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*Strategies of Entrepreneurial
Companies within the Mobile NFC
Business Ecosystem*

MSc in Innovation and Entrepreneurship

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Abstract

Mobile NFC technology has been considered one of the key trends over the last two years. However, very few commercial and successful deployments have happened since its appearance. Furthermore, the major initiatives have been driven for large players such as Mobile Network Operators and Banking Institutions resulting in a dominant position of well-established and large companies. A Business Ecosystem (BE) is a network compound of both established companies and new ventures with a common goal. Thus, the purpose of this study was twofold – firstly to understand the structure, evolution, dynamics and health of the Mobile NFC ecosystem and secondly, to explore how Entrepreneurial Companies (ECs) face such a broad system from a strategic point of view. This was accomplished by developing a theoretical framework constructed from two main fields of research, i.e. Business Ecosystem and Strategic Entrepreneurship. A multiple and holistic case study was conducted and data collected was based on interviews with Founders, Vice Presidents and CEOs of five different ECs – all of which perform NFC activities in the Nordic/Norwegian market. The analysis was focused mainly on the Norwegian context but it was also necessary to refer to the Nordic and Global context due to early stage of development. The findings are consistent with prior literature, in the Norwegian Mobile NFC Ecosystem, ECs are defining their strategies based on the broader ecosystem. A platform leader (keystone) strategy was identified in order to build the infrastructure, enhance and facilitate the growth and productivity of the network and likewise, there was identification of the presence of several niche players – each with the purpose of exploiting specific opportunities and strategies that contribute not only to their own performance, but to the overall health of the ecosystem.

Keywords: Mobile NFC Technology, Business Ecosystem, Strategic Entrepreneurship, Norwegian Mobile NFC Business Ecosystem, Entrepreneurial Companies, Strategy, Platform Leader, Keystone, Niche Player, Business Ecosystem health.

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List of key acronyms

BE	-	Business Ecosystem
B2B	-	Business to Business
B2C	-	Business to Consumer
EC	-	Entrepreneurial Company
EMV	-	Europay, MasterCard and Visa
GPN	-	Global Policy Network
NFC	-	Near Field Communication
NMNBE	-	Norwegian Mobile NFC Business Ecosystem
MNO	-	Mobile Network Operator
OEM	-	Original Equipment Manufacturer
SE	-	Strategic Entrepreneurship
SEI	-	Secure Element Issuer
SME	-	Small and Medium-Sized Enterprise
SIM	-	Subscriber Identity Module
SP	-	Service Provider
RFID	-	Radio Frequency Identification
TSM	-	Trusted Service Manager

1. Introduction

The first chapter will provide a background of the chosen topic and why it is important to investigate it further. In addition, I will state the objective and purpose of this study and also draw its delimitations.

1.1. Background

In the last decades we have seen different innovations and subsequent trends in the mobile phone evolution (GSMA, 2012). What started with analogue (i.e. voice only phones) was followed by digital voice and data; then, there was the appearance of new features such as high-speed data, Internet, cameras, touch screens, application stores, location-based services and most recently, a new spectrum of services based on *NFC technology* has emerged.

NFC technology per se is not a new term at all; this technology has been used during the past decade in the form of Smart Cards – for instance cards for public transportation like the Oyster Card in London and building access key cards. Moreover, this technology has been widely used in the payment industry where it has been fostered by international payment schemes such as Visa (Paywave) and MasterCard (PayPass). This technology has had a steady growth in different markets with Asia as an early mover, followed by Europe and Latin America (Euromonitor, 2010).

Mobile NFC technology is the combination of contactless services based on NFC technology combined and strengthened with all the features that offer mobile technology such as screen, communication link, keyboard, memory, processing power and one of the most important strengths, which is access to hardware-based security identity token – which could be in different form factors such as a SIM card or an SD card (GSMA, 2012), the latter is crucial for sensitive services such as payment.

This research project will focus on two main topics: the network of companies with a common goal (i.e. commercialization of NFC services) and secondly strategic thinking of entrepreneurial companies (ECs), which are part of that network.

1.2. Problem formulation

One of the key characteristics of Mobile NFC technology is the support of multi-application. This refers to the possibility of storing different applications from different service providers¹ (SPs) in the same secure element (SE)² of the mobile NFC handset hence making it possible to store in the same device: a mobile payment card of Bank X, a mobile payment card of Bank Y, a mobile transport card of Transport Operator Z, and a mobile access key of Hotel W. Therefore the need of a specific NFC mobile handset, a specific NFC secure element (e.g. NFC SIM) and a complex network compound of a multi-industry environment are the main factors related with the problem definition.

GSMA states that Mobile NFC brings new services to the consumer in a wide variety of industries (GSMA, 2012) such as: payment, retail, transport, ticketing and government. The latter will produce a complex technical and business network compound of a large number of stakeholders – each of them with individual strategies and targets. Thus, interests of each player must be harmonized; the solution and service needs to be interoperable in order to gain market acceptance and furthermore collaboration among all the different actors is required (Benyo, 2009).

According NFC Times (Times, 2013) there are around 210 Mobile NFC Projects (see Figure 1) around the world. However, few of them are considered successful commercial initiatives. The majority is either in pilot stage or has yet to take off completely. What are the barriers when it comes to commercial deployments? Ten identified barriers have been found (Apanasevic, 2012) where the biggest challenge is located in a macro environment context. According to Apanasevic, the absence of global agreements on a business model, specific legislation, undeveloped infrastructure, lacking of critical mass of consumers and co-opetition are the main obstacles.

¹ A Service Provider can be considered any entity willing to offer mobile NFC Services such as Banks, Transport operators, Loyalty Companies, etc.

² GlobalPlatform, a leading GPN in this field, defines Secure Element as the component in a device providing the security and confidentiality required to support various business models. An SE can exist in any form factor such as SIM, Embedded SE, Secure Memory Card, etc.

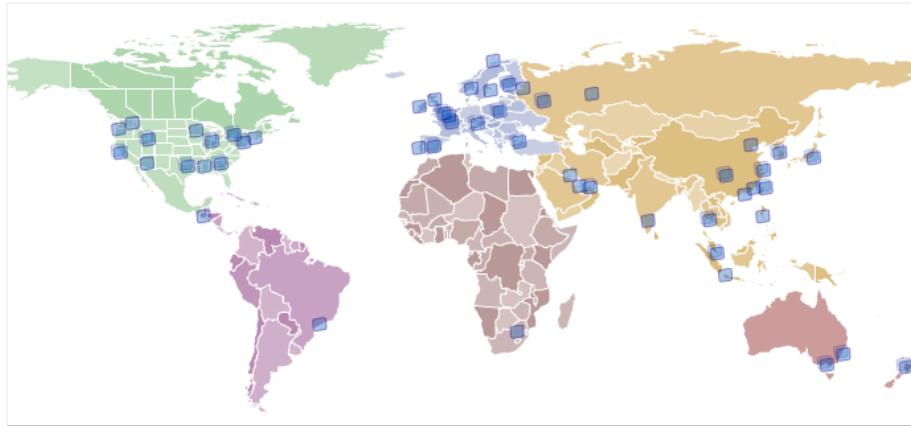


Figure 1 Mobile-NFC Projects Source: (Times, 2013)

The business network compound of different players with a common objective, i.e. the proliferation of Mobile NFC services, is called Mobile NFC Business Ecosystem. This business network is rather complex and is still under development in several regions around the world. In fact, a mature ecosystem has yet to exist and there is a lot of skepticism regarding the success of this technology and thus the survival of both ECs and the NFC Business Ecosystem per se (Hodgkinson, 2013) is still in doubt.

In global NFC commercial initiatives, it is possible to visualize that the main players are well-established companies such as MNOs and SPs, namely banks and transport operators in addition to Handset and Smartcard manufacturers, meaning there is a dominant position held by well-established and large companies.

However, it is a reality that both established companies and new ventures are part of the same network and as such, both need to engage themselves in order to contribute to the health of a Business Ecosystem (BE). Thus it is important to understand the current situation in regards to this specific context, which differs from other external environments where traditional *new ventures strategies* such as Blue Ocean (Mauborgne & Chan, 2004) or Lean Startup (Ries, 2011) can be adopted. Overall, it is interesting to explore how new ECs face such a structured and complex ecosystem from a strategic point of view.

1.3. Purpose and objective

With the given background and problem formulation, the purpose of this master thesis is to:

“Explore and analyze the Mobile NFC Business Ecosystem and the strategic thinking of entrepreneurial companies immersed in it”.

The overall objective of this master thesis is “to identify how strategic thinking of entrepreneurial companies contribute to both the health of the individual firm and the NFC Business Ecosystem by drawing upon a combination of Strategic Entrepreneurship, Business Ecosystem theories and qualitative data analysis”.

1.4. Delimitations

This master thesis delimits its scope to primarily looking at ECs that can be considered potential players in the Nordic and Norwegian Mobile NFC BE. However, since this ecosystem is still under development, I will also refer to the global situation whenever it is required. Additionally, part of this research will map the current Norwegian ecosystem by depicting the main members who are part of it and the services they offer.

On the other hand, it is out of the scope of this research to study the role of Global Network policies in BEs but how they support standardization will be mentioned briefly. In addition, regulatory agencies and governmental influences are not part of this study. Overall the main focus will be the B2B performance within the network and how those relationships contribute to the health of the Business Ecosystem and the firms as such.

The result of narrowing down the research topic to focus as much as possible on the Nordic/Norwegian Mobile NFC Business Ecosystem was tactical since the student has practical experience in this field and made it easier to collect required data. Finally, it is important to mention that this research was limited to 17 weeks of work – which constrained what kind of data and how much data was collected – and the limited number of ECs in this field was also a limiting factor during the data collection stage.

2. Literature Review

This chapter presents and discusses existing literature in regards to my research topic; therefore, the purpose is to identify relevant sources which are important for the definition of my theoretical position. The literature review will focus in three main fields i.e. Mobile NFC technology, Business Ecosystem theories and finally Strategic Entrepreneurship. It is important to mention that part of this section identifies the gaps in these fields and ideas that were used to refine this research.

2.1. Literature Review

As part of the literature review process, I gathered information from different sources such as books, articles, white papers, scientific papers, conference reports, Internet sites and journals. More specifically I have focused my research using tools such as Google Scholar and the following specialized databases: ESBSO Host: Business Source Premier, ProQuest ABI/INFORM Global and Emerald.

There are three main research streams covering the chosen topic:

- ❖ **Mobile NFC Technology:** The purpose is to give the reader an overall understanding about the technology in addition to findings and research gaps with regards to this field.
- ❖ **Business Ecosystems:** The literature in regards to this field will be crucial in order to understand the main implications about complex and structured networks; this field will cover the collective interests of different stakeholders with the aim of deploying and commercializing Mobile NFC services.
- ❖ **Strategic Entrepreneurship:** Finally, SE will support the second pillar of this research, which is about the ECs per se, the individual interest and their internal forces; thus, it is important to know the current findings, how this is being developed and how it can be expanded.

Keywords: Business ecosystems, NFC technology, mobile technology, entrepreneurship, strategy, start-up, SE , NFC in Norway, NFC projects, NFC commercial projects, strategy, Business Ecosystem keystone, Business Ecosystem Creation, Business Ecosystem health, strategic thinking, NFC challenges.

2.1.1. Mobile NFC Technology

NFC stands for Near Field Communication and is a standard which covers communication protocols and exchange data formats based on existing radio frequency identification (RFID) technology. It is designed to operate over short distances (around 4 cm) and has a maximum speed rate of 424kbps (NFC Forum, 2006).

As discussed in the introduction, NFC technology per se is not new at all. However, *Mobile* NFC technology is considered as an emerging technology and as a matter of fact, it is considered one of the top ten strategic technologies of 2013 (Petty, 2012). While there is a limited amount of current literature, a NFC Research Framework has been defined and evaluated (Özdenizci, et al., 2010) and serves as a crucial base for this research. The NFC Research Framework covers four main categories: NFC Infrastructure, NFC Applications and Services, NFC Ecosystem and NFC Theory and Development – where the first two categories can be considered as within the technical fields, whereas the last two are considered as within the business field (strategy, business models, stakeholders, context and foundations).

A total of 74 academic papers were reviewed and classified using the proposed framework. According Özdenizci et al. (2010), NFC technology has been considered a hot topic for academic research in recent years. However, the majority of the work that is being developed is mainly in the technical field. Only 4.05% of the total review was dedicated to NFC Business Models and Processes and 5.41% to NFC Stakeholders, Structure and Culture. Evidently there is a lack of attention in areas such as economy, strategy, business networks, business values, culture, policy and legal issues related with NFC Technology. Thus, it is the purpose of this research to contribute to this field by focusing in business networks and strategic thinking for commercialization of services based on this emerging technology.

It is important to stress that despite the excellent job performed by Ozdenizci, et al.(2010), the paper has two main limitations. The first one is that there is a limited time frame of 2006-2010 and the second one is a limited number of referenced journal papers. Therefore, additional literature review that has been developed, such as discussions of the role of Global Policy Networks (Andersson, et al., 2011) is relevant in order to understand the role of formal institutions and influence on business practices

especially in the context of external environment forces. Likewise, the work performed by Apanasevic (2012) where the main obstacles and barriers that face NFC pilots on the way to commercial deployment were identified is essential.

Finally, in regards to business networks, I found interesting the findings in regards to the trust factor among the different business relationships required for deployment of NFC Services (Bockish & Cantú Alejandro, 2010).

2.1.2. Business Ecosystems

It is important to start by defining the concept of a Business Ecosystem (BE), which is a relatively new research stream in the field of innovation management. The pioneer in this field is James F. Moore (Moore, 1997). As stated by Moore, *“like the idea of democracy galvanizing a society, the idea of a business ecosystem provides a vision and proof of concept that multiple contributors with different interests can join in a common cause”* (Moore, 2005, p. 31). A BE, from a technical perspective, can be considered as a network of firms that collectively produces a holistic, integrated technological system that creates value for customers (Mäkinen & Dedehayir, 2012). Furthermore, an ecosystem may cross over different industries; a clear example is Apple as a member of an ecosystem that interacts over several industries such as PC, electronics, information and communication.

Mäkinen and Dedehayir (2012) provide an extensive literature review in regards to the key characteristics and evolutionary dynamics of this topic. The authors focused their study in four main aspects: BE's members and their roles, factors that influence the evolution of BE, the dynamics of ecosystem change and the strategic considerations of firms positioned in ecosystems where all aspects were covered by 68 articles gathered from ISI Web of Knowledge database.

It is important to emphasize the contribution from Iansiti and Levein (2004) due to the relevance in identifying the ecosystem's members and corresponding strategic roles. The authors believe that the organizations are not isolated, but instead the economy is driven by a complex network of organizations that are interrelated and depend on one another for mutual effectiveness and survival. As the authors state, *“Strategy is becoming, to an increasing extent, the art of managing assets that one does not own”* (Iansiti & Levein, 2004, p. 1). This is one of the crucial points in this matter since firms

must manage these external assets and a clear example is technologies that go beyond their own boundaries.

In a BE, the organization and network success must reflect the collective performance of all network members and not just the maximal perform of some at the cost of possible failure for the network as a whole. This is a crucial directive in the context of BEs (Iansiti & Levien, 2004).

Furthermore, BEs are mirrored with its biological counterpart (Moore, 2005) by stating a firm may employ “niche” or “hub” strategies. In their opinion, niche strategies are pursued by a larger number of firms and look for differentiation by focusing in unique capabilities and leveraging key assets provided by others. On the other hand, hubs adopt one of three different strategies: keystone, dominator and landlord (Iansiti & Levien, 2004).

In order to create a competitive advantage, firms must examine characteristics of their own ecosystem in which they are involved. It is important to stress that in this project I will apply this concept in order to evaluate specific strategies of ECs rather than well-established companies as focused in Iansiti & Levien’s work. Moreover, it is important for this research to evaluate how ECs strategies will impact the overall health of the broader ecosystem. Finally, Iansiti and Levien’s work explain briefly the role of regulations or markets when it comes to being keystones or dominators. This is a possible further study for research and Foer (2004) provides a good starting point for this topic from an antitrust perspective.

The second broad theme is about the evolution of the business ecosystem – which is about interdependent organizations that evolve reciprocally with one another and the factors that play important roles in this evolution. The authors have identified a wide variety of works in this field including findings such as the terms of co-opetition – where firms can cooperate and compete at the same time (Basole in Mäkinen & Dedehayir, 2012) – and processes of firms such as feeding-off, supporting and interacting with one another in exchanging knowledge and resources (Bahrami and Evans in Mäkinen & Dedehayir, 2012).

The third main topic is about the dynamics of ecosystem change where literature describes a BE as a hierarchical network of innovation and corresponding businesses in

order to explain this internal process. Thus, an ecosystem is comprised of firms on different levels in the hierarchy, all of them with certain purposes. A firm specializing in the production of a certain module will endeavor to continuously innovate and capture returns from its innovations, but there is also an innovate interdependence that is prevalent in ecosystems (Adner, 2012).

