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Change of Roles and Structures in Ecosystems

An Exploratory Case Study

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This thesis was written as a part of the Master of Science in Economics and Business Administration at NHH. Please note that neither the institution nor the examiners are responsible – through the approval of this thesis – for the theories and methods used, or results and conclusions drawn in this work.

Preface

This thesis is written as part of our Master of Science in Economics and Business Administration at the Norwegian School of Economics (NHH). Our specializations are Strategy & Management and International Business. This study is part of Digital Innovation for Growth (DIG), Norway's leading research centre on digital transformation and innovation for sustainable growth.

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We hope this thesis proves to be an interesting read and that it provides valuable insight into the development of ecosystems.

Bergen, December 2021

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Abstract

This thesis investigates the research question: “Why and how do roles and structures in an ecosystem change as it matures?”

The methodological approach chosen to answer this research question is an explorative single case study of the establishment of an ecosystem in the healthcare sector. The main data source consists of semi-structured interviews with six informants from five different companies who are currently involved in the project or will be involved in the future.

The existing literature on ecosystems, the ecosystem lifecycle, roles and structures within ecosystems, and coevolution has been reviewed and used to create a theoretical foundation that was used to discuss the findings of this study. However, while existing research shows that roles and structures within ecosystems change over time, the research field is still novel when it comes to how the roles and structures change and what causes these changes. Therefore, this phenomenon is an interesting subject of analysis.

The findings reveal that the changes in roles and structures in ecosystems over time can originate from *external competition*, *public regulations*, *internal competition*, and *changes in the required competences*. Through these sources of change *roles* can either *change*, *become redundant*, or entirely new roles can *emerge*. The structures within ecosystems can alter regarding *substitutability*, *centrality*, and *decision-making*, which can all represent sources of power within the ecosystem. Additionally, *trust* is found to play an important role in the relationships between the members of the ecosystem, but also as a source of power and competitive advantage. Lastly, *uncertainty* is found to be a relevant factor that affects the identified sources of change.

The findings are significant in that they can help companies involved in an ecosystem to better understand why and how roles and structures change, which in turn can help them to better foresee and maneuver through these changes and to achieve their desired role or structure. Moreover, the findings can contribute to decision-making that improves the overall probability of an ecosystem’s success.

Table of Contents

PREFACE	I
ABSTRACT	II
TABLE OF CONTENTS	III
LIST OF TABLES AND FIGURES	VII
1. INTRODUCTION	1
1.1 BACKGROUND AND PROBLEM STATEMENT	1
1.2 OUTLINE.....	2
2. LITERATURE REVIEW	4
2.1 ECOSYSTEMS.....	4
2.2 ECOSYSTEM LIFECYCLE.....	6
2.2.1 <i>Birth & Expansion phase</i>	7
2.3 ROLES IN AN ECOSYSTEM	8
2.3.1 <i>Leadership roles</i>	9
2.3.2 <i>Direct value creation roles</i>	9
2.3.3 <i>Value creation support roles</i>	10
2.4 STRUCTURES.....	13
2.4.1 <i>Power in ecosystems</i>	14
2.4 COEVOLUTION.....	17
2.5 SUMMARY	18
3. RESEARCH SETTING	19
3.1 THE HEALTHCARE SECTOR IN NORWAY	19
3.2 OUTPATIENT HEALTHCARE PLATFORM	20

3.3	CURRENT ECOSYSTEM PARTICIPANTS	20
3.4	TIMELINE OF THE PROJECT	22
3.4.1	<i>Phase 1: Initiation</i>	22
3.4.2	<i>Phase 2: Technical validation</i>	23
3.4.3	<i>Phase 3: Clinical services</i>	24
4.	METHODOLOGY	26
4.1	RESEARCH DESIGN	26
4.1.1	<i>Research Approach</i>	27
4.1.2	<i>Research Objective and Strategy</i>	27
4.2	DATA COLLECTION	28
4.2.1	<i>Data Sources</i>	28
4.2.2	<i>Sample</i>	29
4.2.3	<i>Qualitative semi-structured interviews</i>	30
4.2.4	<i>Interview process</i>	31
4.2.5	<i>Secondary Data</i>	32
4.3	DATA ANALYSIS	33
4.3.1	<i>Data Preparation</i>	33
4.3.2	<i>Template Analysis</i>	33
4.3.3	<i>Citations</i>	35
4.4	RESEARCH QUALITY	35
4.4.1	<i>Credibility</i>	36
4.4.2	<i>Transferability</i>	37
4.4.3	<i>Dependability</i>	37

4.4.4	<i>Confirmability</i>	38
4.5	ETHICAL CONSIDERATIONS	38
5.	EMPIRICAL FINDINGS	40
5.1	MANY INDIVIDUAL OBJECTIVES – ONE SHARED VISION	40
5.1.1	<i>Learning</i>	40
5.1.2	<i>Expansion</i>	41
5.1.3	<i>Changing minds</i>	42
5.1.4	<i>A shared vision</i>	44
5.2	UNCERTAINTY	44
5.3	THE ROLE OF TRUST.....	46
5.3.1	<i>Trust in the relationship between the players</i>	46
5.3.2	<i>Trust as a base of power</i>	46
5.3.3	<i>Trust in the process</i>	47
5.4	SOURCES OF CHANGE	48
5.4.1	<i>External</i>	48
5.4.2	<i>Internal</i>	55
5.5	OBJECTS OF CHANGE	58
5.5.1	<i>Roles</i>	58
5.5.2	<i>Structures</i>	64
6.	DISCUSSION	75
6.1	WHY ROLES AND STRUCTURES CHANGE.....	76
6.1.1	<i>External sources of change</i>	76
6.1.2	<i>Internal sources of change</i>	77

6.1.3	<i>Uncertainty</i>	79
6.2	HOW ROLES AND STRUCTURES CHANGE	80
6.3	HOW ROLES AND ACTORS ARE CONNECTED.....	82
7.	CONCLUSION	84
7.1	SUMMARY	84
7.2	IMPLICATIONS	85
7.3	LIMITATIONS	86
7.4	FUTURE RESEARCH	87
	REFERENCES.....	VII
	APPENDICES	XIV
	APPENDIX A – CONSENT FORM.....	XIV
	APPENDIX B – MAIN INTERVIEW GUIDE.....	XVI

List of Tables and Figures

TABLE 1 OVERVIEW OF THE LITERATURE STUDYING ROLES IN ECOSYSTEMS	12
TABLE 2 OVERVIEW OF CONDUCTED INTERVIEWS	30
TABLE 3 OVERVIEW OF SECONDARY DATA.....	32
FIGURE 1 THE BIRTH AND EXPANSION PHASES OF THE ECOSYSTEM LIFECYCLE	8
FIGURE 2 THE MODEL OF MOORE’S BUSINESS ECOSYSTEM	15
FIGURE 3 INFLUENTIAL POSITIONING IN ECOSYSTEMS	16
FIGURE 4 TIMELINE OF THE HEMIT PROJECT	25
FIGURE 5 OHP IN PHASE 2	25
FIGURE 6 DEVELOPMENT OF THE CODING TEMPLATE.....	34
FIGURE 7 OUTPATIENT HEALTH PLATFORM IN PHASE 2.....	69
FIGURE 8 OUTPATIENT HEALTH PLATFORM IN PHASE 3.....	70
FIGURE 9 OUTPATIENT HEALTH PLATFORM IN THE LONG-TERM VISION.....	71
FIGURE 10 SCENARIO A – TELENOR IS PLATFORM PROVIDER AND SERVICE ENABLER	71
FIGURE 11 SCENARIO B – HEMIT IS PLATFORM OWNER AND SERVICE PROVIDER.....	72
FIGURE 12 SOURCES AND OBJECTS OF CHANGE IN ECOSYSTEMS	75

1. Introduction

1.1 Background and problem statement

The digital economy is entering a new age: The Coordination Age, which is driven by a global need for resource efficiency and enabled by new innovative technologies such as the Internet of Things (IoT), artificial intelligence (AI), cloud computing and 5G. From 1850, the need for faster remote communication resulted in the Communications Age which connected people to each other. From 1990 the need for universal access of information and communication resulted in the Information Age which connected computers with each other. The Coordination Age, which the telecoms are now entering, connects computers, people, processes and more with each other – in short, it connects the physical and the digital world. This creates incredible opportunities for businesses in all industries with examples such as telehealth, smart cities, drones, or robotics. Especially for telecoms, whose core industry is close to reaching maturity, the third age of telecoms is both a challenge and an opportunity (STLPartners, 2018; STLPartners, 2019). Because of the high complexity of potentially value-adding products and services enabled by the new technologies, they can rarely be developed and marketed by one company alone. Consequently, ecosystems are formed, a concept that has been getting increased attention in recent years, both in the corporate and academic world. Ecosystems allow for collaboration and joint value-creation between companies and therefore create value that no single firm could have created alone (Jacobides, Cennamo, & Gawer, 2018; Adner, 2006).

Due to its increasing popularity, the ecosystem concept has been used to describe a wide range of solutions and phenomena under varying terms such as “business ecosystems”, “innovation ecosystems”, “digital ecosystems”, “technology ecosystems”, “platform ecosystems” and others. This heterogeneity of concepts has led to a conceptual and terminological confusion which many researchers have tried to solve by offering definitions.

Bogers, Sims, & West (2019) for example, have reviewed existing research in the field and defined an ecosystem as “an interdependent network of self-interested actors jointly creating value” (p.2).

This interdependency, e.g., through complementary technologies, can be cooperative, competitive or co-competitive, and the goals of the different parties involved influence how well they work together (Jacobides et al., 2018; Bogers et al., 2019). Within ecosystems different

actors fulfil different roles. While some roles are normatively defined, applicable to anyone who chooses to assume the role, or dictated by the flow of activities, others are more ambiguous (Jacobides et al., 2018; Adner, 2017).

An ecosystem lifecycle consists of four evolutionary phases, namely birth, expansion, leadership, and self-renewal (or death) (Moore, 1993). During the whole lifecycle the ecosystem goes through multiple role transformations and structural reconfigurations (Lu, Rong, You, & Shi, 2014; Annanperä, Liukkunen, & Markkula, 2015; Dedehayir, Mäkinen, & Ortt, 2018; Zahra & Nambisan, 2012). This shows that ecosystems are not static but coevolve over time in a process through which changes in the ecosystem and changes in the ecosystem's environment influence each other and cause mutual adjustments (Lewin & Volberda, 1999; Moore, 1993).

Summarized, existing research shows that roles and structures within an ecosystem change over time. However, the research field is still novel when it comes to how roles and structures change and what causes these changes. Within this context, roles can be understood as the participants' membership and relationships, while structures describe the power distribution and power influence within the ecosystem (Han, Lowik, & Weerd-Nederhof, 2017).

Therefore, the purpose of this study is to explore how the dynamics within an ecosystem change over time. More specifically, we want to examine why and how the roles and structures change as an ecosystem matures and how these changes affect the participating parties and the ecosystem as a whole. This has resulted in the following research question:

“Why and how do roles and structures in an ecosystem change as it matures?”

1.2 Outline

This thesis consists of seven chapters. After the introduction, chapter two presents a review of the existing literature on ecosystems in general, followed by literature on the ecosystem lifecycle, roles and structures in ecosystems, and coevolution. Chapter three introduces the research setting which includes information on the healthcare sector, the studied case, its participants, as well as a timeline of the project. This chapter aims to provide the reader with the necessary context. The next chapter presents the methodological choices that were made in

this study, regarding research design, data collection and analysis process. This chapter also assesses ethical considerations and how high research quality is ensured. Following the methodology chapter, the data that has been collected from the semi-structured interviews, as well as from secondary data sources, will be presented in the findings chapter. Chapter six discusses and analyses the findings in context of the literature presented in chapter two. The discussion explains how the findings support, contradict, and contribute to the existing literature. The last chapter offers practical implications of the findings, limitations of the study and suggestions for future research.

2. Literature Review

To lay the fundament for answering the research question, this chapter reviews relevant literature on the concept of *ecosystems*. The first section presents different ecosystem definitions and types. Next, the ecosystem lifecycle is introduced before ecosystem members and their *roles* are discussed. Furthermore, *structures* in ecosystems will be examined, referring to power distribution and influence between members. Finally, the concept of *coevolution* is defined and put into context.

2.1 Ecosystems

James F. Moore first introduced the concept of ecosystems in business in 1993 by suggesting that a company should not be viewed as a member of a single industry but as part of a business ecosystem that crosses several industries. In such ecosystems, businesses coevolve capabilities around an innovation while working cooperatively and competitively (Moore, 1993). Despite Moore's early introduction, the concept has only really taken hold in academic research in recent years. This has to do with digitalization and the way some of these ecosystems have been exploding in size. Ecosystems are a way of organizing economic activity that seem to grab market share from most other kinds of organized value creation. Therefore, the concept is enjoying increasing attention in academic research. Thereby, the research focus differs quite substantially from Moore's work, as he had not seen the newer generation of ecosystems, such as enormous digital ecosystems like Facebook or Apple. Nevertheless, there remains disagreement on how to define the concept with recent work attempting to define the concept more narrowly (Bogers et al., 2019).

Jacobides et al. (2018) who focus on the emergence of ecosystems and their modular structure, define the term ecosystem as a "set of actors with varying degrees of multi-lateral, non-generic complementarities that are not fully hierarchically controlled" (p. 16). They stress three aspects of an ecosystem. First, "multi-lateral, non-generic complementarities" suggest that complementarities are either unique (A requires B or the value of A is maximized with B, with A and B being two different products, assets, or activities), or supermodular (more of A makes B more valuable). Second, the definition suggests that these complementarities need to be non-generic, meaning that the service is not that standardized that the transaction could take place

in a market instead of requiring the creation of a specific alignment structure to create value. And third, the definition suggests that standards and baseline requirements allow complementors, to some extent, to make their own decisions without the presence of hierarchical governance.

Adner (2017) and Bogers et al. (2019) supplement this focus of participant interdependence based on modularity by stressing the importance of joint value creation. Thereby, Adner (2017) defines the concept as “the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize” (p. 40). Alignment structure refers to the structure that ecosystem members create to define positions and activities between themselves (Adner, 2017). He also introduces two viewpoints contrasting each other, namely ecosystem-as-structure and ecosystem-as-affiliation. The first perspective, ecosystem-as-structure, focuses on activities and begins with the value proposition before identifying relevant actors that provide the needed complementary innovations, products, and services. The second perspective, ecosystem-as-affiliation, focuses on ecosystem actors and sees ecosystems as communities of associated actors defined by their networks and platform affiliations. According to him, this perspective characterizes most of the literature and is valuable for analysing interactions on a macro level (Adner, 2017). However, he argues that it can be difficult to distinguish its characterizations from those of other approaches on interdependence. Pulkka, Ristimäki, Rajakallio, and Junnila (2016) add that participants are not only interdependent with regard to the modular infrastructure and technology but also regarding social aspects such as trust and commitment.

More recently, the meta study of Bogers et al. (2019) links joint value creation, the central goal of an ecosystem, to three important constructs. First, goals of ecosystem members; second, the network of relations between these members; and third, the interdependence of their respective goals. This leads to the definition of the ecosystem concept as “an interdependent network of self-interested actors jointly creating value” (p. 2). This jointly created value is greater than what the actors could have achieved alone (Adner, 2006). Building on the definition, Bogers et al. (2019) argue, that while ecosystem actors want to achieve value creation and success for the entire ecosystem, they tend to prioritize their own interest. Furthermore, they differentiate between three types of interdependence that influence the relationships between ecosystem participants. These relationships in turn affect how well the actors work together to achieve

their common objective. The first type of interdependence is called cooperative interdependence. This refers to a relationship where value creation efforts are rather complementary, and firms compete for attention instead of revenue. The second type of interdependence is called competitive interdependence and refers to competition between ecosystem members. Finally, cooperative interdependence is introduced. This type of interdependence refers to a situation where ecosystem actors both collaborate and compete (Bogers et al., 2019). According to Han et al. (2017) cooperation and competition are thereby likely to happen during different times. For example, two firms might cooperate in the birth phase of an ecosystem to jointly create and validate the value proposition. Nevertheless, once the ecosystem progresses to the leadership stage, the firms could compete when it comes to dividing the captured value between them.

One reason for the large amount of ecosystem definitions is the versatility of the concept. Thomas and Autio (2020) differentiate between seven types of ecosystems: Innovation ecosystems, business ecosystems, platform ecosystems, modular ecosystems, technology ecosystems, entrepreneurial ecosystems, and knowledge ecosystems. Overlaps between the different concepts are possible and the main streams of ecosystem literature are business ecosystems, relating mainly to value capture; innovation ecosystems, relating mainly to value creation; and platform ecosystems, emphasizing the coordination of technological interdependencies through platforms (Jacobides et al., 2018; Thomas & Autio, 2020; de Vasconcelos Gomes, Facin, Salerno, & Ikenami, 2018).

2.2 Ecosystem lifecycle

While individual organizations progress from birth to decline over time, so do entire ecosystems face various stages from creation to termination (Jones, 2013). Thereby, ecosystem literature provides different ways to divide the lifecycle of an ecosystem. While such classification is valuable to analyse the ecosystem over its lifetime, there are no sharp lines but rather different stages that blur into one another (Moore, 1993).

Thomas and Autio (2020) divide an ecosystem lifecycle into three phases: Initiation, momentum, and optimization. This classification ignores the phase of an ecosystem in which it declines and eventually ends or renews itself. In addition, Lu et al. (2014) introduce an

ecosystem lifecycle concept that consists of five stages: Emerging, diversifying, converging, consolidating, and renewing. This thesis, nevertheless, applies the classification of Moore (1993), as it appears to be the most prevalent classification in academic literature. According to his research, ecosystems develop in four distinct phases, namely birth, expansion, leadership, and self-renewal/death. During the birth stage of an ecosystem, members focus on the definition and implementation of the customer value proposition. In stage two, the expansion stage, ecosystems try to “scale up supply and achieve maximum market coverage” or expand to new markets (Moore, 1993, p. 77). In the third stage, the leadership stage, standards, interfaces, a modular organization, and customer relations become more relevant. In addition, it is referred to as a period of consolidation and establishing stability (Han et al., 2017). Stage four occurs, when new competing ecosystems or innovations threaten the mature ecosystem and results either in the self-renewal or death of the ecosystem (Moore, 1993). While it is important to recognize that the phases do not have clear beginnings and endings, but rather flow into one another, it is just as important to understand the interplay between the phases. Considering the lifecycle stage by stage might lead to missing out on understanding to what extent different views or interests of actors in one stage affect behaviour in the previous stage. The following paragraph describes the two focal phases of the case that will be analysed in this work, namely birth and expansion phase, in more detail and attempts to differentiate them from one another.

2.2.1 Birth & Expansion phase

Dedehayir et al. (2018) suggest that the birth phase starts with the initial idea or invention, followed by the start-up phase that includes prototypical application and ends with the first commercialization of the innovation (see figure 1). This means, that there has been a first successful application of the product or service and that a version of it has been sold to the market. In addition, Han et al. (2017) claim that by the end of the birth phase, all ecosystem participants have a mutual understanding of the value proposition. While we agree that there should be agreement on some aspects such as the initial prototype, the customer group that is planned to be targeted or areas of expansion, we question whether the end of the birth phase is really a stage of perfect agreement.

According to Moore (1993), there are two necessary conditions for the following expansion of the offer: First, there needs to be a value proposition that a large number of customers will

value; and second, there needs to be a potential to scale up the concept to reach this broad market. During the expansion stage, ecosystems expand the offer to new geographic markets or customer groups. Thereby, established firms can utilize their capabilities in production, marketing, and sales (Moore, 1993). Generally, value capture and co-creation is increasing in the expansion phase (Han et al., 2017; Moore, 1993; Dedehayir & Seppänen, 2015).

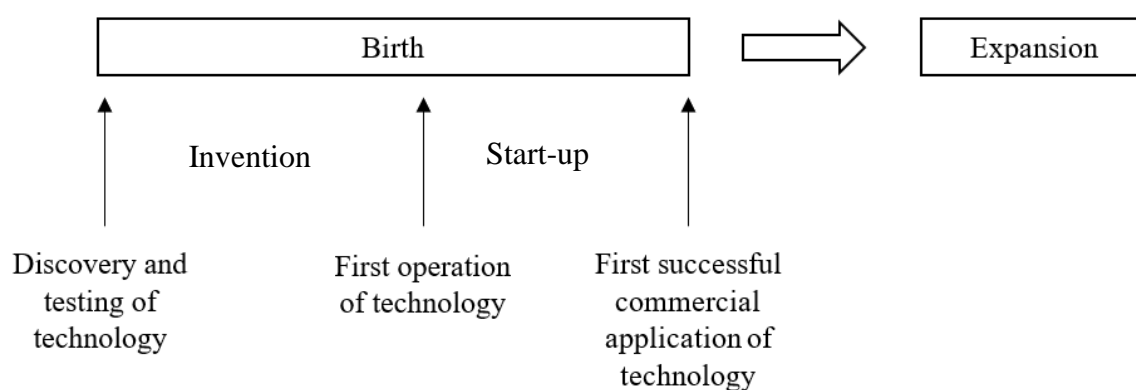


Figure 1: The birth and expansion phases of the ecosystem lifecycle (*Source: Dedehayir et al., 2018*)

Along with the different task areas in an ecosystem's lifecycle go different needs and capabilities that make a neatly defined understanding of roles inevitable. Hence, the following part addresses the distinct roles within an ecosystem.

