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Examining Institutional Entrepreneurship at Early Moments: The Case of Mobile Health in England and Finland

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Abstract

If you have an idea about applying a proven technology to improve the processes in a new area of society, what does it take to implement it in a way that it has wide impact and endures? This is a relevant question particularly now, at the dawn of the age of 'big data', as information and communication technologies are adopted in many areas to harness the ability to collect, retrieve and analyse large amounts of information, and be made available at the level of individual users. Extraordinarily powerful devices developed in recent years offer much promise, but as many examples, such as Betamax, WAP-technology, HD DVD and netbooks, show that even potent technologies may fail to gain predominance and survive. The concept of institutional entrepreneurship is a useful framework to analyse these complex issues as it embodies a comprehensive analytical perspective, combining attention to the institutional environment as well as to the efforts by interested and resourced actors. I use this concept to I investigate the efforts to introduce mobile technology into health care in England and Finland. I employ a distinct research strategy that avoids a retrospective bias, through the collection and analysis of qualitative data before known outcomes, from a wide range of technology, care, regulatory and intermediary organisations. I uncover some of the difficulties to technology adoption and develop arguments about the types of efforts and the impact of context at the early moment stage that contribute to the further development of the concept of institutional entrepreneurship.

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LIST OF ABBREVIATIONS

B2B	Business to business	SHA	Strategic Health Authorities (UK/England)
B2C	Business to consumer	UK DH	UK Department of Health
B2B2C	Business to business to consumer	PCO	Primary Care Organisations (UK/England)
ITU	International Telecommunication Union	GPs	General Practitioners (UK/England)
ICT	Information and communication technology	RTE	Radiation therapy equipment
mHealth	Mobile health	MRI	Magnetic resonance imaging
NHS	National Health System (England)	CT	Computed tomography (scanner)

CHAPTER 1: INTRODUCTION – EARLY MOMENTS AS A WINDOW TO INSTITUTIONAL ENTREPRENEURSHIP

1.1 INTRODUCTION

This thesis project is about the efforts by which novel technologies are introduced to new areas of society. The dynamics of this, whether restricted specifically to technical artefacts or organisational forms and processes, have interested scholars for a long time (Munir and Phillips, 2005). As Tushman and Anderson (1986) recount, already `for close to a century there have been arguments about technological change as a result of chance and spontaneity, or technological genius (Taton, 1958; Schumpeter, 1961), of historical necessity (Gilfillan, 1935), or of economic demand and growth (Schmookler, 1966; Merton, 1968). The development of new, more complex theoretical perspectives has meant that some aspects in these matters still appear unresolved, animating scholars for further investigation, as Purdy and Gray (2009) have noted:

> "*How new institutional fields and new types of organizations emerge in the face of existing institutional constraints is a persistent and intriguing question for institutional scholars."* (Purdy and Gray, 2009, p.355)

Particularly within neoinstitutional theory, which is the broader theoretical context for this work, there has been much interest for conceptual development towards the ability to explain change, to complement its signature emphasis on isomorphism and stability (DiMaggio, 1988; Greenwood, Suddaby and Hinings, 2002). With the concept of 'institutional entrepreneur' scholars in this area have explored arguments about agency, i.e. efforts to make changes in the context of institutional pressures (Lounsbury and Crumley, 2007; Garud, Jain and Kumaraswamy, 2002). This concept has been useful for analysis as it allows to take into account the in-

stitutional context (or structural elements) while assessing activities of actors (or agency).

One of the aspects of this literature that I will highlight is its focus on "*institutional change*" (DiMaggio, 1991; Holm, 1995; Hoffman, 1999; Morrill, 2006), which signifies existing organisational fields and institutional framework that is undergoing change. The term 'change' implies the transformation of an existent entity. However, it has been noted that far less attention has been directed at how entirely novel solutions are created. As Padgett and Powell (2012) note:

We economists, political scientists, and sociologists have many theories about how to choose alternatives, once these swim into our field of vision. But our theories have little to say about the invention of new alternatives in the first place. New ideas, new practices, new organizational forms, new people must enter from off the stage of our imaginary before our analyses can begin…. We understand selection and equilibrium, but we do not understand the emergence of what we choose or of who we are. Our analytical shears are sharp, but the life forces pushing things up to be trimmed elude us. (Padgett and Powell, 2012, p.2)

The concept of early moments in this study is an attempt to capture the phenomenon of creating novel solutions when no precedent in that category, nor even a category, exists. However, one of the underlying assumptions of this study is that new solutions do not come emerge from thin air, but rather have their origins in other fields. Thus, for any new field as well as solution there are *source fields* that supply ideas, resources, actors and models of organising. In other words, genuine greenfields are hard to find, but all have their sources somewhere.

1.2 KEY ELEMENTS OF THE STUDY

In this section I present five key elements of the study.

1.2.1 Favourable conditions for mobile health

This study examines particular type of novel solutions, namely those of mobile technology and how they are introduced to health care. Technology, in its many forms, has become truly pervasive in modern societies. Technology, as 'application of scientific knowledge for practical purposes'[1], is an important and ubiquitous part of the 21st century contemporary industrialised societies. Despite the abundance of it, the quest for still superior technological solutions is ceaseless. These societies are endowed with a stream of ever more sophisticated means to solve their challenges, whether related to managing urban mass co-habitation, to the improvement of human health and longevity, or to maintaining the ecological balance. Increasingly the technologies involved are information and communication related.

Mobile technology, the focus of this study, is part of 'Information and communication technologies', which is a term that consists of a range of technologies to allow the carriage of data and messages between distinct locations. The rapid spreading of personal computers during the 1980's and 1990's, and mobile phones in the 1990's and 2000's, made these devices, and information and communication tech-

1 http://www.oxforddictionaries.com/definition/english/technology?q=technology (accessed 5.1.2014)

nology more broadly, familiar and widely used among people as well as in organisations. As a consequence, there has been a widespread adoption of these technologies for various uses throughout contemporary industrialised societies. The shift towards using new communication technologies has in some cases been radical. For example, between 2005-2013, fixed line telephone subscriptions have consistently decreased while mobile cellular subscriptions have increased rapidly (from 82% to 128% for developed countries; from 23% to 89% for developing countries; from 34% to 96% for whole world) (ITU, 2013). Information and communication technologies have thus become widely used almost throughout the world, particularly as consumer devices. However, applying them for functions in different areas of society, such as in health care as I describe in this study, has been less rapid.

The health care sector, and especially the provision of health care services more specifically, took a clear turn in the 1990's in both England and Finland. One factor that had an influence on this development was the economic crisis in the early 1990's, but there were also new ideas about how to improve health care services. In England, when the Labour party came to power in 1997 there was a significant increase in funding for the NHS, along with some organisational reforms to increase government's control of care quality. With a turn away from health care as a market, which the previous government had advocated, the new Labour government aimed to improve services and reduce waiting times. However, despite these reforms, persistent concern over low productivity and quality, highlighted by few scandal cases of clinical negligence, have been sources of criticism towards the health services still during the 2000's (Boyle, 2011). These scandal cases were mostly framed as lapses in governance, but the three reports investigating these

cases also raised attention also towards deficiencies in care quality (Bevan, 2008). The government's own study in 2009 found that despite of over a decade of continuous reform there were many problems that persisted: Too much variation in quality of services; poor access for some services and some groups of patients; care that should be organised in home or community settings is still unnecessarily organised in hospitals; poor integration of services between care organisations; and overall services could be more people-centred, preventative and productive (Department of Health, 2009). Particularly considering the emphasis in these observations that services ought to centre on patients, and that they should be more preventative in their approach, the potential benefits that mobile technologies offer would make it a plausible technology to adopt for these practices.

If in England the relatively strong central government control of the development of health care deterred moves towards adopting mobile technologies, in Finland the conditions, in principle, were more favourable. Partly as a result of the fierce economic crisis in the first half of the 1990's, and partly due to a historical legacy of local government responsibility for local care, there was a new emphasis already in the 1990's on the total administrative control over health care services to be devolved to local governments. In addition, there was general belief regarding the benefits of giving more responsibility to the individual for their health care. However, while little changes had been made in regards the latter objective, the total devolution of care administration caused widespread concern in the 2000's about access to services, as varying financial resources for service provision caused significant inequality of services between different municipalities. The long waiting times grew still in the 2000's, leading to legislative initiatives to ensure

better access to care. There were also problems in the 1990's and 2000's regarding the integration between primary and secondary care (aka 'joined-up care') (Mattila, 2011).

