested by Chen (2017), which is a combination of the structural, contextual and sequential ambidexterity. The different ways of managing the ambidexterity problem are illustrated in figure 2.

Figure 2
Different types of ambidexterity



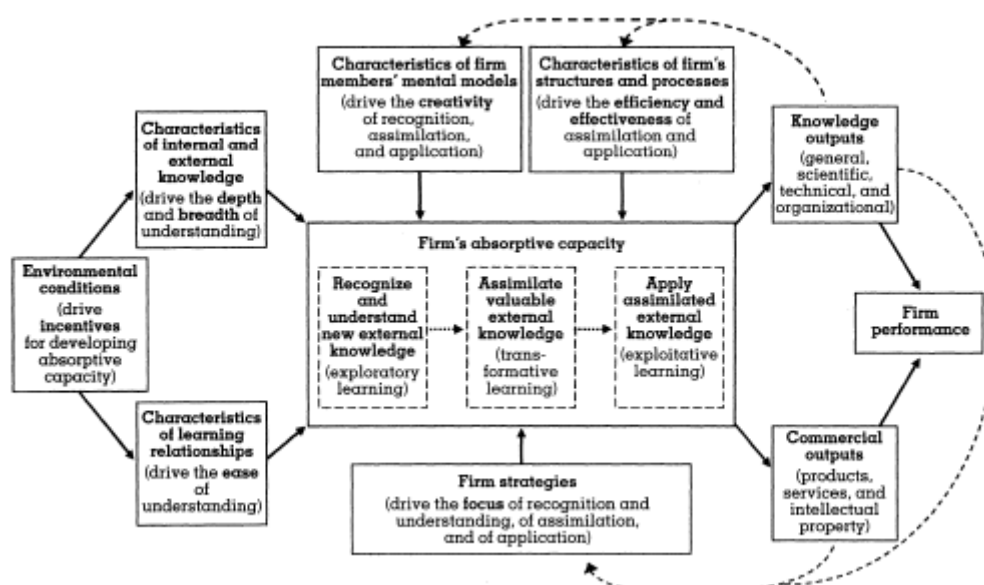
Note: An adaptation of Constant et al. (2020) “Four types of ambidexterity”

2.2.3.2 Absorptive Capacity

An organization's ability to exploit external sources in terms of knowledge is a critical component of an organization's innovation capabilities (Cohen & Levinthal, 1990; Laursen &

Salter, 2006). Cohen and Levinthal (1990) entitle an organization's ability to recognize the value of new information, assimilate it, and thereby utilize the information as an organization's absorptive capacity, illustrated by Lane et al. (2006) in figure 3. They argue that the capacity to evaluate and utilize external knowledge depends partly on the organization's prior knowledge within the specific area. Zahra and George (2002) argue that prior knowledge makes it possible for an organization to value, assimilate and apply external information such as external innovations.

Figure 3
A process model of absorptive capacity



Note: From "A Process Model of Absorptive Capacity. Its Antecedents and Its Outcomes" by Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *Academy of management review*, 31(4), 833-863

Cohen and Levinthal (1990) claim that an organization's absorptive capacity depends on the ability of its individual members. As a result, individuals with close interactions with the external environment are of great importance to the organization's absorptive capacity. These so-called gatekeepers have the assignment of monitoring the external environment but also translating information from the external actors in order for other departments to be able to evaluate the information (Cohen & Levinthal, 1990). However, Tushman and Katz (1980) argue that gatekeepers are just one of many ways to connect the organization with external information areas. The authors highlight that each manager needs to choose and develop appropriate links between internal and external information areas to take advantage of its resources. They argue that these linkages between the internal and external environment should not be fixed since the unit's task, technologies, and external information requirements change over time, which then may require new types of linkages.

Moreover, Cohen and Levinthal (1990) view the organization's absorptive capacity as not only a function of the individual facing the external environment but also includes the knowledge from the individuals that the gatekeepers transmit to. According to Lane et al. (2006), the

organization's processes and routines enable individuals to communicate and transfer their individual knowledge to the rest of the organization, which is critical for the exploitation of external ideas. In the Swedish healthcare context, Fröberg et al. (2014) emphasize the importance of a broad competence among the gatekeepers and suggest that both medical and other knowledge are important. Pikkarainen et al. (2020) highlight how a supporting organization can work as a facilitating factor in OI projects, helping the healthcare professionals. They describe that these organizations can help in questions where the healthcare professionals do not possess the necessary knowledge.

The characteristics of both large and old organizations have been argued as favorable for the exploitation of external sources, largely due to their accumulated knowledge and established routines and processes (Lane et al., 2006). Regarding processes, Bryson et al. (2006) discuss how these may be a facilitator factor within collaboration and highlight negotiation of formal and informal agreements as key processes. They describe how these agreements entail the collaboration's purpose and agree on the problem definition. Furthermore, the authors emphasize that it is critical to have processes in place to formulate these initial agreements since it will affect the outcome of the collaboration.

2.2.3.3 *Culture*

Organizational culture is the shared values and beliefs across individuals at all levels and displays the characteristics of the organization (Alharbi et al., 2012; Dobni, 2008). The organizational culture is one critical factor that determines an organization's openness to external ideas (Thakur et al., 2012). Gassmann et al. (2010) argue that it is essential to create an organization culture that appreciates outside competence and know-how to facilitate OI practices. Managers have an important position when it comes to culture, as they have the ability to create and promote norms and values that will determine the success in reaching strategic goals (Tushman and O'Reilly, 2002).

An organizational culture that entails risk-taking, freedom, teamwork, value-seeking, and solutions-oriented are some of the many characteristics of behaviors favorable for an innovation climate (Dobni, 2008). However, the findings from Johansson Shaibu et al. (2019) show that the organizational culture within the public sector in Sweden does not promote experimentation. Further, there is a tradition of focusing on the more meriting area of research than the more experimental area of innovation and historically, research gets a lot of resources while innovation is not as prioritized, even if the will to work with innovation is there (Larisch et al., 2016; Löfgren Wilteus & Hedefjäll, 2019). Löfgren Wilteus and Hedefjäll (2019) also explain how both parts are important in developing new solutions, as implementation often is about realizing the results of research. Something that may hinder innovation and creativity, is the fact that Swedish healthcare has been described as bureaucratic and built up of silos (Löfgren Wilteus & Hedefjäll, 2019; Norberg et al., 2018b). Norberg et al. (2018b) claim that the separation of professions and functions hinders the necessary cross-section work that is closely linked to innovations.

Another factor to consider when discussing organizational culture within healthcare is what Löfgren Wilteus and Hidefjäll (2019) found; that doctors and other personnel do not know what they are allowed to do when collaborating with the private sector, in terms of laws and rules. As there are many laws to follow and the organizational culture is bureaucratic with many rules to act according to. Löfgren Wilteus and Hidefjäll (2019) argue that healthcare employees refrain from collaborating with companies rather than risk breaking any rules or laws. Private-public innovation partnership success stories could be a way to reduce the fear healthcare employees feel towards collaborating with companies that exist today (Löfgren Wilteus & Hidefjäll, 2019). Frankelius (2014) suggests that the Swedish public sector could learn from earlier practical cases, by building up a sort of project bank documenting earlier innovation cases, including both successful and unsuccessful cases.

2.2.4 Intra-Organizational Factors

At the intra-organizational level, individuals' effect on OI and collaboration are discussed. Subjects that are handled are internal management, innovation champions and Not Invented Here (NIH) syndrome.

2.2.4.1 Internal Management

The management is important in collaboration between public and private actors as they set and maintain the rules of the collaboration and also build trust and facilitate dialogue (Ansell & Gash, 2007). According to Sørensen and Torfing (2011), the public managers' role is to create and manage open and flexible arenas where public actors and external actors can meet for collaborative initiatives. To succeed in the role of a manager, the organizations must give resources and backup but also give the manager legitimacy (Sørensen & Torfing, 2012). The authors further emphasize that the manager needs to possess abilities such as open-mindedness, flexibility, and communicative skills. Although managers can be a vital part of fostering innovation, they can also suppress creativity through strict control, criticism and use of formal structures (Amabile, 1997). As presented, different organizational and regulatory barriers may hinder innovation collaboration. Hence, one of the most important roles of the manager is to give permission and encourage the employees to engage and experiment in innovation projects (Amabile, 1997). Wycoff (2003) argues that one thing that hinders and kills innovation is not having a culture that supports innovation and presents the importance of risk-taking being supported by the manager; otherwise, it will stifle innovations.

2.2.4.2 Innovation Champions

New ideas are transferred from people that have knowledge about the innovation to individuals who do not have any knowledge about it (Cain et al., 2002). This process is defined as the diffusion of innovation which describes how innovations are communicated through communication channels among the individuals of a social system (Rogers, 2003). Cain and Mittman (2002) describe the adoption of innovation as influenced by two factors; the capacity of adopters to evaluate whether the benefits of the innovation outweigh the risks and if the innovation improves the existing solution. The diffusion of innovation and ideas across the organization is associated with several risks that hinder the diffusion process, for instance

formal and informal rules (Norberg et al., 2018a). Key individuals, champions, have proven to facilitate the adoption process of innovation (Howell et al., 2005; Lüttgens et al., 2012). The champions actively promote innovations to overcome organizational, social and political challenges (Howell et al., 2005).

Champions use some key activities to overcome challenges within the organization and to facilitate the diffusion of innovation. One of the key activities is to get the right people involved in the innovation project to overcome several obstacles (Howell et al., 2005). They emphasize how champions need to involve key decision-makers in order to convince top management that the project is worth pursuing. Additionally, it is essential to involve people that are interested in the project to gain and sustain commitment (Amabile, 1997). Two fundamental elements of a champion's capacity are to express a vision for innovations (Howell & Higgins, 1990) and be confident of its success (Howell et al., 2005). According to Howell and Higgins (1990), this capacity could then be used to convince other people to participate in innovation projects and also endure challenging times. Hovlin et al. (2013) claim that diffusion of innovation is favored by involving more people in the innovation process.

Within the public sector in Sweden, (Hovlin et al., 2013) highlight the role of champions in successfully spreading innovation internally. The authors describe that one crucial activity for the champions is explaining the value of innovation at the beginning when most people have difficulties in seeing the benefits. A successful concept to diffuse innovation has been to allow champions to drive smaller innovation projects and thereupon use the success of these projects to spread to the rest of the organization (Hovlin et al., 2013).

2.2.4.3 *Not Invented Here Syndrome*

The organizational culture within the healthcare sector is sometimes characterized by a reluctance against ideas originating from external actors (Qvillberg & Ekdahl, 2020). This is related to the syndrome known as "Not Invented Here" (NIH), which describes when R&D departments only look in their own organization in search of new ideas and technologies (Katz & Allen, 1985). The authors explain the NIH syndrome as when R&D employees value their own ideas and technology as superior compared to other external ideas and technologies, therefore dismissing these as inferior and weak.

The NIH syndrome is critical to overcome to fully gain the advantage of the OI approach (Chesbrough & Crowther, 2006). Katz and Allen (1985) argue that the R&D manager needs to pay attention to how their employees evaluate information since they can develop a bias toward their own ideas. West and Bogers (2014) explain that when an innovation falls within the core competencies an organization has confidence in, they are likely to innovate internally and reject external sources of innovation. Within the healthcare sector, this is elaborated on by Silvi (2015), claiming that there is "a certain amount of skepticism voiced by doctors and scientists who feel that their problems are so specialized that no one outside of their field could solve them". Another aspect of this is what Bommert (2010) argues that innovation might be more accepted by individuals when they are involved and active in idea generation and diffusion of the idea since they feel responsibility and ownership of the innovation.

3 Methodology

This chapter describes the methodology that has been used in order to answer the research questions. Initially, the chapter explains the research design and strategy. Thereafter, the choice of data collection method is described, followed by an explanation of how the data were analyzed. Finally, the chapter includes a discussion about research quality and ethical considerations.

3.1 Research Design and Strategy

This research project has taken a primarily inductive approach to the subject studied. This means that theory emerges from the data collection and observations of the study rather than that theory guides the research which is the basis of a more deductive approach (Bell et al., 2018). The approach of the study has been iterative, meaning that theory, review, data collection and analysis have been conducted iteratively.

The nature of this research is a qualitative single-case study of Sahlgrenska University hospital's collaboration with the private sector for innovation. A case study is a useful approach when the aim of the research is to understand a complex social phenomenon (Yin, 2018). Dul and Hak (2007) explain how the case study as a method allows for studying the research topic in its real-life context and that one rationale for using a case study is when the context is important. Further, they present how the case study usually is seen as useful when there is not a lot of theory available on the subject. As can be concluded from the introduction, the problem that has been studied in this research project is of a complex nature that likely needs to be studied in its real-life context. Because the problem is context-dependent, and that the public healthcare industry differs between countries, there is a lack of large amounts of generally applicable theory in the field which further made the case study beneficial in this research project, in line with what is argued by Dul and Hak (2007).

3.2 Case organization

The case organization, Sahlgrenska University Hospital (SU) is one of the largest university hospitals in Europe (Sahlgrenska Science Park, 2018). The organization consists of 17 000 employees that are divided into six divisions and the chief executive officer's staff (Sahlgrenska University Hospital, 2022). According to the Swedish Research Council (2018), SU is the leading hospital in clinical trials research. Further, SU has expressed the aim to become the leading university hospital in Sweden (Sahlgrenska University Hospital, 2022). The region where SU is located is considered one of the most attractive in Europe for life science-investments due to a high growth, a large number of life science companies within the region, the presence of Sahlgrenska University Hospital and the IT competence needed for developing digital health solutions (Sahlgrenska Science Park, 2018). However, as mentioned previously some challenges still remain when public healthcare organizations collaborate with private companies. The combination of the high regional potential within the life science industry, the expressed aim of the hospital to improve its life science-collaboration as well as the existing

challenges doing this, makes SU a suitable organization to study in this research project. Additionally, innovation collaboration at Sahlgrenska University Hospital happens at different places within the organization, both through the two formalized channels *the Innovation platform* and *Gothia Forum*, but also directly within the different departments which further makes Sahlgrenska an interesting case organization.

3.3 Literature Review

The literature review was conducted to get a theoretical base of the subject researched (Bell et al., 2018). In the initial phase of the literature review, the focus was on a broad range of literature to get an overview of open and collaborative innovation within the life science ecosystem. This included sources such as company-, government-, and consultancy reports as well as scientific papers and books. As the research moved forward, the focus shifted more and more towards academic literature with the use of databases such as Google Scholar. Some keywords were defined and used alone or in combination within the search of these databases. Examples of these keywords were Public Private Partnership, Open Innovation, Public-Private Partnership Innovation, Ambidexterity, and Absorptive Capacity. While reading through the literature, snowballing was used to identify more literature based on the citations from the current articles. Further, during the data collection, when new areas of interest were discovered, the literature was revisited and complemented based on these new aspects.

3.4 Data Collection and Sampling

The primary data collection method has been interviews with different actors within the life science ecosystem, both inside and outside the case organization, to provide insights about obstacles and opportunities for SU to improve their cooperation with the private sector for research and innovation. Apart from the interviews, the data collection was complemented by data in the form of requests from companies to the Innovation platform and Gothia Forum as well as some internal documents about for example processes and strategies. Bell et al. (2007), present how analyzing already existing data or documents limits the possibility of reactive effects when collecting the data, which in this case made it a suitable complement to the interviews.

Collecting and analyzing previous company requests to the Innovation Platform have served several purposes in this research project. Requests from the last year have been briefly analyzed with help from the Innovation Platform to identify how many requests have passed through different steps in the process. Further, these requests enabled the identification of departments and people to interview at the case organization as well as areas to discuss in the interviews.

3.4.1 Sampling

The sampling was conducted by a purposive sampling method, meaning that interview objects were selected based on the research question asked (Bell et al., 2018). This is also a suitable approach to make sure that there is variety in the sample and that all relevant actors are included. After initially identifying and choosing a smaller group of actors to participate in interviews,

snowball sampling was used. Bell et al. (2018) explains how this means that the initial interview participants are used to establish contact with further actors to interview. These new actors being interviewed will then again suggest new actors to interview. According to Coleman (1958), snowball sampling is a good strategy when networks are of importance for the research. As this is the case within the life science ecosystem, the method was suitable in this project.

From the introduction, it could be concluded that the life science ecosystem consists of several actors with different characteristics that all are important for the development of the industry, and that might have different views on barriers and opportunities for improving the collaboration. As the aim of this project was to focus on the public healthcare providers' role in supporting external actors' innovation process, the main actors that were included in the sample were representatives from SU. These representatives included both people working dedicated with strategy, innovation, and collaboration, but also other employees indirectly involved in these processes, such as doctors and others working with the daily operations of the hospital. In order to improve the representativeness of the information obtained from the interviews, the aim was to interview people at different departments and at different hierarchical levels within the organization. Further, to get a broader view on this issue and understand important things to investigate, the sample also included actors from the innovation ecosystem around SU, such as industry organizations and science parks.

3.4.2 Interviews

The initial interviews, primarily the ones with actors in the innovation ecosystem, was in the form of unstructured interviews, meaning that they included only a few, open questions that then were followed up upon depending on the answers from the respondent (Bell et al., 2018). The unstructured interviewing method was chosen for the initial interviews to be able to gain a better understanding of the different actors in the innovation system, their views on the research topic, and to identify issues interesting to investigate more about later in the research process. This is in line with what is suggested by Bell et al. (2018); an unstructured interview is a good option when the researcher needs to get a genuine understanding of the views from members of a social setting.

While moving ahead in the project, the interviews were in the form of semi-structured interviews, following up on issues identified from the previous open interviews and the literature review. The semi-structured interview is an interview that follows a quite specific interview guide, but where further questions might be asked to follow up on some of the answers (Bell et al., 2018). This method was used later in the research process to get more consistency in the interviews and improve opportunities to compare the responses among the interviews. The interview guide was built up during the initial phases of the research project. The literature review was used to identify areas of interest that were discussed during the interview, as suggested by Barriball and While (1994). Also, areas of interest identified during the initial open interviews were used when formulating the interview guide. Depending on the role of the person interviewed, the interview guide was slightly adapted based on the context. To prepare the interviewees for the interviews, they before the interview received a brief

introduction to the research project and some information about what topics the interview would touch upon. The interview guide used in the semi-structured interviews can be found in appendix A.