2.3 Roles in an ecosystem

Ecosystems consist of heterogenous members who have defined roles and positions and each role is contributing unique value to the system (Adner, 2017; Dedehayir et al., 2018). Roles can be defined as a “characteristic set of behaviours or activities undertaken by ecosystem actors” (Dedehayir et al., 2018, p. 3) and are described “in terms of relative positions that occur in a given relationship” (Markham, Ward, Aiman-Smith, & Kingon, 2010, p. 405). Several scholars have analysed ecosystem roles in the past. Jacobides et al. (2018) indicate that existing roles are usually normatively defined and applicable by any ecosystem actor who chooses to assume that role. Dedehayir et al. (2018) have examined roles during ecosystem genesis and add that roles tend to emerge naturally instead of being set by external governance mechanisms (Dedehayir et al., 2018). Three core groups of roles were identified in the literature: Leadership

roles, direct value creation roles, and value creation support roles. In the following, these roles will be introduced briefly.

2.3.1 Leadership roles

The *ecosystem leader* (Moore, 1993; Adner, 2017; Dedehayir et al., 2018), who is also referred to as *keystone* (Iansiti & Levien, 2004), *technology leader* (Adner & Kapoor, 2010), *architect* (Gulati, Puranam, & Tushman, 2012), *hub* (Williamson & De Meyer, 2012), *platform leader* (Gawer & Henderson, 2007), or *dominator* (Dedehayir et al., 2018) is a central player in the ecosystem and enjoys extensive focus by scholars. This role is especially crucial during the birth phase of an ecosystem, establishing relationships and securing the cooperation of firms that provide crucial components to the ecosystem's value proposition (Dedehayir et al., 2018; Gawer & Cusumano, 2014). Thereby, the reviewed literature often assumes leadership by one dominant player. We believe that this might not always be the case, given the highly dynamic and uncertain environment in the birth of an ecosystem. Generally, leaders enforce governance rules, make important decisions regarding timing, standards, and interfaces, forge strong ties with customers and often capture most of the created value once the ecosystem is aligned, as they can exert substantial power (Adner, 2017; Gulati et al., 2012; Dedehayir & Seppänen, 2015). This is remarkable, as the leader only represents a small share of the ecosystem participants and leaves most of the value creation to other actors (Iansiti & Levien, 2004). This makes the leader highly dependent on innovations and investments from other firms (Gawer & Cusumano, 2014).

2.3.2 Direct value creation roles

The leadership role is supported by niche players who act as complementors and represent most ecosystem firms (Dedehayir & Seppänen, 2015). This group of *direct value creation roles* also appears in past research under various terms such as *complementor* (Gawer & Cusumano, 2014; Dedehayir et al., 2018), *follower* (Moore, 1993; Adner & Kapoor, 2010; Adner, 2017), *niche players* (Iansiti & Levien, 2004), *supplier, assembler, user* (Dedehayir et al., 2018) or *specialist* (Rong, Lui, & Shi, 2011). They tend to operate in the shadow of the leader and agree to the structure and rules given by the leader. In the case of platform ecosystems for instance, complementary products or services need to be compatible with the core platform (Dedehayir et al., 2018). Nevertheless, research suggests that direct value creators are responsible for most

of the innovation and create most value within the ecosystem, for example by delivering key materials, components, technologies, and services that are put together in a modular architecture (Iansiti & Levien, 2004; Dedehayir & Seppänen, 2015; Thomas & Autio, 2020). Customers or users are also part of this cluster, building demand and capabilities (Moore, 1996).

Direct value creators differentiate themselves from other actors through their specialized capabilities. In addition, their type of complementarity also gives them power over the leader (Adner, 2017; Iansiti & Levien, 2004; Jacobides et al., 2018). This refers to the previously mentioned classification of unique and supermodular complementarities. Unique complementarity, in contrast to generic complementarity, gives the actor more relevance and makes some sort of governance structures necessary. The complementarity can be one-way or two-way, reflecting the interdependent relationship between ecosystem actors. Supermodular complementarities refer to a situation in which more from one product, service or activity increase the value of another product, service, or activity. Both categories of complementarities can coexist. For example, in the Apple App Store, which represents a platform ecosystem, the platform and app are unique complementors because the app does not function without the platform. The complementarity is one-way, as the platform can operate without the app. In addition, the two components have a supermodular complementarity, because more apps increase the value of the platform. This time, the complementarity might be two-way, as the wider distribution of the App Store in turn increases the reach of potential users and thus the value of the app.

2.3.3 Value creation support roles

In addition to leadership and direct value creation roles, ecosystems tend to have roles that support value creation without directly adding value through products or services (Dedehayir et al., 2018). Dedehayir et al. (2018) introduce the roles *expert* and *champion*, who add value by providing supporting elements such as knowledge, consultation, or connections. In addition, the champion accepts risk when promoting the project to decision-makers within the organization (Markham et al., 2010). Furthermore, Markham et al. (2010) complement this by introducing the informal roles *sponsor* and *gatekeeper*, that are especially important between idea discovery and commercialization of the innovation. While sponsors provide necessary resources to demonstrate the project's viability, gatekeepers "set criteria and make acceptance decisions" (Markham et al., 2010, p.402). Dedehayir et al. (2018) whose work focuses on roles

during ecosystem genesis and builds the basis of the roles classification in this thesis introduce a fourth group, namely “entrepreneurial ecosystem roles”. This group entails the roles *entrepreneur*, and *regulator*. Nevertheless, as these roles can be assigned to the classification groups above, we remain with the three groups presented. Regulators can thereby be assigned to value creation support roles, as regulators support entrepreneurial activity by providing economic and political reforms and loosening regulatory restrictions (Dedehayir et al., 2018). In addition, the entrepreneur can be assigned a leadership role.

Table 1 shows the different terminology of ecosystem role theory. It makes clear that roles differ depending on what kind of ecosystem is considered. In platform ecosystems for example, leaders typically orchestrate other ecosystem participants who align themselves. Hereby, orchestration refers to a set of deliberate and purposeful actions by the leading firm that is trying to create and capture value from the ecosystem (Pagani, 2013). In contrast, roles in innovation ecosystems tend to be connected by interdependent technologies (Han et al., 2017).

Study	Ecosystem type	Roles		
		Leadership role	Direct value creation roles	Value creation support roles (informal roles)
Bogers et al. (2019)	<i>no specification</i>	Sponsor	Other Member firms	Non-profit organizations (e.g., universities, regulatory bodies)
Dedehayir et al. (2018)	Innovation ecosystems	Ecosystem leader, dominator, entrepreneur	Supplier, assembler, complementor, user	Expert, champion, sponsor, regulator
Adner (2017)	<i>no specification</i>	Leader (focal firm)	Follower (Buyer, supplier)	
Gawer & Cusumano (2014)	Platform ecosystems	Platform sponsor	Complementors	
Williamson & De Meyer (2012)	<i>no specification</i>	Lead firm	Partners	
Rong et al. (2011)	Business Ecosystem	Initiator role	Specialist role, adopter role	
Adner & Kapoor (2010)	Innovation ecosystems	(Technology-) leader	Follower (supplier, customers, complementors)	
Gawer & Henderson (2007)	<i>no specification</i>	Leader	Complementors	
Adomavicius et al. (2007)	Technology ecosystem		Component role, application role	Support/infrastructure role
Iansiti & Levien (2004)	Business ecosystem	Keystone, dominators	Niche players	
Moore (1993)	Business Ecosystem	Leader	Follower, Customer	

Table 1: Overview of the literature studying roles in ecosystems (*Source: own representation*)

2.4 Structures

In this research project, ecosystem structure refers to power distribution and influence among ecosystem participants. To be able to analyse why and how structures change, we first need to understand the underlying concept and sources of power and influence. Pfeffer (1992) defines the concept of power as the “potential ability to influence behaviour, to change the course of events, to overcome resistance, and to get people to do things that they would not otherwise do” (p. 30). This definition indicates that influence is enabled by power. Still, as the potential ability to affect outcomes does not have to be exhausted, one might possess power without having influence on a subject, demonstrating the difference between power and influence.

In organizational theory, French and Raven (1959) distinguish between five sources of power: reward power, coercive power, legitimate power, referent power, and expert power. Reward power is based on the receiver’s perception of reward and the sender’s ability to administer positive and decrease negative valences (French and Raven, 1959). Within ecosystems, reward power can be related to value capture of the joint value proposition. The actor that is perceived to be able to capture the created value and distribute it to the players possesses reward power. Coercive power relates to the perceived ability of the receiver to be punished. For example, if an actor fears to be banned from the platform ecosystem due to failed compliance to the platform’s guidelines, the platform owner has coercive power. Legitimate power refers to some sort of moral legitimacy enabling an actor to exert power on others, who in turn have a moral obligation to accept this influence. Referent power relates to influence that stems from the receiver’s attraction to the leader. The receiver wants to be closely associated with the leader and therefore behaves, believes, and perceives like them. Finally, expert power is based on the amount of expertise of the leader, that is perceived by the receiver in a specific field. As ecosystems are based on actors from different areas or industries that all bring unique value to the system to create value that no single ecosystem actor could have created alone, all members are expected to possess expert power to some degree. Nevertheless, expert power could vary throughout the lifecycle of the ecosystem. For example, expert power could decrease once the component in which the actor has unique expertise is validated and other qualities become more relevant.

2.4.1 Power in ecosystems

Bargaining power in ecosystems increases the ability to actively influence or control the ecosystem's development. In addition, it affects the distribution and capture of (monetary) value across member firms (Adner, 2017). This is especially relevant in the presence of role-based governance instead of formal hierarchical and contractual authority arising from employment relationships between ecosystem participants (Gulati et al., 2012). Due to the interdependent nature of ecosystem relationships, bargaining power is divided among all ecosystem participants. Nevertheless, this interdependence tends to be asymmetric and relationships within ecosystems can be cooperative, competitive, or neutral (Adner, 2017; Gulati & Sytch, 2007). Therefore, bargaining power is distributed unevenly among ecosystem members and co-creation does not automatically lead to co-capturing (Clarysse, Wright, Bruneel, & Mahajan, 2014). This asymmetric distribution of bargaining power stems from several sources of power.

Centrality

One source of power within ecosystems stems from a central position. According to Moore (1996), ecosystems consist of three tiers, namely the core firms, the extended network, and the peripheral actors (see figure 2). Core firms usually enjoy more decision rights due to their focal position. This gives them some degree of architectural control, allowing the focal firm to set standards to which complementary offerings from niche firms need to adhere to ensure compatibility (Adner, 2017; Moore, 1993; Dedehayir et al., 2018). In addition, these decision rights can constitute gateway privileges. Focal firms can often decide on the openness of the ecosystem, choose members, membership criteria, and duration or exclusivity of membership (Gulati et al., 2012). One situation in which the focal firm enjoys these gateway privileges is when it has control over the interface. Drawing on this, a focal firm could increase ecosystem openness to support competition among complementors and thereby strengthening its own bargaining power (Gawer & Cusumano, 2014).

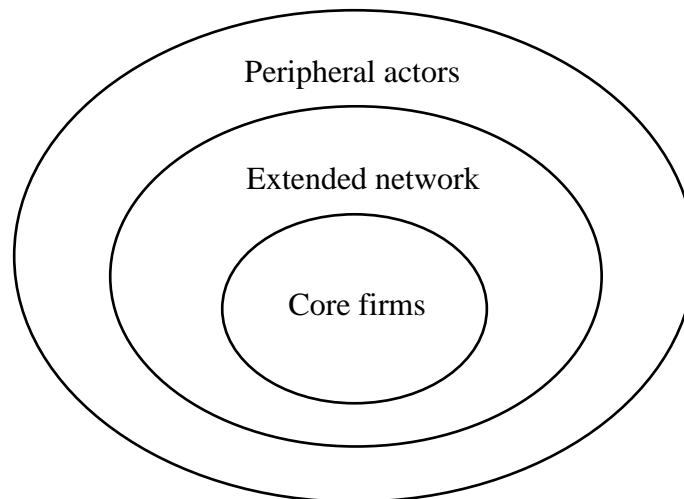


Figure 2: The model of Moore's business ecosystem (Source: Moore, 1996)

Control of critical resources

Another source of bargaining power is the control of a critical resource (Moore, 1993). This could be a tangible asset such as a technology component, or an intangible asset such as a brand, reputation, or access to customers. Being the only practical source of the resource and its uniqueness reinforces bargaining power (Gulati et al., 2012; Moore, 1993). Drawing attention to the well-established resource-based view by Barney (1991), the resource needs to fit the attributes of *VRIO*. This means that the asset should be *valuable* for the ecosystems value creation, *rare* and *inimitable* so that it cannot be easily substituted by competitors or other ecosystem members, and the firm should be *organized* to exploit the advantage of possessing the resource. The more dependent the joint value proposition is on the firm's resource, the more bargaining power the firm possesses (Adner, 2006). Several aspects influence this dependency. First, standardization decreases uniqueness and leads to greater competition of generic complementarities (Jacobides et al., 2018). Second, ecosystem openness affects substitutability of firms. The more easily substituting firms can enter the ecosystem, the lower the bargaining power of current ecosystem participants. Finally, inimitability can be ensured by patent protection, keeping the valuable resource proprietary (Moore, 1993; Adner & Kapoor, 2010). Figure 3 visualizes the described aspects of providing a valuable resource to the system while considering substitutability. In this example, firm A delivers value that is hard to substitute but does not add much value to the joint value proposition. Therefore, it does not possess much bargaining power. While firm B contributes significant positive externalities for the ecosystem, it is also easy to substitute and therefore

does not possess much bargaining power either. Finally, firm C is in a highly influential position as it combines a high added value with a low possibility to be replaced.

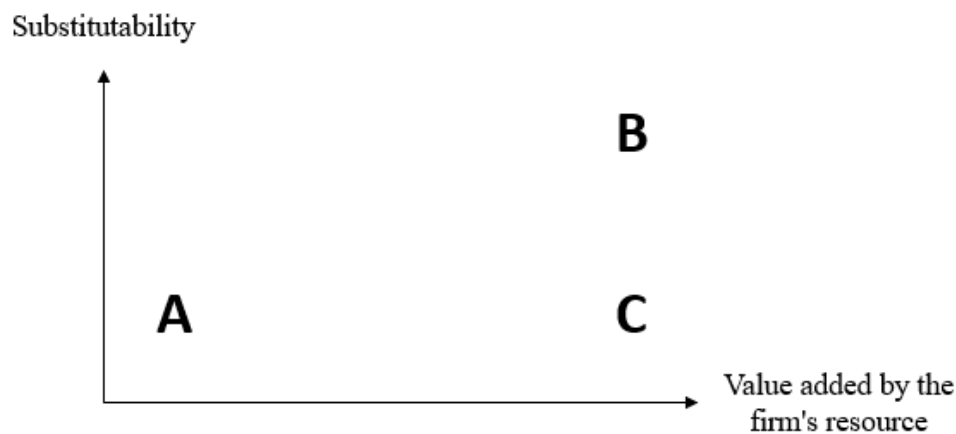


Figure 3: Influential positioning in ecosystems (*Source: own representation*)

Attractiveness of outside options

Although the potential risk of one actor being replaced by another actor from inside or outside the ecosystem does exist and can affect the power balance within an ecosystem, it is assumed in this situation that the actors' best option is to be part of the ecosystem. However, we consider that this does not necessarily have to be the case as players can have multiple options to create and capture value that are not tied to one particular ecosystem. Therefore, the minimum value that the system is giving the actor must be greater than its best outside option. Having attractive outside options therefore improves the position of a player compared to ecosystem members whose only option for value capture stems from the ecosystem. Therefore, the availability of outside options affects the power balance of the system (Adner, 2017).

Status & size

Finally, status and size of actors influence the power distribution between members. Particularly in the early stage, power might arise from being able to provide legitimacy and credibility to the ecosystem. In addition, traditional advantages that come from status and size give companies bargaining power to influence interdependence (Adner, 2017; Gulati et al., 2012). In many cases, larger firms simply have more financial resources that can be invested (e.g., in knowledge advantages).

While there is extensive research indicating that ecosystems and their roles, structures and activities are not static but coevolve over time, there is little literature on why roles and structures change and how they change (Thomas & Autio, 2020; Pulkka et al, 2016; Han et al., 2017; Dedehayir et al., 2018). The following paragraph describes the current state of research.

2.4 Coevolution

Rosenkopf and Nerkar (1999) argue, that coevolution is driven by external factors as well as internal factors. This approach is supported by Thomas and Autio (2020) who suggest that ecosystems “coevolve through a process where environmental changes and changes in the ecosystem participants mutually influence each other, promoting mutual adjustments” (p.29). External factors that lead to changes in roles and activities within an ecosystem can be government regulations, customer buying patterns, and macroeconomic conditions (Moore, 1993; Dedehayir & Seppänen, 2015). Moreover, competition in the form of new actors from outside of the original system trying to enter the ecosystem might affect coevolution and power distribution (Pagani, 2013).

In addition to competition from outside the ecosystem, roles and structures can be challenged by other actors inside the system (Kapoor & Agarwal, 2017; Tiwana, 2015). This points out the complex relationships within ecosystems including cooperation and competition. Thereby, competition can be especially relevant when firms disagree with the current distribution of roles and structures or the distribution of value across positions (Adner, 2017). Adner (2017) introduces “alignment structure” as “the extent to which there is mutual agreement among the members regarding positions” (p. 42). He adds that firms develop ecosystem strategies to “secure its role in a competitive ecosystem” (p. 47). An example for competition within an ecosystem is a leader who contests and “swallows up” a niche player (Iansiti & Levien, 2004). In addition, niche players might also try to invade each other’s territory to capture more value from the system. Moreover, leadership roles are contestable as well (Adner, 2017). Finally, internal competition is expected to occur once the ecosystem has established itself and profitability and growth are worth fighting over (Moore, 1993).

Regarding how roles and structures change, existing literature suggests that roles are likely to emerge at different times. Furthermore, centrality of roles is expected to alter over the

ecosystem's lifecycle (Dedehayir et al., 2018). Moreover, we note that standard literature often focuses on actors instead of roles, indicating that actors enter and exit the system or transition between different roles. We believe that roles and actors must be viewed separately. Therefore, one focus of this work will be to observe how roles and the actors who fulfil them are connected.

2.5 Summary

An ecosystem can be defined as an alignment structure of the multilateral set of partners that need to interact for a focal value proposition to materialize. This interaction is shaped by cooperative, competitive or coepetitive interdependence between members who have defined roles and positions. Each role is contributing unique value to the system and can be categorized into leadership roles, direct value creation roles, and value creation support roles. Roles are interdependent with the power and influence that firms have within the ecosystem. Sources of power are centrality, control of critical resources, attractiveness of outside options and status & size. As ecosystems mature along the four lifecycle stages birth, expansion, leadership and self-renewal/death; roles and structures coevolve. The current literature gives some reasons why roles and structures change within ecosystems and helps us divide them into two categories, namely internal and external factors. Nevertheless, in this research project, we want to explore further reasons for changes in the ecosystem and dig deeper into the identified ones. In addition, we want to understand how roles and structures change as an ecosystem matures and how roles and actors are connected.

3. Research setting

This chapter will present the context of the case study. First, the studied industry and the challenges it is facing are introduced before the goal and the members of the project will be presented. The chapter also includes a timeline of the project. Since the case project and one of the participants of the project have the same name, we have decided to use uppercase (HEMIT) when we refer to the project and lowercase (Hemit) when we refer to the IT department of Helse Midt-Norge, to avoid confusion. This has been applied throughout the rest of this thesis.

3.1 The healthcare sector in Norway

The Euro Health Consumer Index assesses how well the healthcare systems in different European countries work based on how patients are received and treated (Helsedirektoratet, 2017). In 2018, Norway was ranked 3rd, which makes it one of Europe's best healthcare systems, only ranking behind Switzerland and the Netherlands. This high rank could be partly due to the high per capita spending on healthcare (Health Consumer Powerhouse, 2019). In 2017, Norway spent 65,000 NOK per inhabitant on health, which accounted to 10.4 % of the GDP (Statistisk sentralbyrå, 2018a). While Norway, compared to other countries in the Euro Health Consumer Index, leads in the categories Patient Rights & Information, Outcomes and Prevention, it ranks relatively low concerning Accessibility (Health Consumer Powerhouse, 2019).

Other challenges that the Norwegian healthcare sector, and the welfare state in general, faces and will increasingly face in the future, result from demographic and economic changes. Demographically, the Norwegian population is getting older which implies that the proportion of the working population decreases in relation to the proportion of retired people. This rate was 0.3 in 2019 and is expected to increase to 0.5 in 2060, i.e., two employees must support one pensioner (Statistisk sentralbyrå, 2018b). The increased need for healthcare and the growing public expenditure on healthcare services, as a result of an aging population, is one of the biggest economic challenges for the Norwegian welfare state. These upcoming challenges make it necessary to organize and offer healthcare services in a whole new way and to take advantage of technological innovations such as 5G and IoT (Telenor, n.d.).

3.2 Outpatient healthcare platform

In the observed ecosystem, the involved firms intend to create value by reducing costs in healthcare and increase service levels for patients. For this value proposition to materialize, they are developing a platform, namely the Outpatient healthcare platform (OHP), that enables decentralization in healthcare through remote diagnoses, treatment, and follow-up of patients. While this system is not particularly suitable for patients at high risk of serious illness or death, it could still significantly reduce bed occupancy in hospitals as patients in less serious conditions do not necessarily have to come into the hospital or can leave it earlier. Patients can remain at home in their comfortable environment while being continuously and reliably monitored with the help of artificial intelligence. Especially with respect to the challenge of meeting the society's increasing need for health services, remote patient monitoring can be a tremendous opportunity and is envisioned part of "the hospital of the future". The Outpatient healthcare platform thereby provides the technical infrastructure allowing for secure and reliable data transfer. Based on this fundament, countless applications that strive to improve the quality of healthcare in Norway are possible. One use case, that has been applied during the establishment of the Proof of Concept (PoC) of the platform infrastructure is in the field of remote heart-rate monitoring.