Overall, there is a wide variety of literature explaining the concept of BE (Peltoniemi & Vuori, 2004), a complete literature review of roles, evolution and strategies of business ecosystems (Mäkinen & Dedehayir, 2012). Additionally, there are also works in regards to the evaluation of the health of a business ecosystem from an analytical perspective (Li, et al., 2013) and even business modeling (Tian, et al., 2008). However, I have perceived a lack of research work targeting entrepreneurial companies immersed in business ecosystems. How do they face the structured and complex network? What kinds of strategies are being adopted by new ventures? What role do they have in a BE? Only Zahra & Nambisan (2012) have written an interesting paper about strategic thinking of both new ventures and well-established companies across four types of business ecosystems.

2.1.3. Strategic Entrepreneurship

The literature in regards to this field is scarce, essentially theoretical and the outcome of its developmental nature has resulted in various models. Foss & Lyngsie (2011) have developed a broad literature review of the main contributions in this field from different angles, having as main dependent variables: firm performance and wealth creation and several independent variables: organization structure, entrepreneurial mindset, environmental conditions, collaboration and innovation.

As depicted in Figure 2, SE is the intersection of entrepreneurship and strategy. According to Ireland (in Sascha, et al., 2011) there are six domains in SE: innovation, networks, internationalization, organization learning and growth and top management teams.

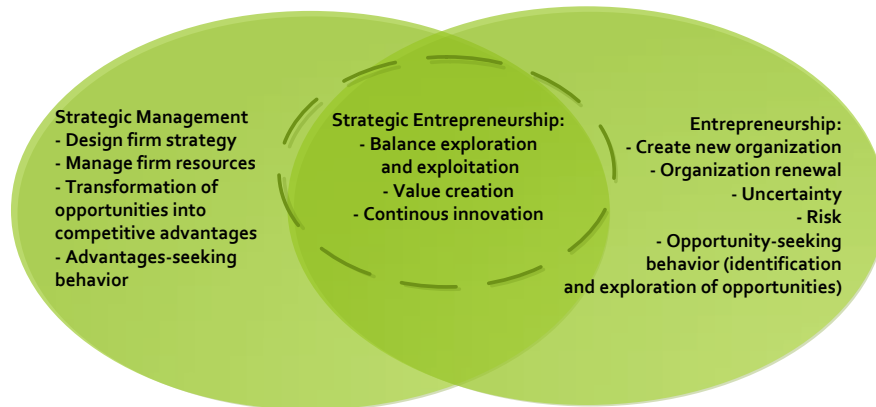


Figure 2 Strategic Entrepreneurship Source: (Ireland and Web in Kraus et al., 2011)

A revised model by Ireland in (Sascha, et al., 2011) introduced 4 dimensions of SE: entrepreneurial mindset, entrepreneurial culture and leadership, strategic management of resources and applying creativity to develop innovations.

There is a compelling work which aims to build a conceptual framework for SE but further research is required in the field of SE applied in the domain of collaboration and alliances (Luke, et al., 2011). Thus, a BE is an accurate context to explore this field in a practical method such as in this research. Overall, Luke et al. (2011) summarizes SE as a distinct process founded on bringing something new to the market; a combination of innovation, opportunity identification, and growth.

Another perspective within this field is about strategic thinking as a driver for influencing the decision making process of individuals to perceive, identify, create, undertake and grow a new business venture (Alsaaty, 2011, p. 67). Furthermore, strategic thinking is required throughout the whole life cycle of a new venture as Alsaaty states: “*creating a whole new business venture is an act of strategic thinking*”.

There is a distinction between vertical thinking and strategic thinking, where the former is just sequential, disciplined, and rule based whereas the latter is lateral, critical, and creative. Thus, business minded individuals with strategic thinking skills are more likely to become successful entrepreneurs in the long run (de Bono in Alsaaty, 2011). Overall, the author summarizes benefits (see Figure 3) from strategic thinking towards entrepreneurs.

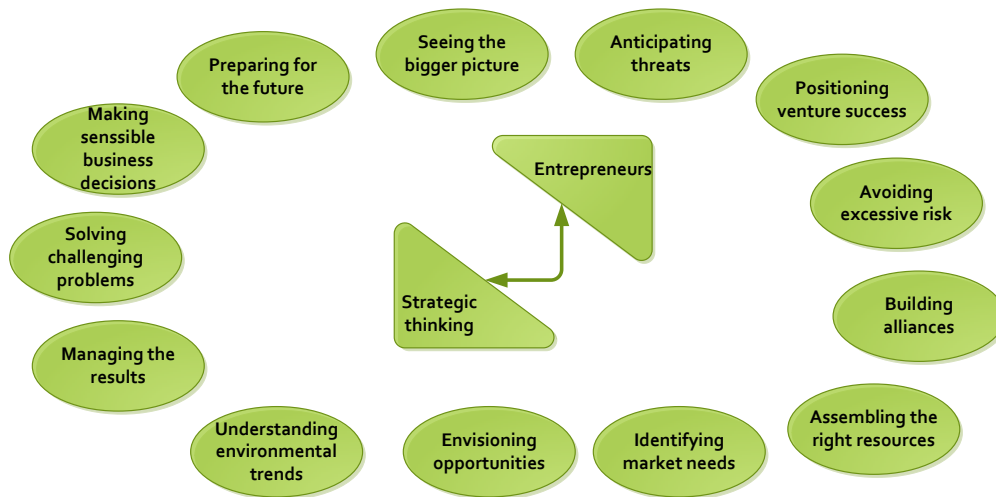


Figure 3 Benefits of strategic thinking to Entrepreneurs Source: (Alsaaty, 2011)

Foss & Lyngsie point out a central idea about SE, i.e. opportunity-seeking and advantage-seeking, where the former is a central subject of the entrepreneurship field and the latter a central subject of the strategic management field. Both processes need to be considered jointly by going beyond the focus of start-ups entrepreneurial (opportunity discovery) characteristics and paying attention to the established firms as a source of entrepreneurial actions (seeking competitive advantage). This is supported by Hitt (in Foss & Lyngsie, 2011, P. 8) by stating, “*firm’s strategic intent must be to continuously discover and exploit entrepreneurial opportunities, in order to continuously create competitive advantages that lead to maximum wealth creation*”.

Sascha, et al., (2011) developed a conceptual model in regards to this topic by using a configuration approach in their perspective established firms, SMEs and start-ups firms where each needs to be differentiated according to the situation in which they operate, in terms of general availability of resources, as well as the organizational structures and capabilities of different types of firms. In summary, the author proposes six interrelated domains for a new conceptual model of SE (see Figure 4). Combining different models (Ireland, Hitt, Harms in Sascha, et al., 2011), the author emphasizes the differences in the situations of the firm and its corresponding growth process. The findings makes an outstanding contribution for this research where the focus is early-stage ECs and as such, the purpose of this research is to find the implications of the different domains in the case of ECs within the Mobile NFC Business Ecosystem and to test whether or not SE can be a method for survival in such a context.

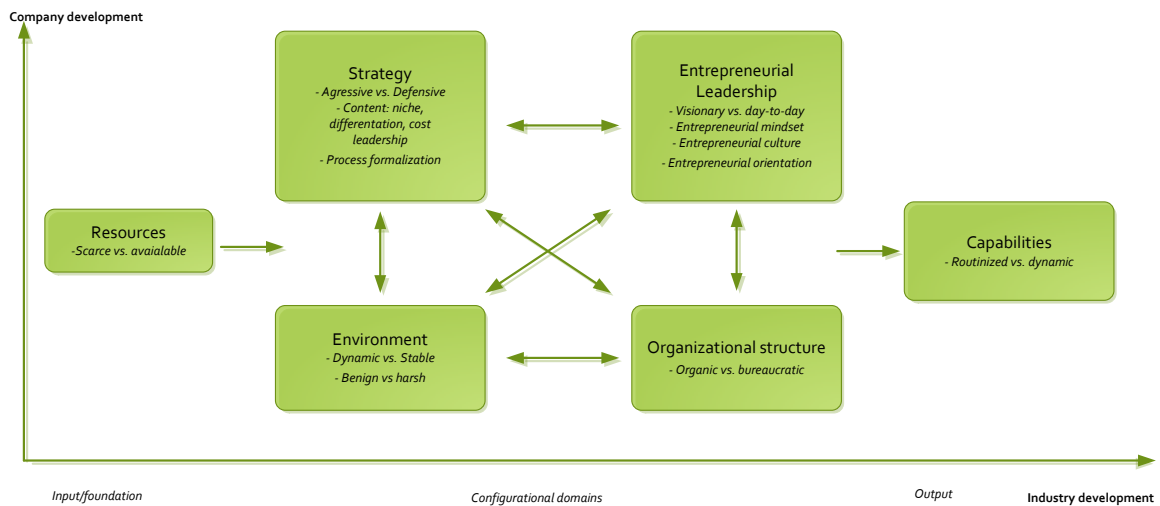


Figure 4 Identifying domains of SE through a developmental configuration approach Source: (Sascha et al., 2011)

SE is quite a broad concept and hence, there is lack of practical studies (Alsaaty, 2011). Therefore, the purpose is to apply these theoretical frameworks to a specific field of practice and subsequently contribute to the current literature. I will also extrapolate and test these theories in order to apply it to both the health of a business ecosystem (wealth creation) and the health of the entrepreneurial firm (firm performance). Furthermore, SE transcends hierarchical level and can be applied to small firms, large firms, established firms as well as new ventures (Agarwal, Audretsch & Sarkar, inalsaaty, 2011) as in the case of a BE.

2.2. Theoretical Position & Conceptual Framework

Figure 5 explains the theoretical position of this research. As depicted, the goal is to link two main fields for research, i.e. BE and SE, in order to contribute to the current literature of those two fields and to test the concept in a real and current phenomenon.

In order to target the first part of this research, I will describe Mobile NFC Ecosystem by building a model of the current ecosystem and giving a general overview of the current situation in the global and regional context (1). Furthermore, I will narrow down and dig into this topic by analyzing main aspects of the Norwegian Mobile NFC Business Ecosystem (NMNBE) which are relevant for this study. Firstly, I will study the members and their roles in this ecosystem (2) in order to identify the key members, key functions, influences and positions. Secondly it is important to understand the

implications in regards to evolution (3) and finally to explore the internal dynamics in a complex and structured network (4).

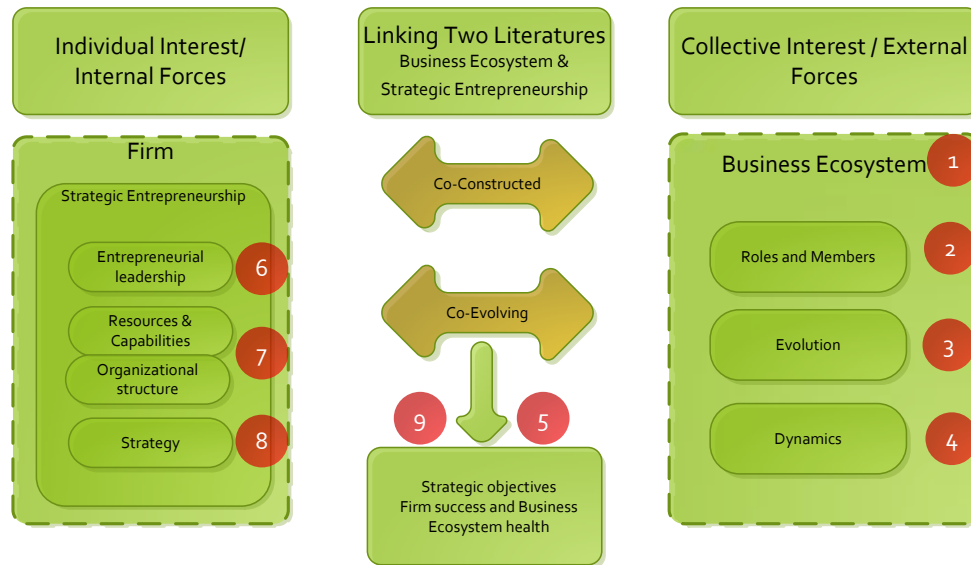


Figure 5 Theoretical Framework

The first part will end with a focus on the symbiotic relationship between ECs and their BE with a deep analysis of the BE health and its implications towards ECs (5).

The second part will be focused in the individual interest, i.e. the ECs within the Mobile NFC Ecosystem. Thus, I will first describe a general overview of ECs (mainly startup companies and corporate sponsored companies) that are considered as potential entrants in both the Nordic and the NMNBE.

This will be followed by an analysis of ECs and SE in this context three domains will be analyzed: the domain of the entrepreneur as decision maker (6), resources & capabilities of the company and the organizational culture of the company (7). Next, there will be a focus on strategic thinking of ECs immersed in this ecosystem (8). By having a general overview of these three domains, it will then be possible to close the second part of the analysis by exploring the influence of SE on the firm's performance (9).

Overall, this conceptual framework will be used in order to answer the research questions which will be presented in the following section.

2.3. Research questions

In order to seek the answer to the objective, the following research questions have been formulated:

- ❖ **RQ1.** How is the NMNBE constructed? And what are the implications towards ECs?
- ❖ **RQ2.** Who are the key members? And what are their roles?
- ❖ **RQ3.** How is the current evolution of the NMNBE? And what are the implications towards ECs?
- ❖ **RQ4.** How are the internal dynamics of the NMNBE? And what are the implications towards ECs?
- ❖ **RQ5.** How is the NMNBE health and what is their influence towards ECs?
- ❖ **RQ6.** What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?
- ❖ **RQ7.** What resources are required by ECs immersed in the NMNBE?
- ❖ **RQ8.** What strategies are adopted by ECs within the NMNBE?
- ❖ **RQ9.** How does strategic thinking influence the health of ECs immersed in the NMNBE?

3. Research methodology

This chapter explains the research framework to be used in the process for achieving the defined objective. I will first give a brief introduction about the rationale behind the case study research followed by the case design per se and methods. Next, I will explain the data collection process followed by the analytical method and reporting. Finally, issues about validity and reliability will be addressed.

3.1. Introduction

In every research project it is necessary to consider underlying assumptions in order to assure validity of both research and design (Myers, 1997). The proposed philosophical perspective for this project will be interpretive since the aim is to produce understanding of the whole context within the Mobile NFC Business Ecosystem.

Following the same line, the level of research is exploratory – involving both deductive and inductive reasoning. As I have seen in current literature, there is little research in regards to my problem statement. The goal is to develop a better insight in regards to SE of ECs within BEs and also test the propositions developed from the literature. As Wilson states: “*where there is a lack of published research about a given topic an exploratory research is a viable research design*” (Wilson, 2010).

The methodology or research design to be implemented will be a Case Study where as stated by Yin, “*A case is an empirical enquiry that investigates a contemporary phenomenon within its real context, especially when the boundaries between phenomenon and context are not clearly evident*” (Yin, 2009). Likewise, the nature of this research project (objective, purpose and research questions) requires a need for detailed understanding and an in-depth analysis of a specific and real problem.

3.2. Research design and method

In order to link initial research questions of the research study with the collected data and the conclusion to be addressed, a proper research design is needed. There are five components of a research design: (1) Study’s questions, (2) Propositions, (3) Unit of analysis, (4) The logic linking the data to the propositions, (5) The criteria for interpreting the findings.

The first component has been described in Section 2.3. The outcome of this research question clarifies the boundaries of this study by stating the organization, context and

geographical area to be studied. Likewise, it is important to define these questions in order to define exactly the type of evidence to be collected and the priority for the data collection process (Yin, 2009).

Albeit this thesis is an exploratory study, it was important to define propositions derived from the overall purpose and developed from the literature in order to guide a deep analysis within the scope of this study and to point out what is necessary to study.

The third component is about the unit of analysis for the case being studied. For this thesis, one main level unit of analysis will be adopted:

- ❖ Entrepreneurial companies, including corporate sponsored and independent entrepreneurs with a focus in the firm part of interaction within an external environment, i.e. the Mobile NFC Business Ecosystem.

It is important to stress the relevance of the context and its analysis. The Mobile NFC Business Ecosystem will describe the overall mechanism of the whole system, which is important in order to understand the dynamics towards ECs.

The fourth and fifth components about linking data to propositions and criteria for interpreting the findings will be elaborated in Section 3.5. The main purpose of these components is to present and indicate the steps of data analysis and techniques.

Next, it is necessary to present the case study design. A multiple-case was used for this study in order to follow a replication design and to predict similar results in regards to this phenomenon. Furthermore, in order to focus on the holistic aspect of the design and to avoid the pitfall of focusing on embedded units rather than the main unit per se, I will follow a holistic approach (see Figure 6). As stated by Yin, *“the holistic approach is needed when the relevant theory underlying the case study is itself of a holistic nature”*. It is important to emphasize the flexibility of this design from the beginning – therefore allowing modifications during the data collection phase.



Figure 6 Multiple Case Design Source (Yin, 2009)

3.3. The case study research design process

In Figure 7, we can see the case study design process, which was based on the Cosmos Corp Case Study Method, used in this thesis. The process began with the definition and design phase which was about developing a theoretical framework focusing in SE and BE theories followed by the case selection targeting ECs mainly based in the Nordic region.