Interviews were conducted either through online video calls or in person, depending on the availability and geographic location of the participants as well as the situation with the Covid-19 pandemic at the time of the interview. All interviews were recorded after approval from the participants, so they could be revisited afterward. Notes were taken during the interviews to enable a discussion of initial thoughts directly after the interview. This is an approach advocated by Ranney et al. (2015), who claim that notes allow for an initial analysis or “debriefing” after the interview and further explains that taking notes is an important way to keep the data if the recording fails. Additionally, all the semi-structured interviews were transcribed, meaning that the recordings were used to write down everything said in the interview (Bell et al., 2018). Transcribing the interviews was done to enable deep analysis of the responses and it also removes human errors during note-taking as well as reduces the risk of bias and interpretations from the researchers (Bell et al., 2018).

One important thing to note is that by recording the interview, there is a risk that the interviewees feel uncomfortable and also become more careful with what they say (Bell et al., 2018). However, the benefits of being able to record and transcribe the interviews were considered to outweigh the disadvantages and risks with recording the interviews. In cases the interviewee refused to be recorded, the plan was that the interview would still be conducted, with an increased focus on notetaking during the interview. However, since all interviewees approved to be recorded this was not necessary.

In table 2-4, and figure 4, a summary of the conducted interviews is presented. For the respondents from SU, the information is presented in two separate tables with no correlation between them, in order to keep the anonymity of the respondents. In total, 34 interviews were conducted. Of these were 22 held online and 12 in person. Apart from the role presented in table 3, several respondents at SU conduct research as a part of their job and a few possess the new role of Industry Relations Coordinator.

Table 2

Conducted interviews with respondents from the innovation ecosystem

Respondent	Organization	Time
1	Business Region Gothenburg	30
2	Vinnova, Swedish's Innovation Agency	30
3	Chalmers Ventures	45
4	Leading Health Care	45
5	Chalmers University of Technology	45
6	MedTech West	60
7	Sahlgrenska Science Park	45
8	The Regional Cancer Center West	45

Table 3

Conducted interviews with respondents from SU

Respondent	Role	Time
9	Head of Department	30
10	Project Manager	60
11	Unit Manager	60
12	Strategist	45
13	Head of Unit (CTU)	45
14	Head of Development	45
15	Strategist	45
16	Business Developer	60
17	Biomedical Engineer	30
18	Head of Division	60
19	Senior Consultant	45
20	Head of Unit, Senior Consultant	30
21	Hospital Physicist	60
22	Head of Department, Senior Consultant	45
23	Planning Manager	45
24	Head of Department, Senior Consultant	45
25	Head of Department, Senior Consultant	45
26	Orthopedic Engineer	45
27	Head of Division	30
28	Senior Consultant	30
29	Resident (Innovation and Technology)	45
30	Research Coordinator (CTU)	45
31	Care Unit Manager (CTU)	45
32	Section Leader	30
33	Strategist	60
34	Business Developer	45

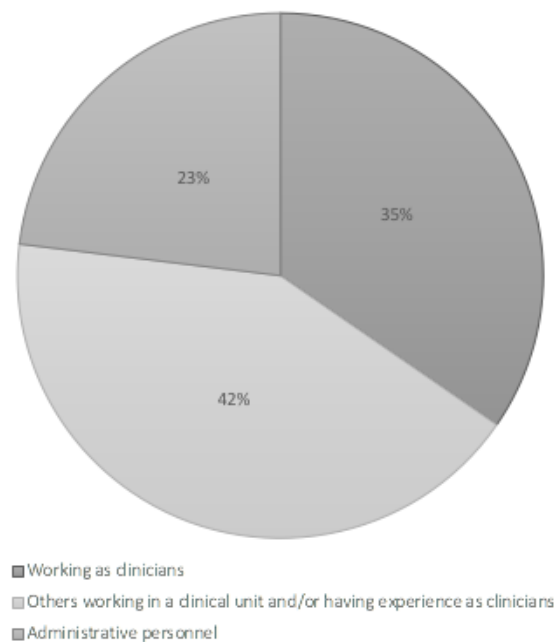
Table 4

Departments at SU represented in the interview sample

Department	Respondents
Office of the Hospital Director	2
Competence Center AI	1
Department of Ambulance and Prehospital Emergency Care	1
Department of Cardiology	1
Department of Geriatric	1
Department of Hand Surgery	1
Department of Hybride and Interventional Procedures Center	1
Department of Medical Physics and Biomedical Engineering	2
Department of Oncology	1
Department of Orthopedics	1
Department of Orthotics, Prosthetics and Central Sterile Services	1
Department of Pediatric Cancer Center	1
Department of Psychotic Disorders	1
Department of Rheumatology	1
Division Management Group	4
Gothia Forum	1
Simulation Center	1
Strategic Planning	1
The Innovation Platform	2
Transplant Center	1

Figure 4

The background of the interviewees



3.5 Data Analysis

The interviews were analyzed using thematic analysis. Braun and Clarke (2006) present that the main benefit of this analysis method is that it is a flexible approach to analyzing data and that the method helps in identifying and analyzing patterns within the data. Within the thematic analysis, a theme is a category identified in the data that are connected to the research questions (Bell et al., 2018). In this research project, the data set that the thematic analysis was applied to were the interview transcripts from the interviews conducted during the project. The thematic analysis followed the six-step approach presented by Braun and Clarke (2006) after the data initially had been coded into the four levels of analysis presented in the theoretical framework. Below, the steps undertaken in the analysis are presented.

Step 1

Familiarizing with the data, which is also supported in the process of transcribing the data. All data are read through before starting the coding.

Step 2

Create the initial codes. Interesting information in the interview transcripts will be highlighted and keywords will be identified.

Step 3

Sorting of the codes into different themes. Codes were analyzed, to see how they could be put together into different themes.

Step 4

Make sure all themes are distinct and that the data within the themes cohere. Include reading the data extracts under all themes to see that they cohere, and secondly, the themes are put in relation to all data to check that they reflect the data set as a whole.

Step 5

Identifying the main message of each theme and writing down what each theme is about as well as naming them. This process is facilitated by reading through the data extracts of the theme again and summarizing what the data tells.

Step 6

Produce the report and final analysis.

During all interviews, the language used was Swedish as that was the native language for all respondents. As that also is the language used by the case organization, letting the respondents talk Swedish allowed for more elaborative answers. Due to this, all quotes provided in the report are translated from Swedish to English and it is important to note that some interpretations might have been made by the researchers while translating the quotes.

3.6 Research Quality

To review the quality of the research, validity and reliability are two important factors to consider (Bell et al., 2018). External reliability refers to whether a study can be replicated. Although research methods are explained and transparent, the constant development and change in the case organization might limit the replicability. However, this problem is not unique to this study, but rather a problem present in most kinds of qualitative research, as argued by for example LeCompte and Goetz (1982).

The internal reliability refers to whether other researchers would come to the same conclusions as the original researchers; in other words, the interobserver reliability is important (LeCompte & Goetz, 1982). To improve the internal reliability in this study, a process of transcribing the data was undertaken. Additionally, the interviews were read through and analyzed by both researchers, further improving the internal reliability. The process of thematic analysis also makes it possible for other researchers to review the data analysis, increasing the research reliability.

Bell et al. (2018) refer to validity as to how believable the findings are and also how applicable they are to other contexts. As mentioned previously, this research includes interviews with different actors and people from different departments and roles within the case organization to get a broad view of the subject in the study. The single case study has been criticized for its lack of generalizability (Bell et al., 2018). However, Donmoyer (2009) presents how the previous view about the importance of generalizability is not adequate anymore. Instead, he suggests that research concerned with individuals and not aggregates should be looked at as suggesting possibilities and insights rather than providing definitive solutions and actions. In

this case, this means that valuable insights can be gained from the results, but that they not necessarily are directly applicable to all other settings. Guba (1981) suggests that instead of generalizability, the term transferability should be used, and that even if generalizability is not possible to reach, some transferability between two contexts may exist if they have essential similarities. The degree of transferability depends on the degree of similarities between the contexts and therefore a “thick description” of the two contexts is needed to be able to determine this.

3.7 Ethical considerations

Bell et al. (2007) present some important ethical factors to consider when conducting a research project. These include potential harms to participants, informed consent and invasion of privacy. Additionally, Gray (2017) presents avoiding the use of deception as another factor to consider. In this project, to maintain the interview participants' privacy and avoid harm, the interview responses have been anonymized and treated in a responsible manner. To handle the issue of informed consent, the research participants were sent out information about the study and their participation before the interviews and by that, they were able to make an informed decision about whether to participate or not. Furthermore, the true purpose of the research project was presented to the participants to avoid deception. At the beginning of the interviews, the interviewees were also asked for consent to record the interview.

Another ethical issue to consider is other kinds of data retrieved from the organization apart from the interviews. In this situation, due to the fact that the case organization is a public organization, much of the retrieved data is already available to the public. In potential situations where that was not the case, the researchers consulted the supervisors at the case organizations to see how the data could be used within the research project and they were also asked to review the report before publishing, making sure that sensitive information is handled correctly. Even if the case organization is a public healthcare organization, the project has not handled any patient data and therefore no ethical concerns related to this needed to be handled. Further, as this report is a student project, it is excluded from the need for ethical approval from the Swedish Ethical Review Agency.

4 Results

This chapter describes the results based on the interviews and internal documents. The result section begins with a description of the current situation at Sahlgrenska University Hospital regarding research- and innovation collaboration, including a description of the two organizations the Innovation Platform and Gothia Forum. This part is then followed by results at the four levels of analysis introduced in the theoretical framework, divided into sub-themes.

4.1 Current Situation

During the interviews, it became clear that collaboration initiatives between Sahlgrenska University Hospital (SU) and the industry have very different characteristics and can come in many different forms. Collaboration initiatives can be initiated either through the Innovation Platform or Gothia Forum, the formalized channels for research- or innovation collaboration, or happen directly at the division-, department- or unit level at the hospital. In the result, the terms innovation and research are used separately to describe different kinds of projects. This does not necessarily mean that research projects are not considered as innovation activities, but rather just that the project is conducted within the frames of research.

4.1.1 The Innovation Platform

The Innovation Platform is a supporting organization belonging to Region Västra Götaland (VGR), supporting both SU and the other healthcare providers in the region. They have different working areas and within the area of collaborative innovation between healthcare and the business sector, they help both employees with an idea that needs support from a business partner in developing a solution, as well as companies that have a need to get in touch with the healthcare sector to develop their innovations. One employee at the Innovation Platform presented that to employees at SU, they can give support about for example innovation processes, help directing to the right functions within the organization, funding, or legal guidance. Further, the Innovation Platform coordinates the innovation fund, from which employees within VGR can apply for funding to their innovation projects. The Innovation Platform is also part of different national initiatives and networks, one example being the innovation motor project, aiming at easing the process of reaching out to external actors for support when a need is identified within the healthcare sector. For external actors contacting them, they can direct to different functions within VGR, help with connecting the external actors to clinical departments within VGR and SU and help setting up contracts when a collaboration is agreed on. While they can give support in different stages of the development process of a product, it is important that the innovative idea is not a fully developed product that needs to be handled by the procurement organization.

The work at the Innovation Platform follows a quite structured process. For external parties such as industry actors that want to get in touch with SU, they can fill in a form at the Innovation Platform's website and provide information about the company/product, development stage and what kind of collaboration they are in need of. After this, the requests are discussed at a weekly

meeting before getting back to the sender of the request. The actors sending in a request can expect a reply within 10 days. During the weekly meetings, different employees from the Innovation Platform, SU and VGR discuss the request, where the request belongs, whether the desired collaboration is feasible and what the next steps are. For most requests, the originators are offered a free initial meeting where the request and opportunities are further discussed. If there is no match for the request within SU or the desired healthcare provider, or if there are other reasons to not proceed with the request such as if the request should go to the procurement organization, the Innovation Platform gives feedback to the requester. They can also direct the requests to other functions within VGR or SU, to other actors in the innovation ecosystem such as science parks, or to already ongoing innovation initiatives. If the request is proceeded with and leads to a collaboration initiative the Innovation Platform helps with juridical aspects and collaboration contracts. For initiatives where industry actors use SU's or VGR's resources in their development process, they have to pay for the resources used, such as the time a department engages in the collaboration.

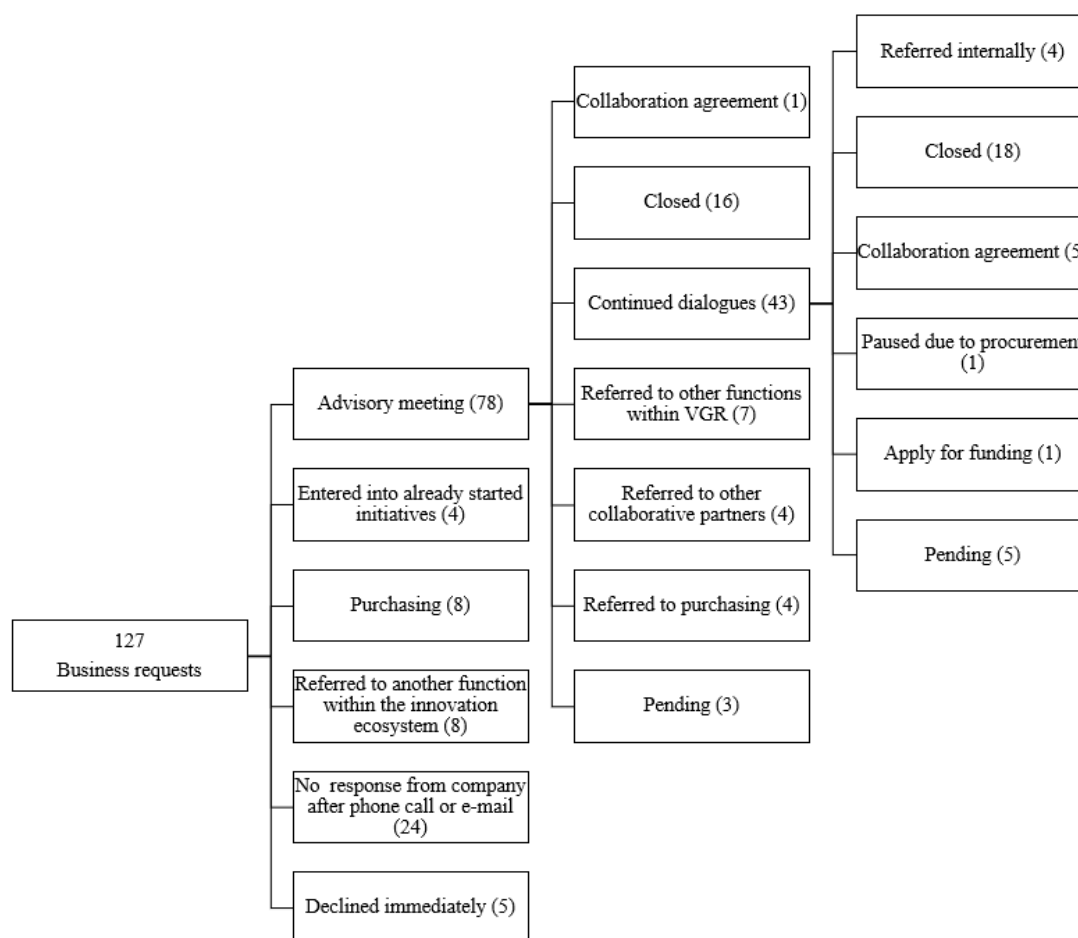
The Innovation platform can help facilitate different kinds of interactions and collaborations, such as discussions/interviews with clinicians, workshops, reviews of user-friendliness, need assessments or testbed opportunities, which is an open environment where external actors can test their solutions in real or simulated environments.

“If you go through the Innovation Platform, the whole healthcare organization becomes a testbed”- employee at the Innovation Platform

In 2021, the Innovation platform received 127 requests from the business sector. Of these, 78 passed to an initial advisory meeting, and the primary reason some did not was that the companies did not respond to calls or emails from the Innovation Platform. Of the requests getting an initial meeting, 45 continued to further discussions with the Innovation Platform, while others did not. A respondent from the Innovation Platform explained that the primary reason for closing requests after this meeting was because this first initial meeting was enough for the company in their development stage. Of the ones passing also this stage, 5 ended in contracts and agreement for collaboration. In total, 5% of the requests sent to the innovation platform so far have ended in agreements for collaboration. Also in this last stage a reasonable amount of requests were closed due to varied reasons, that for example could be that there was no match or interest from any department within SU or VGR, that there were no agreements regarding the terms of a contract/compensation, or also here that the companies were already satisfied with the service from the Innovation Platform. The full view of the handled requests in 2021 can be seen in figure 5.

Figure 5

Requests handled by the Innovation Platform during 2021



Note: Some requests were still ongoing at the time for data collection, why they are not visible in the figure

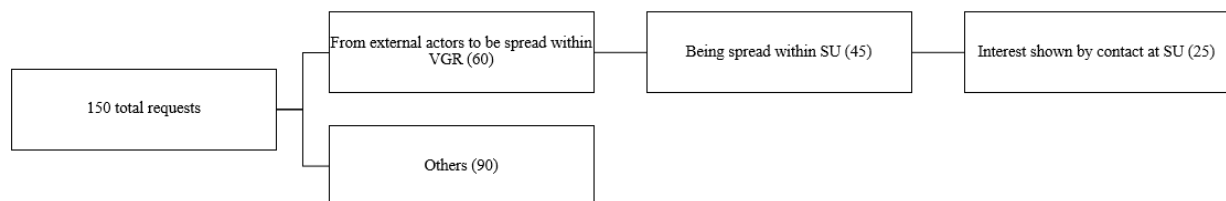
4.1.2 Gothia Forum

Gothia Forum is a supporting organization specialized in clinical trials. They have two own clinical trials units (CTUs) but are also working with supporting clinical trials at clinical departments or specialized CTUs at hospitals in VGR. Gothia Forum can support external actors as well as actors and individuals within VGR and SU and roles among their employees include lawyers, project leaders, data managers or quality coordinators. Trials can be initiated by individual researchers or pharmaceuticals-/MedTech companies and can concern either drugs or MedTech products that also are regulated and in need of scientific examination. The respondent from Gothia Forum explained that they can assist through the full research process with evaluating study protocols, examine costs and contracts, funding applications, applications for ethical approval as well as conducting trials at their departments with everything that includes, such as monitoring, verification, and control of data. For trials concerning areas where SU have specialized CTUs, those units are usually well known in the industry and often get the requests from the beginning. In other cases, Gothia Forum can direct requests to these units and help the requesters to the right recipient and in such cases help with specific actions when needed, such as juridical guidance. Gothia Forum is also part of a national network for study requests, meaning that requests can be sent out either regionally or nationally.