3.3 Current ecosystem participants

The four companies building the ecosystem's core during the current phase are Helse Midt-Norge IT, Telenor, Microsoft and Infiniwell. This paragraph briefly introduces each of them.

Helse Midt-Norge IT

Helse Midt-Norge IT (Hemit) is the IT department of the regional health authority in central Norway. From January 1st, 2022, it will be established as a separate health enterprise with the goal to strengthen the area of ICT in the trust group. Hemit operates and manages the ICT systems for all hospitals in the health region and contributes to better patient treatment, patient experience and management quality. In addition to ensuring that critical systems are available at all times, Hemit delivers future-oriented technological solutions and services to hospitals. Therefore, they run large regional and national projects. In 2020, Hemit had 367 employees, a turnover of 935 million NOK and a profit of 11.7 million NOK. It is divided into five

departments: basic operation, management, project & digitization, system development, and service operation (Helse Midt-Norge IT, n.d.). In the observed project, Hemit delivers insights into what problems need to be solved, architecture and security, clinical service integration and access control, and supports the project financially (Internal document 3; Haugstad, 2021)

Telenor

Telenor is one of the world's largest mobile telecommunications companies based at Fornebu in Bærum, close to Oslo. The majority-state owned multinational has a leading position in mobile, broadband and TV services in the Nordics. In addition, Telenor has substantial activities in subsidiaries and joint ventures in Asia. In 2020, the company counted 188 million customers and annual sales of around 14 billion US dollars (Telenor Group, n.d.). With a market capitalization of 205 billion NOK in 2020, Telenor is the third largest company on the Oslo Stock Exchange, only surpassed by DNB and Equinor (Euronext, 2021). The company employs around 16,000 people and ranks among top IoT connectivity providers in the world (Telenor connexion, 2021). In the current case, Telenor provides project administration, finances, and facilitates and orchestrates co-creation. In addition, it serves as a communication provider of 5G and edge computing, supplies technical skills and knowhow to create the platform (Platform-as-a-service) and ensures end-to-end security for the transport of data (Internal document 3).

Microsoft Norway

Microsoft Norway is a subsidiary of Microsoft Europe and related to the American Microsoft Corporation. They worked with Hemit on multiple projects and deliver software and consultancy services to Hemit. In the project, Microsoft Norway contributes with its cloud computing service Microsoft Azure. This service aims at building, testing, deploying, and managing applications and services through data centres that are managed by Microsoft. Thereby it provides infrastructure for data storage and software for data processing, which enables developers to create solutions faster as they can use already existing solutions and building blocks (Azure, 2021).

Infiniwell

Infiniwell is a Norwegian start-up which is based in Trondheim. Founded in 2017, it combines secure networking, medical devices, and artificial intelligence to develop applications for patient diagnostics. The applications including remote patient monitoring, are based on

electrocardiogram (ECG)-measurement and enable patients to stay at home while their conditions are continuously monitored (Infiniwell, n.d.). If the system detects that a patient has an arrhythmia or a high fever, a notification is sent to a hospital control centre, which then can decide whether the irregularities require hospitalization and treatment (Haugstad, 2021). Thereby, Infiniwell partners with the Indian medical device company Clarity Medical who provides hardware for collecting and displaying data (Infiniwell, n.d.). While growing continuously, the start-up counts 11 employees as of November 2021. In the current project, Infiniwell's role is related to the use case that was tested during the PoC, remote heart-rate monitoring. Therefore, they supplied medical equipment, AI-based software, and a user interface.

3.4 Timeline of the project

The following paragraph describes the timeline of the project until today and gives a brief outlook on the next phase of the ecosystem. Phases 1 and 2 are internal names of the different project phases. The term "phase 3" was assigned by us in order to maintain uniformity and logic, as the phase has not yet been given any name by the project team. In addition, we have added a theme to give the reader more context.

3.4.1 Phase 1: Initiation

In January 2020, Hemit contacted Telenor and asked for consultation on how new technologies such as 5G and the Internet of Things (IoT) can be used to improve the public health sector. In fall of the same year, Telenor handed over an extensive report that presented the opportunities including potential use cases that aim at improving the efficiency of transportation and hospitalization of patients. Basic requirement for such use cases is Telenor's key capability, secure and reliable connectivity. In addition, the report identified a big hurdle for an efficient implementation of these innovative data-driven solutions. As of today, most medical technical equipment (MTE) suppliers collect, store, and control patient data themselves to use them for product development or to sell them to the health authorities. As a result, protocols are not uniform which complicates the integration from different equipment or software sources and makes efficient and secure processing of data that comes from medical technology providers difficult. To solve this problem, the report recommended developing an

infrastructure of health data that is based on common standards and controlled by Hemit with respect to data security and ownership. This common network of health data could be enabled by 5G because the new generation technology standard for broadband cellular networks allows for network slicing. This technology feature enables the establishment of an isolated logical network for the health trust. Therefore, it gives the opportunity to ensure reliable and secure data transfer of critical tasks. Finally, the report suggested a cooperation between Hemit and Telenor. More specifically, Telenor suggested establishing a team that explores the opportunities of “an ecosystem for operation and management of MTE”. Thereby, the report already considers a platform.

3.4.2 Phase 2: Technical validation

After the report was presented by Telenor, phase 2 was initiated and Hemit stressed to develop a Proof of Concept (PoC). Several objectives were followed in phase 2. First, the PoC should validate the technology and test different hypotheses regarding the Outpatient healthcare platform to convince decision makers within Hemit of the idea. Thereby, end goal of phase 2 was to establish a reliable and secure communication infrastructure for health data. Second, the players aimed at developing a business model for the ecosystem that would ensure value capture for all parties involved.

During this process, Infiniwell and Microsoft were onboarded to the ecosystem at the suggestion of Hemit. Together, the involved companies developed the infrastructure, in which end-to-end secured data streams from the patient through Telenor’s network into Infiniwell’s software which runs in Microsoft Azure. The infrastructure was applied in a pilot referring to the use case “remote heart-rate monitoring” where hardware from the Indian medical technology provider Clarity was used. The pilot was ready in February of 2021 and proved, that secure and fast transfer of medical data was possible with the developed infrastructure. The infrastructure, that grants the Norwegian health authorities’ control and ownership of the data, was named the “Outpatient Healthcare Platform”. After initial scepticism, the successful demonstration of the platform infrastructure convinced the management of Telenor and lead to willingness to invest. In addition to establishing the Proof of Concept, different scenarios for the business model were created. The two scenarios, which will be described in more detail in the findings part, differ mainly in terms of platform ownership and value capture. To date,

no final decision has been made on which scenario to follow. After the Proof of Concept was established, the project applied for funding from the Norwegian Research Council which has started an initiative called “Health Pilot” that gives public sector bodies and private businesses the opportunity to collaborate on innovative projects within the healthcare sector with low financial risk. The Council thereby grants funding of up to 25 million NOK per project (The Research Council of Norway, n.d.). The decision whether the project gets the funding will be made in December. In that case, the project will enter phase 3 in January 2022.

3.4.3 Phase 3: Clinical services

Now that the infrastructure and fundamental technology has been established, applications that run on the platform need to be developed. Therefore, focus of phase three is designing comprehensive clinical services across primary and specialist health services. Thus, the plan is to expand the ecosystem and onboard new players such as service designers, research companies, advisors for data security as well as public institutions. The innovation is not about the platform anymore but about how to utilize this infrastructure with concrete applications. Phase 2 established grounding in the management of the health authority and the management of St. Olavs Hospital, where most applications will be tested initially. Since there are seemingly infinite possibilities for applications, the idea is that clinical staff will help define which use cases are advisable to start with. If the Norwegian Research Council grants the fund, there are already six players in line to join the ecosystem. On the one hand, three R&D suppliers, namely *EGGS Design*, *SINTEF*, and *KPMG* are planned to join the system for service design, research, security, and advisory purposes. And on the other hand, three public actors, being *St. Olavs Hospital*, *Malvik Kommune*, and *Operating Room of the Future* will be included in the project to provide premises for testing, give insights into processes and routines in everyday work in the specialist health service and assist with input for the design of new services. Figure 4 shows the three phases and their most relevant milestones. In addition, it gives an understanding of the current position of the project in its timeline.

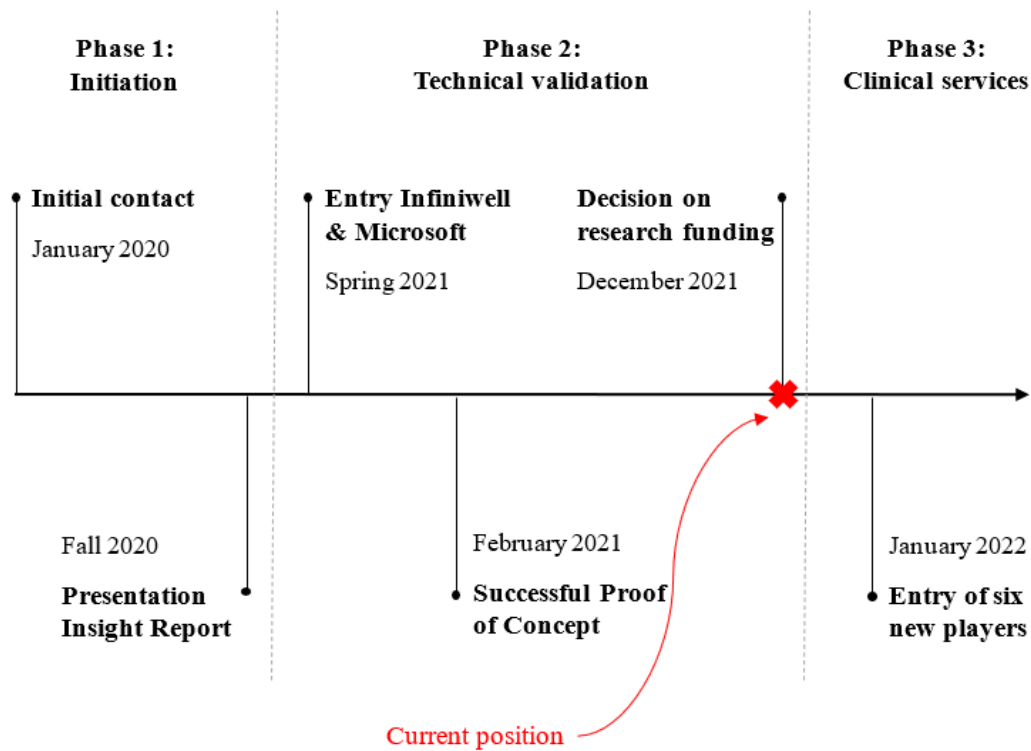
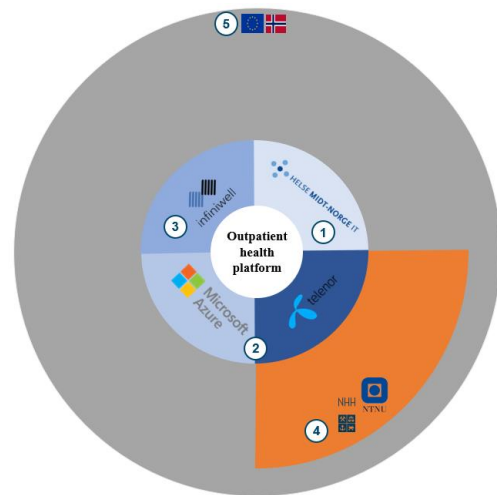


Figure 4: Timeline of the HEMIT project (*Source: own representation*)

In addition, figure 5 visualizes the ecosystem in the currently finishing phase 2. The “customer” Hemit (1), the infrastructure providers Telenor and Microsoft (2), and the application provider Infiniwell (3), who have been introduced previously, build the core of the ecosystem. In addition, Telenor can draw on technical and business knowledge through its research partnerships with NHH and NTNU (4). While these partnerships are explicitly mentioned in Telenor’s representations of the ecosystem, they are less central to the value creation of the ecosystem and therefore visualized further away from the core of the platform. Furthermore, the Norwegian and European government (5) set the boundaries of the ecosystem, especially through legislation on data privacy and security, and by providing financial support through the Norwegian Research Council.

Figure 5: OHP in phase 2



Source: own representation

4. Methodology

In this chapter, the methodology that has been applied to answer the research question will be presented in detail. First, the research design, approach and strategy will be explained, followed by details about the data collection and data analysis process. The final part of this chapter assesses the research quality and considers ethical concerns surrounding the research.

4.1 Research Design

The research design is a systematic plan of how the research question will be answered and has implications for the research process (Krishnaswamy & Satyaprasad, 2010; Saunders, Lewis, & Thornhill, 2019).

Two methodological choices that must be made are whether the used research method is going to be quantitative, qualitative, or mixed and whether the research follows an exploratory, descriptive, explanatory, or evaluative purpose (Saunders et al., 2019).

The aim of our research is to understand why and how roles and structures in an ecosystem change as it matures. Since this research area is still relatively unexplored and further understanding is needed, our research is based on an exploratory design to address this literature- and research gap. The exploratory design is especially useful when the research aims to clarify the understanding of an issue, problem or phenomenon and it provides the necessary flexibility and adaptability to meet the initial uncertainties in this research process (Saunders et al., 2019).

Since the research question is open-ended and complex, it is more appropriate to be researched with non-numerical data compared to numerical data. Therefore, the study will be based on a qualitative research method (Creswell & Creswell, 2018).

Qualitative research methods are unstructured or semi-structured and allow for data to be collected in a non-standardized manner. This increases the flexibility during the data collection process since questions, procedures and the focus may be altered as new insights emerge during the research process (Saunders et al., 2019).

4.1.1 Research Approach

The research in this thesis is built on an abductive approach to theory development. Abduction is a combination of deduction and induction and is seen as going back and forth between data collection and analysis because each informs and advances the other (Charmaz, 2011). A deductive approach involves the development of a theory which is then tested through data collection and analysis, while an inductive approach starts with collecting data from a particular case and then uses the collected data to explore a phenomenon, identify patterns and generate a theory or conceptual framework (Saunders et al., 2019).

On the one hand, the context for our research was decided in a deductive manner since this thesis is written in collaboration with Telenor. Additionally, our working process began with reviewing literature on ecosystems and existing theory has been central in developing the interview guides, which gives part of the research a deductive character (Saunders et al., 2019). On the other hand, the fact that there is a lack of literature and research on our specific research topic and our research question is exploratory in nature calls for an inductive approach to theory development (Eisenhardt & Graebner, 2007).

Given the complex and exploratory nature of our research topic, we consider an abductive approach to theory development to be most suitable for our research.

The high amount of uncertainty involved in this research, calls for an equally high degree of flexibility. An abductive approach provides this flexibility, as it allows us to form new questions when we discover something surprising during inductive data collection and subsequently collect new data about these new aspects (Reichertz, 2007).

4.1.2 Research Objective and Strategy

The research strategy is the plan of how to answer the research question and meet the research objectives in a way that follows the research design. When choosing a research strategy, the present knowledge on the topic, the amount of time available and the access to data sources should be considered (Saunders et al., 2019).

The objective of this research is to contribute to the evolving ecosystem literature by combining existing theory with our collected data and to advance the academic research on ecosystems. We believe that there is a lack of research on why and how the roles and structures in an ecosystem change as it matures, forming a topic we add insights to. Additionally, we

want to contribute to the area with managerial knowledge of what reasons seem to be behind roles transformations and structural reconfigurations during the ecosystem lifecycle.

To answer the research question and reach the research objective, we chose a case study as our research strategy. A case study is a “research method, generally used to investigate a contemporary phenomenon in-depth and in its real-world context” (Yin, 2018, p. 286). The “case” in case study refers to a person, a group, an organization, an event, a change process, or another type of case subject (Saunders et al., 2019). As mentioned in the previous chapter, the case used for this case study is the HEMIT project.

This strategy is a qualitative approach that allows us to gather detailed data and perform an in-depth analysis, which is crucial for answering the exploratory and complex research question (Saunders et al., 2019).

4.2 Data Collection

We collected the primary data ourselves, while the secondary data was provided by our contact person in Telenor and retrieved from the internet. Our contact person in Telenor also assisted us in selecting the other informants from the project and provided us with their contact information so we could arrange the interviews. This support was essential for the data collection process given the limited time available for this research project.

The following chapter will present detailed information on how the primary and secondary data was gathered and handled, a description of our sample and details about the execution of the interviews.

4.2.1 Data Sources

The primary data in this research was collected through seven semi-structured interviews with informants from the current and future participating parties in the HEMIT project.

Even though the interviews were all consistent on the main topics, they were non-standardised. This provided us with the flexibility needed for an exploratory study, as it was possible to alter subtopics to fit the conversation and to add questions depending on the responses given by the informants throughout the interviews (Saunders et al., 2019).

The secondary data consisted of documents provided by the contact person in Telenor and publicly available information such as company websites and media articles.

4.2.2 Sample

For some research projects it is possible to reach census by collecting data from an entire population. In this research project, however, it was not possible to collect data from every member of the case as this research is subject to time constraints. Therefore, the scope of data collection had to be limited through sampling. This allows for time to be saved as organising the data becomes more feasible when fewer cases are involved, and the results will be available quicker as less data has to be prepared for analysis and then analysed (Saunders et al., 2019). Additionally, many researchers argue that using sampling leads to a higher total accuracy than a census (e.g., Barnett, 2002). Collecting data for a few selected cases leaves more time for designing, for example, an interview guide and collecting more detailed information during data collection (Saunders et al., 2019).

Given the exploratory and complex nature of our research question, we considered purposive sampling, and more specifically theoretical sampling, to be the most adequate technique. As a non-random sampling technique, purposive sampling means that the researchers use subjective judgement to select the samples. This technique is particularly useful in case studies when the researchers need to be selective to answer the research question. Consequently, purposive sampling cannot be considered representative of the target population. Theoretical sampling, a special case of purposive sampling, requires an initial idea of where to sample and then continuously chooses more participants to fit the needs of the emerging theory (Saunders et al., 2019). As theoretical sampling is based upon simultaneous data collection and analysis, we consider it to be a good fit for the abductive character of our research.

The process of choosing the sample for this research project began after getting in touch with our contact person in Telenor who helped us choose and get in touch with the participants based on their relevance to the research. At this point it was decided to interview informants from Telenor, Hemit and Infiniwell because they were the most relevant for our research since they are the players that are currently involved in the project. Even though Microsoft is also involved in the project, it was unfortunately impossible for us to interview them, as it was difficult for our contact person in Telenor to find a suitable informant within Microsoft.

We also decided to interview informants from EGGS Design and SINTEF. We considered them to be relevant for our research as they are going to join the HEMIT project in the next phase and their expectations about their involvement, role and value capture in the project will

affect the changes in dynamics that are about to happen as the project enters its next phase.

In line with our theoretical sampling approach, we went back and forth between analysing the data and collecting more data from new informants as our categories and theories emerged. This process became increasingly focused as the data collection and analysis advanced and was continued until we felt like saturation was reached. Data or theoretical saturation is reached when collecting additional data provides little to no new information and categories are well developed (Saunders et al., 2019).

In total, six informants from five companies are represented in this study. This allowed us to explore different perspectives, which was in turn important to answer the research question. By including different views, it was possible to draw conclusions from responses that were repeated by several informants.

Informant Number	Company	Date
Informant 1	Telenor	29.10.2021 & 17.11.2021
Informant 2	Telenor	04.11.2021
Informant 3	Hemit	11.11.2021
Informant 4	Infiniwell	01.11.2021
Informant 5	EGGS Design	16.11.2021
Informant 6	SINTEF	05.11.2021

Table 2: Overview of conducted interviews

4.2.3 Qualitative semi-structured interviews

Given the exploratory nature of our research question and the need for flexibility during the data collection process, we considered qualitative semi-structured interviews to be an adequate choice. The semi-structured interviews were prepared by creating an interview guide with predetermined key questions and themes which gave the interviews a certain degree of structure. Covering the same main themes and questions in all the interviews ensured that we would be able to compare and see patterns in the collected data. However, the interview guide was flexible and adjusted depending on new topics that emerged during the interviews, which were then discussed in greater detail while other topics were omitted (Saunders et al., 2019).

The choice of semi-structured interviews was also motivated by the expectation that our knowledge and understanding would evolve throughout the research process.

4.2.4 Interview process

We started the interview process by developing an interview guide including the themes we wanted to explore based on knowledge from existing literature, secondary data sources and our research question. Initially, we developed one main guide, which was then modified after new insights were gained. The main guide can be found in Appendix B.

As recommended by Ghauri, Grønhaug and Strange (2020), the interview guide was reviewed by our supervisors before the interviews were conducted.

All informants were first contacted by email and asked to suggest a time for the interview to prevent a lack of time or other circumstances to distract them during the interviews. Since, during the research process, we were not in the same city/country as our informants, the interviews were conducted over Teams.

Ahead of each interview we conducted basic research about the company to make the necessary adjustments to the interview guide. We interviewed one informant at a time, and we aimed at a duration of 60-90 minutes for each interview to ensure flexibility regarding follow-up questions. The interviews with the informants from the companies that will join the project in the next phase, lasted around 30 minutes each. In total, we conducted seven interviews. Before starting the interview, the informants were asked to sign a consent form (see Appendix A) that contained information about the data handling process and guaranteed the informants anonymity and the right to withdraw from the research project at any time without providing a reason. We also asked for consent to audio record the interviews.