The second phase was about preparing, collecting and analyzing each individual case study as a whole. Therefore, an individual case report was written in order to reach replication. The dashed lines show the flexible approach adopted where important findings during the data collection may impact the initial theoretical propositions. Finally, during the last phase, a cross-case report was drawn as the main tool for concluding the research questions.

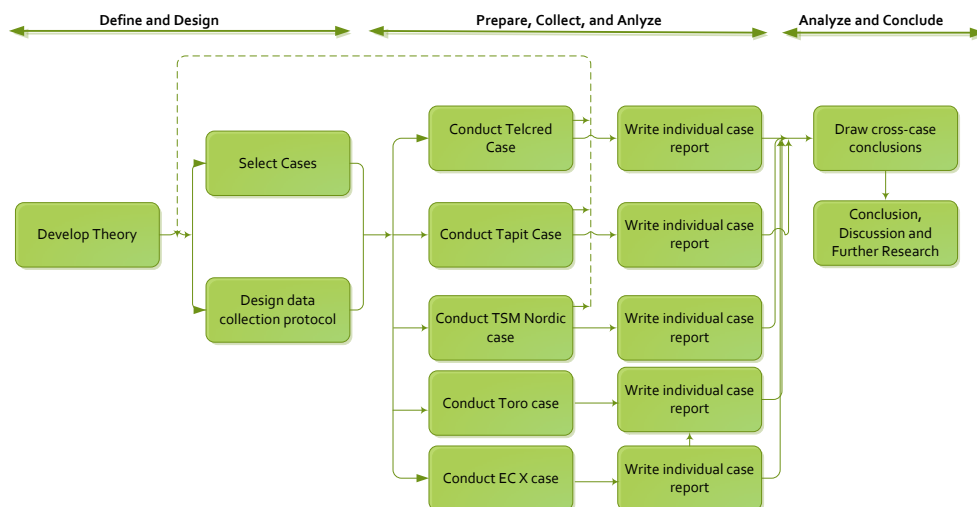


Figure 7 Research design process Source (COSMOS Corporation mentioned in Yin, 2008)

3.4. Data Collection

The data collection protocol is relevant for multiple-case studies and a major way of increasing reliability of research (Yin, 2009). The first part of this protocol is an introduction to this case study research (see Chapter 1). In the second part of this protocol, data collection procedures that comprise mainly of sources of data and access to the case study sites will be mentioned.

The data collection was based on a combination of semi-structured interviews and documentary analysis of each unit of study – meaning articles, white papers, mass media, and press releases. The most important use of those documents was to corroborate and augment evidence from other sources. By combining these methods, conclusions were made not only based on interviews, but also from different sources of information; hence increasing validity by the use of data triangulation (Yin, 2009).

In the interviews, I focused in gaining access to key persons with deep knowledge about the company and their corresponding strategies. Thus, I targeted CEOs, founders and Vice Presidents for each company (See Appendix E). Furthermore, the nature of these interviews was “focused” – following a conversational matter where questions were carefully worded in order to avoid bias.. Thus, it was extremely important to define a line of questions and therefore an interview guide was developed (See Appendix A).

The interview guide consists of a set of questions reflecting the line of inquiry. Questions were carefully selected and categorized according to the defined theoretical framework in order to assure the data was collected according to the needs. In this interview guide I mainly focused on level 1 question, i.e. the actual specific questions for interviewees. However, in order to not lose sight, I also included level 2 questions, which represent the mental line of inquiry.

The interviewees were contacted by email invitation – where I received 5 positive answers out of a total of six invitations. Each interview was planned according to the availability of the interviewees and all interviews lasted a maximum of 60 minutes. Four of the interviews were conducted through Skype and one interview was conducted face-to-face. Each interviewee was asked to accept terms of confidentiality and anonymity (only 1 EC decided to remain anonymous) and all Skype interviewees were recorded using a Skype recorder plug-in while a mobile device was used to record for face-to-face interviewees.

As I have previously discussed the use of data triangulation for this project, it is also important to emphasize two additional principles of the data collection phase: a case study database and chain of evidence. For the former, a digital case study was constructed and the database contains notes, recordings, transcriptions, documents and coding. The purpose of this was to make raw data for independent inspection in order to increase reliability of the entire study (Yin, 2009).

Yin suggests maintaining a chain of evidence by allowing the reader to trace every step, in either direction, from initial questions to case study conclusions (see Figure 8). In this sense, reliability of the project is increased.

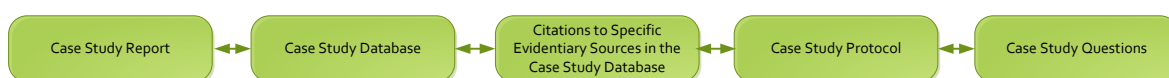


Figure 8 Chain of evidence Source: (Yin, 2009)

As will be explained in Section 3.5, an individual report was written for each case study where each report contains the presentation of data collected and the analysis of the data. This set of individual reports was the grounds for the first part of the analysis (Section 4.1), which contains citations to interviews and documents part of its corresponding databases – allowing the reader to follow the stated protocol where it is linked in the content with the initial questions.

3.5. Analytical method and reporting

The analysis phase started with the transcription of each interview followed by the coding stage, where it was possible to fracture the data into categories and also allowed identification of the main codes related with the research questions. The main goal of codes is to facilitate in the comparison of data, categories and different case studies (Wilson, 2010).

The approach for coding data was a combination of both emergent coding and priori coding since some categories had been predetermined through the theoretical framework while several new categories were developed during the examination of the data. This approach provides the flexibility to note any unforeseen codes (Wilson, 2010). Furthermore, I used open coding to label – having a total of 8 categories and 20 labels – and a coding frame table was produced in order to facilitate a comparative analysis process.

The overall strategy in this phase was “*Relying on theoretical propositions*” (Yin, 2009) – where theoretical propositions were crucial during the design phase and remain relevant at this point to shape the data collection plan. I explored codes in depth in order to find patterns, themes and ultimately build broader concepts considering the defined theory (Strauss & Corbin in Wilson, 2010). As analytic tool, I used a pattern matching logic in order to compare the patterns found during the coding phase with predicted ones.

As discussed in Section 3.2, this research is based on a multiple case structure. Therefore, the first part of the analysis is presented using a generic report covering the BE ecosystem while the second part consists of the individual reports presented for each case study where each individual report is composed of an introduction of the company and a summary of the main findings in regards to the propositions. The conclusion chapter covers the cross-case analysis where the reader will be able to see either replication or contrasting results.

3.6. Reliability and validity

There are four commonly used tests in order to enhance the reliability and validity of a research project (Yin, 2009). Some of these have been discussed in the previous sections; however, it is important to have a general overview of the tests used in this research project.

Firstly, I followed a data collection protocol that is extremely important for increasing reliability of multiple-case studies. Triangulation was used by a combination of semi-structured interviews and documentary analysis for each unit of study. Thus, it was possible to increase validity by using this method.

Through the use of a case study database case, all data collection was carefully documented. Additionally, the use of chain of evidence made it possible to establish a traceable inference throughout the analysis. Both of these elements contribute to the reliability of the project.

During the analysis phase, patten matching and replication logic were used in order to increase validity. Finally, for the reporting phase, each case study report was sent to the respective interviewee for final input and confirmation in order to increase the veracity of the facts.

4. Results and analysis

The first part of this chapter aims to analyze the Mobile NFC Business Ecosystem illuminated in the defined theoretical framework where I will focus on analyzing the Nordic region and narrow it down to the Norwegian context. The intention of the first part of this analysis is to build a knowledgeable foundation in order to provide a complete understanding of the context and to put the reader into perspective. Moreover, I will answer the first set of research questions related to the collective interest of the Business Ecosystem (RQ1, RQ2, RQ3, RQ4, and RQ5). The second part of this analysis aims to analyze and summarize key factors of ECs immersed in the aforementioned context, considering ECs as focal companies within the ecosystem; therefore, the second set of research questions (RQ6, RQ7, RQ8 and RQ9), related to the individual interest and internal forces of the firm, will be addressed.

4.1. The mobile NFC Business Ecosystem

Following a top-down approach, I will firstly give a general overview of the NFC Ecosystem at the global level in order to visualize the complete universe of firms that are participating in this ecosystem and their linkages. Afterwards, I will go one level down by analyzing the Nordic region and finally, I will focus on the local scenario, i.e. the Norwegian context (NMNBE). It is at this level where I will analyze the key factors in conjunction with the empirical investigations.

Thus, I will identify and analyze the *current* main players in the Norwegian ecosystem by identifying current roles and main functions (*AS-IS model*). I will also analyze the evolution by describing a potential *TO-BE* model for this ecosystem. This analysis will be dedicated to the internal dynamics, i.e. the level of interdependence among the different firms, and at this level I will focus on the whole network, which is formed by both well-established firms and entrepreneurial firms. Finally, I will close this section by giving a high level assessment of the health of the NMNBE.

4.1.1. Global Context

I will use a network map in order to visualize stakeholders as nodes, the linkages and relations among them. Firstly, Figure 9 depicts the different industries that are involved in the Global Mobile NFC BE; all of them may potentially boost the proliferation of NFC services towards the end user.

The Mobile NFC BE is being built by a mixture of existing ecosystems from different industries and new stakeholders will be needed. According to the project data base of NFC Times (Times, 2013), from a total of 214 projects worldwide, 71% has been driven by the Payment industry in conjunction with the Telecom industry. The previous statement was confirmed by all interviewees, stating that nowadays only big players – meaning Banks and MNOs – have the power to foster the technical infrastructure required for the deployment of mobile NFC services.

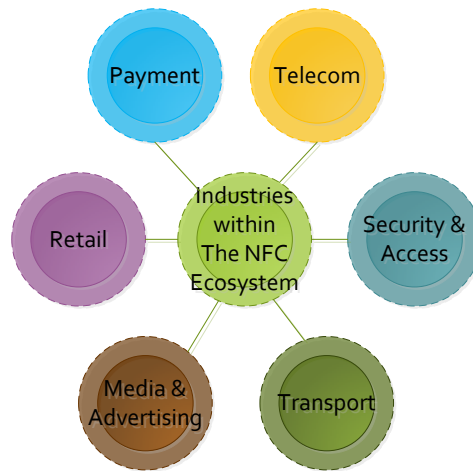


Figure 9 Industries within the Mobile NFC Ecosystem

Albeit the majority of main initiatives have started having bilateral relationships between MNOs and Banks, it is foreseen that once the basic infrastructure is in place, new players will come on board. This will produce a complex network with a significant amount of players. Figure 10 depicts the main stakeholders in the Mobile NFC BE as well as its corresponding connections among them where the thickness of the connecting lines corresponds to the degree of interaction in the ecosystem.

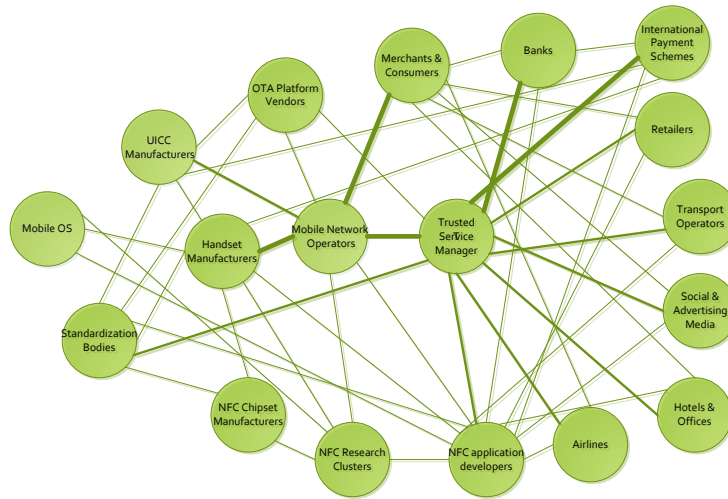


Figure 10 Mobile NFC Business Ecosystem (Global level)

As mentioned before, the ecosystem has been driven by either alliances of MNOs (e.g. ISIS, Weve,) or multiplayer alliances (e.g. IDA, TSM Nordic, Gran NFC Korea Alliance). In general, the purpose of all these alliances is to set an interoperable NFC infrastructure. Appendix B presents a summary of the main global commercial NFC Business Ecosystem around the globe.

When it comes to Mobile NFC Services in the Nordic region, there are initiatives in all Nordic countries. However, the maturity of each business ecosystem differs among the countries in terms of technical and business feasibility (refer to Figure 11).

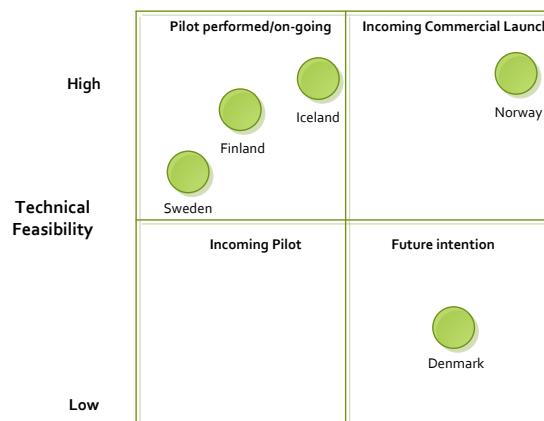


Figure 11 Nordic Mobile NFC Initiatives

Denmark presents the lowest intention for commercialization, followed by Sweden where despite of the fact that they have performed several pilots, there is still no

agreement among the different MNOs and SPs to initiate a real commercial initiative (NFC World, 2013).

On the other hand, Finland and Iceland are likely to initiate commercial activities, with Finland having Elisa MNO as a main driver and Iceland having had a successful pilot. Overall, only Norway has started to build a real commercial Mobile NFC BE. Therefore, in the next section, this country will be analyzed in detail (see Appendix C for a detailed description per country).

4.1.2. Local context

In this section, I will analyze the Norwegian Mobile NFC ecosystem (NMNBE) in depth. Nambisan & Sawhney propose different models for network-centric innovation systems where in such models it is possible to visualize different ways of generating value, different types of intermediaries, relationships and roles (Nambisan & Sawhney, 2009). Due to the nature of NMNBE where technology and innovation play an important role, the proposed model suits perfectly in order to find out *How the Norwegian NFC Mobile NFC Business Ecosystem is constructed and what are the implications towards ECs? (RQ1)*.

Figure 12 depicts two different ecosystems within the Norwegian context based on the nature of the NFC service. This has an impact in terms of innovation space and network leadership, implying that the “secure” NFC BEs faces more restrictions in terms of innovation in addition to more formal structures compared to the “non-secure” BEs.

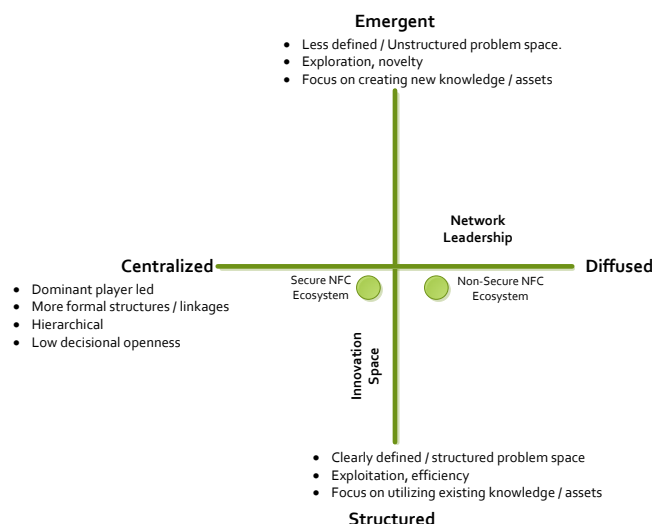


Figure 12 Norwegian NFC Network Model Source: (Nambisan & Sawhney, 2009)

Based on the current perception of the structure of the NMNBE, I will present a suggested model that may be considered as a potential approach for the incoming development of this ecosystem in Norway. An innovation network is comprised of four different models of ecosystems: Orchestra, Creative Bazaar, Jam Central and MOD Station (see Figure 13).

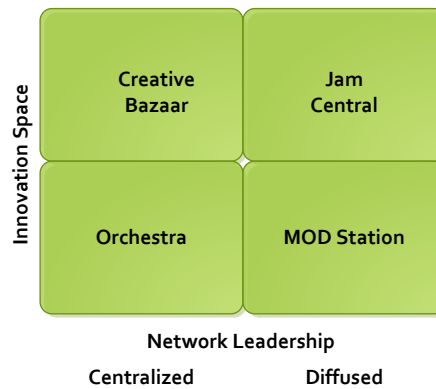


Figure 13 Model of Network-Centric Innovation Source: (Nambisan & Sawhney, 2009)

By using the model of network-centric innovation as a form of representing an ecosystem, it is possible to visualize that the NMNBE for secure NFC Services is following an Orchestra Platform model.