Gothia Forum tries to enable as many trials as possible, as the respondent representing them explained: *"As long as we have resources, we accept most requests"* and further explained that they can staff extra personnel for projects if needed. Further, the representative from Gothia Forum explained that they try to evaluate the importance of a study while at the same time they should not prioritize and evaluate research as it is difficult to know what research will have the most impact: *"...things happen that make different things important in the future"*.

In 2021, Gothia Forum received 150 requests. Of these, some came to their own CTUs while others came to Gothia Forum to be spread to clinical departments within VGR. Among these requests, 60 were received directly from external actors with the aim to be spread within VGR by Gothia Forum and of these, all except from 2 came from industry actors or Contract Research Organizations. Contract Research Organizations are often hired by companies to provide clinical trial support. A majority of the request concerned pharmaceuticals, while a smaller amount concerned MedTech products. These 60 requests were sent out to different actors within West Sweden's healthcare system. 45 requests were sent within SU to 77 different contacts (one request can be sent to different contacts). Of these, interest was shown for 25 of the studies, corresponding to 56% of the requests sent within SU. The requests handled by Gothia Forum in 2021 are presented in figure 6 below.

Figure 6
Requests handled by Gothia Forum during 2021



4.1.3 Current Collaborative Initiatives

Within SU and the different departments and units, interactions with the industry vary a lot, both in terms of types and scope. One kind of interaction is involvement in a collaboration project that has gone through the Innovation Platform or Gothia Forum. While some respondents had taken part in such projects, it was not that common. Further, it was not consistent among the respondents what they counted as collaboration for research or innovation and there is no common overview or reporting of ongoing projects, so it is not easy to know exactly what or how much collaboration is happening at SU. As one respondent put it: *"I believe that a lot of collaboration is happening, but then you approach a specific department directly and suggest a collaboration"*.

When industry actors want to get in touch with SU for a research- or innovation project and do not go through the Innovation Platform or Gothia forum, contacting specific doctors was mentioned as the most common way. Companies are usually approaching specific doctors working within the field of their product and that they often already have established contact

with, who make the initial decision about whether to proceed with the request. Sometimes, they can also approach the relevant department or unit at SU with the request, even though it is more common that the department gets involved after an initial contact between the company and a doctor. This can be the case either if the doctor thinks the request is interesting or because they forward everything to their manager. One Head of Department described that *“It is unusual that the departments get these requests ... they usually approach individual doctors. ... And then they turn to their manager or maybe even higher within the organization”*. Although this was mentioned by several respondents, other Senior Consultants state that they have never received such a request, but that companies only contact them trying to sell their products. *“No, I have never received such a request ... they only want to sell us stuff”*, was mentioned by one Senior Consultant and Head of Department, and the same view was shared by other respondents.

Most respondents highlighted that they often work with industry actors within the scope of industry sponsored clinical trials, especially regarding pharmaceuticals. This was naturally common in the CTUs but also happened at the other departments the respondents represented. One Head of Division expressed that *“We are very used to working with clinical trials of pharmaceuticals”*. All the CTUs covered in the interviews have a clear process of how to handle requests and how to decide which studies to conduct. One respondent highlighted that this is important in order to follow the regulatory framework surrounding clinical trials. For the clinical trials, fewer respondents had experience from conducting clinical trials concerning MedTech devices although it differs between departments depending on the nature of the medical field they work in. Further, a Senior Consultant also working as Head of a Clinical Department presented that *“we get a lot of requests from the pharmaceutical industry ... Regarding MedTech, it is much less common ... traditionally, there are fewer studies behind medical devices”*. However, the same and other respondents highlighted that in some situations when tests are needed for a medical device, a clinical trial is the only way to test it due to different regulations of how you can use new products. This was explained by one respondent: *“We have had a bit to do with MedTech, but that has also fallen within the frames of clinical trials because it was a product not being CE-marked so it had to be as a clinical trial. I have mainly been in contact with the regulated form of it [collaboration regarding MedTech products]”*.

Other respondents explained that at their departments, they have themselves initiated research projects together with industry actors. One Business Developer explained that they work together with industry partners a lot in order to *“avoid reinventing the wheel”*, so after identifying a need and sometimes building a prototype, they reach out to industry actors, usually start-ups, working with these things and asks if they want to use them as a testbed for their product in a research project. If the company is interested and agrees on the terms of a project, both actors put in their time and resources and no compensation is received by any part, although the department at SU sometimes apply for funding from the innovation fund.

Looking outside the field of clinical trials, several respondents explained that they do not think the companies know that they can initiate collaborations with SU or that testbed opportunities exist. While many respondents had worked together with companies in the context of research,

several respondents had never experienced a company reaching out to them to initiate a collaborative innovation project. One respondent, working as an Orthopedic Engineer said that it happens now and then that someone wants to initiate a clinical trial, but that *“...a direct request of clear collaboration for an innovation project has not happened”*. Another respondent expressed that *“The projects we have been involved in have gone through the Innovation platform, otherwise it is mostly internal research projects... it [company requests directly to departments or employees] is probably quite unusual”*. A third respondent, working as a Business Developer said that *“No, I have no experience at all of that we have received a request, but rather that we have reached out to the industry in all the projects we have conducted”*.

What was relatively common in terms of collaboration with industry actors for innovation was collaboration within the scope of already procured products and suppliers, for example through different development agreements. One respondent explained that *“the most common collaboration is with more established businesses where they already have a working product but want to launch a new version and in that you can be a part of the development. Sometimes you can try whether the ergonomics is good or when launched if the area of use is good”*. Another respondent had the same experience, saying that with big suppliers, they can give feedback on products already procured and, in that way, collaborate in the further development of the products. For internally initiated innovation projects, working with already procured suppliers were mentioned as a way to easier collaborate with the business sector and work around potential problems regarding for example regulations and time-consuming processes:

“We invited three companies that were already procured, that presented their solutions. We proceeded with one and that was nothing we needed to procure ... it was a bit of luck that it could go within the frames of existing agreements” - Business Developer

“We asked them [an already procured supplier] to look at their agreements with us, how does it look, is there any opening? Any opportunity we can use in the existing agreement for development, a door we can open and use. In that case you have gained a lot already. So that is how it turned out and consequently, we never turned to the open market but called it development work within the existing procurement agreement. And we saved a lot of time thanks to that.” - Strategist

Looking outside the field of research or collaboration within existing procurement agreements, although not that common, some respondents have experience of other kinds of collaboration projects that have not passed through the innovation platform. One respondent explained that *“The big players know there are opportunities to come in early and test. So usually it is about being some sort of test site and then we are in an area of work that is quite innovative so there are also a lot of companies created by people having a connection from here”*. Another respondent explained that while these projects are less common than collaborations within the frames of research or procured suppliers, they have still conducted some of these projects although it requires a bit more work before entering into these collaboration agreements. This respondent, working as Head of Department explained: *“In these cases we take help from our*

lawyers and economists that help us set up agreements and sometimes approval is needed from senior managers if it concerns long-term collaborations”. The view that the scope of the project and which company it concerns determines how much effort is needed to set up the collaboration was shared by another respondent explaining:

“The bigger the company is, the higher up in SU’s hierarchy the decisions are made to establish some kind of formal collaboration. Sometimes it is formal collaboration where contracts are signed, and economic compensation is given. In other cases, it passes almost completely under the radar. We help a company, usually smaller ones with some sort of measurement or similar” - Hospital Physicist

4.2 Socio-Political Factors

At the socio-political level, different things were mentioned as affecting the collaboration between SU and industry actors. Most of these concerned rules and regulations, both the rules themselves, but also lack of knowledge about the regulations.

4.2.1 Rules and Regulations are Inhibiting Collaboration

During most of the interviews, respondents mentioned that rules and regulations are seen as inhibiting collaboration with business actors. One respondent said that they value collaboration with industry actors but that *“We want to do it within the regulatory framework, follow contracts and so on”*. The respondent from Gothia Forum mentioned that *“Rules and regulations are a recurring problem. Things can go wrong if you do not know where to turn for help and sometimes juridical things are thought of quite late. What concerns actual work with patients always works, but things like protocols and applications can be problematic sometimes”*. Several respondents mentioned that it has become harder to collaborate due to new regulations affecting collaboration for research and innovation. One Strategist argued that it is complex and hard if you do not get help, but that they have structures to ease this, and that it should not be a reason to not start a collaboration project. However, another respondent explained that in some situations, they might keep away from entering a collaborative effort if they feel that *“we might not manage to do it regulatorily”*. Another respondent believed that the same is probably experienced sometimes by companies; that they are interested in collaborations but withdraw because of all regulations and rules and the fact that they have not considered such things in time.

Several respondents highlighted that often different rules and regulations are conflicting with the industry actors' wishes for the collaboration and this might affect the collaboration. These conflict areas are mentioned to often relate to secrecy about for example patient data.

“We have a lot of rules and regulations to cope with and that is just how it is, but of course it can create conflicts sometimes. We cannot just hand out patient data, and we cannot discuss everything they want to discuss and so on.” - Development Manager

Apart from the rules and regulations themselves affecting collaborative partnerships between the public and private sector, most respondents highlighted that there is a lack of knowledge among employees at SU about what rules and regulations they need to adhere to. One respondent mentioned that *“I believe people know they have something to adhere to, but they do not know the specific rules, for example GDPR”*. Likewise, a Business Developer explained that *“For example they do not know that you need a collaboration agreement where terms are clearly stated”*. One mentioned consequence of this knowledge gap is that projects might be undertaken without considering and following important regulations, and several respondents highlighted the need for support in these questions to avoid such situations.

4.2.2 The Law of Public Procurement Increases Complexity

One specific law that was mentioned as particularly inhibiting opportunities for collaboration between SU and business partners is the law of public procurement, which is experienced to affect collaborations throughout the whole innovation- and development process. To begin with, several respondents highlighted that in general, the public sector is good at public procurement, but as one respondent that had struggled with these issues put it: *“How do you procure something that can fill a need that does not have a clear solution”*. Another respondent explained that in their project, *“We could not go out and just procure this app, because it did not exist to procure. We had to think differently”*. Only a few people mentioned the area of innovation procurement, and they claimed that it is not very clear if, when and how you can apply that in different projects, and that it is today not used at SU.

What several respondents, both from SU and the innovation ecosystem, highlighted was that one risk with collaborations not handled correctly is that the company can be excluded from a future procurement process. One respondent from the innovation ecosystem presented that *“There is sometimes a bit of naivety, that you enter into a project and then end up in a dead-end, that you cannot continue [due to procurement problems]”*. Another respondent, from SU, experienced that *“It is quite easy to break the procurement rules, because they are so specific”*. Further, some respondents had also encountered companies being afraid of, and avoiding innovation collaborations particularly for the risk of being excluded in a future procurement process.

Another thing experienced as a problem is the opportunities to procure and diffuse the developed solution in case of a successful collaboration. One respondent described that in order to use and spread a solution more widely within SU, it needs to be procured, but sometimes you cannot procure a co-developed solution if another company comes with a similar solution when the procurement process starts. This is something described by several respondents as feeling very disappointing and un motivating as the benefits then are not awarded to the collaborating parties but another actor, sometimes after several years of collaboration. Apart from the disappointment in such situations, some respondents also present how this might make companies refrain from entering into co-creation initiatives as they are not guaranteed their solution can be implemented in case of a successful collaboration.

In order to avoid the above-mentioned issues, several respondents from the innovation ecosystem advocated that early in the process start thinking about future procurement processes to be prepared, even if a potential procurement is several years ahead. However, several people at SU think that this is not always the case when collaborating with industry actors. One Senior Consultant said that *“Not at all I would say, very little.”*, when asked whether they think about future procurement early in collaborative initiatives. Relatedly, several respondents explained that in terms of research projects and clinical trials, it is not that important to think about public procurements, while some respondents argue that the same problems can emerge later.

“Within the frames of a research project, you can basically do whatever you want. But when the project is over, if you have not started the procurement process early and that the procurement is successful, you might end up with a project dying. And that might be a fear, that you cannot, within this law of public procurement, manage to meet the development of products and new technology” - Business Developer

4.2.3 The Negative Impact of New Regulations

Some respondents highlighted that as regulations are changing, it is important but not always easy to stay updated. It is experienced as hard to adapt quickly to new regulations. One Senior Consultant explained: *“Yes, it [rules and regulations] is affecting us a lot. As I described, it has changed quite a lot about what you can and cannot do, so it is important to stay up to date ... it is not very easy to know what is allowed”*. Several regulations, recently imposed, were mentioned as affecting the opportunities to collaborate with industry actors in research- and innovation processes. Two such regulations mentioned are the GDPR and data security regulations, and the new MDR directive, that both are EU directives. As one respondent put it:

“The European Union has made everything more complicated, so much I can say. There are more restrictive rules for taking in different technologies in our environment, and it is very complicated. The law of public procurement that also is an EU directive is also tricky” - Senior Consultant and Head of Department

One respondent expressed frustration regarding the issue with GDPR and data security: *“We still have not really received an answer regarding what is okay or not ... it is really a mess all this. Not even the people working with it all the time have understood what is regulatory allowed or not”*. A Senior Consultant further explained how new regulations take time to adapt to when you for example cannot use existing templates for applications for studies and similar. Some interviewees specifically mentioned the issues with CE-marking and how that affects collaboration. One respondent explained that, for example, if a product that is not CE marked should be tested, it requires much more of the department as they then need to take full responsibility for the product and that is not something you do easily. Further, if the product is CE marked, it has already come a long way and passed through tests somewhere else which limits the need for further collaboration. Additionally, the same respondent mentioned that due to these regulations and steps an innovation needs to pass, the journey from idea to a finished product is much more time consuming and expensive, something that favors the big players in

the industry to come in with something. With these new regulations regarding medical devices, it has also become more restrictive with own-production of medical products, something that was relatively common at SU previously. One respondent explained that *“Until a few years ago, our department helped with some manufacturing for others that needed help. Today we cannot do that due to these new regulations for what equipment you can use within healthcare ... It has happened over time and the aim is patient safety of course, but it also leads to creativity being harmed. Because you know that the way to develop something is much, much longer ... it really has inhibited development”*. Looking to the future, a respondent working as a section leader highlighted that upcoming legislation from the EU regarding AI may increase the complexity of innovations in that area further.

4.2.4 Influence from the Healthcare Ecosystem on Collaboration

Apart from socio-political factors relating to rules and regulations, some interviewees mentioned other things in the innovation ecosystem that are affecting collaborations between the healthcare sector and private actors. To begin with, several people were missing more nationwide initiatives to facilitate collaboration. One such thing is more prioritization from politicians regarding these things. Relatedly, others are missing funding from the government, both resources to bottom-up innovations within healthcare, but also funding for covering the costs of the healthcare organizations' time, something especially smaller companies have problems covering today. However, at the same time, one respondent from the Innovation Platform explained that such funding usually can be received, if you just know where to go. Another respondent is missing initiatives to ease the process of spreading solutions to other regions, so they do not have to come up with solutions to problems already solved. This was explained being due to the fact that a solution developed within VGR and owned by them cannot within current regulatory frameworks be spread to other regions in Sweden. It was expressed that *“We have realized now that today, you need to have a company within the constellation to spread a developed innovation”*.

One respondent from the innovation ecosystem also commented on research and innovation, and the system as a whole, saying that *“Medical research has become very scientific which does not match with innovation that is more about a system that needs to adapt. The system has slowed down innovation”*. A Senior Consultant and Head of Department commented on a similar issue regarding a dilemma between research and innovation: *“There are dilemmas between research and innovation also. It is hard to apply for patents because you need to publish if you conduct research, and if you publish you are revealing your innovation, and if you do not publish, you get no funding. So, there is this dilemma for us what applies in these borders between research and innovation”*.

Additionally, some respondents were commenting on the education of healthcare professionals. They explained that today, research is a big part of the education, but the same for innovation is missing:

“I think that you should include it as a part of the education in the same way you have done with research, that you early in the education learn about innovation and that you also initiate how the business side are working and how collaborations are realized in a good way, so you anchor it early among the employees” - Planning Manager

4.3 Inter-organizational factors

Looking into the inter-organizational level of collaborative innovation, frequent themes discussed by the respondents include the ways and forums in which the different actors can meet, including the impact of personal relationships. Further themes related to this factor is how to actually set up the collaboration and what impacts the success of a common project.

4.3.1 The Issues with Unclear Entry Points

During the interviews, when discussing the ways in which SU and private industry actors can meet, several respondents mentioned that they think it is not always clear what channels to use, both when the industry actors are turning to SU but also when someone from SU wants to get in touch with a business actor. This is something several respondents think should be clearer and better communicated in external channels. One respondent working at the innovation platform explained that *“If you want to get into SU as an external actor, it is a jungle”*, at least if you do not go through the established channels. This is highlighted as especially problematic when there are no established relations between the parties. *“I believe that many departments are hard to reach for the companies”*, was expressed by one respondent. Another respondent has heard companies express their frustration about how hard it is to reach SU with these questions. Further, one respondent from the innovation ecosystem that usually are in contact with companies expressed that it is a problem that:

“The healthcare organizations do not reply to emails. The companies should be happy if they get a reply at all. And if they are lucky and receive an answer, it is usually just that they are not interested” - Respondent from the Innovation Ecosystem

This view is shared by several respondents expressing that they probably do not reply to all the requests they get, either because it is not interesting, or because they do not have the time to reply or refer to the right person. However, a few respondents not getting a lot of requests today expressed they would appreciate it if the companies contacted them instead of the other way around. Those respondents explained that the primary reason they are the ones initiating the projects today is because they do not receive any requests for collaboration but that it is something they would also appreciate.