While subsequent legislative efforts have sought to correct these aspects, reform programmes concerning health care, along with social care, have continued still in last years. The new legislation of 2011 further increased the choices that patients have for receiving care. Moreover, focus on the patient has been on the increase as well, although it has so far signified only encoding in legislation the right of patients to receive good quality care (Mattila, 2011). Public discussions have referred to more patient empowerment in care processes, but these have not received formal recognition in the laws and directives regulating the provision of care.

1.2.2 Intellectual dilemma

This study has been motivated by an intellectual dilemma in which the practical conditions would appear to favour the emergence of a new set of practices but this has not occurred over a relatively long time. A more common-sense version of this dilemma is that mobile technology can perform a variety of functions that could solve some of the dire challenges in health care, and it is counter-intuitive that this technology has not been taken advantage of in the many years that mobile devices have been common among the population. A more theoretically based view of this dilemma has its roots in core propositions of the theory of institutional entrepreneurship, which has sought to explain how actors are able to introduce novel

solutions despite a highly institutionalised, isomorphic environment (aka "paradox of embedded agency", Holm, 1995; Seo and Creed, 2002). In the first proposition of this argument an external shock, such as a technological disruption or a broader crisis affecting the sector, destabilises the existing institutional framework (Greenwood, Suddaby and Hinings, 2002), creating an opening for novel solutions. In the second proposition institutional entrepreneurs cultivate and capitalise opportunities that they are presented with to create and implement novel solutions (Purdy and Gray, 2009).

Thus, applied to mobile technology in health care, these theoretical propositions arguably suggest that mobile technologies should have been adopted in health care forthwith. The logic of the argument holds that at the moment of a technological disruption, such as the rapid advancement and increase in the use of mobile technology, or a broader crisis, such as concerns over how to ensure adequate resources in the health care system, these create openings for institutional entrepreneurs as opportunities to introduce new solutions. As my data shows, there have been plenty of actors to pursue such initiatives. Yet, at the initial moment when this research began, it was clear, from personal observation and searches through the Internet, that mobile technology had not been spread and adopted widely in health care. This raises a question of why a technology, which has been relatively common since the second half of the 1990's, and which is accepted and used widely particularly among consumers/patients, has not become part of an area of society, namely health care, where this technology would potentially solve many of the problems that are commonly discussed as acute? My intellectual dilemma, thus, is

a more general formulation of this: what accounts for the apparent difficulty of implementing novel solutions, even if they are proven technologies?

Furthermore, this practical dilemma has a theoretical sibling in the extant conceptualisation of how institutional entrepreneurs pursue the introduction of their novel solutions. As I will describe in chapter two on literature, scholars employing this concept have found these efforts to be either of cognitive or socio-political nature. Yet, it is pertinent to ask whether this may be the extent of how these actors attempt to bring about changes. In other words, where do the artefacts themselves come from, if these actors are not involved in developing them? Through responding to my research questions I will also address this broader intellectual dilemma.

1.2.3 Research questions

I state my main research question for this project:

- *How does the early moment perspective impact the conceptualisation of institutional entrepreneurship*?

My supporting research questions are:

- *How do the efforts of institutional entrepreneurs differ at early moments from those described by the extant literature?*
- *How do the perceptions of context at early moments differ from how context is perceived in the extant literature?*

My research questions are designed to expand our understanding of the core concept of institutional entrepreneurship. The early moment stage is a phase distinguished by experimentation and uncertainty in regards the continuity of the tried solutions, as I have explained above. It is a useful vantage point because it applies a particular lens on institutional entrepreneurship activity, different from the more common perspective of attempting to examine the entire period of institutionalisation. The specific aspects by which I will examine institutional entrepreneurship at early moments are the efforts of actors, as well as the context surrounding them. Efforts and context have been some of the core elements in the literature on institutional entrepreneurship, as I will show in the next chapter. Through examining these aspects at early moments I contribute to a more comprehensive understanding of institutional entrepreneurship as a concept, as well as respond to the broader question about why the introduction of novel technological solutions appears slow. I have referred to this broader question above as the intellectual dilemma motivating this research.

1.2.4 Arguments

I have operationalized the above stated intellectual dilemma by studying the efforts of institutional entrepreneurs at the early moment stage. Existing theoretical work on institutional entrepreneurship has produced a plethora of studies that describe the entire process of institutionalisation. However, they have little to offer in terms of the early moments, as the Padgett and Powell quote above suggests.

They do not specify what are the reasons why early initiatives fail to advance. Therefore, by focusing on early moments my study makes a contribution to our understanding of institutional entrepreneurship.

Based on my findings and analysis, I make two arguments: First, I argue that, in contrast to what earlier literature has suggested, the efforts of institutional entrepreneurs consist also of technical activities, at least at the early stages of institutionalisation process. Second, in cases where a field is in a development phase and no bespoke institutions exist, institutional entrepreneurs are forced to grapple with considerable contextual impediments that originate in the surrounding source fields. These arguments lead me to conclude that institutional entrepreneurship should be conceptualised broader than it currently is. These actors build material artefacts at the early moments. These efforts and the artefacts may have institutional effects, and therefore this concept should encompass these types of efforts. Moreover, when examining processes of institutionalisation, all attention should not be on the power of the efforts of these actors. The contextual conditions, from source fields, exert considerable resistance to these efforts. The conceptualisation of institutional entrepreneurship should also have a more inclusive consideration of the surrounding context in cases when a new field is emerging.

1.2.5 Key definitions

There are four core concepts upon which I rely in this study. The most central of these is the temporal construct of 'early moments', which appears frequently in

this report. 'Early moments' is the initial stage in the process of institutionalisation. This term is a paraphrasing of the Tushman and Anderson (1986, 1990) idiom 'era of ferment', by which they refer to the early period of development in the life cycle of technological change. In their three longitudinal studies the 'era of ferment' was the most important stage to determine the trajectory of technology development. Other variably useful terms have been offered for this period of development: "*developmental phase*" (Hargrave and Van de Ven, 2006), "*market development*" (Fligstein, 1996, 2002), "*innovation stage*" (Morrill, 2006, in Purdy and Gray, 2009) and "*pre-history*" (Helfat and Lieberman, 2002). However, despite this proliferation of terms, early moments have seldom been the subject and focus of careful and detailed study.

In this study, early moments refers to a time period between the first events or efforts regarding an issue (use of technology, operating model, system of beliefs), and when the issue has become institutionalised, i.e. taken-for-granted. The early part of this time period is characterised by distinct type of events and activity: development and experimentation of new solutions, trials of products and services in pilot projects, activities that are perceived as potentially only temporary in nature. As a result, one feature to denote early moments is uncertainty about the persistence and continuity of the solutions that are being experimented with.

The end of early moments is demarcated by increased certainty and stability of the choices. In reference specifically to technology, Tushman and Anderson suggest that one indication of the end of early moments is the appearance of a dominant design, which "*reflects the emergence of product-class standards and ends the period*

of technological ferment" (Tushman and Anderson, 1986, p.441). In the creation of novel professional practices, for Purdy and Gray "*innovation stage*" ends when "*new practices are accepted*", "*resource pools emerge*", and "*multiple new organisational forms emerge*" (2009, p.373). This study draws on these insights to derive a working definition of early moments as a '*period of experimentation with novel solutions, characterised by uncertainty regarding their continuity, and before their wide-spread recognition*'. During the period that this research is concerned with mobile health has been in a phase of early moments. This is indicated by the wide variety of experiments that I describe throughout the empirical chapters, and the uncertainty that respondents have expressed regarding the development of various aspects of the field.