In regards to non-secure NFC Services, the NMNBE differs to some extent. In this context, members have less dependency amongst themselves and possess a more diffused ecosystem; therefore following a MOD station model.

In Figure 14, the current NMNBE is depicted as it is being constructed nowadays and we can see the members that are already part of this ecosystem. As discussed before, the lines represent current interconnections or ones that are under development where these interconnections represent a business and technical relationship.

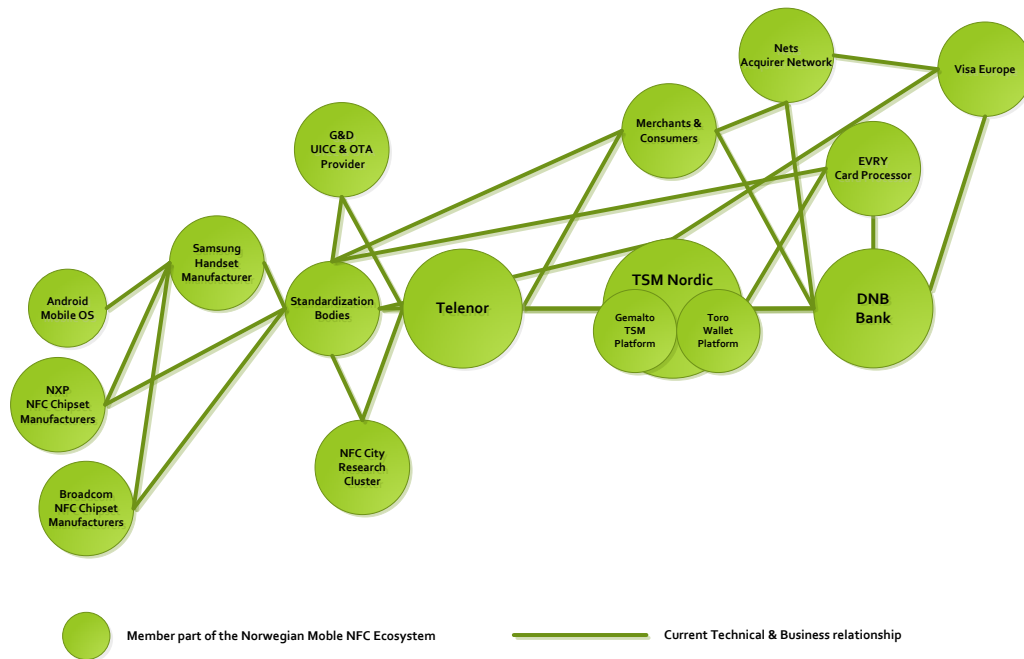


Figure 14 AS-IS Norwegian Mobile NFC Business Ecosystem

Even though this ecosystem is under development, we can see that there is already a complex network of different players, a network of organizations, and even different industries that co-evolve both their capabilities and roles (Moore, 2005) to further align their investments with the ultimate goal to create value for the consumer.

4.1.3. Roles and members

Current literature defining specific roles and key stakeholders in the Mobile NFC Ecosystem from a technical perspective (GlobalPlatform, 2013) and from the activities they perform (Forum, 2011; de Bel & Gaza, 2011) already exist. Thus, the purpose of this section is to instead analyze key stakeholders and their roles from an operating strategy perspective.

Clearly, one of the key roles within a Business Ecosystem is serving as a hub. In order to determine this key player, we need to first identify the node with the highest number of connections and the degrees of separation between nodes – where in the case of the latter, hubs on average have a smaller number than the other nodes. This is a pattern that can be visualized in any kind of network (Iansiti & Levien, 2004). With regards to Figure 13, it is then possible to identify that case 3, TSM Nordic, is the node with the highest number of connections.

Next, it is important to identify the role of the hub. In regards to TSM Nordic, the main goal is to decrease complexity involved in the coordination and integration of new members in the Norwegian Mobile NFC ecosystem. As stated by the interviewee, “*TSM Nordic will be the platform provider, the enabler, that will be our main role*”; furthermore, “*TSM Nordic will create a cluster of services that you pool together from smaller companies to make a big, common service so all stakeholders can benefit*” (Ramstad, 2013).

From a technical/service perspective, TSM stands for Trusted Service Manager. A TSM company is an independent trusted party which facilitates the provisioning and secure life cycle management of mobile NFC services (Forum, 2011). However, TSM Nordic aims to go further by not only being a technical enabler, but also a business broker. They aim to serve as a neutral business and technical platform in order to achieve productivity and growth of the ecosystem.

Figure 15 depicts the relationship between the different cases. Toro is an EC which provides a mobile NFC Wallet platform. In that sense, Toro is a technical partner of TSM Nordic in the Norwegian context and will therefore, together with Gemalto (TSM technical provider), serve as technical integrators for the ecosystem.

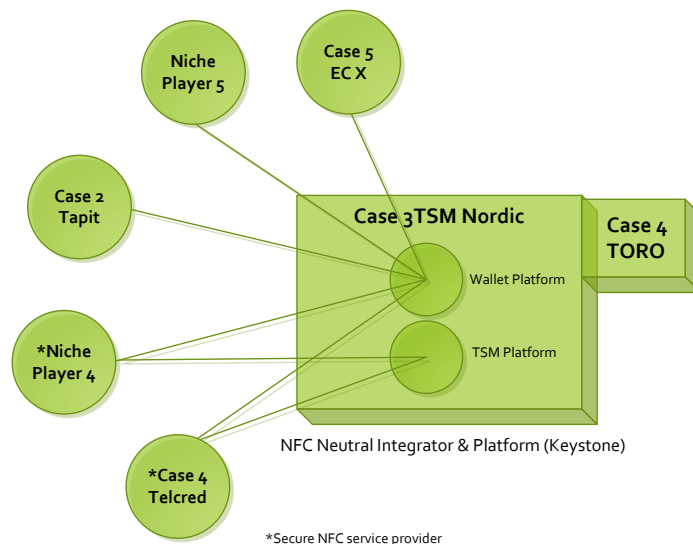


Figure 15 Business Ecosystem roles and relationships

The next role to identify in the NMNBE is niche players. The literature describes them as “species” that individually do not have an impact on other species in the ecosystem. However, collectively, they represent the bulk of the ecosystem. Thus, Case 1, Case 2, and Case 5 can be considered to be part of this category. All these companies aim to

exploit a specific capability – access control for Case 1,, marketing & advertising for Case 2, and social media) for Case 3 – in order to differentiate from each other.

So far, I have used the different cases to identify the two main roles derived from the biological system theories and adapted to a business ecosystem: niche players and keystone. Subsequently, the main purpose of the second research question is to then highlight that the strategic role adopted by the key members will have an influence on the overall ecosystem health, as stressed in Section 4.1.6, and the company performance per se.

4.1.4. Evolution

In the context of the NMNBE, TSM Nordic, as a platform leader, will connect technologies of different members (e.g. Telcred or Tapit). In addition, it is also possible to visualize complementors and component makers (e.g. Samsung, NXP, G&D) that will produce different technological subsystems (Li in Mäkinen & Dedehayir, 2012). Hence, besides cooperation, competition will also occur – resulting in a co-opetition approach followed by MNOs and SPs where there is a need to cooperate at the infrastructural level but also a need to compete at the application level in order to foster the evolution of the ecosystem.

With regards to external factors, it was not possible to identify any factor in the social and economic environment that could influence the direction of the ecosystem. However, all of the interviewees agreed that new technological changes could take place in new application domains outside of the focal services and one predicted that, *“In about 10 years from now, you’ll pay with your phone everywhere. You’ll probably interact with everything. So you have, obviously, all the marketing impressions you have every day you walk outside with movie posters – everything will be kind of enabled with NFC”* (Bakos, 2013). Furthermore, the evolution of the business ecosystem may be impacted from a competitive environment. This is something that is already happening currently – where cloud solutions (e.g. PayPal) are actually challenging the whole NFC Business Ecosystem due to the fact that it presents less complexity and a smaller investment (Yarbrough & Taylor, 2012).

Finally, Figure 16 depicts how the NMNBE may evolve in the upcoming years. Considering the roles, strategies, and evolution, it is possible to see potential key

entrants that will increase the diversity of services and therefore growth and productivity of the ecosystem.

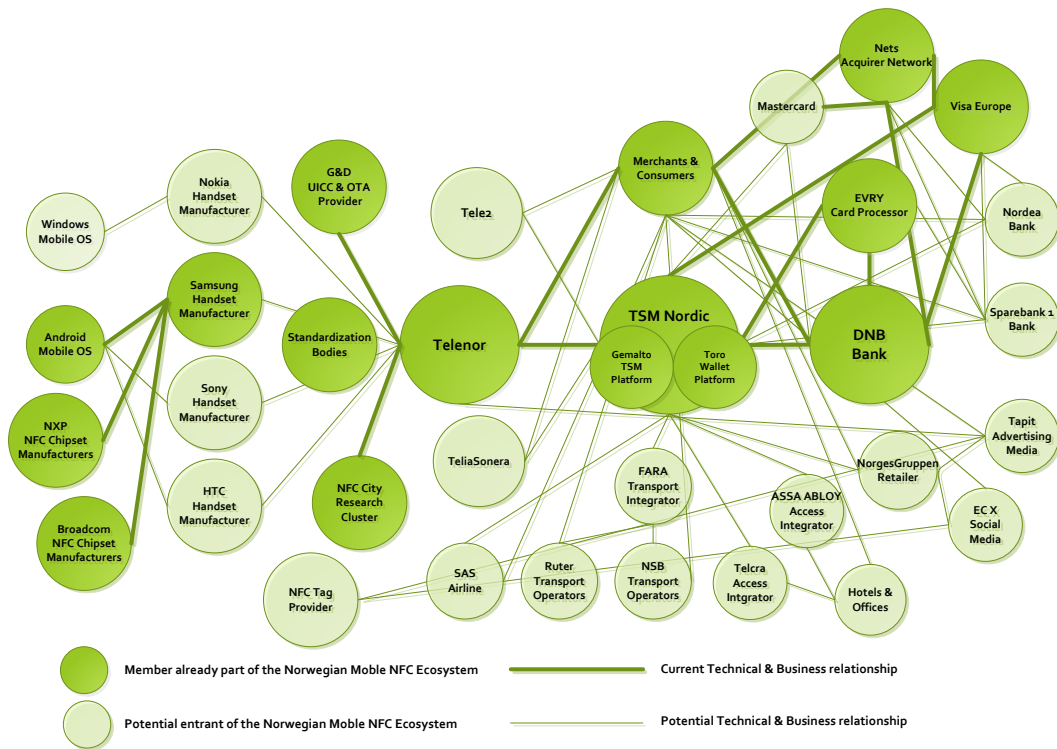


Figure 16 TO-BE Norwegian Mobile NFC Business Ecosystem

4.1.5. Dynamics

This section will focus on dynamics of change internal to the ecosystem. As previously stated, an ecosystem is a hierarchical network of innovations and corresponding businesses and hence consists of a set of modules and sub-systems, which can be considered as a component of a higher level (Mäkinen & Dedehayir, 2012). Therefore, a BE from a module producing firm can be represented as a module that comprises a number of components but at the same time is one module among other complementing modules (Adner & Kapoor, 2010) as shown in Figure 17.

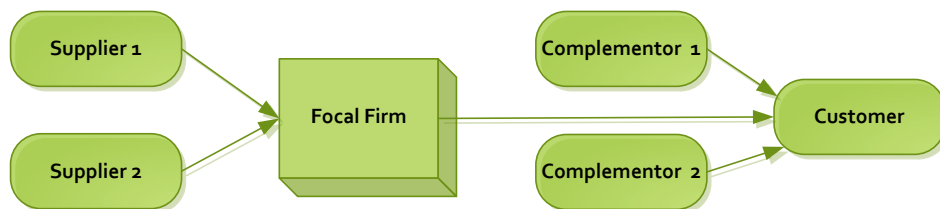


Figure 17 Schema of a BE from the view of a module producing firm Source: (Adner & Kapoor, 2010)

As can be seen in Figure 18, TSM Nordic, Toro and Telcred are the companies that experience the highest level of interdependence in order to both create value and reach the final end user. Any failure or constraint from either a complementor or supplier will impact the performance of the focal firm.

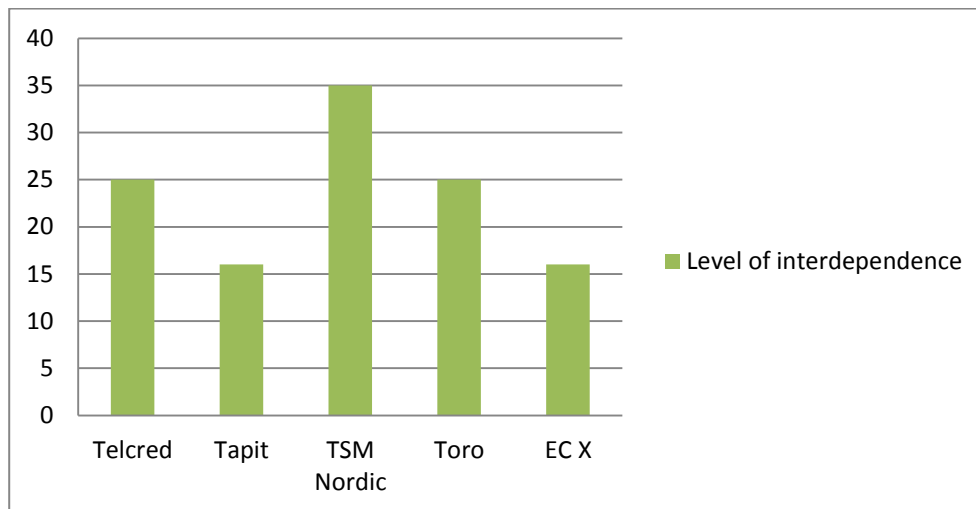


Figure 18 Interdependence between the focal firm and its components Source: Appendix D

4.1.6. Health

In this section, I aim to answer RQ5 by exploring the health of the NMNBE – crucial factor. Moore states that before releasing a product, it is important to make sure that the entire ecosystem is working (Moore, 2005). Hence, it is important to know and assess the actual health of the external environment.

RQ5 was answered using the five attributes framework proposed by Qiang, which extends previous works in regards to the health of BEs' (Li, et al., 2013). According to Qiang, in order to analyze a business ecosystem, there are five health attributes: ecological attributes, structural attributes, functional attributes, operational attributes and life cycle attributes. Figure 19 maps these attributes with regards to the NMNBE in order to give an overview of the current health.

Figure 19 Norwegian Mobile NFC Business Ecosystem Health Source: (Qiang et al, 2012)

Attribute	Index	Norwegian Mobile NFC Business Ecosystem	Indicator
Ecological Attributes	Ability to promote performance, economic spillover and ability to utilize it, smooth operation, competition level and competition order.	Ecological attributes refer to both ecology and complex system adaptive theories. One of these attributes is synergetic evolution, which is about the growth. Figure 16 depicts a potential scenario for the NMNBE evolution although it is still difficult to visualize the economic spillover effect on the involved companies. Secondly, self-organization refers to breaking original competition channels and looking for more “co-opetition” strategies. This can be seen in the <i>wallet framework</i> proposed by TSM Nordic – where SPs will compete at the application level, but cooperate at the “ <i>wallet</i> ” level. Finally, adaptability is where innovation and management performance will be relevant in order to assure the stability of the ecosystem.	
Structural Attributes	Number of support and complementary enterprises, contribution of direct suppliers/distributors, investment prospects, technical accumulation and future attention by scientific research institutions, industrial polity and regulatory support by authorities.	The basic structure is initiated by TSM Nordic with complementary companies that are comprised mainly of Nets, Evry, and Samsung are in place while Apple is an important threat for this structure (iPhone ~40% market share in Norway). Additionally, niche players are popping up and offering a wide variety of complementary services (such as Case 1, 2 and 5) and enriching the ecosystem. In regards to investment institutions, two big players are investing in NFC technology (Telenor & DNB) and potential entrants, especially new banks, are visualized to join in this context. As part of the support mechanisms, The Research Council of Norway, Tromsø Country Council and University of Tromsø are functioning by developing NFC research clusters.	
Functional Attributes	Rate of return on common stockholders’ equity, enterprise survival rate, new enterprise success rate, growth rate of enterprise.	There are certain limitations to measure this criterion in general. Firstly, there is no current empirical data to measure it and secondly, a quantitative approach will be needed. However, it is possible to have a general perception (Case 3) in regards to the expected rate of return. According to TSM Nordic, there is a considerable amount of investment for a platform set-up and operational costs that may hinder the integration of new stakeholders and impact financial performance and	

		reduce robustness.	
Operational Attributes	Transparency and confirmation of 'value platform' strategy of business ecosystem, profitability compatible commercial opportunities of value sharing platform of business system and contract stability.	<p>In regards to this matter, I highlight the operating strategy adopted by TSM Nordic, which is positioned as a neutral, trustable and shared platform. In that sense, there is indeed a strategic clarity in order to ensure long-term stability of value-shared in the NMNBE.</p> <p>Platform compatibility is crucial not only in technical matters but also commercial opportunities. Technically speaking, the platform is being built with neutral standards directed by GPNs. Therefore, new companies will be able to “plug-in” without any restriction. While the situation is complex commercially as previously mentioned, the investment and operating cost are considerable (Ramstad, 2013) and this may hinder the business model and prices for integration of new players. Finally, contract stability refers to the mutual understanding and trust among different members through an implicit contract. Again, the role of TSM Nordic will be crucial, not only as platform enabler, but also as commercial broker with the capacity to manage B2B relationships in order to guarantee cooperation among large scale companies.</p>	
Lifecycle Attributes	Current phase in which the system becomes healthier from exploitation to authority and national economic and technical development level	<p>The author suggests four phases of a BE life cycle development course. The NMNBE is in the early stage, i.e. the exploiting phase where different companies are conceiving, designing and establishing a value platform. However, it is possible to visualize the incoming expanding phase as depicted in Figure 16 where it is possible to scale and increase the number of members in order to acquire a more expansive market breath.</p> <p>Finally, the last two phases envisioned are the Authority phase, where there is a core platform providing long term value, and Rallying phase, where there is necessary to reconstruct the value platform by introducing new ideas or rebuilding technology.</p>	

■ Attribute satisfied ■ Attributed satisfied partially at the current stage ■ Attribute is not satisfied or there is at least one showstopper.