“That would ease things for us, because if they are motivated from the beginning and know the terms, there is less work for us, and we might also not always know what we need either. They have maybe developed a solution or seen a problem we do not have identified. So, it would be much, much better if they contacted us” - Business Developer

“Yeah, I believe that is the future and how it should be. You cannot just sit by yourself and think about what we should do” - Business Developer

Regarding what way the respondents prefer the companies to take when contacting SU for collaboration initiatives, the opinions differ a bit. One Strategist explained that they have discussed this and that their motto is that there should be “no wrong doors” to enter SU, but that the handling otherwise should be the same. It is further explained that it is important to not hinder the spontaneous activities that are happening directly at the department or unit level. Relatedly, many respondents, especially the ones working at clinical departments, highlighted the importance of personal relations for a collaboration to happen. As two Senior Consultants put it:

“The most important factors... it comes back to personal relations. It must be someone that you can work with in a good way and that is pushing enough, in order to attract interest. Because there exists so much, so it must be something passing through the noise. And then, that you have a personal contact is usually what makes the difference” - Senior Consultant and Head of Department

“Yes, I believe personal relations are a prerequisite, whereas they can be very hard to establish. Because if you know each other then you start discussing joint projects, which is how one of our projects started. You trust each other and know that you can work together. I do not know how to get there if not doing it that way [with personal relations]. - Senior Consultant

However, personal relations and the collaborations based on these are not without downsides. One such problem explained is that you become very dependent on one person, and there is a risk of everything stagnating if that person gets sick or quits. Further, some companies, especially smaller companies and start-ups do not have these contacts, something explained by several respondents as limiting their opportunities of collaboration. Because of this, several respondents highlighted that while personal contact has its benefits, it would also be beneficial with one way to enter into the healthcare system.

Most respondents raised the thought that at least for requests from actors without established relationships and concerning other things than clinical trials, the way through the established channel, in this case the innovation platform, should be the preferred one. One reason behind this is the risk of requests not being handled at all or becoming tossed around the system if a company blindly contacts someone within SU and the request does not reach the right person. For collaborations between actors already having established relationships, the opinions differ a bit. As one respondent put it: *“I think it makes sense that the innovation platform handles the requests. But then there is the question of what to do with established relations?”*. One Head of Division, whose opinion are shared by several respondents, elaborates further on this:

“If you already have an established channel, you do not need a central channel the request needs to pass. But I believe it would be beneficial if we had one way in, that if

you need contact regarding these questions with SU... That it is clear from the outside of the organization that you can start here and then you will get help to be referred to the right department/unit. Because we are a large organization, and it is not always easy to know. Because maybe you send your request somewhere and get no reaction, so you try somewhere else and also there get no reaction. I think we need one way in so we can handle this internally. To see if this is something we are interested in, do we need any internal support to process the question. And then we can reply that; no, we are not interested or yes, we want to discuss this further or similar, because otherwise there is the risk that nothing happens, and no one gets a reply. ... And also, that we risk missing out on things we might be interested in” - Head of Division

Several arguments were brought up by the respondents for why it would be good with one single point of entry into SU for the above-mentioned external requests for collaboration. One of these is that it would be easier for the companies to know where to go. Further, one respondent from the innovation ecosystem highlighted the importance of acting professionally when interacting with companies to make sure everything is done the right way. It was claimed that if the requests pass the innovation platform, you can make sure that this professional attitude is kept, something that is not always the case if a company contacts a clinician directly. This was also highlighted by one of the Head of Divisions at SU. Similarly, another respondent from the innovation ecosystem claimed that there are a lot of benefits with these platforms as they are better equipped in terms of rules, regulations etc. Additionally, another mentioned benefit of using one formal way for entering the healthcare system is that it is easier to get a fair and equal treatment of all requests with focus on achieving the largest health benefits of the innovation, something highlighted by many respondents as an important aspect as SU is part of the public sector. As one respondent put it: *"It is important that there is no unequal treatment and that all companies have the same opportunities and not only the one coming first or knowing someone"*. However, that was highlighted by one respondent as sometimes difficult to live by when you have personal relations: *"You want to do everything fair and equal, but these relationships still exist, and you cannot get rid of that"*. Another respondent explained that there also might be competition between companies developing similar solutions, something that is important for SU to handle fair as there probably is a lot of gain in it for the companies that succeed entering the system.

Further, several respondents explained that by following the logic of one entry point, the requests would likely pass through the right hierarchy from the beginning, as the clinicians need to check with their manager anyway if they get a request they are interested in picking up. Also, several clinicians expressed that they would be more likely to pick up a request from a company they do not already have established relationships with if it before had passed through a formal channel doing initial filtering. For example, gathering the needed information and making sure the request ends up at the right department or person. One Senior Consultant expressed that *"Yeah, definitely, that [requests coming through the innovation platform] would be better, knowing that it has passed some sort of filter"*, and another one similarly said that *"Yes, that would be more interesting, because the things coming now are way too abstract"*.

Looking at the area of clinical trials, most respondents agree that the way it works today is mainly good. Several respondents explained that for clinical trials, the networks are very established, and that people know where and to whom to turn with different questions and requests which makes the need for a central node making the initial handling of a request less needed. However, one respondent from a CTU still sees the problem of requests sometimes not reaching the right person, why it would be beneficial to get the request to a common mailbox at their department.

“They [the doctors] are usually quite busy so it would be practical to get the requests to our mailbox so we can make sure it reaches the right person. I usually see email threads that have passed through different people and eventually it ends up here. I guess it is not a big problem, but I also do not know how much gets stuck on the way.” - Research Coordinator

4.3.2 Lack of Forums to Meet

Apart from the need of having working ways for SU and industry actors to get in touch, several respondents were expressing the need for different forums to meet and how these might differ depending on the development stage of an innovation. One respondent from the innovation ecosystem claimed that in order to succeed, it is important with the right areas to meet.

Respondents from different departments at SU agreed that for testing of new solutions, it is easier with products that are somewhat fully developed. One Senior Clinician explained that *“It is easier to take an almost complete solution and maybe develop or adjust based on our operations than the opposite. But it also occurs that you turn to a company with your needs and ask if they can develop it. But that takes longer time and is more long term”*. One respondent working at the simulation center adds on this:

“There are two ways of doing it, you can do it very early and agile, test something, go back, change back and forth and so on, but that might be unrealistic. It is hard to get access to simulation and personnel that regularly. So I think it is primarily when we think we have a product that is ready, almost ready to be launched. But at which point we are still willing to make essential changes somewhere.” - respondent from the simulation center

Although actual testing might be easier to do later in the development process, several respondents expressed the wish to also be included earlier in the companies' processes. One Senior Consultant explained that:

“In my experience, we usually get consulted quite late. ... And sometimes I think that you do not include us in the development work, but that you make it yourself and then you want to test it and sometimes that is okay. But I think the problem then is that we are not a collaborating partner but rather just someone performing a task. It is becoming just buying a service, while I would like that we could be included in the

development process in another way. And there I sometimes think that it is missing ... we do not have that many good forums there. Sometimes you maybe just want to sit down and discuss a product” - Senior Consultant

In order to solve this and have the possibility to participate earlier in the development process, many respondents suggested a somehow similar solution. This is a forum organized by SU, for example in the form of a workshop, discussion forum or pitching event where the companies and people from SU get a chance to sit down and discuss together. This could be a chance both for the companies to present and get feedback on their solutions to better develop them according to the needs of clinicians, but also an opportunity for clinicians to present the needs they feel do not have a solution yet, and maybe a company is interested in developing one. One respondent explained that:

“We have a lot of competence in the hospital about specific diseases, products and needs, and there must be a forum for this. Today, not all projects manage to pass the barriers to be undertaken, which also is reasonable. But sometimes you can miss some kind of more informal forum where you can just discuss ideas, new technology or innovation” - Senior Consultant

Another respondent highlighted that:

“We need an arena where we can meet in an easier way, find each other's knowledge and specialist competence. There is so much winning with more collaboration, both between groups within the hospital, but also there is so much competence out there that we are missing, and we need to make that connection smarter. There must be an opportunity to an arena where the companies maybe can sign up and then you can have different specialists from SU there” - Planning Manager

Adding to this, the respondent also explained that a benefit of SU arranging a forum like this is that it would probably feel credible for the employees as it is in a controlled environment where they can be sure it is within the rules and regulations of collaborations. One respondent presented that such a forum can also help in building personal relationships that might help the interactions to result in bigger, more long-term collaboration projects. One Head of Division claimed that SU needs to be better at inviting the business sector, and explained that they had a similar event, but focused on research, with participants from SU and from the university sphere that turned out very successful. During this event, both sides got a chance to present what problems they had or what they were working with and based on this some matchmaking occurred which is explained to have resulted in several concrete collaboration projects. One respondent from the innovation ecosystem also had positive experiences from similar events, in this case a pitching event with different collaborating organizations from different countries where companies could get feedback on their ideas, something that was appreciated.

Additionally, it was explained that the simulation center can fill an important role as an arena to collaborate around products that are still not ready to be tested on patients but where you still

can get important input to avoid costly changes late in the process and make sure a product is developing in the right direction.

4.3.3 *The Hurdle of Negotiation and Setting up Contracts*

When entering into a collaboration agreement with a company, several respondents explained that one barrier that needs to be passed is negotiating and agreeing on the terms of the collaboration so there is a win-win situation and that all actors feel they get something positive from the collaboration, not only the business actors. For the respondents at SU, they presented how the benefits can be either monetary or/and that they get access to an innovative product or treatment method they can influence by investing their time and resources in a project. One Head of Division explained how SU needs to think about what their aim is with different projects before agreeing on terms of a collaboration:

“There needs to be benefits for both parties so it is not only us getting paid for a service but that we also think about what we would like to achieve with the collaboration” - Head of Division

Several respondents highlighted that setting up contracts might be a barrier partly because they do not know how to do it, but also because it can be hard to agree on terms. As one respondent explained: *“Who has the need, who is responsible and how do you share profits, efforts, risks and so on?”*. Another respondent presented that *“there is sometimes a conflict about who is going to pay. But lack of knowledge about how you should do it can also be a barrier”*. One Strategist explained that SU have things to learn from the business side here:

“Business sense is something we need; we at SU and healthcare in the public sector needs to be even better at this. Sound business principles are important. For example, how do you write a contract and similar?” - Strategist

Several respondents agreed that discussions about funding are usually problematic. One Head of Division explained that *“We should have compensation for our effort”*, as SU is a part of the public sector. Another respondent explained that industry financed clinical trials help their department keep going. However, the need for replacing SU’s costs might also stop some industry actors from collaborating as it becomes too expensive or because they do not know whether the investment will pay off.

“... because the companies are primarily interested in whether it will be profitable, and is it worth it for them? Or will it only be a cost, then they are not interested. ... Companies are not always ready to invest money until they know it is a good idea” - respondent from the innovation ecosystem

“It ends up in economics. Because it can be that we want to test everything for free, and the companies want to earn money ... We want to see that if we test something for a company, we do not want to pay, but at the same time, the company cannot afford to

give these products for free. They are dependent on money, so it is a constant discussion about whether you should pay for things or not.” - Senior Consultant and Head of Department

This is highlighted by several respondents as being extra tough for smaller companies as they do not have the same resources as the bigger players in the industry.

For clinical trials, the process of writing and agreeing on contracts seemed to be smoother. Respondents working with clinical trials explained how a lot of their time is spent on negotiating, but that it is usually no problem because they are used to it. The problem they sometimes experience is that they need to say no to trials if it becomes too costly for them and they do not get compensated for all their costs.

4.3.4 Divergent Characteristics of SU and Collaborating Partners

When a collaboration project is undertaken, several factors were brought up during the interviews as either inhibiting or facilitating the collaboration. Several respondents highlighted that the actors taking part of the collaboration have different logics in how they work, something that can give rise to conflicts in a collaboration, especially outside the field of clinical trials where the companies are more used to the procedures. One respondent explained that *“it is like we are speaking different languages”*, and that it is important to try to understand each other's language and logic for a collaboration to work. Another respondent expressed it as some sort of “blame-game” between the different parties.

During many interviews, people brought up that they sometimes feel that companies have no idea how the healthcare sector works, and that it is too much of a business approach from them, something that can complicate the collaboration or lead to it not happening at all. One Senior Consultant explained:

“There is this thing with business-side versus patient value. Sometimes we feel that no, this is too much just marketing”. - Senior Consultant and Head of Department

Another respondent presented a situation where they felt the project manager from a company did not listen to the needs of the healthcare department but rather had more focus on their goals with the project. This respondent felt that the companies would benefit from reducing the buying and selling mindset. Contrarily, several respondents explained that people within SU have trouble understanding the business side, something that if they did would ease collaborations. One respondent from the innovation platform thought both parties would benefit from taking in each other's opinions and experiences so they can meet better.

Several respondents explained that these disputes are usually less apparent if the representatives from the companies have worked within the healthcare sector before. They also explained that it is the same the other way around, if the healthcare employee has experience from the business side as they then understand each other better. However, that is not always the case and in these

situations, potential conflicts can, according to the interviewees, be mitigated by good communication where both parties get to explain their aims and organizations so they thereafter can agree on a common goal. One Business Developer explained how they had overcome these kinds of problems by keeping a positive attitude and gathering all actors together, and gave an example: *"We have had situations where we needed to put them on track and describe how the healthcare structure looks and how it works in Sweden. But they have been very understanding and compliant"*. Another respondent agrees that gathering all actors "around the same table" until you have sorted out everything that is unclear is the only way of overcoming these situations. A few respondents explained that smaller companies and start-ups usually are less used to working with the healthcare sector, and therefore can be more surprised by how things work than the established companies. However, one respondent explained how the smaller companies are usually easier to put on track as there are fewer levels within their organization and the representatives from them usually also have the mandate to make decisions.

Additionally, many respondents highlighted trust between the actors as an important aspect of a successful collaboration. Several respondents had experienced companies trying different ways into SU even if they were turned down at one department and requests that did not feel serious. One Senior Consultant explained: *"We are becoming frustrated if there are requests that do not feel serious but that the company anyway wants to get in. They can use quite assertive methods to get in and that is bothering"*. Others had experience from companies saying things about their innovations that were not true, companies avoiding giving some information, companies trying to sell a product as a collaboration project about an innovation to avoid procurement although the product was fully developed, and other similar situations:

"They try to use some loopholes. We had one MedTech product we were about to take in where they said it was CE-marked. Then I quickly googled and saw that was not true. The Swedish Medical Products Agency had withdrawn their approval due to changed regulations and when I asked them, they were just quiet and changed the whole product" - Head of Unit

"We had one MedTech company that wanted us to test an algorithm in a product. And they tried to frame it as it had a lot of clinical benefits although that was not really the case. And then it turned out a subscription to use it cost a lot. So, you are becoming a bit sceptical" - Senior Consultant

Such situations are something respondents experience has damaged the trust, not only for these specific companies but sometimes for companies overall and they therefore wish for companies to be more open and honest when approaching SU, and one respondent also highlighted the importance of meeting people in person to build this trust.

Another difference some respondents have experienced being a bit problematic is the timeframes the different actors are working with, where companies are demanding and are used to and in need of things happening very fast while things are moving a bit slower in the healthcare system. Several respondents highlighted that this is especially problematic for

smaller companies that need things to happen faster and often do not have the resources to wait. One respondent explained: *"Everything needs to happen very fast, especially in a smaller company, because otherwise you will not survive, and with us, things take so much longer than what they expect. So that is one clash that exists"*. To overcome potential conflicts regarding this, one respondent stressed the importance of early on getting the company on track with the timeline they can expect when working with SU. Related to the inertia within SU and the public sector, some respondents also highlighted the risk of losing initiatives due to things taking too much time, both to other regions in Sweden, but also that companies turn abroad if they reply and work faster.

Further one area of conflict that some respondents brought up relates to research and publishing of results. In some situations, these respondents had experienced companies not wanting the research results to be published as they have things with their products they do not want to be published or because the results of the research project were not what they thought. To avoid these conflicts, one respondent explained that it is important from the beginning to be very clear about what will be published and that it is also specified in the contracts.

4.4 Organizational Factors

Looking into the organizational factor, it includes how the organizational characteristics affect the ability to collaborate and innovate. Themes that have been discussed related to this factor are how it is difficult to manage both producing healthcare and developing for the future, the organizational capacity to evaluate and assimilate external information and lastly, the organizational culture.

4.4.1 The Difficulty Being Ambidextrous

During most interviews, the respondents brought up the issue of producing healthcare today simultaneously as developing better care for tomorrow. One Head of Department said *"...we are a University Hospital and shall drive education, development and innovation."* along with their primary assignment of producing healthcare. Another respondent explained that: *"We need to balance producing healthcare with our development assignments, which we also have"*. The majority of the respondents conclude that the biggest obstacles to doing these activities simultaneously are time and resources. A Strategist illustrated the current situation within healthcare as *"The equation for consumption looks in one way and the equation for available resources looks in a different way and this needs to be aligned in different ways otherwise we will not be able to provide good healthcare in the future"*. Several respondents highlighted the importance of innovation to help patients in the future. One respondent emphasized that: *"We need to do this in order to satisfy our current and future patients' needs"*.

The recent Covid-19 pandemic has made the problem more difficult than before. A Head of Department described the pandemic situation as *"We have been fully occupied with the pandemic ... We still have a lot to deal with in the wake of the pandemic. We have to increase production again and take care of all patients who have had to wait"*. A Head of CTU said that

during the pandemic “...there have been people moved here and there”, which has made it more challenging to work with clinical trials and innovation. However, the same respondent emphasized that “*Healthcare always comes first, and we have to treat children and adults; otherwise, they die*”. Therefore, as a consequence of this, the respondent said, “...it is easy to push things like this [work related to innovation] forward” while “...at the same time one must consider the future”. This aligns with what one respondent said:

“We have a tendency to focus on what is right in front of us without thinking about the patients who have not yet arrived” - Head of Division

A large number of respondents gave evidence that SU personnel want to be a part of the development of innovation but that it is perceived as disturbing their core assignment. This opinion is highlighted by a respondent that said: “*You want to contribute to development ... but the challenge is that there are too few employees and a large focus on producing healthcare and thereby it becomes more of a burden*”. Although it is difficult to simultaneously produce healthcare while developing new innovations and treatments for the future, SU needs to try to do this, which is highlighted by another respondent “...we still have to try to do several things at the same time”. To manage this the healthcare needs to understand that “*We do not need to do everything ourselves ... we have support functions within our own organizations, and we can also get help from companies*” which was said by a Head of Department.