Another prominent feature in this study has been the concept of 'organisational field'. I rely on the frequently quoted definition of the concept by Powell and DiMaggio (1991):

"By organisational field we mean those organisations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies and other organizations that produce similar services or products." (1991, p.148)

I infer from this definition that the pivotal characteristic of organisational fields is the large number and variety of types of organisations involved. Scott (2008) has suggested that this concept is broader than industry, adding a variety of other organisations than just those that provide similar services or products. For Scott these are for example "*exchange partners, competitors, funding sources, and regulators.*" (p.86) In this study I consider organisational field of mobile health to con-

sist of also other types of organisations, such as innovation promotion agencies, consultancies, professional and industry associations, and intermediary services such as a law firm. Moreover, as this study focuses on a case that occurs in an interstitial space between two sectors (Morrill, 2006), namely health care and telecommunications, this field includes organisations from both of these source fields.

I adopt this broad view of organisational fields as I expect many types of organisations to have influence on the development of mobile health field. While my inference is mostly due to a close reading of the Powell and DiMaggio definition, it is also reflected in the views of the respondents of this study. The diversity in organisational fields is well displayed in several of the organisational field sketches that interview respondents have drawn (chapter eight). Their sketches display the perception that a large variety of organisations have a role to play in the development of mobile health. I elaborate on the methodological implications from the use of this concept in chapter three.

Third core concept of the study is that of institutional entrepreneur. There have been different conceptualisations of this term. Some authors have perceived institutional entrepreneurs as engaging in relatively 'concrete' efforts of building technologies and developing organisations. For example, Scott (2008), drawing on Aldrich and Ruef (2006), suggested that institutional entrepreneurs create new types of organisations or industries, by marshalling new technologies and designing new organisational forms, or by creating new supply chains and markets. In contrast, others have argued that these actors engage in a more cognitive and socio-political types of activities. Garud, Jain and Kumaraswamy (2002), by reference to DiMaggio

(1988) and Aldrich and Fiol (1994), argue that institutional entrepreneurs create systems of meaning that tie various institutions together, and that they foster collective action by creating stable sequences of interaction between organisations.

I draw on both views in my use of the concept, in order to be open to all kinds of potential influences on the development of the mobile health field. My working definition of institutional entrepreneurs thus is that they are actors of any kind, possibly individual but especially organisations, who engage in efforts to advance the institutionalisation of a novel solution. These efforts may be technical, i.e. developing objects such as concrete devices or service outputs. They may be efforts to create social or cognitive associations, i.e. creating collaborations or making claims about the solutions through advertising. Finally, they may be efforts to create structural elements, such as new organisations, funding or regulations. I consider all of these activities to contribute to the institutionalisation of a novel solution, by confirming and fostering the existence and recognisability of the solution.

Fourth, I also provide a working definition of mobile health. I indicate in chapter five that at the time of this research, no clear, authoritative definition existed. The data of this study provided little help in terms of determining what mobile health means, as they pulled in many different directions. However, a conception of mobile health that has guided me throughout this study is the following: mobile health consists of mobility related information technology devices and applications, employed in health care services or wellness maintenance, used either by patients or by care professionals.

1.3 CHAPTER OUTLINE

This thesis consists of ten chapters. Chapter two is a review of the literature that provides the theoretical framing for this thesis. I focus on the concept of institutional entrepreneurship. This concept has been developed as part of neoinstitutional theory in order to explain action and change. Institutional theory, and particularly the neoinstitutional variety, has been oriented towards explaining stability and isomorphism. Institutional entrepreneurship is a useful concept for this study, as it focuses on action in an environment of institutional pressures. As I will describe, the developing field of mobile health is surrounded by source fields that exercise that pressure on the activities for promoting mobile health. In my discussion of institutional entrepreneurship I concentrate on four aspects of 'structuration', 'agency', 'theorisation' as part of agency, and 'field context'.

Chapter three describes the methodological setting and the research design of the study. I discuss the characteristics of past studies on technological and institutional change. Related to these approaches in past literature, I introduce two core considerations to this study. First, the concept of 'organisational field' has been frequently employed, but I argue that the true spirit of this concept calls for a large number and a wide range of participating organisations that effectively may resemble a 'field of organisations'. Second, I highlight the criticisms against retrospective and presentist studies, and describe my approach as non-presentist. This implies studying the phenomenon without knowledge of the outcome, which potentially could influence the analysis of the researcher, and with a keen and 'hori-

zontal' focus on the past. I also detail the different aspects of the research design: the types of organisations involved in the study, the different forms of data collection, the issues focused on during the data collection, and the analysis process.

Chapter four provides macro-level context to the empirical cases. With the help of graphs I present four aspects of country profile relevant to this project: Economic indicators that relate to the development and funding in telecommunications industry; comparative aspects of health care systems and technology use in health care services; inventiveness in ICT and medical technology industries; general technology use in the countries. In addition to presenting statistical data, I describe in more detail historical and current aspects of industrial policy, as well as key elements of the structure of the two health care systems.

Detailed case analysis is divided into four chapters, one of which concerns the ideas about mobile health, and three describe the various efforts to materialise these ideas. The effects of the surrounding context on those efforts have a significant role in the latter three chapters. The chapters have been divided into two, first describing the case analysis from England and then that of Finland. In addition to the specific focus of each chapter, a common thread runs through the empirical chapters in the form of timeline that gives a sense time for mobile health ideas and activities. In these graphs I show, to the extent that the data allows, the temporal pattern for the occurrence of ideas and activities, as described either in interviews or in organisational documents.

Chapter five is about the ideas of mobile health, namely how mobile health is un-

derstood as a concept at a more general and field level. I describe results of a database search of newspaper articles on mobile health, which portrays the foci of public talk on mobile health. I then present in detail the views of the organisations participating in this research on what mobile health means for them in terms of devices, in terms of the functions the devices are used for, and in terms of primary users. I use this data to argue that instead of consolidation towards a distinct category definition mobile health has been perceived in a wide variety of ways at this early moment stage.

Chapter six details the efforts to create mobile health related objects. The chapter examines the extensive endeavours to materialise the ideas about mobile health into objects, such as technology devices and applications, business and service concepts, and research outputs. In addition, I describe the many obstacles that these efforts have faced, resulting in struggles relating to technology integration, the development of business models and how to take advantage of research outputs. This has been the most active area of institutional entrepreneurship efforts at the early moments of mobile health.

Chapter seven is an account of activities to set up institutional structures, but it is also about the influence of existing structures. Such structures may be e.g. regulations, organisational units and funding, what some have referred to as governance mechanisms (Scott, 2008; Morrill, 2006). However, in both countries there has been only little effort as of yet to set up bespoke structures of these kinds for the developing mobile health field. Instead, majority of the chapter describes the various obstacles of existing institutional arrangements of the surrounding source

fields that have impeded these efforts.

Chapter eight analyses the efforts at social and cognitive associating to promote mobile health. The chapter describes the efforts by organisations to seek collaborations for their mobile health initiatives, and those instances when they have joined projects set up by others. I illustrate respondents' conceptions of field development with several examples of the sketches that interview respondents drew to display their view of the social structure of the developing mobile health field. I also discuss the efforts of cognitive associating. By their claims organisations have made attempts to cognitively embed mobile technology solutions into health care. Yet, it is particularly the claims of the challenger type of organisations that have faced resistance, as their vision of mobile health requires health care reform and extensive evidence of the impact in health outcomes or cost efficiency.

Chapter nine consists of a discussion that draws together the core findings of the study and relates them to the issues raised in the literature review. There two main arguments here. Examining institutional entrepreneurship at early moments highlights the prominence of technical efforts by actors seeking to institutionalise novel technology solutions. This stands in contrast to the arguments that institutional entrepreneurs engage in cognitive and socio-political efforts. Second argument concerns the role of context, which in past literature has received limited attention. In addition the view of how context impacts institutional entrepreneurs has been narrow, as many studies have focused on change in an existing organisational field. This mobile health study describes the development of a new field, and

thus the contextual factors derive from the surrounding source fields.

Chapter ten concludes the report, with a view of broader implications of the study and reflections on the project. I return to some of the core issues of this study, such as the intellectual paradox and the main research question outline in this introductory chapter. I contend that the early moments perspective is highly useful to provide novel insights on institutional entrepreneurship. I discuss also the broader implications of the approach employed in this study, and the prospects for future research in institutional entrepreneurship as a result of the findings here. I also review some of the limitations and methodological challenges of the study.