In the beginning of every interview, a short introduction was given to the informants, including a short description of the research project, our background, and the purpose of the interview. Throughout the interviews the informants were asked open questions to encourage them to share detailed and insightful accounts of their views, ideas, attitudes, and thoughts of the project.

We also instructed the informants to ask for a reformulation if a question was unclear. We asked follow-up questions on answers that we considered relevant to our research. These follow-up questions allowed us to promote further discussion about relevant topics we did not consider in the general interview guide.

The concluding part of the interview process was the transcription of the interview recordings word by word to maintain the original data as much as possible.

4.2.5 Secondary Data

To complement the primary data collected in the interviews, we also examined secondary data which is data that is originally collected for some other purpose (Saunders et al., 2019). Sources of secondary data in this research project included documents provided by our contact person in Telenor, as well as publicly available information about the participating companies and their respective industries. Although the analysis is solely based on the data collected during the interviews with the informants, the secondary data were still crucial in gaining an overview of the context of the project. Table 3 gives an overview of the secondary data that has been utilized. While the report that was written by Telenor for Hemit gave a good overview of the challenges the healthcare sector is facing, how 5G and IoT can help solve them, and what potential use cases are; the presentation slides summarized the activities within the project so far and going forward and gave an overview of the current and future players and their objectives. The secondary data was also helpful during the development of the interview guide.

Internal documents	Description of content
Internal document 1	Report written by Telenor for Hemit about how 5G and IoT can be utilized in the health sector
Internal document 2	Presentation slides with information about the ecosystem, use cases, the PoC, and potential scenarios for functional responsibilities in the future
Internal document 3	Presentation slides with information about the next steps of the project and the consortium of potential actors
Internal document 4	Final presentation for Hemit including a summary of phase 1, the scope and results of phase 2 and the future of the project

Table 3: Overview of secondary data

4.3 Data Analysis

This chapter will present how the data has been prepared, coded, and analysed. The interviews were transcribed, and the applied coding method was Template Analysis.

4.3.1 Data Preparation

To prepare the primary data for analysis, the audio-recordings from the interviews were transcribed. This was a time-consuming process since we did not only write down word-by-word what the informants said, but also how it was said. According to Saunders et al. (2019), it is essential to add contextual information to assure that important occurrences that affect the conduct of the interviews are not missed. For this reason, we added notes for when an informant laughed, used irony, or communicated in any non-verbal way. To capture this contextual information as accurately as possible and to start the initial coding as soon as possible, we conducted the transcriptions right after every interview.

Every transcription was saved as a separate word-file with a name that ensured the informant's anonymity. The interviews were all conducted in English, so no translation was necessary.

4.3.2 Template Analysis

The data was analysed throughout the research process and the coding template was adapted continuously. This was done by applying Template Analysis to analyse the data. In this approach, only a proportion of the data is coded before an initial coding template, which is a hierarchical representation of themes, subthemes, and thematic codes, is developed (Saunders et al., 2019). We based our initial coding template on the first interview that was conducted. We both coded the transcript separately, compared our results and jointly decided on the initial coding template. This early coding was also helpful in adapting the interview guide for further interviews as we identified themes that we wanted to talk about in more detail in later interviews.

Since this research project is of exploratory nature, there has been an iterative process of modifying the research question and adding relevant theory to the literature review whenever new information and themes were discovered during the interviews. As more interviews were conducted, transcribed, and analysed, the coding template was modified several times until a

satisfactory template was reached that represented key themes and relationships in the data (Saunders et al., 2019). Figure 6 provides an example of how the fifth, sixth and seventh higher order theme in the coding template changed over time. These themes were first called “roles”, “structures” and “competition and cooperation” before they were split up and included under the new names of the fifth and sixth higher order themes “sources of change” and “objects of change”. This change was done when it became evident, that the findings should be divided into sources and objects of change in order to answer the research question of *why* and *how* roles and structures change in an ecosystem.

- | | |
|--|---|
| <ul style="list-style-type: none"> 5. Roles <ul style="list-style-type: none"> 5.1. In the project 5.2. In the final ecosystem 5.3. Relationship between the players 5.4. Decision-making 5.5. Membership openness 6. Structures <ul style="list-style-type: none"> 6.1. Power and influence <ul style="list-style-type: none"> 6.1.1. Substitutability 6.1.2. Interdependency 6.1.3. Centrality 6.1.4. Status & Size 7. Competition and Cooperation <ul style="list-style-type: none"> 7.1. In the ecosystem 7.2. From outside the ecosystem | <ul style="list-style-type: none"> 5. Sources of change <ul style="list-style-type: none"> 5.1. Internal <ul style="list-style-type: none"> 5.1.1. Competition 5.1.2. Required competences 5.2. External <ul style="list-style-type: none"> 5.2.1. Competition 5.2.2. Public regulations 6. Objects of change <ul style="list-style-type: none"> 6.1. Roles <ul style="list-style-type: none"> 6.1.1. Roles 6.1.2. Relationships 6.2. Structures <ul style="list-style-type: none"> 6.2.1. Substitutability and interdependency 6.2.2. Centrality 6.2.3. Decision-making |
|--|---|

Figure 6: Development of the coding template

Since many themes in this research project are interrelated, it was sometimes difficult to decide which theme to assign a unit of data to. In such cases, we tried to evaluate which theme the data unit relates strongest to in regards of the relevant theory and the overall findings. In some cases, however, the data unit strongly related to two themes and was therefore included under both.

Finally, the coded units of data were organized into an Excel spreadsheet, where they were categorized into their respective themes and subthemes. Furthermore, comments about which informant the quote is from and in what context it has been said were added. This enabled us to draw out data units from the different themes for analysis without losing context. Excel also provided us with the flexibility needed to change themes and subthemes and getting a good overview of the findings.

4.3.3 Citations

To present some of the statements made by the informants, the citations had to be customized. The “[...]” in the middle of quotes indicates that parts of the original quote have been removed. Written words in parentheses mean that we have either decided to use a different word than the informant, without changing the meaning, that we have replaced a word to explain the context more properly, or that we have replaced names to assure the informants’ anonymity.

4.4 Research Quality

This chapter will assess the quality of the methodological design and the findings. Commonly, the quality of quantitative research is determined based upon the four criteria reliability, validity, generalizability, and objectivity (Sinkovics, Penz, & Ghauri, 2008). However, these criteria are often considered inappropriate for assessing the quality of qualitative research as it differs in nature and design from quantitative research (Saunders et al., 2019; Sinkovics et al., 2008).

Therefore, we follow the evaluation system for qualitative research developed by Lincoln and Guba (1985), which is directed towards trustworthiness and includes the four criteria credibility, dependability, transferability, and confirmability (Lincoln & Guba, 1985). Credibility is used as the parallel criterion to internal validity and is concerned with ensuring that representation of participants’ socially constructed reality corresponds with what the participant meant. Transferability is the parallel criterion to external validity or generalizability and is concerned with the degree to which the findings are applicable in another context. Dependability is the parallel criterion to reliability and involves showing that the findings are consistent and can be replicated. Especially in the context of an exploratory case study, it is important to record all changes in research focus so the emerging research focus can be understood and evaluated by others (Saunders et al., 2019). Lastly, confirmability can be understood as the parallel criterion to objectivity and considers whether research results have been influenced by the researchers (Lincoln & Guba, 1985).

4.4.1 Credibility

Several precautions, including participant validation, triangulation and peer debriefing have been taken, that contribute to higher credibility and ensure that the findings are plausible. To avoid any possible misunderstandings, we encouraged the informants in the beginning of each interview to ask for a re-phrasing of a question if it appeared unclear (Lincoln and Guba, 1985). To ensure that we understood the informants' intentions correctly, we asked follow-up questions and asked the informants to further explain what they meant if their answers seemed unclear.

Another technique that has been applied to ensure credibility, is the use of triangulation, which is the use of multiple data collection methods, data sources, analysts, or theories to achieve a more complete understanding of the studied phenomenon and context. Among the different existing kinds of triangulation, we have chosen the triangulation of sources, which involves using different data sources within the same data collection method (Patton, 1999).

In our case, the informants represented a variety of organizations and positions, and all had unique experiences within the HEMIT project, which allowed us to investigate the case from a broader perspective and to hear different perspectives from the different informants. To ensure that conclusions were not drawn from one experience or position, but from multiple sources of information, we only included themes and categories in the findings which were verified by at least two informants. In addition, the findings from the different interviews were compared against each other to establish whether there were any internal conflicts between the drawn conclusions.

Furthermore, by combining the primary data from the interviews with secondary data, we were able to cross-check the collected information.

The final technique to strengthen credibility has been peer debriefing our findings with our supervisors throughout the research process. Peer debriefing is the process of other educated peers to present an outside perspective of the findings (Guba, 1981). These discussions were a valuable source of feedback. Besides, we took advantage of being two researchers working on this study by reviewing each other's work. After the interviews we each reviewed the collected data separately, before discussing the findings and interpretations together. One aspect that might impair the credibility of this study, is the limited amount of time we were able to spend to understand the context of the HEMIT case. However, since the HEMIT case is complex and involves many different actors, it was important to invest time in understanding

the context. Before starting the interview process, we investigated secondary data (internal documents) that was provided by Telenor to gain a good overview of the ecosystem. The process of obtaining a better understanding of the healthcare sector in Norway and the HEMIT case continued throughout the research process.

Another weakness of this study is that informants might provide incomplete information as the complexity and size of the ecosystem might make it difficult for the informants to be fully informed at any given time.

4.4.2 Transferability

As this study was explorative, abductive, and qualitative in nature, the intent is not to be completely representative, but rather to “maximize the range of information uncovered.” (Guba, 1981, p.81). Besides, the aim of theoretical sampling, as it was used in this study, is not to be fully representative, but to uncover the information that is relevant and important to our specific research project. More specifically, our objective has been to obtain in-depth knowledge on why and how the roles and structures in an ecosystem change as it matures, rather than converting the findings into general rules.

Lincoln and Guba (1985) emphasize the importance of providing a detailed description of the research, so other researchers can more easily evaluate whether our findings can be transferred into other contexts. We make this possible by offering a detailed description of the research setting, as well as the methodology. Additionally, the main results of our study have been visualized in a model, which will be, together with a more detailed discussion on the transferability of our findings, presented in chapter six.

4.4.3 Dependability

To guarantee dependability each research phase has been documented. The process of collecting and analysing data is detailed in this methodology chapter, and the interviews have been recorded and transcribed, which allows the readers to examine the process themselves. By documenting all changes that occurred during the research process, dependability is further increased (Lincoln & Guba, 1985). The methodology chapter includes how the research topics and interview guide have evolved, and how the conceptual framework has been gradually developed as data was collected and analysed.

Additionally, in accordance with Guba's (1981) dependability audit, parts of this study have been reviewed and evaluated by our supervisors.

4.4.4 Confirmability

In this research project, we, as researchers, have been the main data interpreters. To decrease any subconscious bias that may exist and to ensure confirmability, we let our supervisors assess the literature review, the interview guide, the findings, and the discussion throughout the research process (Lincoln & Guba, 1985). Besides, confirmability has been increased by putting aside personal opinions and values, so they won't affect the research outcome, and by being alert to any background assumptions that may exist throughout the research process (Charmaz, 2014). Additionally, to increase trust between us as researchers and the informants, we let them sign a consent form which assured them of their privacy and anonymity. We believe that this acted as a motivation for the informants to openly share their thoughts and experiences and to not hold back information. Lastly, by ensuring credibility, transferability, and dependability, the confirmability of the study is also increased (Guba & Lincoln, 1989).

4.5 Ethical Considerations

Due to their potentially significant impact on research quality, research ethics need to be considered throughout the research process (Saunders et al., 2019). Ethics in a research context refer to "the standards of behaviour that guide your conduct in relation to the rights of those who become the subject of your work or are affected by it" (Saunders et al., 2019, p.252-253). The main subject of this research project were the informants who participated in the interviews and therefore the main ethical issues to consider were confidentiality of data and maintenance of anonymity.

To guarantee the anonymity of the informants, information such as names, job titles or other information that could be used to identify an informant directly or indirectly, has been either removed entirely or replaced by a pseudonym when transcribing the audio-recordings. The explanations of the used pseudonyms were kept in a separate document.

While focusing on making the informants anonymous, we could not do the same with the organizational names as they were crucial in understanding the context and thus had to be included. However, this thesis is written as a collaboration between NHH, and Telenor and all

participating parties are organizations, whose information, except from the information collected in the interviews, is publicly available.

Furthermore, it was important to secure safe storage and handling of the collected data. Besides using pseudonyms for informants' names and titles and storing the explanation of the pseudonyms in a separate document, all audio-recordings were deleted once the transcription process was completed. All data was stored and encrypted in the cloud which is secured by a password. After the completion of this research project, all confidential information and transcribed material has been deleted.

Furthermore, the research project was reported to The Norwegian Centre for Research Data (NSD) to ensure that our data processing process is in accordance with data protection legislation. We also ensured that personal data was handled in accordance with the General Data Protection Regulations (GDPR). Before starting the interviews, we have obtained permission from every single informant to use their personal data through a consent form. This consent form also informed the respondents of the confidentiality of the collected data, guaranteed them of their anonymity, and gave them the right to withdraw consent at any point of the research process without having to provide an explanation. When creating the consent form, we used a template from the NSD to assure that all guidelines are considered.

5. Empirical findings

This chapter presents the empirical findings from the interviews and provides the basis for the discussion in chapter 6. The empirical findings consist of selected quotes from the interviews which are presented together with our interpretations.

First, we present our findings about the *objectives* of different players in this ecosystem, the high degree of *uncertainty* involved, and the role *trust* plays in the cooperation.

Afterwards, we focus on *why* the roles and structures within the ecosystem might change over time. We found that there are *external and internal* sources of change. While *competition* can be both, external and internal, *public regulations* are an external and *required competences* an internal source of change.

After looking into the sources of change, we focused on *how* the roles and structures within an ecosystem might change over time as a consequence of the sources of change. We found that roles can *change, become redundant*, or entirely new roles can *emerge*.

Finally, when it comes to power and influence, we found *substitutability, centrality*, and *decision-making* to be especially relevant.

5.1 Many individual objectives – one shared vision

Since Telenor, Infiniwell and Microsoft are commercial actors, one of their long-term objectives is clearly to earn profits. However, this is not their sole objective, and the participating actors in this project seem to have several short- and long-term objectives, and most importantly, a shared long-term vision.

5.1.1 Learning

Learning has been an objective for Hemit and the reason for the project initiation. They wanted to understand how IoT and 5G can be utilized to tackle the capacity problems that the health sector will increasingly face as a consequence of demographic change and to increase the overall quality of healthcare.

“[...] we wanted to understand more of the technology related to 5G, and what kind of opportunities that would give us.” (R3)

Besides capturing value and meeting the customers' needs, learning is also a crucial objective for Telenor.

"[...] and we [Telenor] also have something to learn from this. How can we go to the health sector and what kind of problems are they dealing with regarding technology? And at [the] same time: How can we learn? We have to understand their problem [that needs] to be solved in order to find out how we can orchestrate technology so it can fit into their purpose and the problems they have." (R1)

Even though Telenor is not capturing monetary value from this project in the current or next phase, their short-term objective of learning makes the participation in the project attractive in the long-term.

5.1.2 Expansion

By learning about the characteristics and needs of the healthcare sector today, Telenor can capture value in the future by using the gained in-depth knowledge in new business areas and by moving from being a connectivity provider to being a technology advisor and developer.

"Maybe Norway can be a frontrunner in this, and we [Telenor] can be the leader in this technology for sectors like health, industry, transport, and fish farming." (R2)

"I think that this is what the customer wants from Telenor, to be a part of their future decisions and we need to be a technology advisor and developer." (R2)

"[...]it will be a new business area for Telenor, and a new business model beyond the connectivity, which is our strategy." (R1)

Expansion also seems to be a long-term objective for Infiniwell. When asked if they intend to use their technology and insights from this project as a blueprint in other health regions, the respondent answered:

"That's exactly what we're hoping to do. And just like we were able to very quickly get the current phase up and running within weeks because our system was built for that, we want to extend our system to be able to quickly go into other healthcare systems both nationally and internationally." (R4)

According to the respondent from Hemit, the national government wishes to set up more national services in healthcare and that the expansion of the Outpatient healthcare platform might be an option.

“We are open to run the discussion and see what others [health regions and national authorities] are thinking and if they believe that we have chosen a path that they trust and that they think is valuable. Then we can discuss with them how we can make this happen as a national service”. (P3)

5.1.3 Changing minds

The short-term objectives of Infiniwell in this project were to showcase their abilities and to cooperate with big and respected partners such as Telenor and Microsoft. By showcasing their abilities, they hope to, in the long-term, change peoples' mind about AI in healthcare.

“[...] to be able to say that we have this project going with respected partners like Telenor and Microsoft, that actually made a big difference for us [...].” (R4)

“[...] we have to change peoples' minds. [...] when you talk to people and you say: yes, we're able to monitor patients and analyse their vital signs using AI [...], people are still thinking, maybe it's five or ten years in the future, but when you show them something working today, then their minds start changing [...]. So being able to show something outside of our own lab but running on Telenor systems is hugely important to change peoples' minds because when you introduce new technologies, the hard part is not the technology, the hard part is the people and the processes and everything that's in place today that's formed around a certain way of doing things physically. Now you want to propose something that's very different and very scary, you have to start changing peoples' minds.” (R4)

For Telenor, besides potential new business areas, the short-term objective of learning also relates to how the process of co-creation might change the way of thinking and working within Telenor in the long-term.

“It is important to not just look into what impact and effect each project and ecosystem initiative is going to have, but actually that we are working in another way. The mindset that

we have partners, not only vendors; we have customers, but they are also partners. I think this is a mind shift as well and especially in the communication and cooperation.” (R2)

The respondents from Telenor argue that a change in the way of thinking and working within Telenor is necessary in order to enable the shift from being a connectivity provider to being a technology advisor and developer, which was addressed in the previous subchapter.

“I think it's a factor for us to actually change the mindset. For Telenor [this is a] new way of thinking. We will bring in something new. If you don't take that position, I think that we will continue to just give connectivity. So, I think it's a high risk for us not to do it and I think that's a mind shift.” (R2)

This necessary shift in mindset also relates to the management. Since Telenor is listed on the stock market, today's focus is mainly on the short-term KPIs. The respondents argue that this focus has to, at least partly shift to long-term innovations, and uncertainties and risks have to be accepted in order to grow.

“They [Telenor] are not used to running this kind of business with a lot of uncertainties. So, this is about changing your mindset and accepting the risk, and not having the correct answer before we start. This is the agile way of working.” (R1)

“They [the management] are in change mode, but it will take time. [We are telling them] in order to grow, you need [...] to invest in long-term projects. The money will not come this year, it will not come next year, maybe in two or three or four years ahead. This is something new for them. They are very focused on the short term KPIs because the stock exchange market is expecting this.” (R1)

“[There are] many barriers and risks, but we need to make sure that we try to make it happen because I think this is the way forward. Do ecosystems and have an [active] part in that. This is quite different from what we are running today in the core business.” (R2)

It becomes clear from the quotes above that uncertainty plays a crucial role in this change in mindset that Telenor is currently experiencing. Due to the high degree of uncertainty in the studied project, uncertainty will be presented as a separate finding in the next subchapter.

5.1.4 A shared vision

While all actors have some individual objectives that make the project interesting to them, the analysis of the collected data suggests that intrinsic motivation to contributing to solve a problem for society is something that all actors have in common and that is regarded as crucial for the projects long-term success.

“Our ambition is to deliver good quality patient care and efficient hospitals. So that is the goal and that is what we need to deliver upon.” (R3)

“[A] ‘we’re solving this together’ type of approach, which I believe, if we are going to be able to actually make change, is the way it has to be. So, I think it’s really important to bring that attitude into the bigger ecosystem.” (R5)

“[...] everyone’s been aligned on the same goal, so that helps.” (R4)

“We have a clear statement of what we want to achieve for the society. [...] We have to build a sustainable healthcare and one of the biggest issues in sustainable healthcare is that we have to move the services out of the physical building of the hospital and that’s what we’re aiming for.” (R1)

5.2 Uncertainty

As mentioned in the previous subchapter, the high degree of uncertainty in this project is another finding. Interestingly, while all involved and future actors see some degree of uncertainty and risk in this project, it seems to be the highest for Telenor. This might be due to the fact, that for Telenor, the involvement in this ecosystem is the furthest away from their core business compared to Hemit, Infiniwell, Microsoft and the service providers joining the project in the next phase.

“Co-creations are identified with a lot of risks and uncertainty, and we have to share it. One part in any ecosystem cannot bear all the risk on their own shoulders, so we have to share the risk and uncertainty of [...]: We don’t know what the service will be, and when it will play out.” (R1)

As of today the uncertainty involved in this project is mainly related to what the final business model is going to look like and who is going to own the final Outpatient healthcare platform. The issue of platform ownership will be presented in greater detail later in this chapter.

The respondent from Telenor expects the uncertainty in some areas to decrease, as the project moves forward and decisions are being made, but to increase in other areas as these areas become more relevant or as new challenges, that cannot be foreseen today, may arise. Areas of risk and uncertainty that might become more relevant as the project moves into the next phase are public regulations and uncertainties about what the competitive landscape within and around the ecosystem will look like.