4.2. Entrepreneurial companies within the Mobile NFC Business Ecosystem

This section covers the second part of the analysis illuminated in the theoretical framework – which aims to analyze key factors in regards to strategic thinking, mindset and performance of ECs as focal companies within the Mobile NFC Ecosystem. It is important to emphasize that I will be referring to the Nordic area (regional context) due to the nature of each case study. Additionally, in this section I will also present an individual report for each case study that was used as a *pillar* of analysis for Section 4.1.

The case selection was mainly conducted based on ventures with less than five years of life and less than 35 employees. According to Crunchbase, there are only a total of 83 companies globally with less than 35 employees that are offering some kind of product/service related with NFC technology (Crunchbase, 2013). This depicts limitations in terms of timing and number of companies venturing into this field. Following a judgmental sampling, I succeeded in including a wide variety of different players within the Nordic context with reference to their roles described in Section 4.1.3.

Next, I will introduce each company followed by an individual report including results of data gathered through the interviews as well as other secondary sources. It is important to highlight that each individual report aims to answer the rest of the research questions, RQ6, RQ7, RQ8 and RQ9, and present individual perspectives with regards to the first set of research questions.

4.2.1. Telcred

Telcred is a spin-off from the Swedish Institute of Computer Science. The company aims to commercialize an idea which was born in 2006; this initiative was led by Dr. Babak Sadighi whose research was centered on security, policy and trust. The aim of the project was to develop an innovative model for physical access control which uses NFC capability of mobile phones. The current result model is now being commercialized by Carlo Pompili, the current CEO of the company.

The innovation involves a strong focus on security, over-the-air distribution of credentials, off-line verification, resource constrained lock controller, scalability and simple maintenance. Telcred is building their competitive advantage through the use of a patented technology and by targeting a state of the art approach based on signed

certificates and asymmetric cryptographic methods, all of which differentiates its solution from other competitors (Telcred, 2013).

Among the main partners of Telcred are ARTEMIS Industry Association³, which sponsors a research in embedded systems. Telcred is also a partner in the research project nSHIELD⁴, which addresses technologies for Security, Privacy and Dependability in embedded systems, in addition to being a part of the incubator program with STING⁵ (Stockholm innovation & growth), which is a leading incubator that functions in helping entrepreneurs to build international growth. As previously implied, as a spin-off from SICS⁶ (Swedish Institute of Computer Science), Telcred is also in partnership with the security research group at SICS, which is the leading computer science research institute located at Kista, north of Stockholm. Finally, Ericsson IPX was also a partner in a pilot project. However, it was later acquired by Gemalto with whom Telcred has no formal relations with today.

Overall, Telcred is a research-based startup which develops solutions for the next generation of access control systems and tries to solve the problem of traditional key management which can be considered inefficient and insecure. The latter is particularly true, especially for large organizations (shipping companies, telecom operators, utilities), which use traditional keys to protect their assets or restrict areas.

Currently, Telcred is running a joint pilot project with KTH with the goal of launching commercially before the end of 2013. Telcred mainly targets enterprise customers and plays the role of a product company selling both hardware and software in addition to doing direct sales. However, they do not discard the option of playing an OEM role and/or licensing their technology.

Figure 20 Telcred Individual case results and analysis

Theory		Case
<i>Business Ecosystem- Collective Interest / External Forces</i>		
Research Questions	Propositions	Telcred Analysis

³ www.artemis-ju.eu

⁴ www.newshiled.eu

⁵ www.stockholminnovation.com

⁶ www.sics.se

RQ1. How is the NMNBE constructed and what are the implications towards ECs?	P1a. The NMNBE is constructed following an innovation approach which relies on harnessing the power of network and communities to increase growth, robustness and productivity.		Telcred is immersed in a complex network where technical and business connections will be required in order to deploy their services. This implies that it is necessary to have a structured compound composed of different stakeholders with a common goal, i.e. the development of NFC Services.
	P1b. The NMNBE is following the Orchestra Model where there is a prominent network leader and a structured innovation space.		Due to the nature of its product, i.e. “secure” NFC service, Telcred experiences certain restrictions not only from platform leaders (such as in an Orchestra Model) but also from GPNs. In their opinion, the situation should not be as such and the business ecosystem should be open and diffused.
RQ2. Who are the key members? And what are their roles?	P2a. The NMNBE is a compound that consists of one hub keystone and several niche players.		Within the Mobile NFC Ecosystem, Telcred is playing a niche role. They are dependent on a platform leader (keystone) such a TSM or an MNO (SE Issuer) in order to get the service to the market.
RQ3. How is the current evolution of NMNBE? And what are the implications towards ECs?	P3a. The NMNBE follows a co-evolutionary process among members as interdependent organizations that evolve reciprocally with one another.		The evolution of Telcred depends on the current evolution of the ecosystem. At the moment, Telcred has not been able to evolve due to limitations of their current context. Their evolution will depend on having an open SE where the customer, as opposed to the large players, will decide on the final service.
	P3b. The relationship between firms may be cooperative as well as competitive – resulting in co-opetition among ecosystem members.		Telcred, as a service provider is required to cooperate with SE (Secure Element) Issuers. However, co-opetition is not required. In fact, in terms of competition, they are in a niche position, which allows defining specific market entry strategies.
RQ4. How are the internal dynamics of the NMNBE? And what are the implications towards ECs?	P4a. Insufficient component performance will not allow the focal firm to develop beyond its existing performance level. Furthermore, insufficient complementor performance will not allow the focal module to demonstrate its full performance potential towards the end user.		Telcred is not able to commercialize massively without having access to SE (Secure Element). Thus, complementors are really impacting their current performance. Due to the nature of their service, they suffer from a high rate of interdependency. SE access is considered the main bottleneck in this matter.
RQ5. How is the current NMNBE health and what is their influence towards ECs?	P5a. Business ecosystem health influences not only the performance of ECs, but also their achievements.		Telcred will be able to enter the NMNBE in the presence of an open ecosystem. According to the framework in Figure 19, the overall health of the ecosystem will allow the entrance of new players.
<i>SE of the EC- Individual Interest / Internal Forces</i>			
Research Questions	Propositions		Telcred Analysis

RQ6. What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?	P6a. The awareness - business and technical wise - of the entrepreneur is a direct result of a sensing process and in most cases directly linked to the performance of the firm.		The CEO of Telcred has an entrepreneurial mindset with an ability to connect both business and technical sides of the concept. In this corporate culture, it is necessary to understand both aspects in order to define compelling strategies and succeed.
	P6b. Entrepreneurs strive not only for opportunity-seeking but also for advantage-seeking behaviors simultaneously.		The CEO of Telcred is focusing mainly in developing a competitive advantage for their current service in the short term. However, they are open to exploring new opportunities in the long term.
RQ7. What resources are required by ECs immersed in the NMNBE?	P7a. In a dynamic, structured and complex environment, resources that can be combined and developed over time to generate unique capabilities and increase competitive advantage are required.		Telcred requires very specific technical expertise. However, a combined profile that links the bridge between the technical complexities and the commercial business case is crucial.
RQ8. What strategies are adopted by ECs within the NMNBE?	P8a. ECs immersed in the NMNBE are adopting complementary strategies, i.e. a leader platform strategy, and a value-adding strategy related to the innovation platform that will define the overall performance of the firm.		Clearly, Telcred's strategy is to be positioned as the best capable offline NFC access control system, i.e. a niche strategy.
RQ9. How does strategic thinking influence the health of ECs immersed in the NMNBE?	P9a. The strategic thinking approach adopted will determine the success or failure of ECs immersed in a BE. Thus, ECs that capitalize on this dynamic cycle of innovation, entrepreneurship and strategic thinking in the ecosystem are especially well positioned to succeed.		Indeed Telcred has a strategic approach that focuses on exploiting non-obvious connections and services. Telcred has been able to exploit innovation and entrepreneurial mindset, but there is a remarkable limitation in regards to their network strategy, which is hindering their current health.
Proposition is supported	Proposition is partially supported	Proposition is not supported	Inconclusive data in the case

4.2.2. Tapit

The concept behind Tapit is “easy delivery content to consumer, useful content and consumer engagement”. Tapit is a mobile media & technology startup based on NFC technology and thus, content can be shared by tapping an NFC phone anywhere that the Tapit logo can be found (CrunchBase, 2013).

Tapit aims to be a mass market player and as previously mentioned, while major initiatives are currently focusing mainly in payment, Tapit wants to go beyond by specializing in marketing campaigns and collaborating with marketing agencies in order to cover a wide range of sectors including retailers, government, telecommunications and media owners.

The overall Tapit solution covers the ability to deliver any form of digital content such as video, music, maps, social media, etc. and turn static physical objects such as outdoor

advertising panels and in-store Point of Sale merchandise into an ecosystem of interactive gateways that allow people to gather digital information onto their phones effortlessly via a simple "tap" (Tapit, 2013).

The company was founded in 2011 and headquartered in Sydney Australia by a team of entrepreneurs and technical experts led by Jamie Coyningham (CEO and cofounder) and Andrew Davids (COO and cofounder).

Tapit has received several rounds of funding including a \$500k seed funding in August 2011 and a \$2.3M series A funding in December 2012 where the latter has allowed Tapit to expand internationally with offices in New York, Sydney and Stockholm. Tapit also has distribution agreements with representatives in UAE, Japan and Vietnam (CrunchBase, 2013). Niklas Bakos is the Vice President for EMEA and has the objective for business development mainly in the Nordics and Western Europe.

Figure 21 Tapit Individual case results and analysis

Theory		Case
<i>Business Ecosystem- Collective Interest / External Forces</i>		
Research Questions	Propositions	Tapit Analysis
RQ1. How is the NMNBE constructed and what are the implications towards ECs?	P1a. The NMNBE is constructed following an innovation approach which relies on harnessing the power of network and communities to increase growth, robustness and productivity.	In Tapit ‘s perspective, the approach is indeed network oriented. So far, the community has been more oriented on technical matters and less consumer oriented. It also feels a bit of fragmentation since some stakeholders are pretty much focusing on specific services such as payment. Hence, interconnections exist, but a network of ecosystem of services still needs to be built.
	P1b. The NMNBE is following the Orchestra Model where there is a prominent network leader and a structured innovation space.	Tapit offers a “non-secure” NFC service. In that sense, this company experiences more innovation space – resulting in a more diffused ecosystem that follows a MOD Station model where companies come together in order to modify and exploit existing technology defined by the community.
RQ2. Who are the key members? And what are their roles?	P2a. The NMNBE is a compound of one hub keystone and several niche players.	On the global context, there are indeed platform leaders such as Google and Samsung. Tapit is playing a niche role, i.e. a mobile NFC Marketing Agency.
RQ3. How is the current evolution of the NMNBE And what are the implications towards ECs?	P3a. The NMNBE follows a co-evolutionary process among members as interdependent organizations that evolve reciprocally with one another.	For Tapit, the evolution is in a very early stage and different stakeholders are trying to develop their own solutions. However, at some point all the technology will be merged – this is a healthy sign for proper development of a new technology. Tapit is contributing to the evolution

			of the ecosystem by creating awareness of the technology from which it will at the same time benefit from for the adoption of new services.
	P3b. The relationship between firms may be cooperative as well as competitive – resulting in co-opetition among ecosystem members.		Even though Tapit is serving a niche market, they apply the concept of co-opetition very well. They need to cooperate with other Marketing Agencies by complementing their services and define compelling services for end customers.
RQ4. How are the internal dynamics of the NMNBE? And what are the implications towards ECs?	P4a. Insufficient component performance will not allow the focal firm to develop beyond its existing performance level. Furthermore, insufficient complementor performance will not allow the focal module to demonstrate its full performance potential towards the end user.		Tapit has a low level of interdependency compared to other cases due to the nature of their service. In fact, it has been able to enter the market in Sweden even though there is no NFC Business Ecosystem there. However, they are still dependent on components such as NFC tags and complementors such as NFC handsets. Likewise, they will benefit from the awareness driven by other industries (e.g. payment).
RQ5. How is the current NMNBE and what is their influence towards ECs?	P5a. Business ecosystem health influences not only the performance of ECs, but also their achievements.		The overall ecosystem impacts Tapit's performance. A clear example is their success in markets such as Australia where there is already an on-going development of a NFC Business Ecosystem.
<i>SE of the EC- Individual Interest / Internal Forces</i>			
Research Questions	Propositions		Tapit Analysis
RQ6. What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?	P6a. The awareness - business and technical wise - of the entrepreneur is a direct result of a sensing process and in most cases directly linked to the performance of the firm.		Australian driven startup company, Tapit VP in the EMEA has the goal of developing the new business. He has a technical background and more than ten years of experience in mobile technology, marketing and sales. The latter implies a very specific mindset driven by innovation in mobile technology, business development and entrepreneurship.
	P6b. Entrepreneurs strive not only for opportunity-seeking but also for advantage-seeking behaviors simultaneously.		Tapit VP strives more for advantage-seeking by improving the current solution and becoming a potential platform capable of generating business intelligence. The verticals are well defined and thus, there is a very specific focus rather than exploring new opportunities.
RQ7. What resources are required by ECs immersed in the NMNBE?	P7a. In a dynamic, structured and complex environment resources that can be combined and developed over time to generate unique capabilities and increase competitive advantage are required.		Tapit requires resources with mobile technology and business expertise. Tapit's competitive advantage is based on the unique combination of NFC Technology with marketing and advertisement.
RQ8. What strategies are adopted by ECs within the NMNBE?	P8a. ECs immersed in the NMNBE are adopting complementary strategies, i.e. a leader platform strategy, and a value-adding strategy related to the innovation platform that will define the overall performance of the firm.		Tapit's strategy is to be positioned as the best NFC marketing & advertising agency, i.e. a niche strategy.

<p>RQ9. How does strategic thinking influence the health of ECs immersed in the NMNBE?</p>	<p>P9a.The strategic thinking approach adopted will determine the success or failure of ECs immersed in a BE. Thus, ECs that capitalize on this dynamic cycle of innovation, entrepreneurship and strategic thinking in the ecosystem are especially well positioned to succeed.</p>	<p>Tapit has developed a strategy based on the identification and exploitation of a specific opportunity and benefit from an existing platform(s) of established companies in order to leverage a unique value proposition towards end customers.</p>	
<p>Proposition is supported</p>	<p>Proposition is partially supported</p>	<p>Proposition is not supported</p>	<p>Inconclusive data in the case</p>

4.2.3. TSM Nordic

Back in 2000, DNB and Telenor created a Joint Venture called Doorstep AS in order to explore new business opportunities within the Banking and Telecom industries. The aim was to develop innovative and standardized banking and payment solutions on mobile phones with Doorstep being a driving force in developing these kinds of services in the Norwegian Market (Confidential Document).

During the summer of 2011, DNB and Telenor in conjunction with Mastercard, G&D, Nets and Teller executed a successful trial of mobile contactless payments in Oslo. Approximately 200 end users and 20 merchants such as the coffee shop chain, Kaffebrønneriet, the beauty health wellness chain, Vita, and the supermarket convenience store chain, Deli de Luca, were equipped with necessary equipment to carry out contactless payments with a mobile phone (Tap2Pay, 2011).

In general, feedback from end users and merchants was predominantly positive. Moreover, it was possible to identify a wider variety of obstacles to overcome such as partnerships, agreements with merchants, availability of NFC handsets, security, a healthy NFC Ecosystem, etc. (Tap2Pay Results, 2012).

The Tap2Pay project was launched in May 2012 with the ambition to develop mobile contactless payments in the Norwegian market. The goal was to commercially launch mobile contactless services in 2013. The project is jointly owned and run by Doorstep, DNB and Telenor. The project’s mandate is to develop business models and commercial services in addition to setting up a platform company called TSM Nordic (Confidential Document).