1.4 CHAPTER CONCLUSION

I have laid out the key elements of this study and of this thesis document in this chapter: The theoretical interest, case background, motivation for the study, key concepts, and the chapter structure and content of this document. In short, with this study I have sought to understand better the efforts to institutionalise novel technology solutions in a new area of society. I have suggested that there is much technology development that fails to have impact. In order to examine these and the related efforts, and how they are influenced by the context, I have focused on a specific time period in the process of institutionalisation, the early moments stage.

The efforts to introduce mobile technology into health care have provided a fitting case study that combines the commonly perceived need for reform in a highly

institutionalised sector (health care), rapid advancement of a technology (mobile technology) and its proven use in other sectors, as well as efforts to merge these two factors. Some of the theoretical claims suggest these conditions engender institutionalisation of the technology. However, the absence of mobile solutions in health care at the moment when this research was begun raised an appropriate question about why familiar and proven technologies become institutionalised only slowly if at all in new areas of society. The core concept that I employ in this study is institutional entrepreneurship, which usefully is poised to take into account both the actions as well as the institutional context in the development of a new organisational field. As mobile health development has been at the early moment stage, this case has been a good opportunity to study institutional entrepreneurship at its early moments. The next chapter describes how this concept has been employed in past studies of technology and institutional change.

CHAPTER 2: ACTIVITY AND CONTEXTUAL CONDITIONS IN INSTITUTIONAL THEORY - REVIEW OF SELECTED LITERATURE

2.1 INTRODUCTION

The question of how to frame this study theoretically is not uncomplicated, as there are many literatures that could inform a study that is concerned with these issues, and they all have their merits. The literature ought to provide answers to questions regarding the organisational efforts and the contextual conditions at the early stages of development at industry or broader level. Some authors have explored their arguments in the frame of a broader set of literature, such as Munir and Jones' (2004) consideration of institutional theory, social movement theory, structuration theory and actor network theory. They also note that it has become conventional among organisational theorists in recent years to dismiss out of hand the merely technical or economic functionalist arguments, in order to leave space for a more detailed examination in a socio-cognitive strand of arguments. This position is succinctly described by Rao, Morrill and Zald:

> *"A political perspective directs attention beyond technological or transaction cost analyses of organizational change to consider how entrenched, field-wide authority is collectively challenged and restructured; how new norms, values, and ideologies are infused into social structures via political contestation; and how institutional entrepreneurs and activists play key roles in framing new practices, mobilizing resources (including constituencies), and garnering legitimacy for new forms."* (Rao, Morrill and Zald, 2000)

The context for mobile health is primarily the health care sector and one of the theoretical frameworks to study health care within organisational literature has been institutional theory. This sector is governed by extensive regulations for care

and administrative procedure. It is also highly process oriented, i.e. it has exhaustive formal operating processes such as care pathways that dictate the activities of the professionals (Dopson, 2005). In theoretical language, it is a sector that is highly institutionalised with norms and professional practice. To study health care, institutional theory has been employed in different ways: While some have referred to it as part of a broader exposition of literature (e.g. Dopson, Fitzgerald and Ferlie, 2008; Barley, 1986), others have used it as the entire foundation for their analysis. Examples of this latter approach are Inoue and Drori's (2006) study of the evolution of the global health system, and Scott et al.'s (2000) work on the changes in San Francisco Bay area health care system.

My investigation revolves around the tensions between the existing institutional arrangements (of the source fields, i.e. mainly health care and telecommunications) and the novel solutions being proposed, and therefore institutional theory seems a fitting theoretical context for my study. The friction between standardised rules and practices and the attempts to introduce novel solutions have been extensively explored over the last two decades (DiMaggio, 1988; Powell and DiMaggio, 1991; Seo and Creed, 2002; Lounsbury and Crumley, 2007). Since DiMaggio's lament that "*institutional theory tells us relatively little about 'institutionalisation' as an unfinished process"* (1988, p.12) there have been plenty of attempts to develop a concept of agency and change within this framework. Yet, I argue that this literature is excessively focused on cognitive effects, and has failed to recognise a set of other effects that become more visible when studied in close scrutiny. In the interest of providing a focused treatment for the review of past work in this area, I have

narrowed the set of literatures to those that revolve around the concept of "*institutional entrepreneurship"*. I will review the arguments in this subset of institutional literature through constructs that are closely linked to this concept in institutional theory, namely 'structuration', 'agency', 'theorisation and legitimacy', and finally 'field conditions' as another important aspect in early moments and entrepreneurship. In consider these four aspects in relation to the concept of institutional entrepreneurship and the temporal aspect of an early or initial stage, for which I will develop in this study the construct of 'early moments'.

As I discuss the literature on these concepts, I carry along the distinction between *institutional change* type of cases and *emerging fields* cases. The former, and more common in this literature, concerns cases where authors perceive there to be an existing field that is going through changes. The latter concerns other cases where a new field is being created along with its institutional arrangements, albeit the construction of which takes place in the context of surrounding fields or sectors. This distinction is important because it has implications on the context in which the efforts to construct a new field of mobile health are made.

Institutional theory has had a somewhat uncomfortable relationship with agency and change, as it was initially more oriented towards explaining permanence. An initial critique by DiMaggio (1988) noted the excessive focus in institutional studies on homogeneity and endurance, i.e. how institutions "*reinforce continuity and reward conformity*" (Garud, Hardy and Maguire, 2007, p.957), while neglecting questions of interest and agency (Dacin, Goodstein and Scott, 2002; Lounsbury and Crumley, 2007). Institutions become taken for granted (Berger and Luckmann,

1967; Jepperson, 1991) and develop path dependencies (David, 1985; Arthur, 1988). Whether the theoretical lens has its origins in economics, sociology or cognition, stability of institutions has been the main focus, and any aspects of organisational reform have concerned change that is isomorphic, towards dominant forms (Garud, Hardy and Maguire, 2007). Instituting new solutions, or "*new practice creation"*, has received little attention (Lounsbury and Crumley, 2007, p.993; Maguire, Hardy and Lawrence, 2004), which arguably has been consistent with this characteristic interest in dominant and persistent forms and practices. It is only relatively recently that there has developed an interest in exploring non-isomorphic change within the framework of institutional theory (Dacin, Goodstein and Scott, 2002).

Yet despite the rising interest there still has been missing a broader view of what is involved in making the efforts to institute new solutions. In particular, for a theoretical framework that is concerned especially with elements that steer or direct behaviour, there is surprisingly little treatment of how the existing institutional conditions restrict the efforts to create new institutional arrangements. In other words, analysis of how the different contextual factors have specific consequences on these efforts. Much of the attention by scholars on contextual matters has been on how the institutional context may provide an opening for novel solutions to be introduced. I will begin with the concept of 'structuration' that is generally used to explain broader, field-wide processes of institutional change.

2.2 ASPECTS OF INSTITUTIONAL ENTREPRENEURSHIP

2.2.1 Structuration

'Structuration' is one of the core concepts in that part of institutional theory that tries to conceptualise processes of change. This is a concept that signifies macro-level cumulative processes by which organisational fields become organised (DiMaggio and Powell, 1983, 1991). I note three aspects in regards the concept of structuration by which the past literature has either neglected key effects, or by which it is unhelpful for studies that focus on the earliest stages of a developing field. First, scholars in this area have emphasised social in their definitions of structuring, perceiving social organising the pivotal activity in the development of a field. However, this raises the question whether other types of activities, such as those of material effects, may give structure that guides behaviour and gives direction to field development. Secondly, from the point of view of an early moments study, the timing of structuration is also of core importance. While this aspect of structuration has received less attention, there seems to have been agreement that development towards field maturity proceeds in stages, or episodes. Yet, what occurs within the episodes has not been elaborated on. Thirdly, collective action has been one of the core features by which authors have explained the structuration of new fields. A question that has remained is whether it plays an equally central role at all stages of field development, and especially at early moments.

For Powell and DiMaggio, structuration is the "*institutional definition*" of the field, made up of four specific elements: augmented level of interaction between a set of organisations; the structures of domination of the field; extended level of information concerning the field; and mutual awareness among the organisations involved in the emerging field (Powell and DiMaggio, 1991, p. 65). Meyer, Gaba and Colwell (2005) express this widely used definition in more simple terms as mostly about social associations: the patterns of interaction, sharing of information, and the mutual awareness. The "*structures of domination*" that Powell and DiMaggio add refers to governance mechanisms, which is the one 'non-social' feature in their definition, and one that some others, e.g. Morrill (2006), have emphasised.