“We have a clear statement of what we want to achieve, but we don't have the right answer today [regarding] how this is going to be, how we can solve this, but [...] as long as we go, some risk elements will decrease, and we will face new challenges that we don't foresee today.” (R1)

“But maybe there will be some requirements and conditions changing, or someone buys up [a company that is part of the ecosystem], and so the competitive landscape is changing during the project. This project will be two to three years, a lot of things can happen during this time.” (R1)

Another factor of uncertainty that is closely related to competition, is the fact that there will be a public procurement process in the future, in which Hemit will make an official commercial request and several competing companies, including Telenor, can hand in their offers. When Telenor was asked about this future public procurement process, the respondent answered that this was another uncertainty that will become relevant in the future and will change the competitive landscape.

This public procurement process and its impact on the dynamics in the project and how it affects the actors' actions and behaviours today will be presented in more detail later in this chapter.

5.3 The role of trust

Another key topic that has been identified is the importance of trust in several contexts: in the relationship between the players, as a base of power or competitive advantage, and regarding the process of the project.

5.3.1 Trust in the relationship between the players

Since the relationships in ecosystems are not regulated by formal contracts and control mechanisms, mutual trust seems to be highly important, and was, without exception, mentioned by every informant. Trust, transparency, openness, and honesty seem to be particularly important in order to create a cooperative environment to meet the high degree of uncertainty that is involved in this project.

“[The cooperation] is identified by transparency. We are very open to each other. We are honest and are playing with open cards. We have a true feeling that we want everyone to succeed in this [...] and I think that's the reason why there's a lot of harmony and good dialogues in this ecosystem.” (R1)

“Trust is essential in every part of the process, [...] whether that is from our perspective, the customer or the partners. [...] I think that's the fundament of an ecosystem and cooperation.” (R2)

5.3.2 Trust as a base of power

Trust also seems to function as a base of power. Telenor has been mentioned to be highly trusted in the Norwegian market based on their strong brand, their size, their financial resources, and the experience other actors have made through earlier partnerships.

“They [Telenor] are a trusted partner, they are a known partner, they are [a] big company. So, in healthcare that's the kind of partner you want. You don't really want the kind of partner like we [Infiniwell] are. We are a new actor and don't have a lot of track record. So, for a health care provider to base their future on a small company, that would be very difficult, but a small company in conjunction with a big, proven provider like Telenor, that's a different story. So, Telenor being the big carrier of this project, I think is the only way it could have

been done. They are a big commercial actor that's stable, that has a proven track record, and that's what you need in the healthcare business.” (R4)

The findings suggest that this trust gives Telenor a competitive advantage over hyperscalers or system integrators which they consider to be their biggest competitors.

“We [Telenor] are Norwegian, we are trusted, we have a position. Hemit went to us first. They think: ‘Telenor is [a company] that we have trust in.’ [...] I think the hyperscalers have some issues with trust globally. So, we have some major advantage [because we are trusted] in Norway.” (R1)

This competitive advantage based on trust is also interrelated with substitutability since a lack of trust in the Norwegian market can make it harder for other companies to try and replace Telenor.

“I don't think that Telenor is going to be replaced [because of] trust. It's more like the standing in the Norwegian market and the trust that we have across different sectors. Microsoft, for example, doesn't have that.” (R2)

Trust in the company that handles the data is especially important in the context of the HEMIT case since there are strict regulations regarding data protection in the healthcare sector and the handled data is highly sensitive.

“The Norwegian society is very keen on keeping the health data locally in Norway. Telenor [in contrast to hyperscalers] can guarantee this [data] sovereignty.” (R1)

5.3.3 Trust in the process

Lastly, it has been mentioned by several informants that it is important to trust the process of the project, and to trust that each player can contribute with a valuable product or service.

“The trust in that we can achieve something greater together than we can do by ourselves [is essential].” (R2)

“When you're running such an open innovation co-creation, I think trust is a very important aspect and when you invite someone, it is based upon a belief that they can deliver something that is valuable in the big chain.” (R3)

“You need to have confidence in that you have the right product or service that is needed [...] for the final services. [You have to] believe that the investments will pay off.” (R1)

“We really need to trust the process, because this [project is] really complex and we cannot jump too fast, we need to do it in the right way, and we need to trust that the process brings us through all the steps that we need.” (R5)

5.4 Sources of change

When looking into *why* the roles and structures within an ecosystem change over time, it becomes evident that the findings can be divided into external and internal sources of change.

5.4.1 External

Competition and Coopetition

When asked about competition in the past, present, and future of the project, one of the informants from Telenor replied that they did not experience any competition in the project so far, but they expect this to change in the future.

“We don't have any competition, [...] but it will be more when we come down the street.” (R1)

As the project is moving closer to value capture, it is expected that it becomes more attractive to actors from outside the ecosystem. Telenor sees their biggest competitors in the future to be hyperscalers and integrators.

“I do believe that integrators are going to play a big role. And consultancies, it could be Sopra Steria, Capgemini, PwC, those companies are building up integrator competence.” (R1)

“I think that hyperscalers and integrators are also interested in [providing] the platform for one or different sectors.” (R2)

When the informants from Telenor were asked if they perceive their direct competitors, Telia and Ice, as competitors in this ecosystem, we found that the informants rather think that there will be some kind of cooperation, especially related to the potential expansion of an Outpatient healthcare platform to other health regions.

“I think we will cooperate with other competitors because we have to do this together. We can't have competition for competition's sake. We also need to create value. So, I do believe that we have to cooperate somehow. [...] I do believe that Norway is not big enough to have competition in everything.” (R1)

“There are only three big providers in Norway. The biggest one is Telenor and then we have Telia and Ice. I don't think that we can take all health regions alone. Then we will be too big. That's why I do believe that even though Telia [and Ice] is our competitor today, that they are our cooperative partner in the future as well.” (R1)

“I don't think that Telia is going to be the biggest competitor, but they are going to be a part of it, maybe in some other ecosystems and partnerships.” (R2)

When the informant from Infiniwell was asked about his expectations of competition in the future, he said that new players will have to be onboarded even if the new onboardings are direct or indirect competitors of Infiniwell. He believes that in order to increase the value the ecosystem can create and to move towards the goal of digitalizing healthcare and bringing it to the patients' home, more suppliers of medical technical equipment have to join the project.

“We provide one type of service, one type of data, one type of equipment, but there are other companies out there that provide similar but different [products and services]. There will be some equipment that needs to be connected into this ecosystem. We don't want to be the only provider of that. We want to be providing what we can do best.” (R4)

“If [no other MTE providers are onboarded] then that's kind of a failure of the project because [...] our mission is to digitize and bring health care home and so having one company be the bottleneck there, I don't think that's a good idea.” (R4)

The informant also expects the project to become more attractive to big medical technical equipment providers when it moves closer to value capture, and the end customer, the hospitals

in the central Norway health region, begin to purchase the solutions. Thus, competition is expected to increase in the future of the project.

“I think the smaller companies will be easy to convince. The big ones like Philips, GE and Medtronic will be much more difficult to convince. But, once St. Olavs purchases the solution, then I think you will see a change in attitude there as well. But right now, there's no incentive for a big supplier to join an open consortium.” (R4)

Hemit also expects the competition to increase for suppliers of medical technical equipment and AI as the ecosystem starts operating. The informant argues that at this point the clinicians will be the ones who choose which systems are most suitable for their day-to-day operations. This also represents a significant shift in power and will be discussed later in this chapter. The informant further argues that the competition between the suppliers will likely be based on trust and cost-efficiency.

“When you look at this [platform] being in operation, then it's a lot of suppliers of artificial intelligence, and they need to prove that they are better than others. [...] At that point it is the hospitals that will order from Hemit [...] and then it is the doctors that decide which systems they trust. If they trust one system, it's good for the supplier of that system. If they trust several systems, then it's probably a question of cost efficiency.” (R3)

The situation regarding competition could also significantly change for Telenor in the future based on the uncertainty surrounding the public procurement process and the platform ownership, which will be discussed hereafter.

“Later, the situation may be very different for Telenor. [...] Telenor doesn't know how much Hemit will run and if Hemit decides not to run all of it, then it will still be a competition between many parties.” (R3)

Platform ownership

One of the key findings in this study, that is also related to competition and one major source of the uncertainty that has been presented earlier, is the fact that the role of the platform owner in the HEMIT ecosystem has not yet been assigned or assumed.

“We have not decided yet, [...] and maybe it will take years before [we do].” (R1)

“We don't know yet, and that's one of the questions we have to answer in this project.” (R4)

This fact is quite unusual compared to other cases in which platform ownerships naturally falls to the platform entrepreneur who started building the platform and an ecosystem emerged after other players joined. In the HEMIT case there doesn't seem to be one player that, because of its competencies or the particular project setting, clearly is the natural candidate for the role of the platform owner. As of today, there are two scenarios: one in which Telenor is the platform provider and service enabler, and one in which Hemit is the platform owner and service provider.

When talking about this with the informants, there seem to be different preferences and considerations for each player involved.

Telenor's preferred scenario is the one in which they own the platform, and they also expressed that they believe that is what the customer wants, and that Hemit does not want to run the platform all by themselves.

“If I'm looking from the outside and in and look into the strategy of Telenor, they're saying that we're going to do the platform way, [...] and I am 100% sure that the customer wants Telenor to be the platform owner.” (R2)

“Telenor. You have asked me on my personal opinion. I'm quite clear on that one, and that's related to security, end-to-end security.” (R1)

“They [Hemit] do not want to be a big IT department, which will be the consequence if they have to orchestrate this by themselves.” (R1)

The informant from Hemit was clear on that they do not want to run the platform all by themselves, but that it is not clear today what parts they are going to run themselves and which parts they are going to buy. He expressed their openness to discuss these topics in order to find the solution that creates the most value for the healthcare sector. He also voiced how important this decision is for the ecosystem and that it has strong implications, especially for Telenor.

“It's not our ambition to own and run most of it ourselves. [...] Our mindset is not to build our own position but to create value and by creating value we will serve the position that is needed.” (R3)

“It's a critical question, because if we decide to do a lot of this ourselves and buying just the ‘transport of data’ from Telenor, that will change their business model. But then you need to be open and address that this is a critical point that will not be decided yet and that will happen later on.” (R3)

The informant from Infiniwell does not seem to have a preferred scenario, as it doesn't affect them a lot, but he believes that Telenor has a clear preference, while Hemit doesn't.

“I don't actually [have a preferred scenario].” (R4)

“I'm sure Telenor would like to have the opportunity to operate the data centre, they are also a business, so of course they want that. For Hemit, I'm not sure that they have a preference. I think they seem to be very open to both models because they're also in the learning mode. [...] So, I think they would be fine either way. [...] I think they're equally interested in learning how this would work in a public cloud and using Telenor may be a good way to learn that.” (R4)

The considerations for Telenor in choosing a preferred scenario are mostly related to expansion, substitutability, and centrality. If Telenor is the platform owner, they could more easily expand the platform to other health regions in Norway or perhaps even internationally. In contrast, if Hemit is the platform owner, Telenor would simply be a connectivity provider and could be substituted more easily. These points are both interrelated with centrality, which will be discussed in more detail later in this chapter when we discuss how the roles and structures within an ecosystem change as a consequence of the sources of change.

For Hemit the considerations regarding platform ownership relate mainly to technologies, competences, capacity, and costs.

“There is a lot of issues that come into play: What do we have of relevant technologies and investments we have done earlier? What is our competence to run things that we don't have? But [another] crucial thing is also costs. Our customer, the hospitals, will not buy this directly from Telenor. They will buy it from Hemit and Hemit, as a total provider will deliver the service and then it's just a question of how much will be in-house and how much will we buy. And if, let's say, [buying] a certain kind of total service [from Telenor], is double the cost

from just buying the transportation of data and fix the other parts ourselves, then we need to have a very good argument [for the hospitals] why we should double the costs.” (R3)

Questions about how the players think the decision about platform ownership will be made, also yielded different answers. While Infiniwell believes that the customer will decide, Hemit says it will eventually be their decision, in dialogue with the customer. Meanwhile, Telenor hopes it will be a joint decision but is aware that regulations in the public sector and politics will also come into play.

“That decision will be made by the customer. So, in this case St. Olavs, what they're comfortable with. [...] I mean, we have to adapt to what the customer wants, [...] so their wishes and their motivations will weigh as much, if not heavier than ours. The customer will have the final say on those kinds of questions.” (R4)

“Hemit decides. As I said earlier, we buy from suppliers. In some services we buy the whole lot, and in other services we just buy parts of it, and we set it up in-house. It's a question about costs, strategic purposes, competence, capacity. [...] So, the decision is made by Hemit, but always in a dialogue with the customer.” (R3)

“If we isolate our ecosystem, we definitely will have a joint decision. But there [will] probably [be] regulations and public enquiries, [...] that's one of the uncertainties. From my point of view, it will be a joint decision and based on common sense. But there is one uncertainty, and this is the regulations and the politicians.” (R1)

This uncertainty of public regulations is another key finding and source of change and will be presented in greater detail in the next subchapter.

Finally, since Telenor seems to be the only player with a clear preferred scenario on platform ownership, we asked the informant what Telenor is doing today in order to reach the preferred scenario in the future.

“There are still two different options and that's the reason I cannot conclude even if I have a clear opinion on what I prefer and what I will recommend. I have to let the ecosystem conclude [by] itself. The only thing I am concerned [with] now is to give enough information so that all

parties have enough and the same information to make the decision. [...] I will not take too much place in this [decision], but I will answer everyone who is asking.” (R1)

The question of who will own the platform is a significant source of change since the decision will have substantial consequences on the roles and structures in the ecosystem. This will be discussed separately later in this chapter.

Public regulations

As mentioned in the previous chapter, another potential source of change are public regulations.

“We can meet problems [...] such as public regulations and inquiries, and the way the primary and secondary [health] sectors are working together.” (R1)

Besides public regulations that might come into play later, that cannot be foreseen today, the fact that there will be a public procurement process is a major source of uncertainty. It is also closely related to competition, because Hemit will make an official commercial request in the future, for which many companies, including the consortium that Telenor is a part of, can hand in offers.

“We are fully aware of that there will be a public inquiry down the road. There will be inquiries and competition.” (R1)

It became evident during the interviews, that it is very important for Hemit to strictly separate the co-creation phase from the tendering phase. This will change the dynamics and relationships between Hemit and the other players and will also impact the role that Hemit will have to assume. This will be discussed in greater detail in the chapter.

“[One problem is] the fear among many actors in the public sector. They are afraid of dealing with private companies. Their fear is [that] at the point [of] making commercial requests, they will be attacked for having chosen their partners before and not running a clean and safe commercial process. For us it's very important to split very much between this open innovation co-creation phase [and the] later commercial requests. I've also been targeting national government to make sure that our understanding and our way of doing this is correct and safe. And I used [the key message of] these national players within our own organization, to build

safety that it is okay for us to work with commercial companies, we just need to have a huge split between working together now and the future commercial processes.” (R3)

To increase their chances of winning the tender, Telenor is gaining knowledge and experience from the current co-creation, as well as getting insights on what the requirements might be and making sure they can meet these requirements.

“We have to have confidence in that we are doing the right things and we will get inside information. We are building competence and experience that leads us to have an advantage in this competition [...] and at the same time Hemit will get insights [into] what they are going to ask for. What are their requirements going to be? And we will try to influence those requirements during this project. [...] and there are not so many other parts in the Norwegian market which are able to compete with us.” (R1)

Hemit is hoping for other major actors to enter the public procurement process to forge cooperation for the future, but they also consider it fair that Telenor uses their insights, that they gain during the current co-creation phase, in the later commercial phase.

“In the future, for a commercial process, we could hope that Telia and others are also thinking in the same way, working in the same way and then we will have more major players to work with in the future. But [since] Telenor is investing time and costs to build insights as part of this co-creation process, it's very fair that they can use this knowledge for the commercial stages later on [...] but it will be our own process and own decision.” (R3)

5.4.2 Internal

When looking into *why* the roles and structures within an ecosystem change over time, it becomes evident that, besides the external sources of change that have already been discussed, there are also several internal sources of change.

Competition

While competition has been presented as an external source of change in the previous sub-chapter, competition can also come from within the ecosystem and can potentially change the dynamics in the ecosystem.

The first source of internal competition is related to platform ownership. While only two scenarios, Telenor or Hemit as platform owner, have been discussed above, Telenor's informants also mentioned that Microsoft, who is currently a part of the ecosystem, might also have an interest in being the platform owner.

"I do believe [that Microsoft have an interest in being platform owner]. They are for sure a platform owner today, they are hyperscalers. And I do believe that the [telecommunications companies] under the hyperscalers is a perfect match." (R1)

"I think, in the end it is going to be a battle between Microsoft and Telenor, who [will be] in charge and will have this service 'as-a-service' for the health sector in Norway." (R2)

However, Telenor also believes that they have a competitive advantage over Microsoft that is related to trust.

"The customer doesn't care, but if they can choose, they will choose Telenor and not Microsoft. So, then I think that Microsoft will understand that [they] don't have the possibility that Telenor would have because [we] have trust that [they] don't have." (R2)

Another situation of potential internal competition occurred during the research period when one of the new players for the next phase, EGGS Design, was bought by the consulting, digital services, and software development company Sopra Steria.

Within Telenor, this raised concerns regarding value capture intentions. While EGGS Design will be part of the ecosystem from the next phase on, they will not be part of the final platform solution, so their value capture will be solely during the project. Telenor was concerned that Sopra Steria could be a competitor when it comes to value capture in the final solution and how this could affect the dynamics between Telenor and Sopra Steria in other projects where they cooperate, but also the dynamics between Telenor and EGGS Design in the HEMIT project.

"We see Sopra Steria as a competitor in some situations, but also a partner in other situations. We have a lot of projects going on with Sopra Steria [where] we are partners." (R1)

"This is quite interesting to learn and experience [...] because now the dynamics will change. I'm not quite sure if Sopra Steria has another view on their value capturing. EGGS Design,

which is a service design [company] are in this project to capture value [...] and once the project is finished, they have no interest in it. [...] We are the commercial part, we have our biggest value capture after the project is finished, when we have [the final] service. Will [Sopra Steria] have other ambitions than EGGG [Design]? Will they be interested in the final solution [and be] competitors to us?” (R1)

“[...] maybe Sopra Steria is more a of competitor than Telia. And we have some other ecosystems and partnerships with Sopra Steria, and I thought that this is going to interrupt, in the long run, our relationship with EGGG [Design].” (R2)

“As long as EGGG Design doesn’t change the value capturing, the competition will not be activated. But if Sopra Steria is going to have an interest in the platform and the service in the end, which means that they will change their value capturing, then [...] Sopra Steria could become a competitor and then we probably have to rediscuss and re-collaborate. But as we speak today, there is no sign for that. As long as their value capturing is still the same, I do believe that we continue as planned.” (R1)

However, these concerns were communicated openly, and EGGG Design ensured Telenor that EGGG Design would remain an independent entity and their value capture intentions in the project would not change.

“[EGGG Design] guaranteed that they will continue as before, as a [service] design company and they are not changing their value capturing, which was my concern.” (R1)

“EGGG [Design] is going to be a separate business unit. So, they are keeping the EGGG [Design] brand, the employees, [...] the structure, the strategy, everything that we have. When we discussed this in the consortium, [I think] the other players felt that this has a bigger impact than it actually has. So, they have all these questions, but I know that in this consortium it will not have any implications at all.” (R5)

Change in required competences

Another source of internal change is the requirement of new competences to move the project towards the goal of digitalizing healthcare and moving healthcare to the patients’ homes, or the omission of competences that are no longer needed. In the next phase of the project, several players will be onboarded that will create and capture value during the project but will not be

part of the final service. This has significant implications for the membership openness of the ecosystem, and the nature of the decision-making processes, which will be discussed in greater detail in the next sub-chapter.

“New players are onboarded because capabilities and competences were missing.” (R4)

“For this research funding, we have expanded the ecosystem with new partners [for the next phase].” (R1)

The requirement for new competences also leads to the involvement of people with different backgrounds from within the companies that are already a part of the ecosystem, which might have an effect on the dynamics between the players.

“There will probably [be] different people involved, because right now we're all engineers, we're building, we want to get this thing going, but once you start handing off to the operational side of the house, then different people will come in, and they'll have more financial goals in mind than what we have today. I'm sure [the dynamics will] change at that point.” (R4)

5.5 Objects of change

This chapter will look into *how* the sources of change mentioned in the previous chapter can potentially change the roles and structures within an ecosystem over time.

5.5.1 Roles

When looking at how the roles within an ecosystem can change over time, it becomes evident that entirely new roles can emerge, or existing roles can change or become redundant.

New roles emerge

One role that emerged in the past of the project as a consequence of internal competition, and was naturally assumed by Telenor, is the role of a mediator.

During the application process to the Norwegian Research Council, it was decided to include EGG Design for their service design expertise in the next project phase, while SINTEF was involved for their expertise as a research organization. However, through a misunderstanding,

SINTEF, who also has a department for service design, thought they would be involved in the project for their interaction- and user design competences. This resulted in a temporary situation of internal competition where two members of the consortium offered the same service.

“In the beginning it was a bit challenging because we were two parties that delivered the same offer [service design] to the consortium. [...] that was a bit challenging because then we were competitors, but we were supposed to collaborate on the same tasks [...].” (R5)

When this situation became clear to Telenor, they assumed the role of a mediator to solve this unwanted situation of internal competition.

“I see that there are two duplicated parts. You have to talk to each other and define who is doing what and what the overlapping competences are that you're bringing in. [...] we cannot dive into this project without solving these issues, we cannot have the risk to dive into an ecosystem without solving the eventual conflict [...].” (R1)

“[...] Telenor said that we have to clean this up, we need to make sure that we don't have two parties that deliver the same service because that's not efficient in an ecosystem.” (R5)

All parties involved in this situation described it as a “lesson learned” that roles need to be clear, and it needs to be specified which competences each actor contributes to the ecosystem.