There is a lot of potential for innovation and research by utilizing the support functions and collaboration with companies. However, the time and resources are still big obstacles which are highlighted by a respondent “... *our care units feel that they are under a great burden... and do not have an awful lot of space to answer any surveys or gather large patient groups*”. This opinion is aligned with what a respondent from the innovation ecosystem said: “*There are no nurses who can get that time [to do testing etc. for companies] ... maybe in research projects*”. Additionally, another respondent that works as a Head of Department and Senior Consultant described how the innovation or idea needs to be very interesting in order to justify putting aside the patient work and raised the issue of balancing the time “...*how much time should I spend on these tests compared to producing the healthcare that needs to be upheld*”.

To solve the problem of limited time to work with innovation and collaborate with companies within the daily activities, several respondents suggested the same solution; namely that time should be set aside for innovation. This argument is illustrated by a Head of Department and Senior Consultant that said: “*I believe that we should do exactly as we have done with research, put aside time for it*”. The same respondent further argued that “...*if there is a wish of producing more innovations there is a need of putting aside time for it*”. The respondent from the innovation and technology program described that a part of the working time has been set aside for innovation, however, not many employees at SU have this opportunity. Additionally, one respondent said:

“There is a lot of experience and knowledge about how to conduct research and also a lot of support available. There is a whole organization for research, however, there is

no such organization for supporting innovation initiatives as we see it. To be able to take advantage of the innovation capacity and ambition that exists in our organization.”
- Business Developer

Another respondent described the difference between research and innovation, “...research has support, and you get access to working hours. With innovation you need to obtain funding yourself”. This aligns with what a Head of Department and Senior Consultant said: “Research is what we are more used to” and claimed that it was easier to see the end product of research compared to innovations “...today's research is tomorrow's medicine. I do not believe that all [employees at SU] think the same about innovations”.

4.4.2 The Strategy is not Enough Anchored in the Organization

Looking into the hospital's strategy regarding collaborating with external actors for research and innovation, one respondent commented on collaborating more with industry actors: “This is one of the hospital's strategies”. During the interviews, when asked if there was an expressed strategy from the management that SU should collaborate more with companies on innovations, the responses differed. A respondent working as Head of Division explained “The hospital director is very clear that she wants to see an extended collaboration with external actors”. Another respondent described that “It is expressed that we should do this”. A third respondent working as Business Developer was thrilled about the recent shift and said, “I have experienced in the last three years that a lot has happened, especially if you take a look at the Innovation platform and the hospital director, which makes me positive”.

However, all interviewees did not share this view of an expressed strategy. A respondent working as a Head of Department said that “I have never heard before that we should collaborate with external actors, but they want us to work with innovation”. Another respondent working as a Hospital Physicist said that “I do not know if strategy is the right word. I would say that a vision exists ... A strategy should be more clear than what it is today”. As one respondent put it:

“It is like they have just put it out there, that you have FoUUI [Research, Development, Education, and Innovation], and they try to stress that innovation also is included now. We work with education, research, and development, but the I [Innovation] still is a bit of a question mark, or an exclamation mark that we still have no real structure for and that is something we need to work with. ... We have been given some tools, but I feel that it is not enough” - Head of Department and Senior Consultant

The same tendencies that the innovation still is a bit behind in this strategy can also be seen in other places. When one division at SU in an internal document presents their strategic work in the area of FoUUI during 2022, basically all goals and actions only concern research and innovation is barely mentioned at all.

Additionally, the absence of a course of action to implement the strategy were raised by several respondents. According to a respondent working as Head of Department collaborating more with external actors *“becomes very much up to individuals, personal contacts, and personal engagement. There are no guidelines or strategic investments”*. A few respondents expressed that they are missing what should be the accomplished outcome of the strategy and what the organization is aiming for. A respondent working as Strategist commented on this, claiming that *“The strategy is quite new and for that reason we do not have any concrete goals”*. However, SU established some guidelines for collaboration with external actors last year, but these seem not to have been widely distributed as many respondents did not know about them. These guidelines contain where employees can look for help in these questions and how intrusion in healthcare needs to be compensated, among other things.

There might be an explanation that the strategy is rather unknown for several of the respondents. According to a Head of Division *“It [the strategy] is still on a management level.”* However, going forward the strategy needs to be known further down in the hierarchy as the same respondent expressed: *“From above you can only create conditions for those who will do the work”*. Resources have been invested that are in line with the strategy, which is highlighted by a respondent working as Development Manager that said *“...the hospital director has invested quite a lot in development, especially in innovation and IT”*. Two initiatives have started in line with the strategy discussed above; a resident program focused on innovation and technology, and the appointment of industry relations coordinators, one person in each division responsible for coordinating the contact with business actors. This role is rather new, and there is an ongoing discussion about the function and responsibilities of the role. A respondent working as a Strategist described the role as *“...they will assist people on the floor to realize their ideas”*. Another respondent working as Head of Division expressed a different view of the role by saying: *“...if you want to get in contact with us, you send in your request to them. Then we will have structure to process the request”*. Although many respondents are positive about the role, there is some scepticism about the role and its effect on innovation collaboration. A respondent working as Senior Consultant expressed that *“individuals that have time for these kinds of assignments are often too far away from the daily activities. Therefore, I am a little hesitant about it”*. However, another respondent had a different opinion and saw the new role as a way to get the support closer to the units.

4.4.3 The Absorptive Capacity at SU

As mentioned above, several respondents highlighted that it is common that companies send requests directly to doctors, researchers, or Head of Departments. A crucial aspect in this matter is that the request reaches the right individual, which is explained by a respondent working as a Senior Consultant: *“...it is of course very important that there is some kind of matching based on competence”*. The argument was further elaborated: *“We would have been bad at being part of a project concerning something outside our area of expertise”*. Another respondent working as Head of CTU described how the scientific question was crucial whether they would start the study and therefore it was good that the doctors received the request first as they are the best to evaluate ideas within their area of expertise. A third respondent described that *“...each*

individual researcher has quite a lot of power to say what they think” regarding how researchers review the request they received. However, there is the risk that the request is not handled at all if it reaches the wrong individual, which has been described as a problem. One respondent explained the disadvantage of being dependent on a few individuals:

“When we are so dependent on specific individuals...it becomes these individuals’ assignment to hold everything in the air, so it does not fall” - Business Developer

Some respondents identified a need for a standardized process to get away from this dependence of key individuals with experience of collaboration and contacts. A standardized process entails everything from how to find the right individual with a request to setting up the collaboration agreement. One respondent highlighted that it would be beneficial *“If there had been a standardized process then everyone could do it [innovation collaboration]”*, which is partly how it looks regarding clinical trials and CTUs. However, several respondents oppose standardized processes as they argued that it is difficult or almost impossible to standardize these kinds of interactions. This was highlighted by a respondent that said: *“It is often new and difficult situations and then a standardized process is not adapted to these kinds of situations, and thereby you still need to create an ad-hoc solution”*. Another respondent elaborated on this: *“I like it if you standardize the process so there is room for tasks that cannot be standardized. You cannot standardize everything but maybe 80 %, which gives room for 20 % that cannot be standardized”*. One respondent working as a Business Developer suggested that *“three things should be fixed: an agreement for cooperation, a clear division of responsibilities and economic terms for the collaboration”* and claimed that more standardization would hinder innovation because it would limit creativity.

As not everything can be standardized, several respondents requested an organization that individuals can turn to when they need help to organize collaboration with industry actors. A majority of the interviewees expressed that they thought that nurses and doctors at the floor do not know who to turn to when they are not sure about different things when collaborating with external actors. It was expressed as quite well-known that employees can turn to the Innovation Platform to apply for money if they have an idea, however, the remaining functions they and Gothia Forum can offer support with are relatively unknown. This was highlighted by one respondent that said:

“I do not think that the general nurse and doctor know what they [supporting organizations] do or how to get in contact with them and whether it is allowed because they might be doing something far more important. I think they are too far away from daily activities” - Planning Manager

The support from these organizations can be crucial for employees wanting to collaborate with external actors, which is why it is important that they are well-known all across SU. As described by a respondent working as Head of Department: *“They are vital for me as a Head of Department and my employees who want to conduct these kinds of projects”*. Several respondents saw a need for these supporting functions to market themselves more to the

employees at SU. Another aspect that is crucial for these supporting functions is what a respondent working in an organization within the innovation ecosystem highlighted: *"It is important to have good contacts on the floor, so they do not become an organization on the side"*.

Several respondents described situations where employees at SU turned down collaboration requests from external actors because they were not sure about rules, laws, and agreements regarding this. It is important that the employees feel safe when collaborating with companies therefore it is important *"...to secure the law aspects beforehand so everything is safe"* as one respondent explained, why legal support becomes a crucial aspect of collaborating with industry actors. A majority of the respondents experienced that the legal support was insufficient at SU today. As a respondent described *"That [legal support] I believe is needed in the future. They are a fairly limited crowd at SU"*.

Another support organization that was mentioned during several interviews was the IT-support organization. One respondent working as Strategist explained that: *"every innovation project that involves IT is rather difficult ... Our IT-organization is more built for administration rather than development ... Therefore, they do not have any space for smaller projects"*. Another respondent described an experience where the organization did not have the time to support an internal project and suggested the reason behind it was *"I think the new journal system has swallowed a large portion of their resources"*.

4.4.4 The Organizational Culture May Hamper Innovation and Collaboration

Historically, there have been several shifts in the attitude towards the industry and the relation between SU and business actors. According to a respondent working as a Senior Consultant *"... if you have been around for a while, you have experienced many fluctuations in this. About 20 years ago, we had a lot of cooperation and interaction together ... We socialized in a completely different way. But then suddenly there was a complete stop. And then probably much of the personal contacts died because one became afraid of making something illegal"*. Several respondents described that during the period where SU and industry actors were closer many employees were offered conferences and other things by large companies. However, this is not the case today, as a respondent working as Head of CTU explained: *"It is not like this today. It is not as if you can go to a conference with a pharmaceutical company"*. Furthermore, the same respondent added *"We have become more and more independent of the pharmaceutical industry in that way. Which is good because it has not disadvantaged us in any way"*.

On the contrary, although it was described during interviews that the close relationship between SU and the industry actors had its problems, the total stop appears not to have been good either as it stopped many opportunities for joint development. Therefore, there has been a shift again within SU, the initiative of the industry relations coordinator shows the willingness from the management to work with innovation and also collaborate more with external actors. As a respondent working as Senior Consultant highlighted *"I believe it has emerged that they want to operate in a different way, and they are open for more collaboration. That is good"*.

However, an interviewee from the innovation ecosystem claimed that *“If they [companies] want to have a discussion with a doctor, then there is a cultural barrier; a fear of being too close.”*. This aligns with what a respondent working as a Strategist said *“...to increase collaboration between SU and the industry...it is very much about changing the culture”*.

The majority of the respondents described the employees at SU as having a positive attitude towards collaborating with external actors but also working with innovation in general. Nevertheless, several respondents highlighted that there is sometimes a scepticism among the employees at SU that the companies just want to make money. One respondent said that:

“Historically, the healthcare sector thinks the companies only want to earn money. People working on the floor see it as companies only come and take things without giving anything” - respondent from the innovation ecosystem

A respondent working as Head of Division explained this by saying *“I believe they [employees at SU] are thinking too short term and are unsure what it can give us in the long term. They see it just as a work effort”*. Further, almost all respondents thought that employees within the healthcare industry experience a fear of collaborating with external actors. According to one respondent:

“There are many employees that are afraid of having a dialogue with businesses that approach the hospital. Because they do not know what type of contact they are allowed to have without it being seen as bribery” - Planning Manager

This conservative attitude towards industry actors might bring both good and bad side effects, as a respondent explained: *“As we do not have much contact, there will be no errors either”*. However, as several respondents argued it is important to dare in these matters otherwise no one will get anywhere. A respondent working as Business Developer described that in some projects, they have not been sure about how to do things but that they have tried and in cases the way they did things was not correct, learnt from their mistakes. This aligns with what one respondent from the innovation ecosystem said, that you need to try and experiment and learn what you can do, otherwise nothing will happen. What is explained as important though is to be honest about potential mistakes and learn from them. As one respondent explained, to overcome these issues and increase the collaboration initiatives between SU and industry actors, there is a need to change the culture so the employees at SU dares to collaborate and experiment. Several respondents highlighted that success stories could work as a facilitator to change the culture by showing the results and effects of collaborations. One respondent explained that: *“We have quality days where we present different kinds of projects for each other”* and presented how doing the same with collaborative projects between SU and external actors might help change the culture and inspire others.

4.5 Intra-Organizational Factors

Regarding intra-organizational factors, it includes a discussion around incentives for individuals to collaborate and innovate. Furthermore, other themes examined are how certain individuals affect collaborative and innovation projects and the importance of managers in enabling collaborations.

4.5.1 *Individuals' Incentives to Collaborate*

During the interviews, respondents presented different motives for collaborating with external actors. The most common motive was to enhance patient care which is illustrated by what a Head of Department and Senior Consultant said: *"I think that the greatest driving force comes from wanting to enhance and drive quality in patient care"*. Another respondent working as Head of Department and Senior Consultant further described that *"... nothing can beat that it is value-creating"*. A second incentive for collaborating with industry actors was brought up by a respondent that described how the outcome of these collaborations can ease the work of the employees at SU and make their work more efficient. Further, one Strategist explained that getting paid for conducting collaborative projects with a substantial overhead is an incentive for collaboration as it then affects the department in a positive way. However, several respondents working at the floor highlighted that monetary incentives are not at all why they are undertaking collaboration projects but rather seeing how they can influence the development of innovations and help their patients, even though getting paid would be a beneficial side-effect for the departments. One Head of Department explained that it is not the financial resources that are the problem, but rather finding available personnel with time to participate. Another respondent added to this by saying:

"For us, one hundred thousand is not a significant amount of money. We cannot hire an extra person; instead, the same individuals get one more thing to do. Then there are some economists somewhere who are pleased that the deficit was 0,1 rather than 0,2"
- Hospital Physicist

The situation is a bit different when the collaboration concerns large, industry sponsored clinical trials, especially regarding pharmaceuticals as one respondent explained that pharmaceutical companies have better opportunities to sponsor studies. One respondent working as Head of Department also highlighted this regarding large companies and pharmaceuticals studies: *"...such studies are beneficial for all parties as they keep our business running and it helps to pay our overhead costs"*. Another respondent working as Research Coordinator at CTU gave an example that research phase three studies are very beneficial in economic terms and also involve less work.

Several respondents found it easier to recognize benefits with research projects compared to other innovation projects, something that can give more incentives to conduct more of these projects. One Head of Division explained that employees at SU probably think a bit too short-term regarding other projects than research and have trouble seeing the long-term benefits of taking part in such a project. On the other hand, a respondent highlighted a conflict that

appeared relating to research projects compared to innovation projects: *"If a company wants us to conduct some measures on the equipment, then we can do it. I do not engage intellectually or emotionally in this kind of project. On the contrary, we employ both our integrity and emotions in research projects"*.

Further, the incentives to collaborate differ depending on the size of the company. A respondent working as a Hospital Physicist explained the differences between small and large companies as:

"...based on my own experience we are more inclined to help smaller local companies for different reasons. It is known that large companies have other places to perform tests and thereby are able to manage themselves. They also have the financial resources"

Another respondent further described how it was interesting to work with smaller companies and contribute to their journey of becoming larger companies. Other respondents also expressed a clear will to collaborate with small companies, yet there are many obstacles since they do not have the necessary resources and personal relationships to collaborate with SU. Looking at incentives for collaborating with large companies, one respondent described that it may give the opportunity to test the newest application or system, which is something that the respondents highlighted as very interesting.

Another aspect that most of the respondents highlighted was that it is easier to collaborate with external actors if the need came from within healthcare instead of a company approaching the hospital with an idea or a product. Additionally, a respondent working as a Senior Consultant explained the differences were due to *"the incentives increase for our employees to participate in projects. The idea may be originally from this unit, making it much more interesting. There is a huge difference"*. Another respondent working at Innovation Platform claimed that *"the benefits for healthcare become clearer if the need comes from within"*. Several respondents described situations where healthcare employees had identified a need and then tried to solve the problem themselves without looking outside the hospital for a solution. According to a Development Manager this could be a problem as it creates many small projects, which might be hard to implement on a larger scale at SU, something that could hinder innovation in the long run. Another aspect of this is that a respondent working in the innovation ecosystem described how employees from the healthcare sector feel disappointed when they find out that the problems they are trying to solve are already solved by an external actor and added on this by saying: *"They [SU employees] are probably not very good at doing external analysis"*.

4.5.2 Certain Individuals' Effects on Collaboration and Innovation

During interviews, most respondents highlighted the importance of driven individuals with interest in the area to be involved in collaboration projects. As described earlier, many individuals within healthcare feel that they do not have time for innovation and collaboration with external actors. Therefore, as one respondent described: *"It requires the right person from*

healthcare that really is passionate about the subject... especially if you do not have the opportunity during working hours". Another respondent working as a Development Manager said "Everything gets easier when you get a passionate individual on board. You get both time and resources that are necessary to reduce the resistance". Additionally, one respondent said: "There are many projects that are run by an individual who is interested in the subject. For example, a doctor that wants to develop this [medical device or medicine] to help kids differently".

Another aspect highlighted by several respondents, is these individuals' ability to recruit and spread enthusiasm about a project. A Business Developer mentioned this *"I start the project and then inspire other people to drive it forward"*. Furthermore, the same respondent said the following regarding successful projects:

"... what has worked well in the past is to find 15 people who are driven, committed and interested in the project. If I do not have the nurses with me, it will not be a successful project. Because then they do not think it is interesting to go and test this on patients".
- Business Developer

Regarding clinical trials, a respondent explained that when a doctor received a clinical trial request it was important for that individual to establish commitment in the rest of the team because *"Everyone needs to be involved in recruiting patients"*.