In a largely comparable fashion, for Lawrence and Phillips (2004) structuration consists of patterns of social interaction, which produce (and maintain) institutional fields. They define these fields as composed of a set of institutions (taken-for-granted practices, understandings and rules) and a network of organisations. They point out that institutional entrepreneurs draw on existing macro-cultural institutions as resources in order to shape, or structure, these relationships and the institutions. The importance of human action for structures is visible in their argument, which goes back to Giddens' (1984) original view of recursivity. The rules and resources that Giddens defines as structures exist only insomuch as they are recursively activated within social practices. This is the agency of actors whose routinized, patterned action is continually needed to implement the structures in question (Emirbayer and Mische, 1998). In these arguments, thus, structuration as

the cumulative process is mostly (in addition to governance mechanisms) about a social process, i.e. the ordering of social relations in the field.

In contrast, other authors have conceptualised structuration as something that is not about social interaction. For Meyer, Boli, Thomas and Ramirez (1997) structuration is the effort to put in place more tangible entities, namely organisational forms. They define structuration as the *"formation and spread of explicit, rationalised, differentiated organisational forms"* (p.156). In a parallel statement Rao, Morrill and Zald (2000) give a more explicit name to these organisational forms, by suggesting that structuration is the formation of specific organisations, namely professional organisations, and their "*various symbolic, cultural, and normative boundaries*" (p.250). They conceptualise structuration occurring through the "*reconfiguration of the institutional context"* (p.250) through the establishment of pivotal organisations such as professional associations, which consequently facilitate the surfacing of alternative practices.

These examples show how the conceptions of the nature of structuration emphasise the social structuring, whether in the form of inter-organisational relations or of how to organise collective action of individuals or organisations as a type of organisation. The studies I have cited above discuss structuration as a case of institutional change in existing fields, which thus presupposes some extant elements that may support and give direction to any structuring activity. Also at an early moment stage, there may be organising of collective interests, through setting up of formal partnerships and industry organisations. However, only focusing on social struc-

turing leaves a question of when these types of efforts are absent, may no other type of efforts contribute to the shaping of the field? If these types of efforts are prominent only at a later stage, and I discuss the timing of structuration next, may some other efforts provide structure to the emerging field?

Another aspect, and particularly relevant for an early moments study, is a question about the timing of structuration, which provides further insight into how authors in this area have conceptualised field-configuring activity. Powell and DiMaggio (1991) emphasize that structuration processes at field level are distinct and a precursor to any institutionalisation of more specific novel organisational forms. DiMaggio underlines this by stating, "*to understand the institutionalisation of organisational forms, we must first understand the institutionalisation and structuring of organisational fields"* (1991, p.267). Barley and Tolbert (1997) concur that contextual changes need to precede any specific product or practice related efforts by which actors assemble resources and construct novel solutions. Otherwise, they claim, the existing institutional framework, with its scripted patterns of behaviour, are likely to cause actors merely to reproduce the behaviours influenced by this existing framework - even if they do acknowledge that cultural constraints may not determine human action completely and without exception.

Lawrence and Phillips (2004) counter the above claims by suggesting that contextual changes and creating specific products or practices are not in fact in sequence but "*intertwined*" (p.692). In their view actors rely on the existing cultural discourses to draw support for their efforts to institutionalise novel concepts and pat-

terns of interaction. In other words, in the absence of the structural elements in the new field actors draw on the existing resources around them, thus making the generation of the new forms and of the new structural elements simultaneous.

In line with the Lawrence and Phillips view, Morrill (2006) and Purdy and Gray (2009) placed structuration at a still later stage. For Morrill, in his study on the development of alternative dispute resolution mechanism in the United States, structuration is the third sequence in his model of "*interstitial emergence"*. For Morrill, echoing the Powell and DiMaggio (1991) perspective, structuration consists of efforts to develop professional jurisdiction and governance mechanisms, whereas the innovation stage is about experimentation with novel solutions, and the mobilisation stage of trying to secure resources through framing. Purdy and Gray (2009) follow on from Morrill's (2006) work to explain that in the innovation stage "*new logics are introduced and debated"*. In the mobilisation stage "*actors compete to gain adherents for their logics*". Third, in the structuration stage "*logics are translated into concrete practices"*, which results in taken-for-granted norms and structures (pp.7-8). Thus, these authors place structuration at a later stage, while the experimentation with novel solutions would initiate the development of "*interstitial emergence"* (Morrill, 2006) or "*emerging institutional field"* (Purdy and Gray, 2009).

Another timing consideration is the temporal pattern of structuration. Some authors have noted that structuring occurs in episodes. Clemens (2007) noted that theories of structuration underscore the episodic nature of historical process. In an

empirical study by Inoue and Drori (2006) on the global health governance one of the findings was that the field structuring process was wave-like. Above I have described Morrill's (2006) and Purdy and Gray's (2009) episodic models. One exemplary formulation of these episodic models is Hargrave and Van de Ven's (2006) collective action model of "*institutional change*" (p.864). At the first "*emergence phase"* (p.883), actors have primarily technical considerations and they 'float' ideas by which to "*address a social issue or develop a new practice*" (p.883), but they do not yet mobilise resources nor proceed to introduce their novel solution. At a "*developmental phase"* (p.883) actors, and in their model as collectives, introduce competing approaches or designs, and engage in political activity to gain support for their solution. "*Implementation or convergence phase*" (p.883) begins when a particular solution has become dominant, and adaptation and diffusion will ensue. While these models, such as the Hargrave and Van de Ven model, are informative to describe the general trend of change as episodic, they still leave questions about the specific content within these phases, and of the nature of development within the phases.

Third issue related to structuration is the emphasis on the social arrangements, and in particular collaborative effort in institutional entrepreneurship. As I have described above, the organising of social relations has been the focus in structuration related literature. This focus has been underpinned by the observation, as Lounsbury and Crumley (2007), Czarniawska (2009) and Leca, Battilana and Boxenbaum (2008) have noted, that no individual actor may be able to establish, maintain or abolish an institutionalised practice, since a practice is constituted by ac-

tions of many actors. Any single institutional entrepreneur, vying to institute a novel practice or form, is dependent on others following the lead to reproduce this action. In order to elaborate what the social organising in this respect means, some authors have discussed the density of interconnections among organisations (Baum and Oliver, 1992) as well as the nature of those connections, noting for example the change from contractual to equity ties (Dacin, Goodstein and Scott, 2002). More recently other authors (Wijen and Ansari, 2007; Mollering, 2007) have explored the idea of collective institutional entrepreneurship, consisting of "*sustained collaboration among numerous dispersed actors to create new institutions or transform existing ones"* (Wijen and Ansari, 2007, p.1079). In fact, the idea that collaboration between actors should be an integral part of structuration, has been one of the components already in the DiMaggio and Powell (1983) groundwork:

> "*Interorganizational interaction can increase in intensity, coalitions can form, information can be exchanged, and an awareness of involvement in a common enterprise can develop" (Lawrence, Hardy and Phillips, 2002, p. 282)*

Collaborative institutional entrepreneurship, as the focus on social organising overall, then has been seen as a core element of structuration in this literature. The essential question from the perspective of an early moment study is whether the focus on social organising, episodic nature of development and collaborative action applies at the stage when the field is not yet settled and may have few if any stable relationships and a clear forum or space where actors congregate. These studies

have not been specific about the timing of these aspects of structuration, but I will highlight these in my findings and discussion of the mobile health case.

2.2.2 Agency

'Agency' is another key term in institutional theory literature, with which authors have sought to specify the ways in which actors initiate new forms, and in what conditions this is possible. While institutional theory has been focused on persistence and stability (especially more recently in the form of neoinstitutionalism), agency as a term is part of a shift to consider more broadly the possibilities for action within this theoretical framework.