As explained in Section 4, the Mobile NFC Ecosystem is a complex network that requires collaboration, coordination, and interaction among different industries and stakeholders. In that sense, the role of a TSM is crucial. TSM Nordic aims to fulfill the role of a hub, a platform leader, in order to reduce complexity of integration by

eliminating the need for bilateral agreements between the mobile network operators and service providers in the ecosystem.

As discussed in in Section 4.1.3, TSM Nordic will be an open and transparent TSM where all MNOs and SPs can connect (banks, public transportation companies, and merchants). Furthermore, the main B2C value proposition will be VALYOU, a virtual wallet for mobile NFC services, which provides a coherent and standardized framework available for all SPs who want to offer NFC services for consumers (Confidential Document).

Figure 22 Individual case results and analysis

Theory		Case
<i>Business Ecosystem- Collective Interest / External Forces</i>		
Research Questions	Propositions	TSM Nordic Analysis
RQ1. How is the NMNBE constructed and what are the implications towards ECs?	P1a. The NMNBE is constructed following an innovation approach which relies on harnessing the power of network and communities to increase growth, robustness and productivity.	TSM Nordic is totally aware they are dependent on a network economy. In their opinion, there is no way to increase market penetration or decrease costs by only relying on bilateral agreements, but following a network perspective with a common goal.
	P1b. The NMNBE is following the Orchestra Model where there is a prominent network leader and a structured innovation space.	TSM Nordic is building a platform with the main purpose of reducing the complexity of integration of new players. Thus, the ultimate goal is to achieve coordination, organization and supportive infrastructure within the ecosystem.
RQ2. Who are the key members? And what are their roles?	P2a. The NMNBE is a compound of one hub keystone and several niche players.	Clearly, TSM Nordic is playing the role of a keystone specie. It is the catalyst under this context by being an open and neutral platform that aims to increase the growth and productivity of the current ecosystem. The goal is to create a cluster where different services from different companies are pooled together in order to create a wealthy offer for the end customer.
RQ3. How is the current evolution of the NMNBE? And what are the implications towards ECs?	P3a. The NMNBE follows a co-evolutionary process among members as interdependent organizations that evolve reciprocally with one another.	Fully supported by TSM Nordic, the only way to evolve is by means of cooperation with all MNOs and all SPs. In their opinion, bilateral initiatives such as the one fostered by Samsung and Visa may make the ecosystem more complex (Swanson, 2013).
	P3b. The relationship between firms maybe cooperative as well as competitive – resulting in co-competition among ecosystem members.	Fully supported by TSM Nordic, the building of a neutral platform and neutral Wallet where different SPs and MNOs will be able to cooperate at the platform level and compete at the service level.

RQ4. How are the internal dynamics of the NMNBE? And what are the implications towards ECs?	P4a. Insufficient component performance will not allow the focal firm to develop beyond its existing performance level. Furthermore, insufficient complementor performance will not allow the focal module to demonstrate its full performance potential towards the end user.		There is definitely a high level of interdependence because TSM Nordic really needs the support of all MNOs in order to reach maximum performance. By having all MNOs, this will enhance the offer towards SPs. Likewise, they are dependent on different complementors such as terminal suppliers, merchants and acquirers.
RQ5. How is the current NMNBE and what is their influence towards ECs?	P5a. Business ecosystem health influences not only the performance of ECs, but also their achievements.		TSM Nordic is a key contributor to the NMNBE health. As mentioned before, they function as the catalyst, where without them there is no real formal initiative that could foster the proliferation of NFC Services in Norway. Evidently, the performance of TSM Nordic will depend on the adoption of NFC services in this country.
<i>SE of the EC- Individual Interest / Internal Forces</i>			
Research Questions	Propositions		TSM Nordic Analysis
RQ6. What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?	P6a. The awareness - business and technical wise - of the entrepreneur is a direct result of a sensing process and in most cases directly linked to the performance of the firm.		TSM Nordic drives for a startup entrepreneurial spirit even though the company is corporate sponsored and this requires a change of mindset. The entrepreneur requires understanding of the service side and the technical complexities; this is needed in order to have a balance in regards to both sides, which can be visualized in more tangible aspects such as a business model and a strategy document which will lead the company.
	P6b. Entrepreneurs strive not only for opportunity-seeking but also for advantage-seeking behaviors simultaneously.		TSM Nordic aims to establish a strong platform and a compelling service offer – starting with a payment service. However, at the same time they strive to explore new opportunities that will enrich the ecosystem by including new services such as loyalty, access and marketing in order to expand their portfolio.
RQ7. What resources are required by ECs immersed in the NMNBE?	P7a. In a dynamic, structured and complex environment, resources that can be combined and developed over time to generate unique capabilities and increase competitive advantage are required.		TSM Nordic requires the acquirement of resources that can understand the different services that are cross-industry. Therefore, a combined set of skills are required to develop new opportunities within the different services like payment, transport, and loyalty that is crucial for business development, commercialization and delivery of the service.
RQ8. What strategies are adopted by ECs within the NMNBE?	P8a. ECs immersed in the NMNBE are adopting complementary strategies, i.e. a leader platform strategy, and a value-adding strategy related to the innovation platform that will define the overall performance of the firm.		TSM Nordic’s strategy is to be positioned as a neutral, open and trustable platform that takes the leadership for commercialization of NFC Services in Norway and the Nordic area.
RQ9. How does strategic thinking influence the health of	P9a. The strategic thinking approach adopted will determine the success		TSM Nordic’s strategy will impact their performance. They have

ECs immersed in the NMNBE?	or failure of ECs immerse in a BE. Thus, ECs that capitalize on this dynamic cycle of innovation, entrepreneurship and strategic thinking in the ecosystem are especially well positioned to succeed.		decided to explore a new field, i.e. NFC technology, and exploit it by connecting different industries by following this integrator role. Their success will depend on the number of stakeholders whom will take part and the variety of services available for the end customer.
Proposition is supported	Proposition is partially supported	Proposition is not supported	Inconclusive data in the case

4.2.4. Toro

Toro is a mobile software company established in Taiwan that focuses on improving the overall NFC user-experience in three different layers: in the real world, on the Internet and on the mobile phone.

One of the main characteristics of Toro is their team, which was formed by a group of specialists in smartcards, secure transactions, mobile applications, graphical design, and database management. By having this multidisciplinary team, they aim to offer the best environment for NFC Services development, deployment, operation, usage and maintenance (Sullivan, 2011).

In order to accomplish this goal, they have developed and are continuing to develop their core product, called *akami suite*TM, which is categorized as a NFC mobile Wallet Platform and provides an interface with the Secure Element and NFC layers, remote management of widgets⁷, a technical layer interoperable with different mobile operating systems and SDK for application development. In addition, the suite includes valued added services such as a marketing platform, social network features and a statistic module (confidential document).

Despite the fact that Toro can be considered as an start-up, they have managed to be part of at least four main NFC commercial initiatives around the globe with Telco companies Orange and Bouygues in France (December 2010), with Telco Finnet in Indonesia (November 2012), with T-Mobile group in Poland (October 2012) and are currently part of the Norwegian commercial initiative to be launched in 2013. In regards to the latter project, they are cooperating with TSM Nordic as a wallet platform provider.

⁷ Applications residing inside a mobile Wallet framework e.g. a mobile bank card

Figure 23 Toro Individual case results and analysis

Theory		Case
<i>Business Ecosystem- Collective Interest / External Forces</i>		
Research Questions	Propositions	Toro Analysis
<p>RQ1. How is the NMNBE constructed and what are the implications towards ECs?</p>	<p>P1a. The NMNBE is constructed following an innovation approach which relies on harnessing the power of network and communities to increase growth, robustness and productivity.</p>	<p>Toro relies on a network approach where different services will be accessible by different channels. The network must support different handsets and allow different TSMs, MNOs and SPs to interact via standardized connections. Only the presence of such infrastructure can increase the success of the ecosystem.</p>
	<p>P1b. The NMNBE is following the Orchestra Model where there is a prominent network leader and a structured innovation space.</p>	<p>Toro is the technical provider of TSM Nordic for the construction of the platform architecture. In that sense, Toro believes in having a common platform which will enable the distribution of services and a platform that will create a new innovation space for different SPs.</p>
<p>RQ2. Who are the key members? And what are their roles?</p>	<p>P2a. The NMNBE is a compound of one hub keystone and several niche players.</p>	<p>As mentioned, Toro supports the keystone role played by TSM Nordic from a technical perspective in the Norwegian context. In the global context, they aim to be a keystone in other ecosystems. In fact, their core product is a platform which facilitates the distribution of NFC Services and reduces fragmentation. The platform is open, secure, and compliant with the different specifications defined by GPNs.</p>
<p>RQ3. How is the current evolution of the NMNBE? And what are the implications towards ECs?</p>	<p>P3a. The NMNBE follows a co-evolutionary process among members as interdependent organizations that evolve reciprocally with one another.</p>	<p>For Toro, the evolution is being fostered by GPNs such as EMVco, NFC Forum, and GSMA – they are the ones pushing it in the right direction. However, ecommerce giants such as Google are starting to see the potential. Despite all, the co-evolutionary process among the different participants is still visible.</p>
	<p>P3b. The relationship between firms may be cooperative as well as competitive – resulting in co-opetition among ecosystem members.</p>	<p>Toro is considered a dynamic partner, where its main goal is to build relationships among different players and propose different models such as a shared-revenue model. They will also cooperate with other technical providers to build infrastructure, but will need to compete in that arena to some extent.</p>
<p>RQ4. How are the internal dynamics of the NMNBE? And what are the implications towards ECs?</p>	<p>P4a. Insufficient component performance will not allow the focal firm to develop beyond its existing performance level. Furthermore, insufficient complementor performance will not allow the focal module to demonstrate its full performance potential towards the end user.</p>	<p>Currently, Toro has a high level of interdependence. They are especially dependent on TSM Technical platforms. However, this will be reduced by the emergence of their own-platform (self-invested). Likewise, they are dependent on the overall NFC awareness among the different SPs since they are the ones that will use Toro as a technology enabler.</p>

RQ5. How is the current NMNBE health and what is their influence towards ECs?	P5a. Business ecosystem health influences not only the performance ECs, but also their achievements.		Toro's performance will be determined by the performance of other ECs within the ecosystem – meaning that if TSM Nordic succeeds in building a compelling platform, new SPs will be willing to join and thus Toro's value proposition and performance will be strengthened.
<i>SE of the EC- Individual Interest / Internal Forces</i>			
Research Questions	Propositions		Toro Analysis
RQ6. What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?	P6a. The awareness - business and technical wise - of the entrepreneur is a direct result of a sensing process and in most cases directly linked to the performance of the firm.		Toro's founder has a strong background in business, smartcards and NFC technology. The latter has strongly influenced the strategy of the company and its performance.
	P6b. Entrepreneurs strive not only for opportunity-seeking but also for advantage-seeking behaviors simultaneously.		Toro aims to evolve continuously and they have a more entrepreneurial oriented perspective focused on exploring new opportunities. They are considered as dynamic and agile in their decision-making process.
RQ7. What resources are required by ECs immersed in the NMNBE?	P7a. In a dynamic, structured and complex environment, resources that can be combined and developed over time to generate unique capabilities and increase competitive advantage are required.		For Toro, resources are crucial. They require unique competences not only in terms of business and mobile technology, but they also require specialists in smartcards, security, design and usability. Only by having all these resources will they be able to develop a product that can fulfill the current market needs.
RQ8. What strategies are adopted by ECs within the NMNBE?	P8a. ECs immersed in the NMNBE are adopting complementary strategies, i.e. a leader platform strategy, and a value-adding strategy related to the innovation platform that will define the overall performance of the firm.		It is difficult to assess Toro's strategy but they clearly consider the local characteristics of each ecosystem. Thus, in the Norwegian context, Toro's strategic orientation is to move into partnerships with main players (e.g. TSM Nordic). In the global context, they may play the role of a leader platform by proposing their core product as a complete platform open to any stakeholder within the ecosystem.
RQ9. How does strategic thinking influence the health of ECs immersed in the Mobile NFC Business Ecosystem?	P9a. The strategic thinking approach adopted will determine the success or failure of ECs immersed in a BE. Thus, ECs that capitalize on this dynamic cycle of innovation, entrepreneurship and strategic thinking in the ecosystem are especially well positioned to succeed.		Toro has been able leverage their startup nature by focusing on innovation and pursuing new value-adding knowledge. Likewise, they have a clearly defined strategy that is totally aligned with a business ecosystem perspective. Overall, the performance of the company is influenced by the number of partnerships within the ecosystem, number of resources and product development focus.
Proposition is supported	Proposition is partially supported	Proposition is not supported	Inconclusive data in the case

4.2.5. Entrepreneurial Company X (EC X)

EC X was spun off by Finland’s quasi-governmental VTT Technical Research Center. This start-up offers a new social networking service based on NFC technology and QR code technology where the value proposition is towards bars, restaurants and all kind of venues that want to build stronger links with their existing customers and to attract new ones through the use of viral social tools such as Facebook and Twitter.

The solution is compound consisting of a mobile application for end users, a web service for management of contacts, profiles and a web-based dashboard for venue operators which can be used to connect with their customers. The general idea is that once the customer is registered with EC X, they can immediately use the service at any venue registered with the service – customer can simply tap a tag to check-in at a location, make friends, redeem coupons, etc. (Social Networks NFC, 2011)

They have been part of one the most important global exhibitions exclusively dedicated to NFC technology, i.e. WIMA (WIMA, 2012). However, there has yet to be a commercial deployment and only a pilot was performed back in 2011 with several bars and nightclubs run by a leading Finnish restaurant chain called Restamax. The trial also included a number of university campuses (Social Networking, 2011). In order to accomplish this, they partnered with Tag Age for tag manufacturing as a complementary product.

Figure 24 EC X Individual case results and analysis

Theory		Case	
<i>Business Ecosystem- Collective Interest / External Forces</i>			
Research Questions	Propositions	EC X Analysis	
RQ1. How is the NMNBE constructed and what are the implications towards ECs?	P1a. The NMNBE is constructed following an innovation approach which relies on harnessing the power of network and communities to increase growth, robustness and productivity.		According to EC X, there are some technology clusters that are pushing the technology and taking the leadership. However, they also believe that there is a community effort driven by several groups.
	P1b. The NMNBE is following the Orchestra Model where there is a prominent network leader and a structured innovation space.		Inconclusive data in the case
RQ2. Who are the key members? And what are their roles?	P2a. The NMNBE is a compound of one hub keystone and several niche players.		EC X is evidently a niche player with the aim to create a new social networking service through the use of NFC technology. They add a new dimension of context and presence to

			people; these connections provide a valuable source of information for companies in promotion, marketing and sales.
RQ3. How is the current evolution of the NMNBE? And what are the implications towards ECs?	P3a. The NMNBE follows a co-evolutionary process among members as interdependent organizations that evolve reciprocally with one another.		For EC X, the evolution will depend primarily on the awareness of the technology, which can be achieved by the proliferation of specific services such as payment. In that sense, there is a co-evolutionary process among the different services available because as soon as NFC payment is spread out, a new gate will be open for new services.
	P3b. The relationship between firms may be cooperative as well as competitive – resulting in co-competition among ecosystem members.		Inconclusive data in the case
RQ4. How are the internal dynamics of the NMNBE? And what are the implications towards ECs?	P4a. Insufficient component performance will not allow the focal firm to develop beyond its existing performance level. Furthermore, insufficient complementor performance will not allow the focal module to demonstrate its full performance potential towards the end user.		EC X has one of the lowest levels of interdependence compared to the other cases. In terms of components, they only require the use of NFC Tags – which to some extent is a mature field. However, in terms of complementors, they still require the availability of NFC handsets and even more importantly, NFC awareness. All these factors will impact their performance.
RQ5. How is the current Norwegian Mobile NFC Business Ecosystem health and what is their influence towards ECs?	P5a. Business ecosystem health influences not only the performance ECs, but also their achievements.		EC X has suffered the consequence of an immature ecosystem. Clearly, the company has not been able to take off – and it actually may not happen according to the CEO. The fact that an ecosystem has yet to exist in addition to the lack of NFC awareness and availability of NFC handsets are really hindering the performance of the company.
<i>SE of the EC- Individual Interest / Internal Forces</i>			
Research Questions	Propositions		EC X Analysis
RQ6. What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?	P6a. The awareness - business and technical wise - of the entrepreneur is a direct result of a sensing process and in most cases directly linked to the performance of the firm.		The founder of EC X has a strong technical background and has been in the industry since 2004. Besides an understanding of all the technical implications in this field, he has also dabbled in business development matters and developed the business model that leads the company.
	P6b. Entrepreneurs strive not only for opportunity-seeking but also for advantage-seeking behaviors simultaneously.		EC X is focused in developing a competitive advantage based on the concept of social network. There is no intention, at the moment, to explore new fields at the same time.
RQ7. What resources are required by ECs immersed in the NMNBE?	P7a. In a dynamic, structured and complex environment resources that can be combined and developed over time to generate unique capabilities and increase competitive advantage are required.		Inconclusive data
RQ8. What strategies are adopted by ECs within the	P8a. ECs immersed in the NMNBE are adopting complementary		EC X based their strategy on analytic market studies where they identified