“There must be a clear understanding in the group what everyone is supposed to contribute with and what's expected of each other.” (R5)

As a consequence of the change in competences that are required to bring the ecosystem forward, membership openness is high and new roles will emerge as new players are onboarded. For the next phase of the project, the consortium will be expanded by R&D-suppliers EGG Design, SINTEF and KPMG, and public players St. Olavs Hospital, Malmik Kommune and the Operating Room of the Future.

EGG Design, SINTEF and KPMG will fulfil the role of service providers that will be paid for their respective services by the consortium and will create and capture value solely in the project and will not be a part of the final platform.

“SINTEF, EGGS Design [and KPMG] will have a time limited engagement here and then they have no intellectual property rights [...]. They don't expect to be engaged beyond this next phase, so there are simply delivering work.” (R4)

St. Olavs Hospital, Malmik Kommune and the Operating Room of the Future will also have a time limited engagement and act as “the customers’ voice” and connecting point between the consortium and the final users of the service.

“They will be our anchors into finding the right clinicians [...] and hopefully [...] get us real patients to try this out on.” (R4)

Membership openness is expected to stay on a high level until the final platform solution is in place, as new competences might be required. Consequently, as new players might be onboarded, additional new roles might emerge in the future of the project.

“I believe that we need to onboard new players as long as there is some relevance. If someone has competence and can bring value to the ecosystem, I believe that we need to expand from time to time.” (R1)

“[...] we are inviting other players if we see they have the skills or technological abilities that will help us on the road to success.” (R3)

Roles change

While new roles are expected to emerge as a consequence of a change in required competences, existing roles are also anticipated to change with regard to sources of power such as centrality.

An example for this is Infiniwell. It is expected that Infiniwell will keep fulfilling the same role as today but that the role will become less central. Infiniwell was very central in phase 2 of the project for the Proof of Concept and is expected to also be central for the R&D work in phase 3.

“Telenor was looking for a 5G mobile network use case, and that's exactly what we do. [...] we came in with a working system basically. So, we provided 'meat on the bone'.” (R4)

“[In phase 3] our role will be in the beginning doing a lot of the R&D work, [...] and we might even lead some of that.” (R4)

However, while still performing similar or the same tasks as before, Infiniwell's role is expected to change in the final platform as it becomes less central as other suppliers of medical technical equipment join the ecosystem.

“Once the building the system part [is] done and you're starting to operationalize and just run the system on a day-to-day basis, then it'll shift more towards either Telenor or Hemit, to be responsible for the day-to-day operations.” (R4)

“I see us as the technology provider. [We] would have to be more involved in the beginning and less in the end phases [when] we will be one of several suppliers of technology in the solution.” (R4)

While roles themselves can change, in regard to centrality and other sources of power, and the same actors keep fulfilling the tasks within that role; actors can also change their roles because their tasks differ significantly in different phases of an ecosystem.

An example for this kind of change is Hemit. Since they sent the request for a report to Telenor that started the first phase of the project, they see themselves as the host for the process and an active co-creation partner. However, moving closer to the public procurement process, which has been discussed in detail earlier in the chapter, it was emphasised by the Hemit informant that it is important to keep a clean line between the co-creation phase and the public procurement process. In this process Hemit will change their role from being a co-creation partner to being a commercial buyer who will receive offers from the HEMIT consortium and others and make an independent decision as a customer.

“[...] we need to have a huge split between working together now and the future commercial processes.” (R3)

In the final platform, Hemit will change their role again, from first being a co-creation partner, then being an independent commercial buyer, and finally being either a customer or leader in the final platform, depending on what the decision on platform ownership will be. The tasks in the two platform ownership scenarios differ so substantially from each other, that it cannot be said that Hemit still fulfils the same role, and the role simply changes, but that Hemit assumes a completely different role depending on who will own the platform.

Roles become redundant

Two roles that Telenor naturally assumed in the starting phase of the HEMIT project either became redundant already or will become redundant in the future of the project, as they were or will be no longer needed.

One of these roles is the role of a “frontrunner” that was taken by two project leaders in Telenor. This was related to the fact that co-creations were something new for Telenor and connected to a lot of uncertainty. By taking a “frontrunner” position and diving into this co-creation with Hemit, the two project leaders in Telenor were trying to change the minds of the management in regard to the way of thinking and working in Telenor.

*“You need to have some frontrunners. You need to have some rebels within the organization.”
(R2)*

This role became redundant after the HEMIT project received more support from the management and commitments to invest in it financially in the next phase were made.

Another role that Telenor assumed and that was crucial in the project so far, is the role of an “orchestrator”. This role was necessary to get the project started and to cope with the uncertainty surrounding what the next step in the project should be. However, despite its importance, this role doesn’t seem to be connected to any power.

“[...] I'm using some time to make people talk and bring them together [...] I think that every ecosystem, every co-creation needs a leader but there is no power connected to being a leader [...]. That's why I'm calling myself an orchestrator. I'm not the manager, I'm orchestrating, I make people talk.” (R1)

“All ecosystems or co-creations need one part to take the lead. Because [otherwise], I don't think anyone would feel responsible to take action. [...] It's not about power, it's all about orchestration.” (R1)

“[...] we took the leadership because if we [hadn't] done this, there would have never been a co-creation or ecosystem.” (R1)

This role will likely become redundant in the final platform because uncertainty will decrease and responsibilities and how value is created and captured becomes clearer.

Another role that will eventually become redundant once the final platform is in place, is the role of the service providers such as EGG Design and SINTEF. Their competences are needed in the next phase of the project to bring the ecosystem forward, but their services are not required in the final platform.

“We are only delivering services into the process. We don't get any value afterwards.” (R5)

“Some of our partners are capturing value during the project phase and do not have commercial interest in the final service.” (R1)

Relationship

Since new roles are expected to emerge, and existing roles are anticipated to change or become redundant, the relationship between the members of the ecosystem is also likely to change. All informants agreed that their relationship so far is harmonic, open, and characterized by transparency, trust, and equality.

“I can't think of a single disagreement that we had. [...] Everyone's been aligned on the same goal, so that helps.” (R4)

“In this co-creation or ecosystem, everyone has to play with open cards and transparency. That's quite important.” (R1)

Even though Telenor is often considered the leader of this project, especially by the players entering the project in the next phase, it has been emphasized how important equality between the players is to create a well-balanced ecosystem and that this balance would be endangered if one single player took up too much space by trying to sell their own services.

“Very much a servant leader, [about the project leader from Telenor] he wasn't dictating, he just tries to make everything work and really pushed this idea of a co-creation in every meeting we were in, so I think that was very good.” (R4)

“You don't have the [...]: ‘I'm the big company. I'm going to decide everything’. That wasn't the case. [...] I don't see any difference in us versus the rest of the partners. [...] I think everyone understands that we all support each other.” (R4)

“[...] from day one, we have been very open and honest to each other. [...] I have been very focused on [including] everyone and to listen to everyone. I'm using a lot of time to make people talk and to get an arena for everyone to share everything because that's quite important that everyone feels that they are included and get some value out of the cooperation.” (R1)

“I have spent a lot of time to introduce: ‘What is co-creation [and] what is special about [it]?’ That means that you have to be open and transparent. You have to share and if [one actor is] taking too much space, the balance in this ecosystem will be wrong and then [it] probably will collapse. We need a balanced ecosystem, [...] and everyone, in my experience, understands and accepts this [...].” (R1)

The relationship between the players of this project is expected to change in the future as a result of the sources of change that have been discussed in the previous chapter. Especially, the public procurement process, internal competition, and the involvement of people with a more financial focus from within the currently involved actors are relevant in this context. In general, informants have expressed that the degree of harmony and equality in the relationship between the players might change as the project moves closer to the value capture.

“[...] when you move further on in the process, there will be some friction. There will be some questions regarding: ‘What's in it for me?’” (R2)

Yeah, there could be [a change in dynamics between the players]. If we look at this as a project, I think the first year won't be an issue. I think the questions will more come towards the second half of the project where we start talking about the financials [and] who supports what.” (R4)

“[...] everything has been going so smooth, but it's not always going to be that way.” (R4)

5.5.2 Structures

When looking at how the structures within an ecosystem can change over time, it becomes evident that power and influence are expected to change regarding substitutability, centrality, and decision-making.

Substitutability

The first object of change within the structures of the ecosystem is substitutability, which is also related to interdependency.

The informants emphasized that the ecosystem is characterized by a high degree of interdependency and that they are creating a service together, that none of the players could create by themselves.

“I think everyone understands that we all support each other. No one company can do this on their own.” (R4)

“I think if Telenor have [had] this idea and they would [have] tried to work upon this ‘alone’, without our guidance, I think they would not have made success.” (R3)

There also seems to be a high dependency on the player who is the main data source in the ecosystem. If this player would leave the ecosystem, it would be crucial to replace this player, because otherwise the ecosystem would collapse.

“If [one player in the ecosystem] is providing data that someone else in the ecosystem is dependent on and [this] partner drops out, then the whole system will collapse.” (R1)

This applies not only to the actor who provides the data, but also to the connectivity provider, data integrator and others.

With this high degree of interdependency, it should be expected that each player should be relatively difficult to replace. However, several informants stated that every current player in the ecosystem could possibly be replaced, and that the ecosystem should be designed that way. This high interdependency paired with high substitutability reflects that the roles themselves are crucial for the ecosystem and hard or impossible to replace, while the players that fulfil these roles can be substituted.

“We're trying to design it so that everyone can be replaced [...]” (R4)

“We can replace Infiniwell because I do believe that Philips, Siemens and GE Healthcare and other big companies throughout the world have [similar] solutions.” (R1)

“They [Telenor] probably could be replaced by Telia.” (R4)

“You can replace Telenor with another actor [system integrator], but then Telenor is going to be a [connectivity] provider.” (R2)

However, this substitutability of the involved players only considers the uniqueness of the competences and resources each player possesses. When asking about other considerations, it became apparent, that trust, which has been mentioned as a source of power and competitive advantage earlier in this chapter, makes it more difficult to exchange players in the ecosystem without disturbing the balanced relationship between the players. Therefore, replacing players has not been in anyone’s interest in the past or presence of the project.

“It’s possible to be replaced, but you have to take the interest into account, you have to work together [and] put in some effort in order to make a new ecosystem work continuously.” (R1)

“[Another] big asset [we have] is that we have trust, we have the dialogue and the understanding of the needs in the healthcare system [...].” (R3)

“I don’t think that Telenor is going to be replaced either [because of] trust. It’s more like the standing in the Norwegian market and the trust that we have across different sectors.” (R2)

“We are building up trust in the ecosystem, so I don’t think that we will change the ecosystem just in order for some minor things like pricing [...]. In my opinion, the trust is much more important than anything else. We have trust in each other, we believe in each other, and we have a good cooperation. I won’t risk anything that can change that.” (R1)

When it comes to the players that are planned to enter the project in the next phase, substitutability is high in theory, since these players solely provide their services in the project and will not be part of the final platform, which indicates that interdependency is lower than between the current players.

“They [EGGS Design] are good at service design and design thinking and they have a lot of resources, but there are many that use the same design thinking and service design mindset.” (R2)

However, in practice, these future players are part of the application to the Norwegian Research Council and can therefore not simply be replaced by another service provider.

“No, I don't think [we will experience outside pressure from other service providers] because [...] we [the consortium] have a contract with the Research Council, we have stated [who] the research partners are, and I don't think they can just throw us out and put someone else in without negotiating with the Research Council.” (R6)

“No, I don't think [we will experience outside pressure from other service providers] because we are kind of written into the consortium.” (R5)

As mentioned above, it has not been in the interest of the ecosystem to replace one of the players with another one. This might change in the future regarding the acquisition of EGGS Design by Sopra Steria. As mentioned in the chapter on internal competition, Telenor considers Sopra Steria a partner in some situations and a competitor in others. In the specific case of the HEMIT project, Telenor is concerned that Sopra Steria has other value capture intentions than EGGS Design had and is interested in being a part of the final solution instead of simply providing its services in the project. This has led to thoughts within Telenor about whether it is a possibility to replace EGGS Design with another service design provider. The fact that the service providers for the next phase are part of the application to the Research Council is not considered a barrier for replacing them.

“When I see that Sopra Steria could become a competitor to our platform, then we probably have to re-discuss and re-collaborate.” (R1)

“I think that [Telenor] needs to look into both the possibility to change them and [...] who can then be their replacement.” (R2)

“[...] our application [to the Research Council has] a clear statement of what we want to achieve for society. So, if we want to replace one part with another part [that] is running the same thing, I don't believe that will change our relations to the Research Council. I think that's technicalities, as long as we continue to research for our goal that we have promised.” (R1)

However, as of today, these considerations are not yet relevant, since the next phase of the project will not start before the beginning of 2022, and Telenor and EGGS Design communicate openly about this issue.

“[...] Sopra Steria is buying one of our partners. What does that mean? [We need to have] free dialogue and we have to be honest to each other.” (R1)

“As we speak today, there is no sign for [a change in EGGS Design’s value capture intentions]. As long as their value capturing is still the same, I do believe that we continue as planned.” (R1)

While looking at substitutability from a perspective of who of the current players could be substituted is important, it is also important to take a look at the attractiveness of outside options and the likelihood that current players leave the project and “replace” it by another one. This likelihood is assumed to not be very high today. Even though the current players will only begin to capture value in the final platform solution, they are not likely to leave the project because they are all driven by a shared vision of providing high quality healthcare and solving a problem for society. The attractiveness of outside options is expected to decrease even further in the next phase(s) of the project, because the current players will start investing money which could be considered sunk costs if they left the project.

“[...] if we get the project, Telenor will have to commit with a quite substantial amount of own financing.” (R6)

Centrality

Figures 7, 8, and 9 visualize the ecosystem in the currently finishing phase 2, the upcoming phase 3 and its long-term vision. This representation helps to understand how the centrality of different actors changes as the ecosystem matures. In phase 2, the “customer” Hemit (1), the infrastructure providers Telenor and Microsoft (2), and the application provider Infiniwell (3), build the core of the ecosystem. They are all “level-one” partners and therefore equally central to the project (see figure 7).

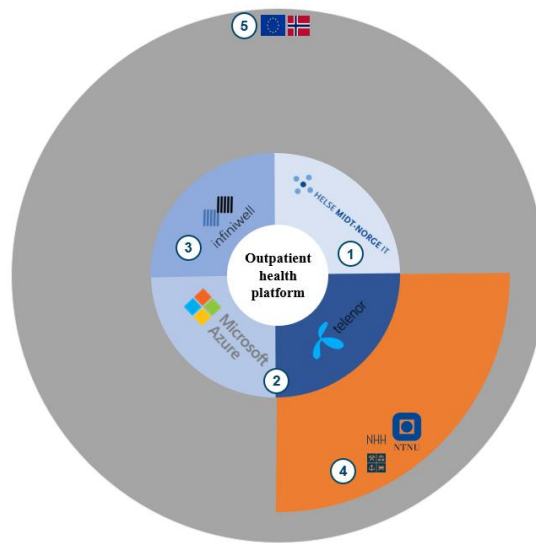


Figure 7: Outpatient health platform in phase 2 (Source: own representation)

Telenor seems to be especially central in the application for funding from the Research Council and was considered the “main partner” or “leader” by the informants from the companies that will join in the next phase.

“They [Telenor] are the ones that will be owning the project, they are the main applicant [...]. The others are suppliers of work, basically. So, both SINTEF and EGGS [Design] will have a time limited engagement here and then they have no intellectual property rights [...]. They don't expect to be engaged beyond this next phase, so they are simply delivering work” (R4).

“[...] In this application [at the Norwegian Research Council], Telenor is the main partner, and then all the transactions go via Telenor. So, if we get the project, we will send our claims for money [to]Telenor.” (R6)

In phase 3, new players are onboarded to support the value creation in the ecosystem. Operating room of the future, St. Olavs Hospital, and Malvik Kommune (6) support the “customer”-side and help to better understand the problems that need to be solved. In addition, the commercial players KPMG, SINTEF and EGGS Design will join the ecosystem (7). They are considered “second-level” partners to the core members as they are paid to provide their supporting services during the project but won't be part of the final solution (see figure 8). This makes their roles less central and also affects their substitutability.

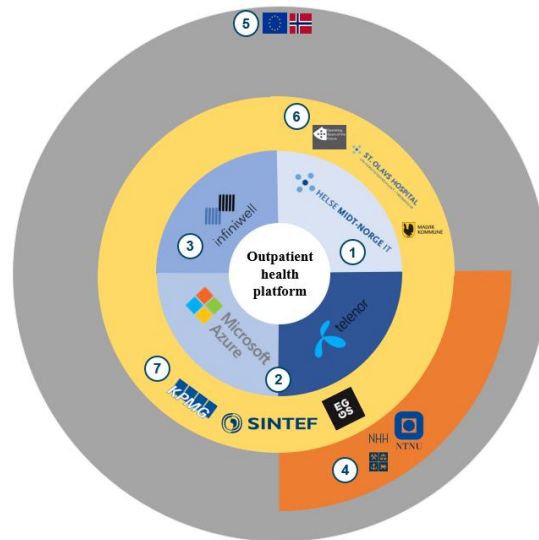


Figure 8: Outpatient health platform in phase 3 (Source: own representation)

In the long-term vision, the core players of the OHP will be Telenor and Microsoft, who provide the technology and infrastructure, as well as Hemit who will eventually be the customer who then supplies hospitals with the service, or the platform owner, depending on what the decision on platform ownership will be.

Infiniwell's centrality is expected to decrease in the final platform. They have been highly relevant and central in phase 2 and 3 of the project, and especially for the Proof of Concept. However, on the platform, many suppliers of medical technical equipment (3) are envisioned to host their applications contributing to better healthcare services in Norway, which will give Infiniwell a less central role than they currently have (see figure 9).

“We provide one type of service, one type of data, one type of equipment, but there are other companies out there that provide similar but different [products and services]. [...] and if [no other MTE providers are onboarded] then that's kind of a failure of the project because [...] our mission is to digitize and bring health care home and so having one company be the bottleneck there, I don't think that's a good idea.” (R4)



Figure 9: Outpatient health platform in the long-term vision (Source: own representation)

Centrality, as a source of power within ecosystems, is also expected to change in the HEMIT project as a consequence of the uncertainty surrounding the platform ownership. As of today, there are two scenarios: one in which Telenor is the platform provider and service enabler (see figure 10), and one in which Hemit is the platform owner and service provider (see figure 11).

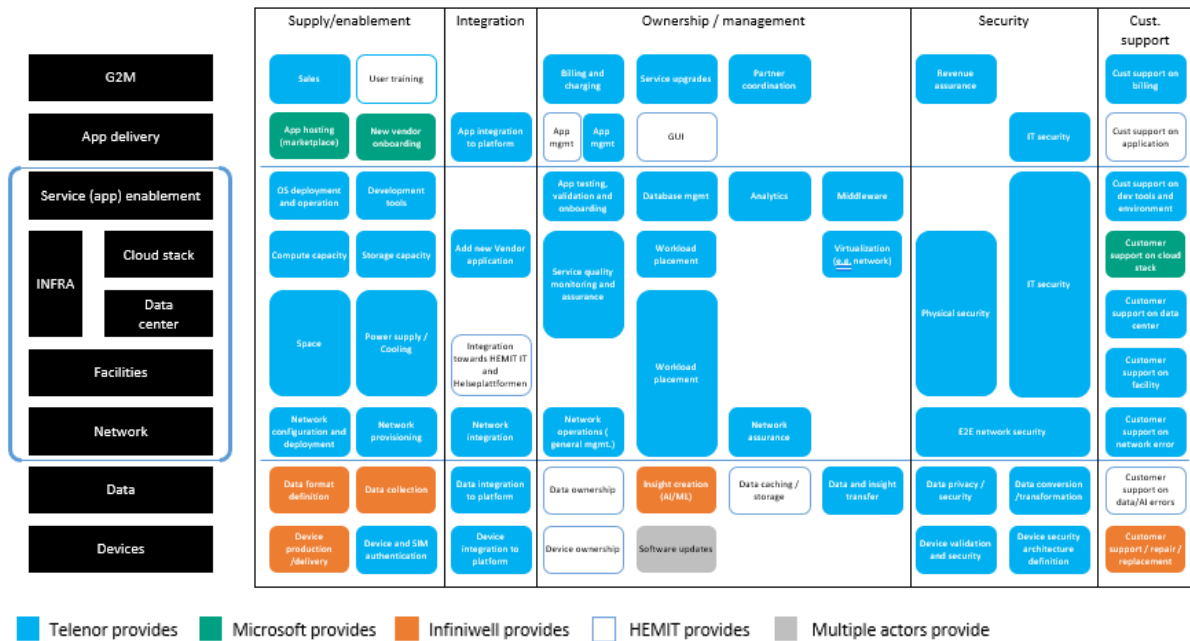


Figure 10: Scenario A – Telenor is platform provider and service enabler (Source: internal document 2)

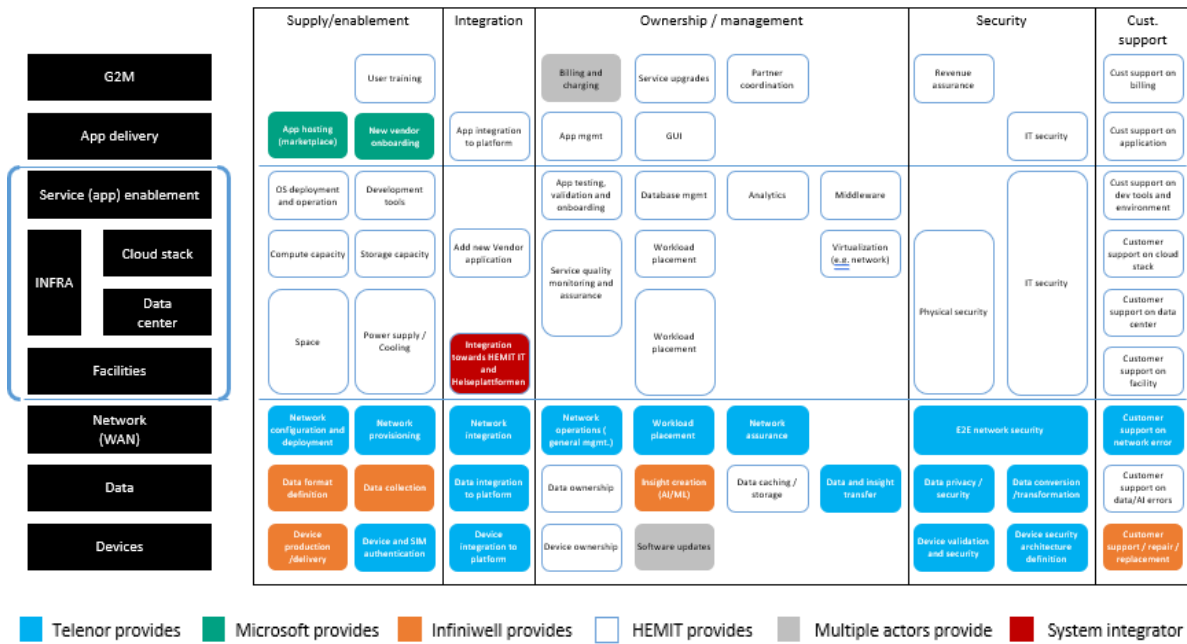


Figure 11: Scenario B – Hemit is platform owner and service provider (*Source: internal document 2*)

While the exact content of each row and column is not important in the context of centrality, the figures depict well how complex the setup of the final platform will be and that there is a wide range of technical and business-related tasks that different providers will be responsible for. It becomes evident from the two figures that there are significant differences in the two scenarios for Telenor and Hemit. The colour of each box indicates who will be responsible for the specific task in the different scenarios.