I raise two issues in regards agency that are relevant in the assessment of literature vis-à-vis early moment cases. First there is the question of whether and under what circumstances is agency possible to begin with. One of the debates under this rubric of agency is the "*paradox of embedded agency*" (Holm, 1995; Seo and Creed, 2002), which I will discuss below. There have been endogenous and exogenous solutions to this paradox to indicate how actors' efforts may be successful, but these both approaches presuppose an existing framework of institutional arrangements, the lack of which makes these analytical models unhelpful for an analysis of an early moment case. Secondly, if agency is possible, the second question asks what kinds of actors are able to introduce new solutions. This literature suggests that agency, by actors with resources and privileged positions, must be possible,

even in fields that are governed by existing institutional arrangements, since societies and its sectors of activity constantly evolve. However, from an early moments study perspective it is less clear how useful these analyses are. The mobile health case questions the ability of the actors traditionally presumed capable, and offers the view to the agency by the less potent actors. Also, as little exists in terms of field bespoke institutions at early moments, the embeddedness of the novel efforts in various source fields becomes the question. At this point the literature provides less direct assistance for early moments analysis.

If societies are dominated by enduring institutional patterns of behaviour, as institutional theory has suggested over many years, when are efforts to change or create new practices and other fixtures of social and economic life possible? Two approaches have been employed to solve this apparent dilemma. The starting point of the discussion are the "*structural constraints",* as the 'institutional patterns of behaviour' have been described. A persistent question in this area has been about the extent of agency that actors have for initiating novel solutions in light of these structural constraints. The more formal phrasing of this "*paradox of embedded agency*" debate (Seo and Creed, 2002; Holm, 1995; Clemens and Cook, 1999; Battilana and D'Aunno, 2009; Wijen and Ansari, 2007) has been described as this:

> "*How can actors change institutions if their actions, intentions, and rationality are all conditioned by the very institution they wish to change*?" (Holm, 1995, p.398)

As a result of the strong emphasis on cognitive effects in institutional theory, these structural constraints have mostly been conceived as cognitive schemas, which restrict the ability of actors to envisage alternative paths of action and the nature of the field (Dorado, 2005).

One of the approaches to this paradox has been to conceive an endogenous solution, where internal inconsistencies within and between institutional arrangements prompt actors to arise, to overcome the institutional constraints of logics and scripts, and to initiate change through mobilising collective action (Seo and Creed, 2002). This approach then presupposes an existent institutional framework, and that the actors are able to muster resources and compelling arguments sufficient enough to overcome the constraints.

The second approach is an exogenous response which suggests that external technological, social or regulatory shocks or jolts destabilise the balance of the field, impelling new and existing actors to "*introduce new ideas*" (Greenwood, Suddaby and Hinings, 2002, p.60). In Greenwood, Suddaby and Hinings' words these actors "*innovate independently, seeking technically viable solutions*" (p.60) to problems. They do not elaborate on the exact nature of this innovating and of those technical solutions, as the focus of the authors' work is on the following stage of theorizing. I return to theorizing, a core element of agency in institutional theory work, below in more detail. The shocks that these authors propose may be novel technological solutions, social upheavals, and changes in the regulatory regime imposed by pub-

lic authorities, which may then disrupt or force the field to adjust to new circumstances.

These two explanations of the sources of agency are part of the same *institutional change* type of cases as I have discussed above. In other words, the agency occurs in a context where an institutional framework exists. While relevant for already existing fields, the contribution of these explanations for an early moment case is limited. As already referred to above, in an early moment context there is by definition an absence of a field-specific institutional framework. At the same time surrounding fields, that may be sources of actors, business models and regulatory solutions for the new field, are likely to exert some influence on the developing field. As a result, an endogenous rupture in the institutional framework is not a possible event, as no such framework exists. Likewise, while an occurrence of an exogenous shock may be possible, when a field is newly developing, there is little to destabilise, and as such this explanation provides little guidance for early moment cases. Rather, such a premise suggests that actors are free to develop novel solutions, without the hindrance of existing institutional arrangements. The hindrance that they face come from the source field institutions, but which ones are the more important, and how to continue pursuing the efforts while facing these obstacles are the core questions in early moment cases – as my discussion of the mobile health case will show in chapter nine.

Another tack has been to explore which actors may act despite the institutional pressures. Both of the two approaches described in previous paragraphs to explain

agency take for granted a very capable actor who will take up the cause to develop novel solutions. Whether it is an external shock of technology or an internal rupture between existing institutions, a potent actor is presented with an opportunity and is able to drive through the desired change.

This potent actor in agency-based explanations has been labelled as the "*institutional entrepreneur*". DiMaggio's (1988) idea of "*institutional entrepreneurship*" has been a core concept for inserting a dynamic of change into institutional theory. In the standard accounts these institutional entrepreneurs "*enact new visions, cultivate and capitalise on opportunities for change, and exert political clout to legitimise new institutional arrangements*" (Purdy and Gray, 2009, p.355). In a more sombre phrasing, the agency of these institutional entrepreneurs focuses attention on those struggles that are fought over resources, stakes and access (Bourdieu, 1990).

DiMaggio's original formulation has served as a basis for much later theorising in this area:

> *"New institutions arise when organized actors with sufficient resources (institutional entrepreneurs) see in them an opportunity to realize interests that they value highly."* (DiMaggio, 1988: p.14)

A pivotal element in this definition of an institutional entrepreneur for later theorising is the initial emphasis on actors that have capacity for action and change efforts on their own. In the early use institutional entrepreneurs were considered to feature actors that are in powerful positions, such as the state and professions

(Powell and DiMaggio, 1983; DiMaggio, 1991; Holm, 1995). Later work has developed further different aspects of this position. Interests of the organised actors have been extended into power politics (Fligstein, 1997; Seo and Creed, 2002) whereas the work of "*realizing*" these interests has been developed as *"leading the efforts to identify political opportunities, framing issues and problems, and mobilizing constituencies*", in addition to which institutional entrepreneurs "*spearhead collective attempts to infuse new beliefs, norms and values into social structures*" (Rao, Morrill and Zald, 2000, p.240). These statements highlight the core features of institutional entrepreneurship: 1) institutional entrepreneurs are actors that are organised and furnished with resources (Hoffman, 1999); 2) they employ power and politics to advance their projects (Fligstein, 1997); 3) key to their success is how they are able to embed their solutions with the activities and interests of other actors in the field, i.e. to fit their solutions with the extant conditions (Maguire, Hardy and Lawrence, 2004).

Particularly notable from the perspective of the mobile health case is that institutional entrepreneurs are often considered to be powerful actors, and one form of power is to be in a "*dominant subject position*" (Maguire, Hardy and Lawrence, 2004, p.674). As a result of such a position, an actor may have the ability to create new dominant practices and to shape the social structure of fields (Garud, Jain and Kumaraswamy, 2002; Greenwood, Suddaby and Hinings, 2002), and consequently to overcome the paradox of embedded agency. Such privileged actors in key subject positions may be intellectual elites and other "*expert theorisers"* (Strang and Meyer, 1993, p.510; Seo and Creed, 2002, p.237), organisational scholars (Benson,

1977), and professional associations (Greenwood, Hinings and Suddaby, 2002; DiMaggio, 1991).

Whether actors are embedded or unembedded may not directly indicate scope for action. Some authors have argued that even if all action is tightly linked to institutional structures, individual agents should not be considered merely as participants or "*accomplices"* to institutionalised social processes. They have argued that agents' motivations, behaviours and relationships merit direct interest and attention (Lawrence, Suddaby and Leca, 2011), which help understand the relationship of institutions and agency. According to some authors, actors may in fact be relatively unembedded from their institutional context, which leaves scope for action (Seo and Creed, 2002; Maguire, Hardy and Lawrence, 2004). Others have argued that actors may be completely embedded, but in fact be in a better position to engage in "*purposeful change activity"* (Reay, Golden-Biddle and Germann, 2006, p.977), as they are 'inside' the institutional apparatus.

Yet, some authors have argued that also other kinds of actors should be considered institutional entrepreneurs, i.e. ones with "*varying kinds and levels of resources*" (Lounsbury and Crumley, 2007, p.993), or ones that may be the dominated and not only the dominant (Maguire, Hardy and Lawrence, 2004). This would open up the view to see three things: it would allow us to recognise a broader range of activity; it would deflect attention away from the heroic imagery of entrepreneurs accomplishing their goals; and it would allow us to see beyond the latter stages of new

practice creation when the powerful actors tend to be active, to notice the activity at an earlier stage (Lounsbury and Crumley, 2007).