Norwegian Mobile NFC Business Ecosystem?	strategies, i.e. a leader platform strategy, and a value-adding strategy related to the innovation platform that will define the overall performance of the firm.		several application areas and decided on using social networks along with the restaurant sector as the first opportunity to exploit. Very few companies are venturing into this field.
RQ9. How does strategic thinking influence the health of ECs immersed in the Mobile NFC Business Ecosystem?	P9a. The strategic thinking approach adopted will determine the success or failure of ECs immersed in a BE. Thus, ECs that capitalize on this dynamic cycle of innovation, entrepreneurship and strategic thinking in the ecosystem are especially well positioned to succeed.		Not unlike many other startups, EC X has several entrepreneurial characteristics. They are innovative, creative, and agile. When it comes to strategic thinking related to the external environment, i.e. the business ecosystem, they still have opportunities to develop in order to improve the performance and position of the company.
Proposition is supported	Proposition is partially supported	Proposition is not supported	Inconclusive data in the case

5. Conclusion

This chapter will fulfill the objective of this thesis on strategic thinking of ECs within the Mobile NFC Ecosystem by drawing conclusions on the different research questions stated in Section 2.3

As depicted in Figure 7 Research design process, a cross-case conclusion will be presented by aggregating the data based on the individual case reports in the following table:

Figure 25 Cross case conclusion

Theory		Cases				
<i>Business Ecosystem- Collective Interest / External Forces</i>						
Research Questions	Propositions	Telcred	Tapit	TSM Nordic	Toro	EC X
RQ1. How is the NMNBE constructed and what are the implications towards ECs?	P1a. The NMNBE is constructed following an innovation approach which relies on harnessing the power of network and communities to increase growth, robustness and productivity.	Green	Yellow	Green	Green	Green
	P1b. The NMNBE is following the Orchestra Model where there is a prominent network leader and a structured innovation space.	Yellow	Red	Green	Green	White
RQ2. Who are the key members? And what are their roles?	P2a. The NMNBE is a compound of one hub keystone and several niche players.	Green	Green	Green	Green	Green
RQ3. How is the current evolution of the NMNBE? And what are the implications towards ECs?	P3a. The NMNBE follows a co-evolutionary process among members as interdependent organizations that evolve reciprocally with one another.	Green	Green	Green	Yellow	Yellow
	P3b. The relationship between firms may be cooperative as well as competitive – resulting in co-competition among ecosystem members.	Yellow	Green	Green	Green	White
RQ4. How are the internal dynamics of the NMNBE? And what are the implications towards ECs?	P4a. Insufficient component performance will not allow the focal firm to develop beyond its existing performance level. Furthermore, insufficient complementor performance will not allow the focal module to demonstrate its full performance potential towards the end user.	Green	Green	Green	Green	Green
RQ5. How is the current NMNBE health and what is their influence towards ECs?	P5a. Business ecosystem health influences not only the performance ECs, but also their achievements.	Green	Green	Green	Green	Green

<i>SE of the EC- Individual Interest / Internal Forces</i>						
Research Questions	Propositions	Telcred	Tapit	TSM Nordic	Toro	EC X
RQ6. What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?	P6a. The awareness - business and technical wise - of the entrepreneur is a direct result of a sensing process and in most cases directly linked to the performance of the firm.					
	P6b. Entrepreneurs strive not only for opportunity-seeking but also for advantage-seeking behaviors simultaneously.					
RQ7. What resources are required by ECs immersed in the NMNBE?	P7a. In a dynamic, structured and complex environment resources that can be combined and developed over time to generate unique capabilities and increase competitive advantage are required.					
RQ8. What strategies are adopted by ECs within the NMNBE?	P8a. ECs immersed in the NMNBE are adopting complementary strategies, i.e. a leader platform strategy, and a value-adding strategy related to the innovation platform that will define the overall performance of the firm.					
RQ9. How does strategic thinking influence the health of ECs immersed in the NMNBE?	P9a. The strategic thinking approach adopted will determine the success or failure of ECs immersed in a BE. Thus, ECs that capitalize on this dynamic cycle of innovation, entrepreneurship and strategic thinking in the ecosystem are especially well positioned to succeed.					
Proposition is supported	Proposition is partially supported	Proposition is not supported		Inconclusive data in the case		

RQ1. How is the NMNBE constructed and what are the implications towards ECs?

P1a is supported

All cases are immersed in a network where the power of the community is higher than the individual force. To conclude, all cases agreed on the importance of an innovation network as a potential approach for building a complex Business Ecosystem. Only by building a network of business and technical connections will it be possible to increase growth, robustness and productivity of the ecosystem and therefore increase the performance of each EC.

P1b is not supported

Even though the proposition is supported by two cases, there is no conclusive data to define a single model. The evidence shows two different models that may depict the current situation in the NMNBE, i.e. Orchestra for “secure” NFC BE and MOD station for a “non-secure” NFC BE. To conclude, the model of NFC Business Ecosystem will be dependent on the nature of the service and the domestic context per se, which also defines the openness in regards to innovation and level of leadership performed by specific stakeholders.

RQ2. Who are the key members? And what are their roles?

P2a is supported

Throughout all the case studies, it was possible to perceive two of the main roles proposed by Iansiti & Levien (2004). To conclude, there is a keystone role in the NMNBE which aims to be the catalyst, platform leader and integrator of different stakeholders with the common goal of commercializing NFC Services. On the other hand, niche players, which represent the bulk of the ecosystem, will enrich the portfolio of services and subsequently the offer for end customers.

RQ3. How is the current evolution of the NMNBE? And what are the implications towards ECs?

P3a is supported

The NMNBE evolution is related to the evolution of the stakeholders immersed in it. As mentioned before, depending of the nature of the service, some ECs have greater freedom – allowing them to evolve faster than the rest. However, there is to some extent a certain level of interdependence.

P3b is supported

As part of the evolution process, ECs immersed in the NMNBE cooperate in order to build a common infrastructure, a common platform shared by different stakeholders. However, ECs will still need to compete in the second level once the platform has been established in order to fulfill individual strategic objectives such as differentiation, customer base and revenue.

RQ4. How are the internal dynamics of the NMNBE? And what are the implications towards ECs?

P4a is supported

Internal dynamics of the NMNBE can be visualized as a network of smaller networks. The smaller network is a compound of the focal firm (ECs), a complementor and component (supplier). All cases demonstrate that without the synergy of these three modules, it is not possible to reach the highest level of performance. Additionally, the level of interdependence among the modules is once again dependent on the nature of the service provided by the ECs.

RQ5. How is the current NMNBE health and what is their influence towards ECs?

P5a is supported

The NMNBE is being built in the correct way – by having strategic “species” as keystones and niches. Moreover, the framework in Figure 19 shows how the current ecosystem is fulfilling important health attributes, with structure and operation being the most outstanding. On the other hand, it is possible to envision potential risks related with the functional attributes. Majority of the cases agreed that the financial feasibility due to high cost of investment and operational costs might hinder not only the individual performance of ECs, but also the whole network.

RQ6. What is the role of the entrepreneur (business owner-manager) in the context of the NMNBE?

P6a is supported

All 5 Entrepreneurs of ECs immersed in the NMNBE has faced important challenges. From all the different cases, it is evident that a certain level of technical understanding is required for successful business development in this field. The majority of the founders have a technical background but their main characteristic is to understand how the technology works in order to explore how it is possible to benefit from it. To conclude, in the NMNBE entrepreneurs need an understanding of business, technology and the interactions between the two fields in order to define a strong strategy for the business.

P6b is partially supported

One of the key characteristics of SE is a strategy concerned not only in exploring new opportunities, but also developing a competitive advantage simultaneously. From the different cases it was not completely evident that there is an application of both approaches at the same time. It is interesting to see that TSM Nordic, a corporate sponsored company, was the only EC which applied both approaches. This implies an entrepreneurial spirit with a strategic influence from the mother company. The rest of the companies were more inclined to adopt either opportunity-seeking or competitive-advantage seeking approaches.

RQ7. What resources are required by ECs immersed in the NMNBE?

P7a is supported

As in any other venture, all ECs showed their concern about the relevance of the resources. The specific technical expertise required were highlighted, but also mixed with specific skills related with each niches' strategy. Moreover, the extent of expertise and the amount of resources determines the speed of the product and service development.

RQ8. What strategies are adopted by ECs within the NMNBE?

P8a is supported

Even though not all the cases are part of the NMNBE, the different ECs demonstrated clear complementary strategies that are related with their corresponding roles. This means that a keystone role will have a strategic implication of cost efficiency and economics dependent on a wealthy network, whereas niche player focus on identifying and exploiting specific strategies in addition to improvising and inventing new business models.

RQ9. How does strategic thinking influence the health of ECs immersed in the NMNBE?

P9a is supported

It was clear from all the different cases that ECs need to define strategies that take into consideration the complex and structured external environment. Several limitations and

constraints are already in place – meaning that ECs venturing in the Mobile NFC ecosystem face more challenges than in other environments where there is more freedom to operate. To conclude, strategic entrepreneurship (SE) applied to an external-macro environment will be a determining factor for the success and position of the EC.

6. Discussion and future research

The purpose of this chapter is to discuss the most critical factors derived from the analysis and conclusion. Thus, the first part will discuss the main topics of this thesis, i.e. BE and SE, while the last part will suggest recommendations for research topics which throughout this research have been found relevant to look into further but which were out of the scope due to the already mentioned limitations.

6.1. General discussion

Section 4 revealed interesting findings and patterns in regards to SE and BE. The construction of the NMNBE is following an innovation-centric network perspective and all interviewees agreed that this ecosystem is rather complex with very formal structures that are sometimes dependent on the activities of larger players such as MNOs and Banks. Furthermore, ECs are also to some extent facing restrictions for the proliferation of services. In fact, a high influence from Global Policy Networks, i.e. global entities, decides on most of the different matters – not only technical, but also “visions” about how this technology can be applied in business life (Andersson, et al., 2011).

Some examples of GPNs in this field are NFC Forum, Mobey Forum, GSM Association, European Payment Council, etc. In support of this, *“There is a wrong assumption that the big players will agree what services will be available for a certain group of handsets, users or a certain group of consumers or certain market, and that I think is a problem for the entire ecosystem”* (Pompili, 2013).

One of the key findings in regards to the construction of the NMNBE is related to the innovation space. From the nature of the different cases, it was possible to identify a key distinction between the services offered. Basically, there is a considerable difference between ECs that would like to offer “secure NFC Services” and those that offer “non-secure NFC Services”. For the former, the NFC Service implies the highest level of security (e.g. a payment transaction) and therefore requires the involvement of a SE (Secure element e.g. a SIM card). In the second case, i.e. “non-secure NFC Service”, security is not an issue and therefore there is no dependency on using it. Overall, this distinction has several implications towards ECs due to the different business connections required for both scenarios.

Therefore, ECs that offer “secure NFC services” face higher restrictions in terms of innovation space, in support of this “*some big companies will pick a couple of services and they decide that these are the services that will be launched in a certain market. And I think that is a big problem because I don’t think that this is the way innovation happens*” (Pompili, 2013). Furthermore, there is once again a considerable influence from GPNs since they are defining the “technical agenda”. On the other hand, the other companies offering “non-secure services” do not have this dependency and agreed that there is higher room for innovation. As stated by one of the interviewees, “*I see a lot of different areas of use, so the innovation level I would say is extremely high because the technology itself is so simple, and by that I mean you can just apply it in a lot of various areas* (Bakos, 2013).

Considering the key findings, it was possible to identify two different BEs depending on the nature of the service (secure and non-secure service) each model has different characteristics. Moreover, it is possible to demonstrate the linkage between SE and BE theories, since each model will require specific strategies and represent specific challenges that ECs will face depending on each model (Nambisan & Sawhney, 2009).

Within the orchestra Platform model (secure NFC services), it is clear that Case 3 TSM Nordic is playing an integrator and platform role: “*we’re going to be a neutral platform company; TSM Nordic will be the platform provider – the enabler. So that is... that will be our main role – to be the enabler*” (Ramstad, 2013). Moreover, TSM Nordic, with the support of Toro is building the technical architecture required for the deployment of secure NFC services that require a high level of structure and coordinated innovation processes. On the other hand, Cases 1 (Telcred), 2 (Tapit) and 5 (EC X) are niche players who will exploit specific market opportunities based on the neutral design proposed by TSM Nordic.

In regards to non-secure NFC Services, the NMNBE differs to some extent. In this context, the members have less dependency amongst themselves and have a more diffused ecosystem. This is due to the fact that ECs wanting to join the ecosystem and to approach customers do not need to perform any kind of business agreement with larger players such as MNOs (Secure Element issuers). Therefore, the ECs have more freedom, albeit GPNs still have influence to some extent in this context. Hence, ECs are

able to exploit knowledge addressed by this community as suggested in the MOD Station model.

In this aspect, it is more about a community that comes together in order to create value by modifying existing value. As stated by an interviewee, *“I think the technology is already there so I think is more about finding those applications, so they may focus in more practical and every day uses for the technology”* (Anonymous , 2013). Likewise, it is foreseen that this model could expand from Norway to the Nordic region as stated by interviewee 3, *“You need a TSM Nordic solution and Norway could be a catalyst for the rest of the other countries”* (Ramstad, 2013).

Regarding roles and members, one key role that was clearly identified within a Business Ecosystem was the role of a hub. On one hand, a hub can build valuable connections, share the wealth generated and create a healthy ecosystem. On the other hand, a hub can only exploit an ecosystem for its own advantage. Both approaches – or operating strategies – have implications in regards to the business performance of the company per se and thus, the mentioned role depicts the actual strategy that a firm adopts in order to face an external environment.

In general, hubs are early movers and the removal of the hub may represent an effective collapse and fragmentation of the network. Moreover, it also functions as an entity that will increase the robustness, productivity and growth of an ecosystem. Although such a beneficial role is not the case at all times, it could be an entity that will affect the performance and health of the network, depending on the strategic decisions, capabilities and business models that the company decides to take (Iansiti & Levien, 2004).

TSM Nordic is playing a keystone role within the ecosystem. The literature identifies keystone species as having specific characteristics that produce for the ecosystem and their members and hence, without the presence of TSM Nordic, it wouldn't be possible to build the Mobile NFC Ecosystem in Norway. A keystone hub strategy differs from hub dominators and landlords in that in a dominator strategy, the hub integrates vertically or horizontally to manage and control a large part of the network and in a landlord strategy, the hub focuses on extracting as much value as possible from the network without directly controlling it (Iansiti & Levien, 2004).

Toro, in the global context and according their current strategy, will serve as a hub platform and they enrich, facilitate and foster the commercialization of mobile NFC services in different initiatives by creating a common platform for the distribution and development of services (Renard, 2013). This strategy is extremely important and fulfills the characteristics of a keystone player as well. Furthermore, it will benefit the ecosystem by being open to any player: *“What is really needed is a model, which allows experimentation. Where the end user will select what they want and approve it and not some big company”* (Pompili, 2013).

Niche players, on the other hand, only occupy a narrow part of the network. However, all of them contribute to the overall health of the ecosystem by avoiding duplication of efforts and by being the best in their sector. For example, *“Tapit is the best in the world at doing – educating the brands and actually providing a full service for bringing up their campaign and giving them some intelligence and reporting in the end”* (Bakos, 2013) while, *“our positioning is really to be the most capable offline access control system - we have a strong technical product and we are pretty focused on doing our thing, which is access control and providing a good service for our customers and not trying to be anything else than that”* (Pompili, 2013).

With regards to evolution, a common pattern found was the “co-evolutionary processes” among the different members of the ecosystem. This was anticipated in the proposition and was emphasized by all five cases. The truth is that all these ECs need to cooperate, exchange knowledge, resources and services in order to contribute to the overall evolution of the ecosystem. Furthermore, another crucial factor in regards to the evolution is the level of “modularity”, which is related to the design of the ecosystem architecture. This factor will determine the degree of interdependence among the different members.

In the case of dynamics, the model proposed by Adner & Kapoor (2010) was extremely relevant for the Mobile NFC Business Ecosystem, where the creation of value is dependent on the sufficient level of development of components as well as complementary modules. Again I refer to the high level of independence prevalent in the entire ecosystem.

It was clear in the case of Telcred, where they are not able to commercialize in Sweden since there is no current Mobile NFC BE in that country, ECs interested in

commercializing “secure” mobile NFC services suffers a higher level of interdependence. Therefore, it is important to consider the maturity and structure of the current business ecosystem in order to visualize the potential challenges to overcome.

Overall, all ECs experience to some extent a certain level of interdependence. The key factors mentioned by all the cases were availability of NFC Handsets as an evident factor of interdependence. In addition, there are different opinions regarding the lack of NFC technology in iPhones and the overall perception is that this will impact the domestic market in Norway and Sweden at the very least as the iPhone has a considerable amount of market share (Bakos, 2013; Ramstad, 2013). However, this is not true of the situation in Finland, where the Android OS is considered a dominant platform (Anonymous, 2013).