One respondent explained that the position of the innovation champion also determines the power this individual possesses and further explained that it is easier if the individual is, for example, a Senior Consultant. Additionally, the background of individuals and their knowledge may further facilitate innovation projects which were highlighted by the resident from the innovation and technology program. The respondent said that the knowledge about the innovation process and its education enabled the respondent to get a mandate from the managers to drive innovation projects and facilitated getting others on board on the project.

4.5.3 The Role of the Manager

A respondent from the innovation ecosystem highlighted that one of the reasons it was difficult for companies to enter healthcare was that they were stopped immediately. One of the respondents explained, *"It is important that there is support in the top management, so that mandate is given to move forward with collaboration"*. Additionally, another respondent from the innovation ecosystem said: *"Companies have difficulty getting into the clinic and often get stopped before they can ask the right individual"*. This aligns with what a respondent highlighted as important:

"The Head of Department is very important to engage in this [collaborating with industry actors]. They must believe that this is something good. Because if they do that, then their employees will also be able to engage in collaboration" - Strategist

During the interviews, several respondents described how the manager and their interests affect employees' opportunity to participate in innovation collaboration. This was highlighted by a Business Developer during an interview *"I have experienced several managers that have turned down requests although many of their employees wanted to collaborate with the company in question. The manager had problems seeing the potential in the project and also why we should collaborate"*. The same respondent further explained that *"We [SU] are a huge organization with 17 000 employees. Hence management becomes difficult, as middle management has much power in deciding whether a project should run or not and often chooses the most conservative way. For example, sometimes it is easier to say that some projects will not be interoperable with future IT systems"*. Another respondent working as Head of Division expressed a wish that every employee should be given the opportunity to work with innovation and collaboration with external actors and explained that it is not good if managers by default say no to projects their employees want to be a part of. The same respondent argued that everyone should be part of finding the needs in healthcare and said: *"This is an opportunity for everyone. You do not need to possess a special position or profession to be allowed to think"*.

Another aspect that works as an obstacle is the matter of available resources, which was highlighted by a respondent working as Head of Department that said, *"It is me as Head of Department that decides if we have the resources to participate and engage in different projects. We might not have the resources to take part in several projects simultaneously without it taking time from patient work"*. The same respondent further described:

"We have a special budget for FoUUI (Research, Development, Education, and Innovation). But it is very difficult to use the whole budget because we need the personnel who can take part in this kind of projects, and they need to take care of our patients... And this requires a lot of effort from me as Head of Department to recruit personnel to the unit " - Head of Department

4.6 Barriers and Facilitators Summarized

The findings show the drivers and barriers to OI that exist on the different levels of analysis. These are summarized in table 5, following below.

Table 5

Summary of barriers and facilitators identified from the empirical findings

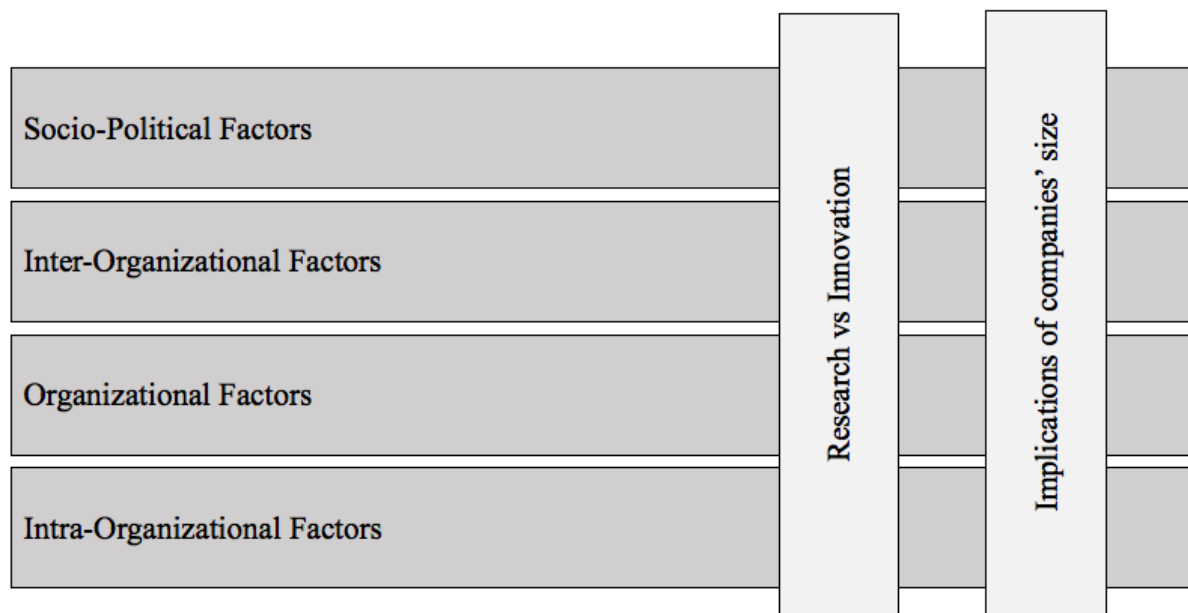
	Barriers	Facilitators
Socio-political	▪ Regulations (MDR, GDPR, etc.) ▪ The law of public procurement ▪ Lack of knowledge about regulations ▪ Innovation missing in healthcare education ▪ Dilemma between research and innovation	▪ Nationwide incentives (for example funding) ▪ Labeling projects as research
Inter-organization	▪ Lack of trust ▪ Divergent incentives ▪ Lack of understanding for each other ▪ Lack of clear entry points ▪ Difficulties finding partners ▪ Lack of arenas to meet ▪ Setting up contracts ▪ Agreeing on funding ▪ Different timeframes	▪ Established relationships ▪ Existing purchasing agreements ▪ Requests passing a “filter” ▪ Common purpose with win-win situation ▪ Transparent dialogue
Organizational	▪ Insufficient resources ▪ Balancing producing healthcare and research/innovation ▪ No time set aside for innovation ▪ Strategy not widespread ▪ Lack of standardized processes ▪ Organizational culture	▪ Supporting functions ▪ Success stories ▪ Prior knowledge
Intra-organizational	▪ Not Invented Here syndrome ▪ Insufficient management support	▪ Value creating projects ▪ Need derived from the own organization ▪ Innovation champions

Note. Some barriers may also work as facilitators if overcoming them and the case is the opposite with facilitators. For example, if trust is established, it becomes a facilitator

5 Discussion

This chapter entails the discussion where the empirical findings will be put in relation to the theoretical framework. The discussion will be organized as follows: to begin with, different types of collaboration will be discussed. Then the four levels of analysis will be discussed. This will then be followed by a discussion of a few overarching themes present at all levels of analysis. An illustration of the discussion is presented in figure 7.

Figure 7
Overview of discussion



5.1 The Different Types of Collaboration

Looking at the three roles Engström (2019) present a public organization can possess when working with innovation, the focus of this report is on the third role, the public organization as a co-creator of new solutions. Although, as Engström explains, the first role, to innovate within the own organization, is a condition to being able to possess the other two roles and hence, some of the discussions include innovation in more general terms. Further, just as Engström presents how this third role is challenging to undertake and Silvander and Hagén (2015) presents how this kind of collaboration is not that common, the same could be confirmed in the empirical data. This could be seen in the fact that the respondents did not have that many examples of when they had undertaken that role and additionally, several respondents highlighted that SU is not that good at collaborating with the business sector. That collaborating with external actors is not widely utilized at SU means that there are reasons for improvement, as healthcare organizations collaborating more with external actors are more successful in innovation than the ones not doing it (Silvander & Hagén, 2015).

However, although the amount of collaboration could be increased, different good initiatives are happening around SU. These collaboration initiatives have different characteristics and different degrees of co-development. Nevertheless, some characteristics can be seen in the

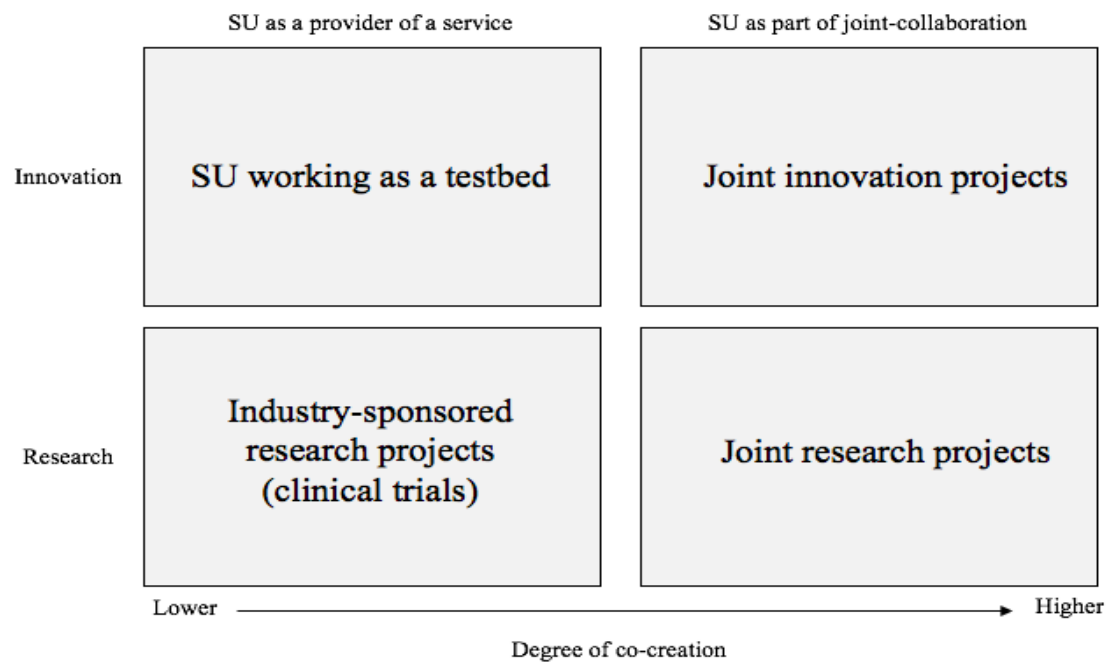
initiatives identified in the empirical data which makes it possible to divide them into four general types of collaboration where two concern research and two concerns other kinds of innovation collaboration. However, important to note is that these types of collaborations are generalized, and it might not always be possible to differentiate the type and sort a collaboration project in just one of these. One project may tap into several types of collaboration, and different types of collaborations might be needed before a solution is fully developed.

The first of the collaboration types are when the healthcare organization is performing a service for the business partner such as conducting a test, needs analysis, participating in an interview or similar. This is in line with the notion of the healthcare organization working as a testbed for new solutions. In this kind of interaction, the industry actor usually pays for the resources in terms of, for example time, that SU puts into the project. Further, this kind of interaction is characterized by a lower degree of joint development and what is to be done in the collaboration are usually primarily determined based on the wishes from the company. Additionally, based on the empirical findings, this kind of collaboration project is usually initiated by the companies through the Innovation Platform and less commonly set up directly in the different departments. The second type of public-private collaboration identified at SU is also characterized by that SU somehow performs a service for a company, but this time in the form of industry-sponsored research in clinical trials for pharmaceuticals or MedTech products. These collaborations are more commonly set up directly at the departments, which sometimes are specialized CTUs. Common for both these types of interaction is that it is usually initiated by the business part, and it is also usually the business part that decides what is to be conducted in the project.

The other two types of collaborations cover a broader spectrum of collaborations. These joint collaboration projects seem to be characterized by a higher degree of mutuality and co-creation, as it was mentioned that the goal and similar features of the project are usually determined together by the parties participating in the project. Further, they can be initiated either by SU or the collaborating partner. Also, these projects do not necessarily include payments from one partner to the other but can instead be about both actors contributing with their resources, in terms of time, expertise, or products. One of these joint development projects are joint research projects that are not industry sponsored clinical trials. The other is joint development of solutions that is not conducted in the form of research projects. The terms of such projects can differ but often this kind of development is conducted within the frames of already procured products or suppliers. As could be seen in the empirical data, this is not necessarily because that is the only or best way of doing it. Rather, it is often a natural part of a purchasing agreement, or it can be used as a workaround to avoid complicated and timely processes if the same project is to be conducted outside an existing purchasing agreement. Although working with already procured suppliers was most common, some projects were ongoing outside existing agreements where the terms of the collaboration could look different but could for example be that SU can use a product for free by providing feedback and help the industry actor in the development of the product. The four types of research- and innovation collaboration at SU are summarized in figure 8.

Figure 8

Types of research- and innovation collaboration between SU and business actors



Apart from having different characteristics, the types of interaction also come with different challenges and opportunities, something that will be further explored in the following discussion. Something that is a common characteristic though is that all different forms of research and innovation collaboration utilizes knowledge from different actors and therefore can be classified as open innovation (OI) as described by Bommert (2010) even though the specific term of OI is not explicitly mentioned by any of the respondents. Hence learning and acknowledging that it falls under the subject of OI give opportunities to learn things from this theoretical field and identify the benefits of OI and potential for improvement in healthcare organizations. Looking at the three core processes of OI as presented by Grassmann and Enkel (2004), the primary forms of OI covered in this report are the outbound form and the coupled form. Relating to the degree of co-creation discussed for the types of interactions happening at SU today it can be seen that the higher degree of co-creation, the more coupled are the OI processes. Although not deeply discussed in this report, also the inbound OI form could be identified at SU, but are more present in internal innovation projects.

5.2 Socio-Political Factors

Looking into the socio-political factors and especially rules and regulations, both previous research and the empirical findings suggest that it is a problematic area working as a barrier for open and collaborative innovation. It is believed to not only limit what you are allowed to do, but rather sometimes lead to that no collaboration at all is happening, as also argued by Löfgren Willeus & Hedefjäll (2019).

5.2.1 While Clinical Trials Work Well, New Regulations are Hindering

As presented by the Swedish Medical Products Agency (2022), the area of clinical trials are heavily controlled and interviewees presented how this is the most regulated form of collaboration. Nevertheless, that does not make it the form of collaboration experienced the hardest but rather is experienced to be the easiest form of collaboration. This has several explanations, one important factor being that the employees at SU are used to this kind of collaboration. Further, as the regulations have been around for a long time, they have learnt them quite well and therefore feel confident about these collaborations. Hence, they are not as afraid to overstep any rules, and these rules are also well known by the companies, further easing the collaborations.

The situation looks a bit different when the collaboration concerns MedTech products that recently received new regulations. While Hollmark et al. (2015) as well as Guerra-Bretaña and Flórez-Rendón (2018) claim that such new regulations increases the need for OI, that is not what has happened at SU where the respondents rather believed that collaboration around medical devices had decreased with these new regulations limiting what you are allowed to do. Just as Ben-Menahem et al. (2020) explains, also respondents from SU agreed that the development cycles of these products are becoming more complex, and it can be seen as a dilemma that it is very complicated to collaborate in the part of the innovation process where it is likely needed the most. Also, both the empirical and theoretical findings agree how smaller companies might be harmed by these regulations more than the bigger companies in the industry as they have less resources for these longer and more costly processes. Additionally, apart from just making the development cycles longer, respondents from SU argued that they also experience their creativity being harmed by these types of regulations, a factor not brought up in the theory reviewed.

5.2.2 Need to Overcome Issues Regarding the Law of Public Procurement

Just as argued by several authors (e.g. Hollmark et al., 2015; Larisch et al., 2016), respondents at SU presented how the law of public procurement was seen as a substantial barrier to innovation. And they also agreed with the findings from Melander and Arvidsson (2020), that the law of public procurement limits the possibilities for OI. Several respondents explained that both the healthcare employees and some companies are afraid of collaborating as they do not want to end up in a situation where the company is excluded from a future procurement process, in line with what is argued by Melander and Arvidsson (2020). Further, the problems of diffusing and implementing solutions resulting from an OI project are brought up both in the empirical data and previous research (Waluszewski & Wagrell, 2013; Smith et al., 2019). In the interviews, it was also discussed that it is not only a problem that specific projects cannot transition from a pilot project to implementation, but how this issue also lowers the motivation for collaboration both among employees at SU and the companies.

Some respondents explained that by conducting collaboration projects within the frames of research they did not have to handle the issues related to public procurement. This is in line with what is presented by Waluszewski and Wagrell (2013) regarding labelling of projects. It

was acknowledged by respondents at SU what Waluszewski and Wagrell present regarding how issues can occur later if you cannot procure the product and implement it more widely. However, some respondents did not mention this issue, which could possibly lead to an unforeseen and problematic situation later, if participants are aiming for a more widespread implementation if the research project leads to a successful innovation outcome. While some respondents in the innovation ecosystem stressed the importance of thinking about future procurement processes early in the process, this was not usually happening in collaboration projects today at SU. Hence, there is room for improvement regarding this issue, in order to avoid disappointment of solutions that cannot be procured after a successful OI initiative.

Several respondents mentioned the issue of procuring something that is not yet developed. Although, The National Agency For Public Procurement (2015) and Andersson (2017) present how the aim of different forms of innovation procurement and innovation partnerships is to ease exactly this, that does not seem to be the case at SU, where innovation procurement was not known by any of the respondents to be used. The few people mentioning the area only knew that it existed but explained that they did not know how it works and where it can be applied. This confirms what is presented in previous research (Hollmark et al., 2015; Larisch et al. 2016; Norberg et al., 2018), that innovation procurement is not well known or used across the healthcare sector and therefore does not work as the driver for OI that it potentially could be. However, as presented in theory; if investing time and resources into these questions, it is possible to learn and improve, as could be seen with the case of Region Skåne and Karolinska University Hospital (Hedman Rahm et al., 2019).

5.3 Inter-Organizational Factors

At the inter-organizational level, the main barriers that need to be overcome regarding how difficult it is for the right persons at SU and external actors to get in touch with each other. There is a lack of forums to meet and when the actors eventually do, potential conflicts regarding diverging incentives and negotiation of contracts need to be handled.