However, Hargrave and Van de Ven (2006) have noted how there are some key problems that discussions of institutional entrepreneurship have overlooked. In particular they address the arguments by Barley and Tolbert (1997) who sought to infuse institutional theory with some of the agency by individuals that Giddens' (1984) structuration model provides. Hargrave and Van de Ven (2006) argue that Barley and Tolbert fail to address two key problems, which are particularly relevant also in cases of early moments. First, their focus on the individual does not include a consideration of the situation when an actor, i.e. an institutional entrepreneur, is faced with powerful actors who are keen to preserve the existing institutional arrangements. In an early moment case these would be powerful actors in source fields, such as IT-firms already established in the health care technology sector. Secondly, they do not address a situation where the institutional entrepreneur lacks the resources to pursue the institutionalisation of the new solution. This may be the case even for actors that are powerful in their original field, but are pursuing new operations in a developing field. These, as are seen with the mobile health case, are relevant considerations for theoretical development in the concept of institutional entrepreneurs, and the early moment stage circumstances highlight some of these issues.

2.2.2.1 Theorisation

I discuss in more detail the idea of theorisation, as it has been a core element in how many institutional theorists have conceptualised agency. I describe what scholars have meant with theorising, and the ways how theorising has been used to explain institutional change. I conclude by pointing out that theorising is at the heart of the problem that this cognitive approach to institutional entrepreneurship has in explaining how new solutions are introduced and how new fields emerge, at least for early moment stage of development. As I demonstrate with the mobile health case, cognitive work to establish mobile health plays a minor role at the beginning whereas other more material work, neglected in these accounts of institutional entrepreneurship, is more prominent at early moments.

Theorisation is part of a broader framing in institutional theory literature on change where these are cognitive processes that are underpinned by rhetorical or symbolic action, and to the disregard of more material forms of action. Typically, such as a study by Suddaby and Greenwood (2005) on institutional change in the accounting profession, institutional scholars have based their change stories on the much-employed Berger and Luckmann (1967, p.64) premise that "*institutions are built upon language".* Another constituting factor of the cognitive emphasis has been the reaction by the neoinstitutionalist scholars against the rational-choice and efficiency driven decision-making in organisations (Emirbayer and Mische, 1998).

Theorising is about creating abstractions to explain phenomena. Strang and Meyer (1993), on whose work much of the writing in this area has drawn, claimed that

diffusion of new ideas and practices may be accelerated by theorisation, through the development of "*abstract categories*" and "*patterned relationships*" (p.492) regarding cause and effect. Theorising also abstracts and yet simplifies properties of practices, and they "*specify and explain the outcomes they produce*" (p.497), making it easier to communicate about the novel solution. Greenwood, Suddaby and Hinings (2002) extended these arguments by exploring the different forms of theorisation as interpretation, representation, translation and normative development. They also noted that theorisation involves the specification of the shortcomings of the current norms and the justification of the new norms and practices (Dacin, Goodstein and Scott, 2002). In all of these activities, communication has an important role to motivate and mobilize action (Suddaby and Greenwood, 2005). Actors make claims about how some meaning is carried and transformed by the novel technology, conveyed and claimed with the marketing materials and other publicity (Munir and Phillips, 2005). Theorisation is essentially an attempt, by rhetoric, to affect the recipients' knowledge and awareness of the matter in question, by producing either novel or reframed cognitive artefacts into the field.

It has thus been a core argument in recent institutional theory regarding change and agency that institutional entrepreneurs use theorisation to legitimate and institutionalise their novel solutions. Theorisation may take different forms depending on the context. In a commercial setting the arguments for the adoption may be about efficiency. An actor may draw a comparison that implies similar benefits from an adoption of a solution than in another field where the ideas have been applied. In a professional setting efficiency reasoning is likely to be less effective, and

the arguments require a normative justification (Greenwood, Suddaby and Hinings, 2002). These authors explain that in their case study, the transformation in the accounting firms' *raison d'etre,* the change was not justified by a positive example in a neighbouring profession, but by continuity with and the need to align changes with the spirit of the values and norms of the profession (Greenwood, Suddaby and Hinings, 2002). This is relevant for the mobile health study as health care is arguably also a sector that is highly professionalised. In practical terms changes may face resistance if not aligned with the values and norms important to care professionals.

One approach to using the construct of theorisation has been to see it as a core element in a process model of change. For Hinings, Greenwood, Reay, and Suddaby (2004) theorisation is part of a process of de- and reinstitutionalisation, where institutional entrepreneurs develop and specify abstract categories, and seek to explain the chains of cause and effect. In other words, it involves creating a model about the new solution and offering a justification of how they fit in the current and future context. The other stages of the model are *legitimation*, which aims at making the ideas seem appropriate by making links with the current values of field actors, and *dissemination* of these ideas to others in the field through coercive, normative and mimetic isomorphism. This process of de- and reinstitutionalisation is part of a broader model of the authors, in which this stage is preceded by political, functional and social pressures, as well as the emergence of institutional entrepreneurs on the scene. Thus, these authors place theorisation at a relatively early stage of the process of institutional change.

Another example of how theorisation has been used to describe the activities of institutional entrepreneurs has placed it in the middle of the process model, after efforts to create social associations, and prior to cultural activities. Perkman and Spicer (2007) suggested that theorising is a technical activity that consists of "*studying, analysing and designing*" (p.1117) the object in question. Prior to these efforts to conceptualise the object, institutional entrepreneurs engage in political activities whereby they seek to develop the organisation, establish collaborations, and to gain access to resources. Perkman and Spicer's concept of theorisation appears to consist of activities that others such as Hinings, Greenwood, Reay and Suddaby (2004) referred to as "*localised experimentation"* (p.312). Yet, due to some ambiguity in their use of the term, one can only assume that they maintain the cognitive character of other uses of this term. Thus, the activities of theorisation for them concern the development of new ideas, as opposed to the development of technical devices. Nevertheless, theorisation has been given a pivotal role of conceptualisation in the processes by which institutional entrepreneurs introduce new solutions.

However, it is useful to recall that the rhetorical focus of these authors has been on change processes in existing fields, whereas a new field without institutional arrangements may have a different emphasis than rhetoric. The argument about theorisation falls short for cases that Maguire, Hardy and Lawrence (2004) call "*emerging fields"* and which Morrill (2006) has called "*interstitial emergence"* – in other words, cases where the new field so far has no distinct and settled patterns of activity and norms. Much of the work by institutional scholars has made the as-

sumption that relatively stable contextual conditions exist, thereby facilitating theorisation to be the critical activity. The conclusion is thus that theorisation cannot occur in a vacuum but in fact requires a certain level of institutional development (Maguire, Hardy and Lawrence, 2004; Beckert, 1999). Theorising needs to draw on existing elements such as widely shared norms and stable relationships. Maguire, Hardy and Lawrence (2004) suggest that at an early stage these norms and relationships tend to be missing, thus making it impossible for theorisation to occur.

Yet, even studies that focus on emerging fields, or early moments, have sought to explain the creation of novel solutions and change within the cognitive-linguistic realm. Maguire, Hardy and Lawrence's (2004) suggest in their study on the emerging field of HIV/AIDS advocacy that theorisation is part of the process, but occurs at a later stage. For them, during the first stage in field emergence, i.e. of "*institutionalisation*", institutional entrepreneurs attempt to connect the novel solution with the existing norms and values in the field. During this stage there are new norms being created around new practices, and actors build legitimacy for these by aligning the new solution with the values of the various stakeholders. Theorisation, in some contrast with the other more linguistically oriented work that has used this concept, they conceive to consist of the processes of assembling of arguments that translate the interests of stakeholders, and the gathering of a coalition of stakeholders through negotiation and bargaining.

This work by Maguire, Hardy and Lawrence thus highlights one of the problems the existing literature faces. The use of the concept of "*theorisation"* has assumed

that certain resources exist upon which new solutions are built. In much of this literature these resources are existing institutions, which institutional entrepreneurs may take advantage of, in order to launch their novel solutions. As noted above, much of this literature discussed institutional change –types of cases, which focus on existing field going through changes. When a completely new field is being constructed, at this earliest of stages no such resources may be available, and thus this literature has limitations for early moments cases. Other resources that are presupposed, but may be missing in an early moment case, are the material entities, such as technical devices and systems as well as social practices, such as professional operative practices. Similarly, at an early moment stage these artefacts need to be built and connected to existing systems and patterns, before the cognitive work may begin. I will return to this issue in the discussion chapter nine.