Another example of a bottleneck mentioned during the case studies was the availability of NFC secure elements (e.g. SIMs NFC). This is especially important for secure NFC services because without access to this element, companies like Telcred are not able to succeed. Therefore, bottlenecks impact the performance of the focal firm and will curb the development of the ecosystem as a whole (Sugai in Mäkinen & Dedehayir, 2012).

It is important to highlight the nature of the Mobile NFC BE, which differs from other ecosystems such as the traditional Mobile App ecosystem where companies can enter freely and reach the customer without any constraint. Such ecosystems certainly experience more freedom in regards to product development and market penetration; this is the complete opposite for companies within the Mobile NFC ecosystem.

Measuring the health of a BE is an important strategy for ECs and consequently, this research project has been focused on the overall health of the NMNBE. It was possible to visualize the level of satisfaction for each attribute and to identify potential threats and opportunities for ECs intending on entering this environment.

It is important to stress limitations in regards to the health analysis – especially when it comes to measuring operation attributes, which requires support of quantitative data. Consequently, the current stage of the devolvement of the NMNBE was a limitation since it is in a very early stage. In spite of this, this analysis gave a relevant view of the actual health of this ecosystem; making it possible to envision potential risks to overcome in order to produce a healthy ecosystem. Overall, taking into account the

phase of the NMNBE development, it is possible to see that the foundations are compliant with what is expected in the theoretical framework where four out of five attributes are fully or partially satisfied – presenting only one potential risk for the ecosystem in regards to the functional attributes of this ecosystem.

With regards to Strategic Entrepreneurship, four different aspects were analyzed within this field. Starting from the role of the Entrepreneur in companies venturing in the Mobile Ecosystem, a common pattern found was the relevance of technical awareness. From all the cases, it was inferred that a technical understanding of B2C and B2B processes is required. Especially for ECs playing a platform role such as TSM Nordic, the business model will be defined following a cost-oriented perspective and derived from the different technical processes. Thus, Entrepreneurs need to understand both the technical complexity and business dynamics within the ecosystem.

A key characteristic of SE is the use of both competitive-advantage and opportunity-seeking strategies (Hitt in Foss & Lyngsie). From the results, only TSM Nordic, a corporate sponsored venture, used both strategies simultaneously while the rest of the ECs were oriented only towards one strategy. In complex networks as the Mobile NFC BE, it is suggested that ECs, especially startups, think as large firms and focus not only in the process of discovering new opportunities, but also in the development of a competitive advantage following a strategic oriented vision. In fact, Toro (Case 4) is currently modifying its current strategy in order to survive and exploit the BE by developing new forms of alliances (Gartner, 2013).

When it comes to resources and organization, ECs within the Mobile NFC Ecosystem face the same challenges as any other company. In accordance to the nature of the service, specific expertise is required albeit product development is always a challenge of any venture. Indeed, for “secure” NFC services, ECs require very specific skills and accordingly, companies like Toro have decided to open a R&D center and an operation office in Barcelona, which is considered the mobile World Capital and is currently hosting the MW Hub, compound of large companies such as NXP, Nokia, RIM, and VeriFone (MW, 2012).

In regards to strategies adopted by ECs within the Mobile NFC BE, it was possible to prove the operating strategies proposed by Iansiti & Levien (2004). It was really interesting to identify each role and its corresponding strategy. TSM Nordic was a clear

example of a keystone. By taking platform leadership, TSM Nordic is the catalyst for proliferation of NFC services in Norway and as highlighted throughout this project, the success of TSM Nordic will depend on the network and vice versa.

Overall, all the cases showed different strategies according to their role and evidently, as in any other market, the external environment represents a challenge for ECs. However, the Mobile NFC BE imposes several restrictions and limitations in regards to evolution and dynamics. As expressed by Case 5, NFC technology is not new at all and had existed for several years. However, the truth is that it has not yet taken off completely due to the complexity, high cost of implementation, high level of interdependence, and all the different factors mentioned before creating a complex environment that require strategic thinking in order to succeed. Therefore, ECs interested in entering this field need to understand the structure, nature, evolution, network and health of the Business Ecosystem in which they are immersed. In addition, by having internal forces such as entrepreneurial leadership, resources and strategic thinking, ECs will be able to improve their own performance and contribute to the productivity, growth and robustness of their BE.

6.2. Recommendation for Further Research

This research project has revealed interesting patterns in regards to how strategic actions must be addressed not only in terms of the firm's internal strengths, but also in terms of their potential impact of the EC's broader ecosystem. However, as mentioned during the literature review, there is an important role of regulations, policy makers and markets to be considered. This means that even though a keystone's goal is to benefit the overall economy of the ecosystem, regulators and policy makers may treat such actions by those as near monopoly and thus further research is suggested on the topic of "*operating strategies within business ecosystem from an antitrust perspective*" (Foer, 2004).

Furthermore, this research project was focused on the Nordic/Norwegian context where there are several limitations due to the current state of development of NFC services. Thus, it is suggested that a deeper understanding of the current BE in the global context should be obtained. As mentioned before, there are mature initiatives in different countries such as USA, Korea, Singapore, Poland that will be valuable in finding insights and patterns through the different scenarios since one of the findings of this

research was also that Mobile NFC BE is domestic specific – meaning that the network structure, evolution, roles and strategies will differ according to country.

A deeper understanding in regards to BE health will also be valuable since this research was focused only on a qualitative analysis. The support of quantitative methods is required in order to measure one of the most important health attributes, i.e. functional attributes, including measures like the rate of return for stakeholders, ECs survival rate, new EC success rate, growth rate, etc. This will provide a good overview of the actual productivity, vitality and creativity of the ecosystem (Li, et al., 2013).

In regards to SE, this research has focused only on SMEs and young ventures and thus, it would be interesting to look at more mature companies and learn about their experiences in this field. In that sense, it will be possible to contrast the classical approaches of a more entrepreneurial and innovative thinking of SMEs vs. the classical strategic management approach of large companies. Overall, SE provides the possibility of developing strategic and entrepreneurial thinking, even in large companies and thus, it would be worthwhile to prove this in an empirical research.

Finally, we have chosen the Mobile NFC BE as the main context for this research. As derived from the main findings, it is possible to conclude that SE is crucial for ECs in order create value in complex and structured environments such as this one. Accordingly, it would be valuable to test the same proposition in a different context, i.e. a Business Ecosystem with different structure, different degree of innovation space and different network leadership.

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8. Appendices

8.1. Appendix A- Interview Guide - Entrepreneurial Company

Purpose and introduction

I'm a student of a MSc in Innovation and Entrepreneurship at the University of Oslo, albeit I have practical experience in the development of NFC Services, this has motivated me to focus my research in the Mobile NFC Business Ecosystem, its symbiotic relationship with Entrepreneurial Companies and their strategic thinking, within this context, the purpose of interview is to collect data relevant for this master thesis.

Introductory questions

1. Can you tell me briefly about your background? Main projects, other startups where you have been involved? What are you doing now?
2. Is Company X corporate-sponsored or launched by independent entrepreneur?

BE. Structure

1. In your opinion how is the network leadership distributed?
2. In your opinion how is the innovation management?
3. What is your perception about this structure? What the opportunities and threats in regards to this aspect?
4. Did you consider a Business Ecosystem model as factor for strategy definition?

BE. Players and Roles

1. Is there any "Seed" Firm? The actor's attractor? If yes name it.
2. Is there any vital member? If yes name it.
3. What are the other players?
4. What is the role that Company X is playing? What are your main functions? What are you main activities?
5. Taking into account this role, what are the main challenges/weaknesses of Company X?
6. What are the restrictions you face from the external environment?

BE. Evolution

1. What are the main factors that contribute to the evolution of the BE?
2. What are the factors that prevent (limitations, constraints) the evolution of the BE?
3. How does Company X contribute to the evolution of the ecosystem?
4. Do you foresee room for evolution of the BE?
5. How do external forces influence evolution? (From the ecosystem environment)

BE. Dynamics

1. How do you see the interdependence between your firm and other players?
2. Is there any bottleneck in the dynamics of the BE? If yes where is located?
3. What are the BE's limitations, constraints of the BE?

*****Starts second part of the Interview*****

SE. Entrepreneurial leadership (The entrepreneur)

1. How would you describe the organizational culture of Company X?
2. How do you describe your mindset, and how do you transmit it?
3. How does the structure of Company X reflect your organizational culture?
4. What are the main competences of the people?
5. Do you think the nature and dynamics of the environment influence what you are looking for?
6. In your opinion, what are the main advantages of ECs over well-established and traditional companies in the context of BEs?

SE. Strategy

1. How do you define your strategic orientation?
2. Do you lead your business following a day-to-day basis or planned and strategic oriented?
3. In your opinion, what are the main factors that influence the overall performance of the company/business?
4. You mention before your role, so what is your strategy taking in to account that role?
5. Do you think your company is following an opportunity seeking approach or advantage seeking, both? Please elaborate.
6. How does company X, shape, navigate and exploit the BE?
7. How does company X create, discover and exploit opportunities within a BE?
8. How do you build connections among members and maintain partners, alliances?
9. How does company X compete in the NMNBE?
10. How can Company X modify or transform the knowledge underlying the existing offering of the dominant firm? And creates new value appropriation opportunities?

BE/SE. Relationship/Health

1. How does the Norwegian Mobile NFC Business Ecosystem influence the health of ECs?
2. How does ECs influence the Norwegian Mobile NFC Business Ecosystem's health?
3. Can you mention your top 5 barriers/obstacles for the success of the NMNBE?
4. How do you visualize the future of the BE?

Conclusion

The interviewer ends the interview by asking if respondent have any last suggestions or comments about the topic.

8.2. Appendix B - Global Mobile NFC Initiatives

Name	Country	Type	Companies	Function
ISIS	USA	Joint Venture	T-Mobile, AT&T, Verizon.	Offer a secure nationwide platform: TSM and Wallet.
Grand NFC Korea	Korea	Association*	KT, SK Telecom and LGU, Payment Card Issuers, device manufacturers,	TSM, NFC ecosystem interoperability, accelerating NFC terminals deployment. Development of NFC applications. Test bed for small companies.
Weve	UK	Joint Venture	EE, O2 and Vodafone	Accelerate development of mobile marketing and wallet services, deploy a consistent set of technologies and avoid duplicated effort.
IDA	Singapore	National Authority	SingTel, M1, StartHub, Card Issuers, Technology providers.	Develop a national NFC infrastructure for Singapore.
Hungaria Mobile Wallet	Hungary	Association*	Telekom group, Telenor Hungary and Vodafone Hungary, Card Issuers, MasterCard.	Set technical standards for NFC Wallets, bring member of the ecosystem together, promote NFC services and educate key service partners.

*Similar associations have been created in other countries such as Germany, Netherlands, France and Taiwan.

8.3. Appendix C - Nordic Mobile NFC Initiatives

Country	Main Facts
Denmark	The four mobile operators (Telenor, TeliaSonera, TDC and 3) have formed a joint venture to develop the field of mobile payment in that country; moreover they have defined a three phase rollout program which will include NFC technology (NFC World Denmark, 2012). The path has been slow in this country in regards to NFC, the first two phases of the program will include mobile payment via SMS and traditional mobile apps, likewise e-commerce via mobile phone number; in the third phase a digital wallet could be introduced being in this stage where NFC would be part of this solution, however still it will be required development of cooperation and technical NFC infrastructure.
Sweden	Sweden started pilots back in 2010 focusing in a wide variety of NFC services such as access (ASS ABLOY, 2011), boarding passes (SAS, 2011), and loyalty (ICA, 2012). Likewise same Nordic MNOs have formed a JV with the purpose of launching a common digital wallet (WYWALLET, 2012) in conjunction with local firms. Despite the fact there is a considerable activity of NFC Trials and that at some point there is already a NFC technical infrastructure, there is no current commercial initiative, this was confirmed by Case Study 1, meaning that the current Swedish ecosystem is technically proven, however in regards to business feasibility, stakeholders are still evaluating the different options for commercial a deployment.
Finland	Finland is perhaps the pioneer in this field, they first formal initiative started in 2006 in the city of Oulu by VTT, Technical Research Centre of Finland, with an aggressive project called SmartTouch and targeting different applications such as access, transport, parking, ticketing, social media, solutions for elderly people, etc. (SmartTouch, 2006). The purpose was to explore and test different NFC opportunities. Likewise payment has been proven since 2009 by payment provider

	<p>Luottokunta, Sodexo, Visa Europe and G&D (Luottokunta, 2009). Furthermore Finish has applied NFC technology for social networking, powered by a local start-up (Case Study 5). Again, all are proven solutions, albeit there is not actual commercial initiative: <i>“it is really sad that it was 2004 when the first initiatives came and now it is almost 10 years and still we cannot see this has really taken off”</i> (Anonymous , 2013). It is a reality that big players such as MNOs or Banks have not started any commercial NFC initiative yet.</p>
Iceland	<p>Iceland, even though the career of this country has been no that long as Sweden or Finland, they have managed to pre-launch the first implementation of contactless payment in that country (Contactless Cities, 2012), the project was done in collaboration with different entities such local acquiring solution provider Valitor, Visa Europe and Oberthur Technologies. The implementation started in January 2012 and the final kick-off was early 2013 (Valitor, 2012) (Ref Validator). Validator has built strong relationships with the main Icelandic Banks which together represent the 95% of the total market share of the country. Furthermore, according Visa Europe, Iceland represents a fertile ground for contactless payments, due to high card penetration and contactless infrastructure (Contactless Cities, 2012). Iceland estimates to have a full commercial launch by the end of 2013.</p>
Norway	<p>Back in 2009 DNB and Telenor created a joint-venture in order to create a Trusted Service Manager for the Nordic market: Trust Nordic, the first activity of this alliance was a Trial called Tap2Pay in the city of Oslo which was focused on payment and targeted different Norwegian merchants. The trial was quite successful, 80% of the customers were very pleased with the payment service, furthermore it was possible to identify key success factors such as diversity of handsets, availability of terminals, ease of use, availability of services and places to use and ease of use (Tap2Pay Results, 2012).</p> <p>The second big NFC initiative is called NFC City which is an innovation project funded by the Research Council of Norway, the project includes different partners such as Telenor, DNB, FARA, University of Tromsø and the Tromsø Country Council. The mains objectives are: exposure of a critical mass of users to various services within a limited geographical area - a NFC city, development of a toolbox for implementation of NFC services and stimulation of service providers to test out their applications and business models.</p> <p>In that sense Norway has been quite active, not only in terms of innovation and exploration but also, they are the ones who are ahead in regards to massive commercialization of NFC Services by starting to build a real business ecosystem for this purpose</p>

8.4. Appendix D- Level of interdependence of ECs

The following table attempts to measure the level of interdependence between focal module, components and complementors. It is possible to visualize the five different cases and also the different members of the ecosystem, different weights were assigned in order to exemplify this.

5 = high level of interdependence, without this member the EC is not able to reach the customer

3 = medium level of interdependence, EC is able to reach the customer with certain limitations

1 = minimum level of interdependence, EC is possible to reach the customer or there is an indirect connection required to reach the customer.

0 = no interdependence

(FF) = Focal Firm C = complementor S= supplier N = no relationship CU = customer

NFC Business Ecosystem member	Telcred (FF)	Tapit (FF)	TSM Nordic (FF)	Toro (FF)	EC X (FF)
TSM provider	5 (S)	0 (N)	5 (S)	5(C)	0 (N)
Wallet provider	3 (C)	3 (C)	5 (S)	0 (N)	3 (C)
MNO (SE issuer)	5 (S)	0 (N)	5 (C)	5 (C)	0 (N)
SP	0 (CU)	0 (CU)	0 (CU)	0 (CU)	0 (CU)
NFC Handset manufacturer	5 (C)	5 (C)	5(C)	5(C)	5 (C)
NFC Tag provider	0 (N)	5(S)	1 (N)	0 (N)	5(S)
NFC UICC vendor	1 (N)	0 (N)	1 (N)	1(N)	0 (N)
NFC Chipset manufacturer	1 (N)	0 (N)	1 (N)	1(N)	0 (N)
Standardization bodies	5 (S)	3 (S)	5(S)	5(S)	3 (S)
Payment scheme	0 (N)	0 (N)	3(C)	3 (C)	0 (N)
Card processor	0 (N)	0 (N)	1(N)	0 (N)	0 (N)
Acquirer network	0 (N)	0 (N)	3(C)	0 (N)	0 (N)
Total	25	16	35	25	16

8.5. Appendix E - List of Executed Interviews

<i>Name</i>	<i>Entrepreneurial Company</i>	<i>Role</i>
Carlo Pompili	Telcred	CEO & Founder
Niklas Bakos	Tapit	Vice President EMEA
Georg Olav Ramstad	TSM Nordic	Founder
Laurent Renard	Toro	CEO
Anonymous	EC X	CEO & Founder