5.3.1 *Implications of One Point of Entry*

The challenge for private companies to get in touch with the healthcare sector to initiate collaborations, and sometimes the other way around, are acknowledged both in the empirical findings and literature, for example as highlighted by Larisch et al. (2016). Several respondents at SU had read or heard about the report by Qvillberg and Ekdahl (2020) where private companies in western Sweden explicitly expressed how complex it is to get into VGR and SU specifically. While a few respondents at SU were surprised that the companies had this view, many of the respondents understood the companies' frustration and agreed that it is not easy to reach them. The respondents at a more strategic level at SU expressed how there should be no wrong doors to enter as a company, but this does not really correlate with the thoughts or actions from other respondents at the hospital. They expressed how they often do not reply to requests due to lack of time in their daily work, lack of interest or because they were not the right person to contact in the issues, something showing that today, the motto of "*no wrong doors*" does not

really work in practice. The consequence of this is the risk of missing out on good initiatives when companies turn to other actors or abroad, as explained by Qvillberg and Ekdahl (2020), a risk also highlighted by several respondents at SU.

That personal relations are facilitating the initiation and realization of collaborations (Bryson et al., 2006; Charles et al., 1998; Löfgren Wilteus & Hedefjäll, 2019), were also highlighted by most respondents at SU, many seeing them as a prerequisite for a collaboration project to happen. However, just as recognized by Charles et al. (1998), several respondents saw the risks of becoming too dependent on some people and many respondents also explained how it harms companies without prior contacts which often are the smaller companies. One further problem with personal relationships that was highlighted by several respondents although not acknowledged in literature, is how these hurt the principle of equal treatment and free competition among companies which is one important underlying value in the public healthcare sector, originating from the law of public procurement. While one respondent expressed how the treatment of companies should be the same no matter what way they enter the system, it became clear during other interviews that this is not the case today, at least not when companies contact departments and employees at SU directly. The reason for this issue not being highlighted in literature might be that this issue is very specific for public-private OI and also to certain geographical areas while much of the literature is looking at OI in broader terms.

In order to get away from the problems with personal relationships and the thought that all ways to enter the healthcare system are okay, several respondents promote one point of entry through the formalized channel of the Innovation Platform for innovation collaboration requests, at least for actors without prior contacts. This goes in line with what is wished for by the companies that have expressed how they are missing clear entry points into the healthcare system (Qvillberg & Ekdahl, 2020). By moving more towards one point of entry, several benefits can be expected. This includes both equal treatment and reduced risk of missing out on opportunities, but also that the professionalism towards companies, highlighted by several respondents, can be kept as well as that juridical issues are handled correctly. Further, several respondents at SU highlighted how they are more likely to pick up a request that has passed through the Innovation platform as some sort of filter, which is in line with West and Bogers (2014), highlighting the importance of filtering among innovation initiatives and presenting how intermediaries can facilitate this. However, as several respondents highlighted, there might not be a need to interfere in the already working relationships as many good things come out from these and that it is also a question about resources. Nevertheless, if there was one more established formal channel, employees at SU can also redirect companies contacting them directly towards this channel that can make the initial handling of the request. The benefits and drawbacks of one more formal way of entry into SU compared to the current situation are summarized in table 6.

Table 6

The benefits and drawbacks of one point of entry summarized

Implications	
Benefits	Drawbacks
• Clear entry points for companies • Equal treatment of requests • Professionalism towards companies and better rigged regarding rules and regulations • Can filter among requests and directs to right department which increases likelihood of the request being picked up • Reduces burden on clinical departments	• More resources needed for the formal way • Might interfere with already existing, well-functioning relationships • Might prolong processes

5.3.2 Mutual Need of Arenas to Meet

Further one area where the employees at SU and the companies have the same wishes concern forums and arenas to meet. This is highlighted by Qvillberg and Ekdahl (2020) as something missing in the western Sweden healthcare innovation ecosystem and the respondents from SU agree with this. As many of the projects starting today are quite extensive, with a lot of work preceding the collaboration, there are no good ways to meet for the smaller, more informal interactions that are usually needed earlier in the development cycles. The risk with this is, as explained by Larisch et al. (2016) that companies develop solutions that do not meet the needs of the healthcare organizations, something also highlighted by interviewees as sometimes being a problem. These interactions can be things such as just discussing a need, an idea or to build relationships that can lead to larger OI projects, all being activities that are experienced as hard to do today when they become mixed up with the daily operations at SU. In line with the empirical findings, the suggestion is that such a forum is organized by SU in order to give legitimacy among the employees and ensure that everything is done within legal frameworks.

5.3.3 The Importance of a Common Understanding Between Actors

Respondents from SU agreed with what is presented in literature, by for example Norberg et al. (2018) as well as Sørensen and Torfing (2012) regarding public-private collaboration, about how the actors are not used to work together in these ways and how this tradition is as a barrier for OI. Several respondents highlighted how the different incentives and timeframes the companies and SU have can hamper the processes, in line with what is argued by Munksgaard et al. (2012). Further, several respondents experienced how the different languages used by the actors can hamper collaborations, as they do not understand each other and what is important for the respective actors, for example when respondents at SU felt that it was too much business focus from the companies rather than focus on the patient needs. This issue is also presented by Gabriel et al. (2017) explaining it as a gap in the understanding of needs, and Davey et al. (2011) specifically explaining how it is hard for companies to make the clinical value of their solutions visible for healthcare employees.

Many respondents believed that a common purpose with a win-win situation for both actors is a condition for a successful collaboration, as is also suggested by Brinkerhoff (2002) and Bryson et al. (2006). Also in line with what is presented in theory (Brinkerhoff, 2002; Westergren & Holmström, 2012; Munksgaard et al., 2012), many respondents emphasized how

mutual trust is important for a collaboration to work out and to find a common purpose of the project. However, several respondents agreed that this is difficult to build and also had experience of companies hurting the trust which might affect the general attitude to collaboration in the longer run. To handle these potential issues, setting up and negotiating the contract become an important part in the process of collaborating so that all actors are on the same page when the collaboration later is realized, although knowledge about how to do this is missing across SU. There might be a need for SU to improve their business sense in order to understand the companies better and improve their ability to negotiate contracts. At the same time the companies also have things to learn in order to understand the healthcare sector better. One important action in order to get this common understanding and build the trust needed is to gather all important stakeholders and have an open dialogue about aims and potential tensions, as highlighted both in the interviews and in literature (Munksgaard et al., 2012; Westergren & Holmström, 2012).

5.4 Organizational factors

At the organizational level, it is important to manage the ambidexterity problem. Further, the absorptive capacity is vital for enabling collaboration with external actors. Additionally, the right organizational culture strengthens opportunities to succeed with improving collaborations.

5.4.1 How the Ambidexterity Problem Might be Managed

Just as managing ambidexterity is recognized as a problem in literature (Smith & Tushman, 2005), the empirical findings show that it is also a challenge at SU. In line with the characteristics of exploitation and exploration suggested by March (1991), producing healthcare should be seen as exploitation while conducting research and developing innovation is exploration. The interviews relieved that SU experiences difficulties managing these activities simultaneously because they lack both time and resources. As Chen (2017), March (1991), together with O'Reilly and Tushman (2011) argue, the interviewee saw that it is crucial fulfilling both current and future patients' needs to succeed in the long run.

Several respondents expressed that the hospital director has communicated a strategy to start collaborating with industry actors, clearly in line with what O'Reilly and Tushman (2011) suggest organizations should do to handle the ambidexterity problem. However, many respondents were not aware of the strategy, indicating that it is not widespread within the organization, something another respondent higher up in the management confirmed. To successfully manage the two conflicting activities, producing healthcare and developing for the future, the management needs to build commitment in the whole organization (Smith et al., 2010) and thereby motivating employees to engage in both activities. Therefore, it can be concluded that the strategy should be communicated more widely in the organization. By a more widespread strategy, decisions to also prioritize innovation could be made easier (Grant, 2016). The empirical findings present that the respondents that knew about the strategy, were missing what the strategy should accomplish in terms of outcomes. One respondent argued that the strategy was unfolding right now, therefore concrete goals were not relevant for right now.

Moving forward, it is essential that the management declare some concrete goals to handle the two conflicting activities (Norberg et al., 2018b; Smith et al., 2010).

Ambidexterity has not been widely discussed in the healthcare setting (Foglia et al., 2019), instead the topic has mainly been discussed in the business settings, where other values are valued. For example, the current situation with the Covid-19 pandemic has contributed to that the management of the SU have prioritized producing healthcare in order to save lives. This shows the complexity of healthcare and how therefore, for obvious reasons, all literature on ambidexterity cannot be applied to a healthcare setting. For instance, sequential ambidexterity as suggested by Chen (2017) is not an alternative to handle the problem in the healthcare setting as they cannot just stop producing healthcare for a period of time. However, sequential ambidexterity might be possible in specific units that are not active in daily healthcare activities.

The empirical findings show that regarding innovation projects, usually no specific time is set aside at SU for this activity, but it is up to the individual and needs to be managed within the daily activities. One respondent highlighted that the idea needed to be very interesting to justify not producing healthcare as it becomes a burden when you are also short on staff. Looking into research, SU have successfully managed the ambidexterity problem by using structural separation but also contextual ambidexterity (Birkinshaw & Gibson, 2004). The Clinical Trials Units (CTUs) is evidence of structural separation where a whole unit focuses on clinical trials and possesses its own strategy, structure and processes, in line with what Chen (2017) characterizes as a structurally separated unit. Others working with research have specific time set aside for it and thereby manage to be contextually ambidextrous. Therefore, as the empirical findings suggest, clinicians are able to more easily justify taking time off for research than work related to innovation. Therefore, a solution to increase the innovation work at SU, and in this included collaboration with industry actors, is to set aside specific time also for innovation. Regarding SU as an organization, they could handle the ambidexterity problem by using a combination of the different approaches structural separation and contextual ambidexterity, at different levels and departments in the organization, in accordance with what Chen (2007) describes as dynamic ambidexterity. In table 7, it is illustrated how SU could manage the ambidexterity problem in different ways in their organization.

Table 7
Illustration of how SU could manage the ambidexterity problem

	Structural	Contextual
Characteristics	Exploration and exploitation activities are separated into different units or roles	Time is set aside for both exploration and exploitation activities
How?	By separate roles and departments such as CTUs focusing on exploration activities	By giving time for both innovation and research within the ongoing production of healthcare
For whom?	For CTUs and other units/roles not directly involved in daily production of healthcare	For clinicians and others producing healthcare

5.4.2 Improving the Absorptive Capacity

The empirical findings show that it is crucial that the request from the external actors arrives to the right department and individual with the right knowledge, otherwise it will be difficult to evaluate and assimilate the request, in accordance with Laursen and Salter (2006) and Cohen and Levinthal (1990) findings about absorptive capacity. As one respondent described, they would be inadequate to evaluate a request or be a part of a project outside their area of expertise, and the risk of no collaboration at all happening increases when the recipient cannot make a fair evaluation of the request. Therefore, it seems critical that external information, in the form of a request, arrives to a department and individual with necessary knowledge in the area of expertise to which the request belongs, as stated by Zahra and George (2002).

In the case when a request comes to the Innovation platform, it could be seen that they are working as a gatekeeper with close contact with the external environment, in line with the description of gatekeepers by Cohen and Levinthal (1990) and this also aligns with the suggestion of one clearer entry point for external actors as discussed earlier. Additionally, many innovation requests from external actors are inadequate, hence it is beneficial that the innovation platform takes a first meeting with the external actors before sending them forward. Even though the employees at the Innovation platform do not always possess the appropriate prior knowledge, they can utilize the entire SU to get in contact with the department and individual with the right prior knowledge. Therefore, as Cohen and Levinthal (1990) argue, the organization's absorptive capacity consists of not only the capacity of the individuals facing the external environment, proven by the connection between the innovation platform and SU.

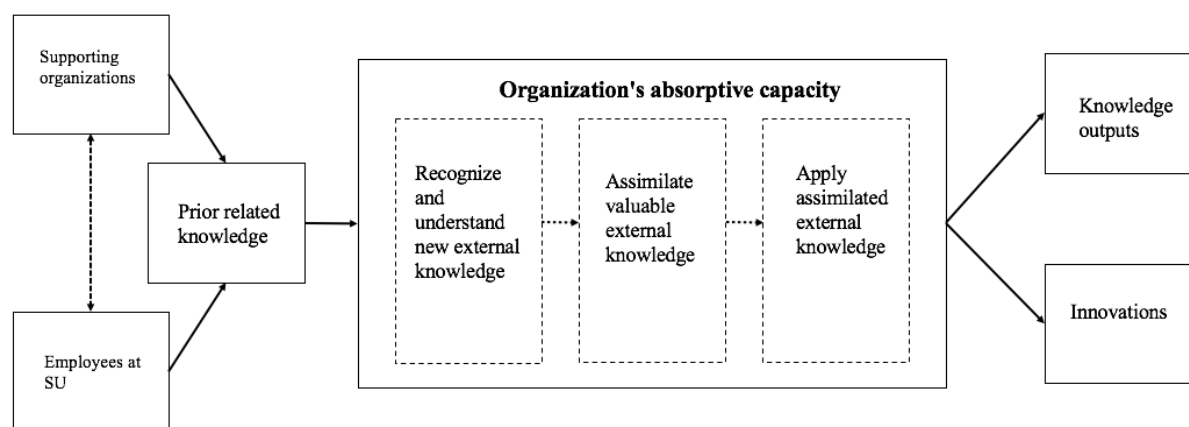
In the result, several respondents described that the collaboration between external actors and clinicians depend on some key individuals and expressed a desire for a more standardized process, something that does not exist relating to innovation collaboration today. A standardized process may consist of some initial agreements needed to set up the collaboration as one respondent suggested, in line with what Bryson et al. (2006) described. Although not recognized by any respondents except people at SU working with strategic questions, guidelines for collaboration with industry actors have been formulated and are one part of what is requested by the respondents in terms of standardized processes. Hence, there is a need for SU to spread these guidelines widely at SU so the employees can make use of the resources that already exist. However, these guidelines do not include templates and examples of contracts, something that is also asked for by several respondents. Under circumstances where employees at SU know about the guidelines and have access to standardized templates for collaboration, more people could collaborate without difficulties. However, as the whole process cannot be standardized there is a need for a supporting organization when employees are facing issues.

Regarding these supporting organizations, both literature (Pikkarainen et al., 2020) and the empirical findings show that these can facilitate collaboration with external actors. However, the empirical findings highlighted some issues related to these organizations. These problems include lack of resources, especially in terms of lawyers and further, many employees at SU do not know that they can gain support from the supporting organizations such as the Innovation

Platform. Therefore, SU needs to establish routines and processes to link the Innovation Platform and the employees at SU, to make better use of the support and the accumulated knowledge within the organization, in accordance with what Lane et al. (2006) suggest. Another effect of this would be that the Innovation Platform's network would increase and thereby make them better as a gatekeeper, both as they become closer to more people within SU, but also that the people they approach knows who they are. In total this would lead to an improvement of SU's absorptive capacity, illustrated in figure 9.

Figure 9

A visualization of what influences SU's absorptive capacity



Note: An adaptation of Lane et al. (2006) "A Process Model of Absorptive Capacity. Its Antecedents and Its Outcomes"

5.4.3 Creating an Environment for Innovation and Collaboration

The overall strategy about to what extent employees at SU should collaborate with external actors has shifted over time. It has left its mark on the organizational culture, where employees have sometimes turned down requests because they do not want to be viewed as having too close interactions with external actors, in accordance with Thakur et al. (2012) findings. The management has the ability to shape the organizational culture by shaping norms and values (Tushman and O'Reilly, 2002), which the empirical findings show that the management at SU have started doing. The management has promoted more collaboration with external actors which has contributed to that employees have started to change their attitude towards collaboration. However, there are still employees at SU that are reluctant to collaborate and that believe that companies only want to make money and hence, the management still needs to promote openness for external ideas and the benefits of it, to facilitate collaboration with external actors, just as Gassmann et al. (2010) argue.

The empirical data show that it exist a fear among professionals at SU to collaborate with external actors, as they are not aware of how they are allowed to collaborate since the organization is bureaucratic with many rules to act according to, in line with what Löfgren Wilteus and Hidefjäll (2019) and Norberg et al. (2018b) describe. Several respondents described that many employees rather turned down requests from external actors than doing something that is not allowed, which is in accordance with Löfgren Wilteus and Hidefjäll's

(2019) findings. This further highlights the need of spreading knowledge about how collaboration can be managed and where employees can get support in these questions.

To have a good innovation climate individuals need to be allowed to take some risk (Dobni, 2008) since people learn from their mistakes and nothing will happen otherwise. This is in line with what some respondents explained, and they suggested that SU needs to promote experimentation and some risk taking, even though it is important to acknowledge mistakes and learn from them when they happen. Both literature (Löfgren Willeus and Hedefjäll, 2019) and the empirical findings acknowledge that success stories could be a facilitator factor toward changing the culture to be open for collaboration with external actors. Furthermore, Frankelius (2014) suggests learning from earlier cases, both successful and unsuccessful ones, something SU could take benefits of. By being better at documenting and presenting earlier cases, employees at SU can take learnings from these earlier projects while at the same time it can be used to visualize the effects of collaboration.

5.5 Intra-organizational factors

At the intra-organizational level, the discussion includes the employees' different incentives for collaboration, the importance of innovation champions and further how managers play a crucial role in allowing collaboration.

5.5.1 *The Implications of Employees' Incentives for Collaboration*

The empirical findings show that the employees at SU experienced different incentives motivating them to collaborate with external actors over innovation and research. The majority of the interviewees highlighted that the biggest motivating factor to collaborate was to enhance patient care. Another factor that was discussed during the interviews was whether money was an incentive for collaboration or not. Some respondents, primarily the ones working at a higher, more strategic level in the organization, agreed that it was essential that they received money for their services as they are financed by public money. However, most respondents thought that monetary incentives were not the primary cause of collaboration since enhancing patient care was more important than the financial.

The incentives for collaboration increased when the need came from within the hospital, as several respondents highlighted. This was mainly due to the fact that they felt more responsible for the idea as it could potentially have its origin in their own department, which in accordance with Bommert (2010) increases incentives for ideas. Furthermore, the empirical findings show that employees prefer to solve the problem they have identified. This could be evidence of the Not Invented Here (NIH) syndrome described by Katz and Allen (1985), where healthcare values its own ideas higher than external ideas. Although, it could also be like West and Bogers (2014) and Silvi (2015) argue, that healthcare employees prefer to innovate internally since they are experts within the area. Further, when companies have troubles expressing how their solutions have clinical value, as argued by Davey et al. (2011), the incentives for healthcare employees to take in external ideas are further reduced. Nevertheless, the NIH syndrome needs

to be overcome to utilize the benefits with open innovation, in accordance with Chesbrough and Crowther (2006). This was acknowledged by many respondents during the interviews, highlighting that with the current way of working in smaller internal innovation projects, there is a risk that they are reinventing the wheel and are missing out on new innovative solutions to their problems.