In scenario A, Telenor (blue) would be responsible for the provision of a majority of the services, which would make them the most central player in the ecosystem, which in turn influences their substitutability and their possibility to expand the platform to other health regions. Hemit (white) would have relatively few responsibilities in scenario A and would take on more of a customer role.

In scenario B, Telenor would be in charge of relatively few tasks, compared to scenario A, and would take on the role of a connectivity provider, which is connected to far less centrality than their role in scenario A. In this scenario, there would be a system integrator (red) involved, which Telenor considers one of their major competitors as of today. Hemit would take on far more responsibilities than in scenario A, which makes them a central part of the ecosystem instead of a customer.

The figures also show that Infiniwell (orange) would have the same responsibilities, and Microsoft (green) almost the same responsibilities in both scenarios. This shows that the changes happening in an ecosystem do not affect all players alike.

“It really doesn't matter that much to us. We [Infiniwell] have pretty much the same job anyway. [...] It might be a little bit more complicated if Telenor is going to do it, because [then] we have more systems to traverse to get out to where Telenor's data centre is, but I think it would be more work on Telenor, it wouldn't be too much of a difference for us.” (R4)

Decision-making

Another object of change that is closely related to centrality, is how decisions are being made within the ecosystem.

In the past and current phase of the project, decisions have been made jointly and since all current actors are equally central in the ecosystem, they all get a voice and are equally important for decisions that have to be made.

“Everyone can recommend everything [...] and then we discuss it in the ecosystem and so far, we have been agreed upon everything on a common basis.” (R1)

This is expected to change in the future, as the ecosystem grows and becomes too big for decisions to be made jointly by everyone involved. It is expected that decisions will be made by the core actors that are the most central in the project. Telenor is also assumed to have a high amount of power in the decision-making process, which seems to be connected to the financial investments they will make in the future of the project.

“The ecosystem will become [bigger] [...] than a democracy can handle, but then it is down to the project team. There will be a core team of decision makers, [...] no more than five or six that are responsible for making decisions and then Telenor as the project owner will be ultimately responsible for what happens, so they would have the final say, I would think.” (R4)

“I think that there are going to be fewer actors that actually [make] the decisions because they also have the most investments.” (R2)

“I think the final decisions will have to be [made] by those who are financing our services. [...] We are not level one partners, we are not putting our own money on the table here, so [we are] not equal partners.” (R6)

6. Discussion

The purpose of this chapter is to answer the research question: *Why and how do roles and structures change in an ecosystem as it matures?* Based on our empirical findings, we developed a conceptual framework, that strives to systemize and structure them in a way that best answers our research question. The framework, that is presented in figure 12, divides the findings into two main parts in accordance with the formation of the research question. The upper part illustrates sources of change, which answer the question of *why* roles and structures change as an ecosystem matures. Those sources, that can be classified as external or internal and that mutually influence each other, are objects of uncertainty about if, when, and how they arise. In addition, uncertainty itself plays a significant role in changes of roles and structures, which we will further elaborate on in this chapter. The lower part of the framework illustrates objects of change, responding to the question of *how* roles and structures change in an ecosystem as it matures. In the following, the framework will be discussed against existing literature that has been presented in chapter two. Although our case displays an extreme example on several dimensions, we try to work out implications that can be applied to other cases. Finally, we elaborate on how roles and actors are connected.

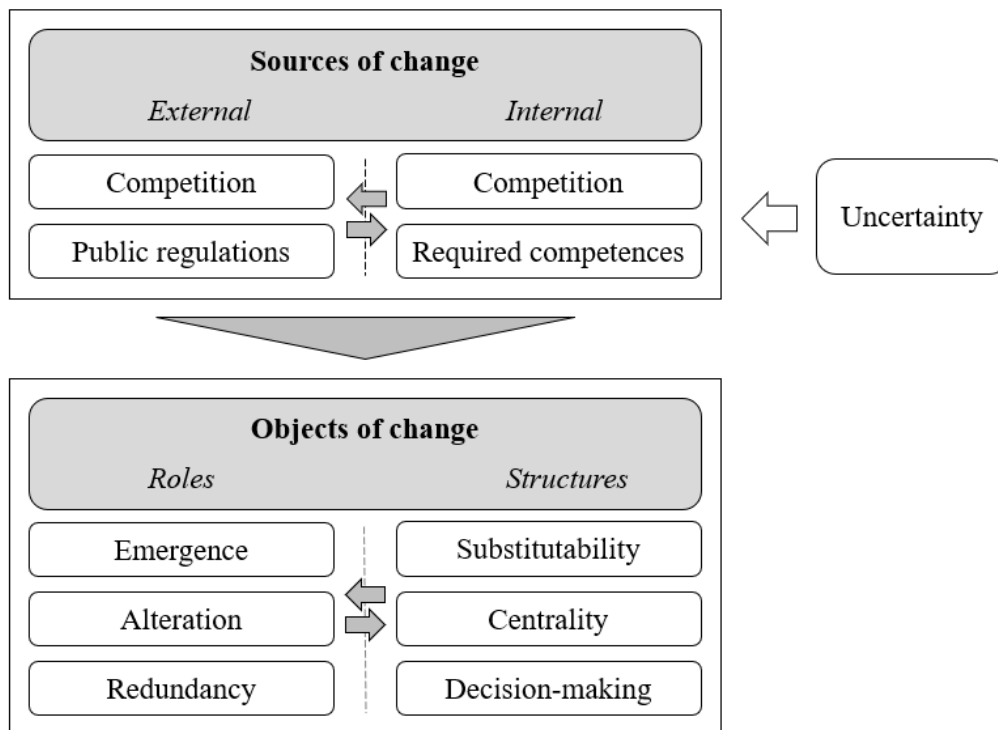


Figure 12: Sources and objects of change in ecosystems (*Source: own representation*)

6.1 Why roles and structures change

With respect to the upper part of the framework, namely sources of change, our findings support existing literature in that changes of roles and structures within ecosystems can occur from external and internal sources.

6.1.1 External sources of change

Like Moore (1993) and Dedehayir and Seppänen (2015), we identify *public regulations* as an external source of change even though regulations take a much more active role in the observed HEMIT case than in most other cases. This has to do with the highly regulated healthcare sector that sets strict boundaries in which the ecosystem can emerge. Thus, it is important to acknowledge that this case is different from highly studied ecosystems such as Apple or Facebook as these ecosystems were able to grow relatively freely (Moore, 1993). In the observed ecosystem, a tendering process contributes to the distribution of the ecosystems most central role, the one of the platform owner. This differs substantially from the usual scenario. Normally, the role of the platform owner falls to the platform entrepreneur who starts building the platform which eventually becomes an ecosystem once other players join. Even if that's not the case, there tends to be someone, whose capabilities make them the natural candidate for the role. In our case, an opportunity for actors to claim that role and position themselves is artificially created. This challenges the understanding of Dedehayir et al. (2018) to some extent, who argue that roles tend to emerge rather naturally instead of being set by external governance mechanisms.

Further, *competition from actors from outside the ecosystem* that newly enter the system represents the second external source of change that has been identified. This is congruent with existing research (Pagani, 2013). Nevertheless, standard literature tends to display this form of competition in a way that new entrants affect the position of current ecosystem participants negatively which incentivizes them to prevent the threat of new entrants. Our findings suggest that this does not necessarily have to be the case. While exclusivity of roles that touch on the infrastructure of the platform tends to be higher, a greater membership openness regarding application providers is expected and even desired once the platform is established. All ecosystem participants support this vision including the current sole application provider Infiniwell. The shared opinion stems from indirect network effects as the

platform represents a two-sided market. More specifically, application providers are supermodular complements, which means that the more of them are part of the ecosystem, the greater the value of the entire platform. The increased overall value makes the platform more attractive to hospitals which in turn increases the number of potential customers for application providers that can be reached through the platform. Metaphorically, the increase in the overall size of the pie outweighs the decreasing share of the pie that can be captured.

Finally, we did not find evidence for two external sources of change that are described in the literature. Moore (1993) suggests that an alteration of macroeconomic conditions and changes in customer buying patterns can affect the coevolution of an ecosystem. We explain the absence of these sources in our research by the short time for which the ecosystem exists and the early stage it is in. Moreover, the commercialization of the innovation has not taken place yet, making it difficult to observe changing customer buying patterns. Nevertheless, we believe that both factors will become relevant for the observed HEMIT ecosystem.

6.1.2 Internal sources of change

In addition to external sources of change, we identified two major sources of change that derive from within the ecosystem.

First, our findings support existing research that identifies *competition between ecosystem participants* as an internal source of change. Literature thereby focuses on leaders swallowing up niche players or niche players invading each other's territory. The situation around platform ownership in the HEMIT case supports the position of Adner (2017) who adds that leadership roles can also be contested. Moreover, our findings contribute to the standard literature, that competition is sometimes desired and sometimes not. This has to do with the two major phases of the ecosystem. On the one hand, we observe a strong co-creation phase in the beginning of the project. In contrast to other platform ecosystems, where the co-creation phase is often more of a solo-creation phase, the HEMIT ecosystem acts truly collaborative when developing and designing the solution. There is total harmony and bliss and competition between members is fully absent. Potential competition arising between EGGS Design and SINTEF is prevented by Telenor who also makes sure that no actor takes up too much space. One explaining factor hereby is uncertainty which will be elaborated on more clearly in the next section. Further, we

believe that learning being one of the main objectives of the actors makes it easier for them to achieve their goals without coming in conflict with one another.

On the other hand, the commercial phase of the ecosystem will present a major shift in ecosystem dynamics. Competition will become more prevalent and even seems to be a requirement for the success of the entire platform. Hemit aspires to have multiple options to choose from in the tender process. Further, as elaborated previously, network externalities encourage the addition of multiple application providers to increase the value of the entire system despite leading to competition amongst one another.

One peculiarity of this case is the clear break between the co-creation and commercial phase. It's even mandated by law that actors must behave in a certain way once the ecosystem moves to the commercial phase and the striking difference in how competition is perceived in the two phases is almost paradox. Still, the observation supports and specifies existing literature that indicates that competition and cooperation might not happen at the same time (Han et al., 2017). By generalizing these findings to research on ecosystems, we believe that ecosystems, that rely on the constructive cooperation of several players, should keep competition out of the co-creation phase as much as possible. Moreover, a clear break between the co-creation and commercial stage is likely to help such ecosystems to increase the probability of success.

The second internal source of change that we have identified refers to a *change in the required competences*. This is often in accordance with the natural evolution of the project through its lifecycle stages and can imply that new competences are required, or that existing competences become obsolete. If new competences are needed, either new roles emerge, or existing roles alter in an ecosystem. New players might have to be onboarded to bring in the new competences. Alternatively, actors that are already part of the ecosystem and possess the needed capabilities could change or expand their current role. This sometimes goes hand in hand with the involvement of new people with different backgrounds from within the same organization that is already part of the ecosystem. As mentioned above, the early stages of an ecosystem rather focus on developing the product or service and therefore often require the cooperation of engineers, whose focus is to get the product or service up and running. Once the focus of the ecosystem shifts more towards a commercial perspective, people with more

of a business mindset become more central to the system and competitive strategies regarding value capture become more relevant.

6.1.3 Uncertainty

We believe that the different timing of cooperation and competition also has to do with the degree of uncertainty shaping the ecosystem. In the early stages of an ecosystem, many ambiguities are present and a clear roadmap that answers all open questions is missing. These ambiguities could for example refer to uncontrollable public regulations being introduced or the dynamics within the ecosystem that include the design of the product, pricing, expansion strategies or simply the feasibility of the envisioned product, service, or solution. The observed HEMIT case is especially remarkable because there is not even certainty regarding platform ownership, the ecosystem's most central role. This stands in contrast to the standard literature because the leadership position is not defined right from the beginning. In addition, as mentioned previously, the case reflects a situation in which a natural owner for the role is missing. Hence, the absence of a dominant platform leader represents a major uncertainty. Cooperation is needed to overcome uncertainties and to share the risks of the project. When the ecosystem progresses, for instance by settling the question about platform ownership, uncertainty will decrease. We conclude that the more questions about the jointly created service are answered, and uncertainty reduced, the more competition will become prevalent amongst ecosystem actors. This conclusion supports Moore (1993) who stresses that ecosystems must have a certain growth and profitability to be worth fighting over and that a certain stability of key processes is necessary to not endanger the entire system. Nevertheless, arising competition in turn contributes to a more dynamic ecosystem environment, creating new types of ambiguities, which indicates that overall uncertainty does not necessarily decrease, but changes in nature as the ecosystem matures. Moreover, the case shows that ecosystems have a higher chance of success in a highly uncertain environment, if they start off with a small group of actors that trust each other. This interpersonal trust is extremely important in the early stages to align the different self-interested actors on a shared objective in a highly uncertain project environment. Nevertheless, we believe that interpersonal trust will become less and less important once the ecosystem matures. New people will onboard, and the system will eventually reach a size that makes interpersonal relationships among all participants unrealistic. Therefore, this type of trust might have to be replaced by governance

mechanisms or other types of trust, such as trust in technology, that helps overcome uncertainty and ensures the common trajectory of the ecosystem actors.

6.2 How roles and structures change

The lower part of the framework illustrates objects of change that result from the occurrence of the sources of change that have just been described. We find consensus with existing literature by demonstrating that there can be an *emergence of entirely new roles*, an *alteration of existing roles* or their *redundancy and exit*. Besides, we suggest that the emergence of new roles and existing roles becoming redundant often occurs at similar times as the ecosystem progresses and moves to a new phase within the lifecycle of the ecosystem where some tasks are finalized, and new challenges occur which require new capabilities. About the alteration of roles, our study finds that roles change regarding three aspects. First, the tasks that a role fulfils can change as the ecosystem progresses. Second, the tasks can be undertaken by another actor as roles are not necessarily tied to actors. And third, power and influence of a role can change, pointing out once more the interrelatedness of roles and structures. More specifically, our research identified three relevant power dimensions that change over the lifecycle of an ecosystem, namely *substitutability*, *centrality*, and *decision making*.

Substitutability

The observed ecosystem is characterized by a high interdependency between actors which is based on a modular technology architecture. The removal of one of the four central players would lead to the collapse of the entire ecosystem, indicating that all four players possess unique complementarities. At the same time, the actors attempt to design the ecosystem in a way, that every player could be replaced. This reduces interdependency between actors and guarantees that the whole ecosystem is not in danger if one party decides to exit the project. We conclude that the roles themselves are crucial for the ecosystem due to their high technological interdependency while the actors that execute these roles can be replaced. Nevertheless, substitutability of actors still varies between different roles. An example: If Telenor ends up being the platform owner, their role will be highly complex and influential, and it would be rather difficult, yet possible, to replace them with another actor. In contrast, if Telenor ends up providing only connectivity services, their contribution becomes more generic, making it easier to replace them with other connectivity providers. On the other hand,

our findings indicate that trust among ecosystem actors is highly relevant and in combination with transparent relationships reduces the likelihood of being replaced. As mentioned previously, we believe that a considerable amount of this trust comes down to interpersonal trust of the people working inside the project. Finally, the threat of crucial actors leaving an ecosystem is also subject to change. In our case, attractiveness of outside options decreases once central players commit to the project financially and risk a significant amount of sunk costs in case of an exit.

Centrality

Regarding centrality, our findings support existing literature that claims that more central players enjoy more decision-rights due to their focal position. This includes decisions on membership openness, duration, and exclusivity of membership, as well as architectural control (Adner, 2017; Gulati et al., 2012). Further, our work adds to the literature of Dedehayir et al. (2018), who found that roles are expected to change regarding centrality during ecosystem genesis. Our findings suggest that changes in centrality are not limited to the birth phase. Referring to Moore's classification of roles from 1996, our case illustrates how Infiniwell transitions from a core firm to a member of the extended network once the platform is finalized.

Decision-making

According to Adner (2017), leaders can exert substantial power by making important decisions regarding timing and standards. Literature thereby often takes the control of the leader as given and stresses the subordinate nature of complementing players that need to adhere to the structures and rules given by the leader (Dedehayir et al., 2018). Our findings challenge this understanding by indicating that the power of the leadership role can vary quite a bit. Despite other ecosystem members describing Telenor as a leader within the ecosystem, the distribution of power is less concentrated compared to the dominant leadership positions that are described in most of the literature. We argue that Telenor is interpreting its leadership role more as an initiator and orchestrator role and power is distributed much more equally than in many other ecosystems. One explanation could be the high uncertainty including the result of the tendering process that will bring clarity to who will become the most central player of the system. Until today, the role is not assigned and cannot simply be assumed. In addition, power might be divided more equally due to the high interdependency of the modular infrastructure. All core

firms which are currently involved contribute unique capabilities that are needed to develop the platform. Therefore, all firms possess some sort of expert power in their field of competence and decisions are made jointly and borne by all parties. However, this is expected to change once the ecosystem expands in size. Then, decisions will be made by the core actors that are most central to the platform's infrastructure and that have made the highest financial investments. This will insert a new hierarchy dimension between core firms and extended network. Core firms will have coercive power that enables them to remove second-level partners from the ecosystem. In addition, Telenor will have reward power over actors from the extended network as it controls finances and pays their bills. Moreover, application providers must adapt their technology to the future platform owner.

Generalizing these findings indicates that smaller ecosystems with a relatively equal distribution of power need to establish some hierarchy once the size of the ecosystem exceeds the number of decision-makers a democracy can handle. In addition, the findings suggest that a more equal power distribution can help to achieve a truly cooperative environment in the co-creation phase of an ecosystem. Nevertheless, ecosystems with a rather equal distribution of power need the presence of an actor who initiates and orchestrates activities. However, this role only relates to project management and is not related to power or influence.

6.3 How roles and actors are connected

Another interesting perspective is the observation of how roles are tied to actors within an ecosystem. Our work indicates that there is a certain set of roles that are required for the success of an ecosystem and whose absence would likely lead to the collapse of the ecosystem. However, our findings also suggest that most of these roles are only loosely tied to the actors that fulfil them. This has to do with standardization and the way the ecosystem is designed and represents an active decision made by the involved actors. They did not want to make the success of the project reliable on certain actors, which at least partly has to do with their vision around the value the platform can create for the society, which they consider more important than individual interests of companies. The role of the platform owner will for example exist independently of who will assume it eventually. Moreover, while Hemit will not be relevant anymore once the ecosystem expands to other health regions, the role of the customer will still exist and simply be assumed by the respective health authority that will be responsible. In the

observed ecosystem, roles are assigned to actors in two ways. First, the candidate naturally assumes the role that suits them best. And second, the actor is chosen through a regulated tender process based on multiple decision dimensions such as competence, price, trust, data sovereignty, or even political considerations.

Generalized, we believe that actors can design an ecosystem in a way that roles are only loosely tied to the actors that assume them. While this decreases the power of each individual member, it increases the robustness of the ecosystem. Actors, that for whatever reason exit the system, can be easily replaced and the continuation of the service ensured. This could be especially relevant for ecosystems involving critical infrastructure in the public sector where the value of the system for society is greater than the monetary return it creates for the involved companies.

7. Conclusion

In this final part of our thesis, we will on the one hand present a short summary and the resulting implications of our findings. On the other hand, we shed light on the limitations of our research project and suggest future research areas.