5.5.2 How Champions Facilitate Collaborations

Both literature (Howell et al., 2005; Lüttgens et al., 2012) and the empirical findings acknowledge the importance of individuals that drive innovation projects and facilitate the adoption of innovation, in literature these individuals are entitled champions. As previously mentioned, one problem within healthcare is getting the time to work in development projects, therefore, the champions need to promote innovations to be able to engage in these projects, which aligns with Howell et al. (2005) description of champions. Furthermore, these individuals are also playing a crucial part of recruiting others to projects, as presented by both the empirical findings and by Howell et al. (2005). Just as Amabile (1997) suggests, the empirical data reveals that it is essential to recruit individuals to the projects interested in the area, otherwise, they will not be committed to conducting tasks in the project. Furthermore, the empirical findings also show that the individuals' background and knowledge affect the possibility of recruiting people and getting time off. For instance, Senior Consultants and Residents from the innovation and technology program possess favorable positions and have more legitimacy in this sense. However, as was expressed in the interviews, all employees should have the opportunity to engage in such projects, so there might be a need to reduce the impact of the profession on opportunities to collaborate with external actors.

Regarding innovation, it was highlighted in interviews that people within healthcare sometimes have difficulties seeing the benefits of innovation and collaboration, in accordance with Hovlin et al. (2013). Just as Hovlin et al. (2013) argues, the empirical findings show that champions help others to see the benefits of innovation and thereby getting people onboard on projects. As mentioned previously, the culture within healthcare is not ideal for innovations; therefore, one crucial task for the champions is convincing others, for instance the management, that the innovation is worth proceeding, in line with Cain and Mittman (2002).

5.5.3 The Importance of Supporting Managers

Amabile (1997) argues that managers have a significant role in enabling collaborative projects by encouraging employees to engage in projects. However, during the interviews several respondents described how companies have difficulty getting into the clinic and that managers stop requests before they even find the right person, no matter if the request goes through the Innovation Platform or to the departments directly. Just as Sørensen and Torfing (2011) argue, the empirical findings show how managers determine if their employees can engage in collaborative initiatives. Furthermore, the managers' own interest is closely linked to whether their employees are allowed to participate in collaboration projects. This highlights the crucial aspect of having open minded managers that facilitates both dialogue with external actors and

opportunities for employees to engage in innovation projects, in accordance with Ansell and Gash (2007) as well as Sørensen and Torfing (2012).

In the literature, Amabile (1997) argues how managers can inhibit creativity with strict control and formal structures; this is shown in the empirical findings where some middle managers are argued to turn down requests even if the employees want to be part of projects. However, as a Head of Department highlighted, it is not easy to balance staff allocation between innovation projects and producing healthcare. The empirical findings show that there is a wish among the respondents to create an environment where each employee has the opportunity to engage in collaborative projects regardless of whom they have as a manager. Therefore, there is a need for SU to work with managers' attitudes towards collaboration and make them more allowing. One important part of this is to have a clear strategy and create a culture where it is allowed to experiment, take risks and fail, in line with Wycoff (2003) findings.

5.6 Overarching Themes

In this section, two overarching themes that were recurring during the interviews and that affect collaborations at several levels of analysis is discussed. These themes include the differences between research and innovation and how the size of the company affects the abilities to collaborate.

5.6.1 *Differences between Research and Innovation*

When comparing collaboration around research compared to other innovation initiatives, it became evident during the interviews that SU are better at working with research than innovation. This could be seen at what initiatives are ongoing today, where most respondents had experience of the research-type of collaboration, especially the one regarding clinical trials, but fewer had experience of other types of innovation collaboration. The reasons behind this are several, but include things such as traditions, strategy, education, and status.

Historically, the healthcare sector has had more focus on research and that is seen as the future of medicine, as one respondent explained. Löfgren Wilteus and Hidefjäll (2019) explain how research is more meriting as academic careers are valued in the healthcare sector. Further, Larisch et al. (2016) explain a path dependency where innovations are thought to be the result of and become legitimated by linear processes of research and clinical trials. One explanation to these things might be that research is included in the education of medical professions while entrepreneurship or business sense are not, as explained both in the empirical findings and literature (Larisch et al., 2016; Löfgren Wilteus & Hidefjäll, 2019). This tradition has led to a situation where the processes and ways of working with research, especially with clinical trials, are very established while work related to innovation are not as straightforward. This could for example be seen in the empirical findings from the Innovation Platform and Gothia Forum where the way a request goes is more straightforward for Gothia Forum while for the Innovation Platforms, requests are more diverse and can take different paths. Further, a higher rate of request passed through the whole process at Gothia Forum compared to the Innovation

platform, highlighting the complexity of innovation and may indicate how research has a higher status and therefore also has it easier to pass through at the departments at SU to end up in an actual project.

What several respondents highlighted is that they believe it is easier to see the benefits of working with and collaborating around research compared to innovation, even though the benefits of both often occur in the future. However, the heavy focus on research is not without risks, as argued by Löfgren Wilteus and Hedefjäll (2019) who explain that just conducting research and publishing does not necessarily lead to applications of the research compared to innovation that usually are more focused on applications and implementation. On the other hand, research is a vital part to get to some innovations and often research in the form of clinical tests and trials are a prerequisite to be able to implement something. Therefore, there is a need to balance these two to get the most out of invested resources.

The process of reducing the gap between research and innovation has started at SU with different initiatives such as a strategy to increase collaboration around innovation and the innovation and technology program for residents, in line with what is desired by Löfgren Wilteus and Hedefjäll (2019). Further, innovation is now a part of the R&D strategy at SU. However, as described by many respondents the innovation is still a bit behind with a clear strategy, funding and time for these activities missing. This could as mentioned in the results also be seen in written strategies regarding research and innovation where research got almost all focus. What is explained by Larisch et al. (2016) is that these issues are not unique to SU but are rather a more general problem in the healthcare sector. They explain how large investments are put into research while innovation only gets limited resources, even when the will to work with innovation is there, which is the case at SU. Therefore, in order to succeed more in this area, there is a need to invest further into innovation activities regarding both strategy, financial resources and time available to these activities.

5.6.2 How the Size of the Company Affects Opportunities for Collaboration

The troubles for companies to enter the healthcare system has been mentioned earlier. As the most common entry point for companies today is through established contacts within the healthcare sector and most of the collaborative projects at SU rely on personal relationships and previous associations, it is even more difficult for companies without these contacts. The empirical findings show that smaller companies and start-ups often lack these contacts and thereby miss the most common entry point into the healthcare sector. Therefore, companies with established relationships, often the larger players in the industry, have a favorable position to get access to SU's resources when there is a desire to collaborate around something. Considering the underlying values of healthcare organizations and the public sector, it could be discussed how fair this is, as the public sector processes should be built to treat all parties equally (The National Agency For Public Procurement, 2015). Large companies with established contacts get advantages by easier getting into the healthcare system where they can develop their products and services using feedback from the healthcare experts.

The empirical findings show a clearly expressed wish among the healthcare employees to collaborate more also with smaller companies, as the respondents highlighted that smaller companies need more help from the healthcare sector than larger companies. The larger companies were explained to often have their own facilities where they can conduct development and testing opportunities and do not depend on the healthcare providing such sites unlike smaller companies that do not possess any of this. However, as the empirical data also reveals it is more challenging to collaborate and help small companies than large companies due to several reasons related to organizational characteristics. The complexity of regulations and new regulations adds extra steps in the development process, making it more costly for companies to develop products. This is acknowledged both in literature (Ben-Menahem et al., 2020) and empirical findings to affect smaller businesses more than large businesses since they do not possess necessary financial resources. Another aspect of this is the timely and slow-moving processes when collaborating in a healthcare environment where the empirical findings indicate that smaller companies are not familiar with the inertia that is closely linked to the sector, something that complicates the collaboration. Looking at large companies, they are more aware of the inertia within the healthcare sector and also have the financial resources to endure a longer process, something smaller companies often do not possess.

Swedish Medtech (2019) findings highlight that Sweden lacks forums where small companies can interact with the healthcare sector, which several respondents agree with. The empirical findings show that SU is insufficient in providing a forum where employees from the hospital can meet companies in the early phase of development. The lack of these forums harms small companies more than large companies since the former are, in contrast to larger companies, more in need of feedback on ideas from healthcare personnel and possibilities to do early phase tests, as suggested by Alaläkkölä et al. (2021).

While different intermediate actors are there to support with both knowledge and funding (Medtech4Health, n.d.), a knowledge gap exists regarding these initiatives within SU. Such knowledge is present among respondents working at The Innovation Platform and in strategic roles in the organization while others do not have this knowledge and are explicitly requesting such initiatives with for example funding for smaller companies. Therefore, there might be a need to close this knowledge gap in order to further improve the possibilities for collaborative innovation. One way of doing this is to spread the knowledge about supporting functions at SU, such as the Innovation Platform, that have competence in these questions.

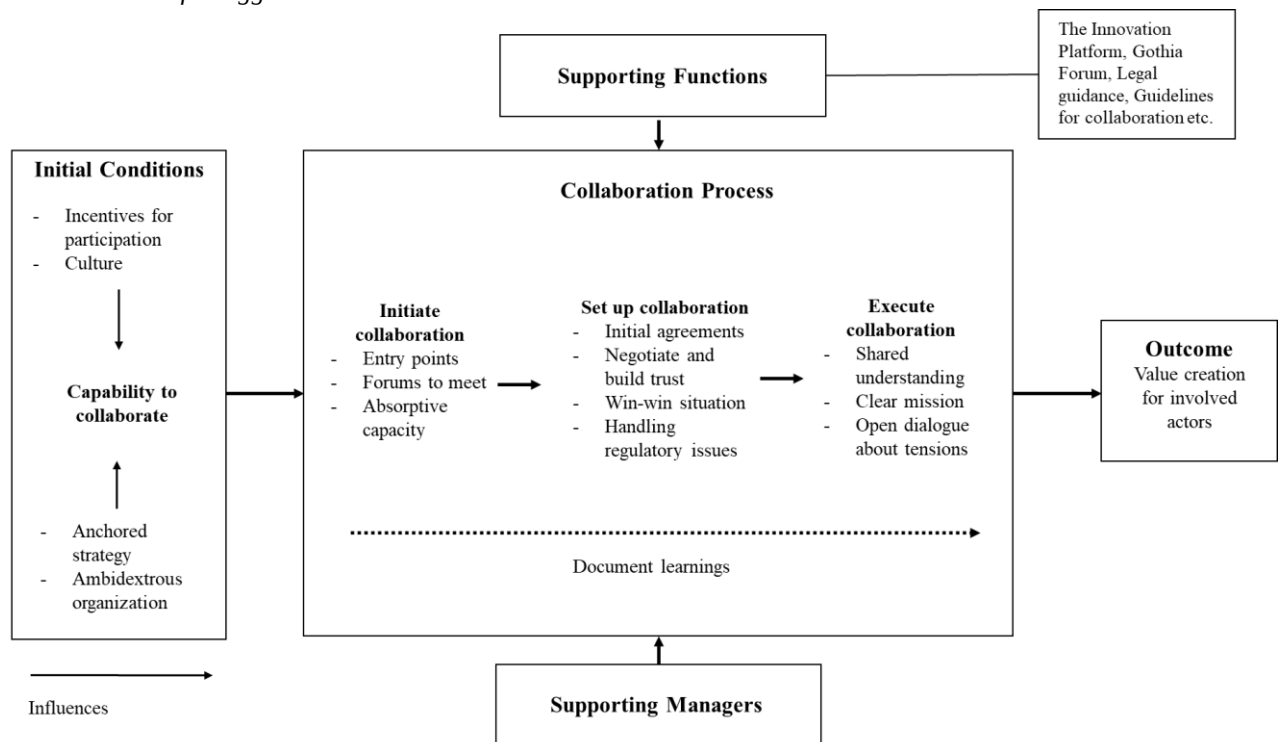
5.7 Summarized Discussion

As can be seen from the above discussions, the different levels of analysis highlight different important considerations when collaborating with business actors. Although separated in the analysis, the findings at the different levels of analysis all relate to and influence each other, and all levels are important to consider. In figure 10, it is illustrated how factors at different levels affect each other and influence collaborative efforts. To begin with, some initial conditions need to be in place in order to enable collaborations to be possible. These include a culture promoting innovation and collaboration and that employees have incentives to

collaborate, meaning that they can recognize the benefits of it. Further, the organization's ambidextrous capability and an anchored strategy are important organizational characteristics enabling collaboration. Moving on, during the collaborative process, supporting organizations and managers play an important role in facilitating the collaborations. During the phases of initiating, setting up and executing the collaboration, different factors are essential for these steps to work well, in order to reach an outcome where value is created for all involved parties.

Figure 10

An illustration of a suggested collaborative model at SU



Note: Adapted from Ansell and Gash (2007) "A Model of Collaborative Governance"

6 Conclusion

This case study has investigated collaborative innovation and research at Sahlgrenska University Hospital (SU) with the aim to understand barriers, facilitators, and potential for improvement. The case study shows how collaborations are today underutilized at SU due to different barriers existing at different levels in the healthcare innovation system. One reason behind this is the various perceptions in these questions among different people, especially the different views at higher strategic levels compared to employees working directly with the clinical tasks and treatment of patients. The benefits of collaboration are not equally acknowledged at all levels of the organization, and research having a higher status than innovation leads to insufficient utilization of different types of collaboration as a means to create innovations. A strategy clearly anchored throughout the full organization can strengthen the opportunities to get a shared vision and show the way forward. To get there, research and innovation must not be seen as separate fields but rather both be seen as important parts that might help and reinforce each other in the development of the hospital and therefore both need to be prioritized in terms of resources and time.

As barriers exist on different levels and have different characteristics, they need to be managed in different ways. While some barriers such as knowledge gaps can be reduced internally, others such as laws and regulations cannot be changed by a healthcare organization alone, at least not in the short term. Instead, there is, regarding some barriers, a need to adapt to the barriers and find ways to work within for example the regulatory frameworks. This is important in order for such things to not hinder more than necessary or lead to no collaboration at all happening. This is also seen at SU to be possible, as within the area of research and clinical trials, collaboration today works rather satisfactory despite barriers in the form of for example heavy regulations. By adapting innovation strategies, making use of facilitators, and working with overcoming barriers for OI within healthcare, there is great potential to take advantage of all available knowledge in the field and through that, enhance patient care and deliver value to the society.

6.1 Recommendations

In order to improve the situation regarding collaborative research and innovation at SU, some recommendations are presented.

Anchor strategy throughout the entire organization

It is important to anchor the strategy also at lower levels in the organization where it is primarily executed to reach a shared vision in these questions. To improve the ambidextrous capability and enable employees at SU to collaborate despite a focus on producing healthcare, it is important that innovation- and collaboration becomes prioritized and given resources, especially in terms of time. Further, it is important to get managers on board with the strategy and that expected outcomes are clear, so that employees at lower levels of the organization are allowed to participate in these activities, no matter which position they possess.

Strengthen the links between supporting functions and the rest of SU

As the supporting organizations and functions play a vital role to better exploit collaboration opportunities, the knowledge about them and what support they offer needs to be spread across the organization. Strengthening the links between these functions and the rest of the organization will lower the barriers for collaboration and increase the absorptive capacity. Further, it is important to spread resources such as the guidelines for business collaboration that exist but are not well known in the organization, to utilize these better.

Consider moving towards one point of entry for external actors

As there exist issues with the current way it works regarding entry points into SU, they are recommended to consider using the Innovation platform as the formal point of entry for company requests outside the scope of established relationships and clinical trials. By doing this, the reliance on individuals can be reduced while it will better ensure equal and professional treatment of requests and that the request reaches the right person.

Organize forums to meet

The need for forums and arenas where the different actors can meet have been highlighted both by companies and employees at SU. These forums could primarily be aimed especially for the smaller collaborative activities and earlier interactions that are difficult to conduct within the healthcare production, such as allowing companies to pitch ideas and get feedback. Through this, employees are able to influence the development earlier in the processes and it can also be a beneficial way to establish relationships for further collaboration.

Document collaboration projects and learnings, and spread success stories

Documenting projects and learnings will allow for improving collaboration efforts based on past experience and a common overview reduces the risk of overlapping efforts. Further, spreading success stories will help change the culture as the benefits of collaborations are visualized. This can also help in overcoming the not invented here syndrome.

Educate and spread knowledge about innovation and collaboration

There is a need to close existing knowledge gaps across the organization regarding collaborations. This includes for example spreading knowledge about rules and regulations and how you can collaborate and where employees can get support with different issues. By more widely educating employees about innovation and collaboration, more employees will be able to take the role of innovation champion, further reinforcing collaboration efforts. Lastly, it is recommended to learn about innovation procurement and investigate opportunities to apply it in some collaboration projects.

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Appendix A: Interview guide

Initial questions

- What is your role?
- In what ways do you collaborate with business actors today?
 - Can you give examples of earlier projects?
- How is a collaboration managed and coordinated?

Level-specific questions

Socio-Political

- How do rules and regulations affect collaborations?
- Which rules are affecting?
- Do employees at SU have knowledge about such rules and regulations?

Inter-Organizational

- What are important factors for a collaboration to work well?
- What ways can company requests come to you?
 - What ways are preferred?
 - Does it differ depending on if a request concerns research or other collaborations?
- How does the process look after a request is received?
- What friction areas exist in the collaboration with business actors?
 - How are these handled?

Organizational

- What hinders exist within SU to collaborate more?
- Is there a pronounced strategy from the board to work with research- and innovation collaboration?
- How do you evaluate requests you receive?
- How is the culture within SU regarding collaborations with business actors?

Intra-Organizational

- What are the incentives to collaborate with business actors?
- What role does specific individuals play for a collaboration?

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