7.1 Summary

The purpose of this research project has been to answer the research question: “*Why and how do roles and structures in an ecosystem change as it matures?*” To address this question, we performed an exploratory and qualitative single case study of an ecosystem that is aiming to improve the quality of healthcare and to tackle the capacity challenges that the health sector is increasingly facing by providing a platform that enables decentralization in healthcare through remote diagnoses, treatment, and follow-up of patients. To illuminate the research question, internal documents from Telenor were reviewed to establish a solid understanding of the case. While we found that research on changes in roles and structures in ecosystems over time is limited, it was sufficient enough for us to establish a good theoretical background regarding roles and structures in ecosystems, the lifecycle stages of ecosystems and coevolution. Based on these internal documents and existing literature, we developed a guide for the interviews with the current and future participating companies of the case ecosystem. The interviews were semi-structured and focused on understanding how roles and structures have changed in the past of the project, how they are expected to change in the future of the project and what causes these changes. During data collection, more specific streams of literature were reviewed, whenever a new topic emerged from the interviews.

By using existing literature and our analysed data, we derived a conceptual framework that visualizes the sources and objects of change in an ecosystem. We found *sources of change* to be either external or internal. *External* sources of change were identified as *competition* and *public regulations*, while *internal* sources of change were identified as *competition* and *changes in required competences*. The *objects of change* were classified as *roles*, which can either *change* or *become redundant*, or entirely new roles can *emerge*. *Structures* as an object of change was found to change regarding *substitutability*, *centrality*, and *decision-making*.

Trust and *uncertainty* were also found to be important factors in the dynamics within the ecosystem.

We believe that the findings highlight interesting factors that are important for understanding the changes in roles and structures in ecosystems as they mature, and what causes these changes. Besides, we identified several interesting findings beyond the research question that can be generalized to other cases to some degree. First, ecosystems that rely on strong collaboration in the development of the product, service or solution should keep competition out of the co-creation phase as much as possible. Moreover, a clear break between the co-creation and commercial stage ensures a successful product or service development in the co-creation phase before natural competition on value capture unfolds in the commercial stage. Further, our findings indicate that ecosystems have a higher chance of success in a highly uncertain environment, if they start off with a small group of actors that trust each other. Finally, our work shows that actors can design an ecosystem in a way that roles are only loosely tied to the actors that assume them, increasing the robustness of the ecosystem.

7.2 Implications

This thesis aims to contribute to existing literature on the changes in roles and structures in ecosystems over time and causal factors evoking them. When it comes to theoretical contributions, this study adds to several parts of the existing ecosystem literature. Additionally, while we create insights that are somewhat unique to the observed case, which happens to be an extreme example on some dimensions, it is possible to generalize our findings to other cases to some extent. Especially in the healthcare sector, where public and private actors intertwine in the context of public procurement procedures, the findings seem to be highly relevant. More generally, the findings can help managers to understand the reasons behind roles transformations and structural reconfigurations during the lifecycle of an ecosystem. It helps firms to define their ecosystem strategy to successfully manoeuvre and achieve the desired role and influence in an ecosystem. This applies both for contesting desired roles that have been assumed by another actor or assuming roles that newly emerge and defending roles and structures that are being contested by other ecosystem members or third parties. Furthermore, it can help to identify stages where a company might be able to take a leadership role. Finally, it helps participants to understand the importance of trust and

transparency among ecosystem actors enabling them to build a collaborative culture and increase the likelihood of success.

7.3 Limitations

This study is limited in a number of different ways. The first limitation is that only one ecosystem has been researched. Telenor carries out other projects that were not considered in this study. Besides the limited time of one semester, this was due to the fit of the chosen case compared to alternative projects. Since we wanted to explore why and how roles and structures change over time, we opted for the case that was relatively the most mature one in comparison to the other cases.

Even though the chosen case was the relatively most mature one, the maturity of the case still is a limitation since the project only started in the beginning of 2020. This might imply there is a bias towards the positive status quo of the project.

Another limitation is that our research is mostly future-oriented, and the findings are based on the respondents' expectations of the future rather than actual experiences from the past. We received solid insight regarding today's situation, however, since this study concerns an early phase of the ecosystem, there is a high degree of uncertainty involved and things are expected to change, which can in turn change our respondents' assumptions and expectations.

The study is also limited to a single case study within Norway, which makes it highly context sensitive. What makes the case even more context sensitive is the fact that it is a case within the healthcare sector, which has special features that do not exist in other industries (e.g., public regulations). Therefore, the implications might not be valid for other industries.

Another limitation is that we did not get to interview a representative of Microsoft, so the perspective of one of the current players is missing. Despite this, the interviews with all the other current actors and two future actors as well as internal and public documents gave us important and in-depth insight that enabled us to answer the research question.

One last limitation is the fact that, just a few days before the end of this research project, the ecosystem members were informed that they were not chosen as recipient for funding from the Norwegian Research Council. While the project members had agreed upon continuing the project independently of receiving the funding prior to the decision, the approval of the funding was assumed during the interviews when discussing the future of the project. It is

difficult to forecast the consequences of this turn of events and we did not have the opportunity to interview the respondents again before the submission of this work.

7.4 Future Research

Some potential future research areas were discovered while working on this research project. One research area that could complement the existing one, is to study the case again once the decision about platform ownership is made. The ownership-question will be especially interesting in this case as the decision will be made between a private and public actor which might have significant implications for the ecosystem as a whole. Another incentive to study the same case at a later date is that the literature suggests that ecosystems must innovate and evolve to stay relevant. It could be intriguing to analyse if and how the HEMIT ecosystem innovates and evolves.

Since this thesis is a single case study, it could also be interesting to investigate other cases and to use our study to compare whether the roles and structures change differently in other cases and industries.

As mentioned before, the healthcare sector has strict regulations regarding safety and data security. Since our case is affected by these public regulations, it could be interesting to further explore the effects public regulations have on ecosystems.

References

- Adner, R. (2006). Match Your Innovation Strategy to Your Innovation Ecosystem. *Harvard Business Review*, 84(4), 98-107.
- Adner, R. (2017). Ecosystem as Structure: An Actionable Construct for Strategy. *Journal of Management*, 43(1), 39-58.
- Adner, R., & Kapoor, R. (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic management journal*, 31(3), 306-333.
- Adomavicius, G., Bockstedt, J. C., Gupta, A., & Kauffman, R. J. (2007). Technology roles and paths of influence in an ecosystem model of technology evolution. *Information Technology and Management*, 8(2), 185-202.
- Annanperä, E., Liukkunen, K., & Markkula, J. (2015). Innovation in evolving business ecosystem: A case study of information technology-based future health and exercise service. *International Journal of Innovation and Technology Management*, 12(04), 1550015.
- Azure (2021). *What is Azure?* Retrieved from <https://azure.microsoft.com/en-us/overview/what-is-azure/>.
- Barnett, V. (2002). *Sample Survey Principles and Methods* (third edition). Chichester: Wiley.
- Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99-120.
- Bogers, M., Sims, J. & West, J. (2019). What Is an Ecosystem? Incorporating 25 Years of Ecosystem Research. *Academy of Management Proceedings*, 19(1).
- Charmaz, K. (2014). *Constructing grounded theory* (second edition). Thousand Oaks, California: SAGE Publications.

-
- Charmaz, K. (2011). *Grounded theory methods in social justice research*. The Sage Handbook of Qualitative Research (fourth edition). Thousand Oaks, California: SAGE Publications.
- Clarysse, B., Wright, M., Bruneel, J., & Mahajan, A. (2014). Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems. *Research policy*, 43(7), 1164-1176.
- Creswell, J. W. & Creswell, J. D. (2018). *Research Design: Qualitative, quantitative, and mixed methods approaches* (fifth edition). Los Angeles, California: SAGE Publications.
- Dedehayir, O., Mäkinen, S. J., & Ortt, J. R. (2018). Roles during innovation ecosystem genesis: A literature review. *Technological Forecasting and Social Change*, 136, 18-29.
- Dedehayir, O., & Seppänen, M. (2015). Birth and Expansion of Innovation Ecosystems: A Case Study of Copper Production. *Journal of Technology Management & Innovation*, 10(2), 145-154.
- de Vasconcelos Gomes, L. A., Facin, A. L. F., Salerno, M. S., & Ikenami, R. K. (2018). Unpacking the innovation ecosystem construct: Evolution, gaps and trends. *Technological Forecasting and Social Change*, 136, 30-48.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of management journal*, 50(1), 25-32.
- Euronext (2021). *Telenor*. Retrieved from <https://live.euronext.com/de/product/equities/NO0010063308-XOSL>.
- French, J. R., & Raven, B. (1959). *The bases of social power*. *Classics of organization theory*, 7, 311-320.
- Gawer, A., & Cusumano, M. A. (2014). Industry platforms and ecosystem innovation. *Journal of product innovation management*, 31(3), 417-433.

-
- Gawer, A., & Henderson, R. (2007). Platform owner entry and innovation in complementary markets: Evidence from Intel. *Journal of Economics & Management Strategy*, 16(1), 1-34.
- Ghauri, P., Grønhaug, K., & Strange R. (2020). *Research Methods in Business Studies*. Cambridge University Press.
- Guba, E. G. (1981). Criteria for Assessing the Trustworthiness of Naturalistic Inquiries. *Educational Communication and Technology*, 29(2), 75-91.
- Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. Newbury Park, California: SAGE Publications.
- Gulati, R., & Sytch, M. (2007). Dependence asymmetry and joint dependence in interorganizational relationships: Effects of embeddedness on a manufacturer's performance in procurement relationships. *Administrative science quarterly*, 52(1), 32-69.
- Gulati, R., Puranam, P., & Tushman, M. (2012). Meta-Organization Design: Rethinking Design in Interorganizational and Community Contexts. *Strategic Management Journal*, 33(6), 571-586.
- Han, J., Lowik, S., & de Weerd-Nederhof, P. (2017). *Uncovering the conceptual boundaries of the ecosystems: Origins, evolution and future directions*. University of Twente.
- Haugstad, T. (2021, May 25). *Ny teknologi gjør at sykehuset kan komme hjem til deg*. In *Teknisk Ukeblad*. Retrieved from <https://www.tu.no/artikler/ny-teknologi-gjor-at-sykehuset-kan-komme-hjem-til-deg/510387>.
- Health Consumer Powerhouse (2019, February 25). *Euro Health Consumer Index 2018*. Retrieved from <https://healthpowerhouse.com/media/EHCI-2018/EHCI-2018-report.pdf>.
- Helsedirektoratet (2017, February 23). *Nøkkeltall for helse- og omsorgssektoren*. Retrieved from <https://www.helsedirektoratet.no/rapporter/nokkeltall-for-helsesektoren/N%C3%B8kkeltall%20for%20helsesektoren%202016.pdf>.

-
- Helse Midt-Norge IT (n.d.). *Årsrapport 2020*. Retrieved from <https://hemit.no/Documents/Hemit%20%C3%A5rsrapport%202020.pdf>.
- Iansiti, M., & Levien, R. (2004). Strategy as Ecology. *Harvard Business Review*, 82 (3), 68-78.
- Infiniwell (n.d.). *Hospital has left the building. Better care anywhere*. Retrieved from <https://www.infiniwell.ai/>
- Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*, 39(8), 2255-2276.
- Jones, G. R. (2013). *Organizational Theory, Design, and Change* (seventh edition). Upper Saddle River, NJ: Pearson.
- Kapoor, R., & Agarwal, S. (2017). Sustaining Superior Performance in Business Ecosystems: Evidence from Application Software Developers in the iOS and Android Smartphone Ecosystems. *Organization Science*, 28(3), 531-551.
- Krishnaswamy, O. R., & Satyaprasad, B. G. (2010). *Business research methods*. Himalaya Publishing House.
- Lewin, A. Y., & Volberda, H. W. (1999). Prolegomena on coevolution: A framework for research on strategy and new organizational forms. *Organization science*, 10(5), 519-534.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Newbury Park: SAGE Publications.
- Lu, C., Rong, K., You, J., & Shi, Y. (2014). Business ecosystem and stakeholders' role transformation: Evidence from Chinese emerging electric vehicle industry. *Expert Systems with applications*, 41(10), 4579-4595.
- Markham, S. K., Ward, S. J., Aiman-Smith, L., & Kingon, A. I. (2010). The valley of death as context for role theory in product innovation. *Journal of Product Innovation Management*, 27(3), 402-417.

-
- Moore, J. F. (1993). Predators and Prey: A New Ecology of Competition. *Harvard Business Review*, 71(3), 75-86.
- Moore, J. F. (1996). *The death of competition: leadership and strategy in the age of business ecosystems*. New York, NY: HarperBusiness.
- Pagani, M. (2013). Digital Business Strategy and Value Creation: Framing the Dynamic Cycle of Control Points. *MIS Quarterly*, 37(2), 617-632.
- Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health Services Research*. 34(5 Pt 2), 1189-1208.
- Pfeffer, J. (1992). *Managing with power: Politics and influence in organizations*. Harvard Business Press.
- Pulkka, L., Ristimäki, M., Rajakallio, K., & Junnila, S. (2016). Applicability and benefits of the ecosystem concept in the construction industry. *Construction Management and Economics*, 34(2), 129-144.
- Reichertz, J. (2007). *Abduction: The logic of discovery of grounded theory*. London: SAGE Publications.
- Rong, K., Liu, Z., & Shi, Y. (2011). Reshaping the business ecosystem in China: case studies and implications. *Journal of Science and Technology Policy in China*, 2(2), 171-192.
- Rosenkopf, L., & Nerkar, A. (1999). *On the complexity of technological evolution*. Variations in Organization Science, In Honor of Donald T. Campbell. New York: Sage, 169-183.
- Saunders, M. N. K., Lewin, P., & Thornhill, A. (2019). *Research Methods for Business Students* (eight edition). Harlow, England: Pearson.
- Sinkovics, R. R., Penz, E., & Ghauri, P. N. (2008). *Enhancing the Trustworthiness of Qualitative Research in International Business*. *Management International Review*, 48(6), 689-714.

-
- Statistisk sentralbyrå (2018a, March 14). *65 000 per innbygger til helse*. Retrieved from <https://www.ssb.no/nasjonalregnskap-og-konjunkturer/artikler-og-publikasjoner/65-000-per-innbygger-til-helse>.
- Statistisk sentralbyrå (2018b, June 26). *Lavere befolkningsvekst framover*. Retrieved from <https://www.ssb.no/befolkning/artikler-og-publikasjoner/lavere-befolkningsvekst-framover>.
- STLPartners (2018, November). *The Coordination Age: A third age of telecoms*. Retrieved from <https://stlpartners.com/research/the-coordination-age-a-third-age-of-telecoms/>
- STLPartners (2019, October). *Telecoms in The Coordination Age. STL Partners' manifesto for a brighter industry future*. Retrieved from <https://stlpartners.com/coordination-age-manifesto/>
- Telenor (n.d.). *Utredning av 5G og IoT for Helse Midt-Norge – forslag til løsningskonsepter*. Unpublished document.
- Telenor connexion (2021, August 18). *Telenor ranks among top IoT operators in the world, reveals new Berg Insight 2021 global report*. Retrieved from <https://www.telenorconnexion.com/press-release/telenor-ranks-among-top-iot-operators-in-the-world-reveals-new-berg-insight-2021-global-report/>.
- Telenor Group (n.d.). *Telenor Group at a Glance*. Retrieved from <https://www.telenor.com/about-us/telenor-at-a-glance/>.
- The Research Council of Norway (n.d.). *Health Pilot*. Retrieved from <https://www.forskningsradet.no/en/apply-for-funding/health-pilot/>.
- Thomas, L. D. W., & Autio, E. (2020). *Innovation ecosystems in management: An organizing typology*. Oxford Encyclopedia of Business and Management. Oxford University Press.
- Tiwana, A. (2015). Evolutionary competition in platform ecosystems. *Information Systems Research*, 26(2), 266-281.

- Williamson, P. J., & De Meyer, A. (2012). Ecosystem advantage: How to successfully harness the power of partners. *California management review*, 55(1), 24-46.
- Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods* (sixth edition). London: SAGE Publications.
- Zahra, S. A., & Nambisan, S. (2012). Entrepreneurship and strategic thinking in business ecosystems. *Business horizons*, 55(3), 219-229.

Appendices

Appendix A – Consent form

Are you interested in taking part in the research project?

This is an inquiry about participation in a research project where the main purpose is to explore the changes in roles and structures in an ecosystem as the ecosystem matures. In this letter we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

This is a master's thesis at the Norwegian School of Economics which is written as part of the research project DIG. The purpose is to cover the research gap that exists on how roles and structures within an ecosystem change as it matures. The project will be limited to the autumn semester of 2021. It is expected that the report and results will be used as part of the DIG project, and possibly our supervisors' future work on ecosystems.

Who is responsible for the research project?

The Norwegian School of Economics (NHH) is responsible for the project. Franziska Haffer and Moritz Oberschachtsiek in collaboration with NHH and Telenor.

Why are you being asked to participate?

You have been asked to participate in this study because you have a central role in the ecosystem we explore and therefore have important information that helps to shed light on the topic.

What does participation involve for you?

You will participate in one or more semi-structured interviews that will take between 60 and 90 minutes to perform. The interview(s) will be audio-recorded.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation. All personal data will only be available to the researchers (Franziska Haffer & Moritz Oberschachtsiek) and the supervisors (Bram Timmermans & Lasse B. Lien). In the study you can be quoted in anonymous form (e.g., person A). You will not be able to be recognized in the publication. Personal data and codes, and audio recordings will be stored on separate secure platforms.

What will happen to your personal data at the end of the research project?

All personal data, audio recordings and transcribed texts will be permanently deleted once the master's thesis has been submitted, which will be on the 20.12.2021.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with NHH, NSD (The Norwegian Centre for Research Data AS) has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- Franziska Haffer: franziska.haffer@student.nhh.no
- Moritz Oberschachtsiek: moritz.oberschachtsiek@student.nhh.no
- Bram Timmermans: bram.timmermans@nhh.no
- Lasse B. Lien: lasse.lien@nhh.no
- Data Protection Adviser for Research at NHH: personvernombudet@nsd.uib.no
- NSD – The Norwegian Centre for Research Data AS: personvertjenester@nsd.no or by telephone: +4755582117

Yours sincerely,

Researchers

Franziska Haffer & Moritz Oberschachtsiek

Consent form

I have received and understood information about the research project and have been given the opportunity to ask questions. I give consent:

- to participate in interviews
- for my personal data to be processed until the end of the project

Signed by informant, date

Appendix B – Main interview guide

Practical information

- We are two master students from NHH, and we are writing our thesis within DIG (Digital Innovation for Growth – Norway’s leading research centre on digital transformation and innovation for sustainable growth) and in collaboration with Telenor on the main topic of ecosystems.
- Thereby, we have received the HEMIT project as our case, where we are now conducting interviews with members from all ecosystem partners in order to explore why and how roles and structures (in the sense of power) change within an ecosystem as it matures.
- Outlook on the structure of the interview: (1) General questions about the ecosystem, (2) roles and structures in the past and present (3) roles and structures in the future

Introduction

- Could you introduce yourself and your role in [company]?

HEMIT ecosystem

- What is the fundamental goal of the ecosystem?
- How has [company] been involved in the HEMIT project?
- When and how did [company] become a part of the project?
- What are your experiences with being a part of the project?
- How has it been to work with the other actors in the project?
- Has there been disagreement about specific decisions in this project so far?
 - If yes, how have these disagreements been solved?
- Has there been some concrete challenges for [company] in this project?

Roles and structures in the past and present

- Roles:
 - How do you regard your company’s role in the project?
 - Did you actively assume that role or was it more of a natural process?

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- Do you think your role has changed?
 - If yes, why?
 - Do you think that your role has changed (when XY happened)?
 - How do you regard the role of [company]?
 - Do you think it has changed?
 - How do you see your company's relationships to the other actors in the project?
 - Did it change?
 - Are some partners in the project harder to collaborate with than others?
 - Does your company have any previous relationship with any of the partners of this project?
- Structures:
 - With which critical competences/resources has [company] contributed to the project so far?
 - Since Infiniwell is the smallest actor in the project, does this affect your perception of them?
 - Since Telenor is the biggest actor in the project, does this affect your perception of them?
 - Would you say that status and size in general have any impact on how decisions are made or how the ecosystem is perceived?
 - Are there any resources that only one actor has that the project is dependent on?

Roles and structures in the future

- What happens if the Norwegian Research Council does not grant the fund?
- Assuming the funding will be granted:
 - When we focus on the final service (outpatient healthcare platform), which role will [company] take in providing this service?
 - With which critical competences/resources will [company] contribute to the final service?

-
- When we focus on providing the final service, do you think [company] might have to assume a different role than it assumed in the planning stages?
 - When we focus on the final service, do you believe Telenor or HEMIT will be the platform provider and service enabler?
 - Does it affect your company whether Telenor or HEMIT is going to be the platform provider/owner?
 - What are the considerations (advantages/disadvantages) for each scenario?
 - What will you do to achieve your preferred scenario?
 - How will the decision between the scenarios be made?
 - Assume [company] stops to contribute to the project, how easy do you think it would be to replace them?
 - We've received insights that the plan is to onboard many new players to the platform if the funding is granted.
 - Who decided that these players will enter the ecosystem?
 - Why do you think [company] will join the system and what do you expect their role to be?
 - Do you think you might experience pressure from any other [XY] providers that might try to substitute your company?
 - Do you think that other current players might get substituted by players from outside the ecosystem?
 - What do you think it needs for the project to be realised?
 - Which challenges do you see in the future of this project?
 - Do you see the fact that public and private actors are involved as a potential challenge?
 - Do you see the strict regulations regarding data and security in the health sector as a potential challenge?

End:

- Is there something you would like to clarify?
- Is there something we have not talked about that you would like to add?