2.2.3 Field conditions

Another crucial question in an investigation of early moments is the contextual conditions in which the efforts for creating new practices and norms are made. I bring up four issues. Literature on institutional change and creation of new fields tends to mention the importance of context, but often provides rather little detail about how the surrounding conditions have impacted the efforts of institutional entrepreneurs. Also, the authors in this area have argued that the existing fields provide opportunities for new efforts, whereas the details of the mobile health case raise the question whether the opportunities in fact come from the field, and

what is an opportunity in the first place. In the third set of issues, distinguishing feature of this literature has been that it has focused only on cognitive and socio-political matters, neglecting any material effects that the surrounding field conditions may have on efforts to introduce new solutions. Lastly, I note how authors have described constraints in their studies, yet they conceptualise these as part of the field. While not illogical or inaccurate considering their *institutional change* type of case studies, they are less useful to inform early moments type of cases as in those there is little of field specific institutional framework to speak of at this stage.

There have been many authors that have argued for the importance of context, or have raised concerns about the tendency to neglect the context in which action takes place (Mutch, Delbridge and Ventresca, 2006: Emirbayer, 1997; Barley and Tolbert, 1997), yet few have specified in detail the effects of surrounding field conditions. Lounsbury and Crumley, 2007, call for research on the conditions under which "*innovative practices are incorporated into existing fields… beyond the invocation of institutional entrepreneurship as deus ex machina*" (p.1006). By this they direct criticism at the tendency to treat institutional entrepreneurs in institutional literature as heroic figures, summoned to produce novel solutions to pressing problems.

Likewise, Maguire, Hardy and Lawrence (2004) drew attention to context by statement that they were keen on developing a "*contextualised understanding*" of institutional entrepreneurship. By this they meant the examination of the "*specific*

characteristics of emerging fields" (p.658) in which the institutional entrepreneurs undertake their activities. One of their research questions focused on the subject positions that allow institutional entrepreneurs to pursue their strategies, which alludes to a description of the context of those positions. Yet, their account is detailed in the actions of the protagonists, i.e. the HIV/AIDS activists, but rather general in regards the details of the context, which is evidenced by their statement that "*emerging fields present would-be institutional entrepreneurs with a relatively unconstrained spaces"* (p.674). While their argument is that emerging fields have little 'institutional baggage' developed yet, in a subject matter such as HIV/AIDS and health care another approach would have most likely found many types of effects from the surrounding fields.

While the focus on the details of action in case studies is expected, some authors have made the argument that the impact of context on activities is formidable. For example, Barley and Tolbert (1997) argue that existing institutions have such a strong hold on actors that they only tend to replicate scripted behaviour. The implication of this, in their view, is that until the context has changed there is little prospect that the actors may assemble a new set of resources and rationales to promote novel practices. Other authors have noted how the impact of contextual effects on the "*microprocesses"* of action (Purdy and Gray, p.356; Holm, 1995; Rao, Morrill and Zald, 2000) may also be positive and contribute to the institutionalisation of new practices. Fligstein (1997) argued that a field may be only forming, or be in a state of stability or crisis and that the strategies and the skills that institutional entrepreneurs need are dependent on this state of the field. Again, as the

authors in these cases provide little detail about the effects of the contextual conditions, we know little about exactly how the surrounding conditions have either positive or adverse impact on the individual efforts that actors take.

Closely related to contextual conditions is the issue of opportunities. According to DiMaggio (1988), institutional change is commonly defined as "*agency, resources and opportunity"* (in Dorado, 2005, p.386). Purdy and Gray (2009) describe institutional entrepreneurs as actors that "*cultivate and capitalise on opportunities*" (p.355) which implies that the opportunities are part of the field, waiting to be exploited. Dorado (2005) states that "*conditions of organisational fields that facilitate the discovery and realisation of opportunities"* (p.391), which seems to suggest a different emphasis where the opportunities are generated apart from the field. She specifies that "*actors identify opportunities for change, but their ability to do so depends on the objective conditions of organisational fields",* and that "*scholars agree that institutional change .... depends on the availability of opportunities*" (p.386). The use of the word 'identify' implies that the opportunities are external to the actors as well, leaving them somewhere between the actor and the field. Nevertheless, these statements suggest that actors identify and capitalise on the opportunities that are made available by organisational fields.

However, it is difficult to gauge the exact nature of the opportunities that arise in organisational fields. The main reason for this is that authors have provided little detail as to how the opportunities occur. A useful example to highlight this is Dorado's (2005) work in which she presents a typology of institutional fields in terms

of opportunities. She suggests that some fields may be opaque in terms of opportunity, where the highly institutionalised and low level of multiplicity will not encourage nor support much change efforts. An "*opportunity transparent field*" (p.395) facilitates potentially a variety of responses, as there is a moderate level of both institutional development and multiplicity. A field that is hazy in terms of opportunities has high multiplicity and low level of institutionalisation, providing favourable circumstances for pursuing novel solutions. Dorado connects these to the potential for resource mobilisation, and develops three profiles of institutional change: Entrepreneurship; partaking; and convening. In the end, existing fields may be either highly, moderately or little institutionalised, and change is possible in principle, depending on different type of efforts, i.e. whether many autonomous actors accumulating their efforts over time (partaking) or more strategic efforts to combine efforts and resources.

However, despite using examples from other literature to explain these different cases, Dorado provides little concrete detail about the conditions that may make opportunities available for actors to capitalise on. Her abstract categories of opportunities, of resource mobilisation, and of type of agency is a coherent framework technically, but one which explains rather the types of outcomes as a result of the pursuit and struggles for change. Fields and their opportunities appear and are described as opaque, transparent or hazy, which are rather results of efforts and reactions to those efforts. Dorado offers stylised categories but little detail that would explicate the contextual conditions in which institutional entrepreneurs make their plays.

Aside from the shortcomings of detail, another limitation in this literature from the perspective of the study of new industries and early moments is a neglect of any material considerations. This is exemplified by Aldrich and Fiol's (1994) classic paper in which they explore the factors that hinder and support activities to form a new industry. They identify two areas of legitimacy. Cognitive legitimacy refers to a general recognition of the new product or practice, whereas socio-political legitimacy designates the new solution as appropriate and right, given the existing institutionalised norms. They support their arguments with case examples from literature, and show how critical the cognitive and the socio-political factors may be in industry creation, and in these respects this work has much to offer for early moment studies as well. Yet they choose to completely overlook any material effects, which reflects the broader tendency in this literature to neglect how technology might have effects that help institutionalise new practices. While their focus is specifically the creation of new industries, they have not considered whether technologies have effects that impact cognitive and socio-political legitimacy.

Lastly, another open issue is the question of how to conceptualise the relationship between efforts that are forming a new field and the surrounding contextual conditions. Many of the studies that I have referred to above examine *institutional change*, which presupposes an existing field with its existing institutional arrangements. Efforts to make changes in this setting will face the both constraining and supporting effects that these arrangements produce. In a less clear-cut case a field that is in the early moments of its existence is likely to lack many of these institutionalised structures, such as professional norms, regulations and taken-for-

granted business models. In spite of that, the actors participating in the new field may often be members of other, pre-existing fields, and thus be governed and influence by the institutions in those fields. This raises a question of how then to conceptualise the new field and its boundaries.

One of the complications in regards new fields and institutions is a partly confusing use of terms. An example of this is Purdy and Gray's account of the efforts to institute alternative dispute resolution mechanism, which would aim to supplement the main court system in the United States. Drawing on Dacin (1997), Dezalay and Garth (1996), and Holm (1995), Purdy and Gray (2009) discuss this as an alternative dispute resolution field that is newly emerging. In their discussion, however, they make reference to "*existing institutions*" (p.355) of that field with which organisations need to contend. They argue that organisations need to develop sufficient resources and legitimacy to survive, and that they need to fit their activities and solutions with the "*activities and the logics of existing institutions*" (p.358). Logically, however, if a field is said to be newly emerging, it is unlikely that there are institutions already in existence in this field.

One solution to this inconsistency is to label the case of alternative dispute resolution as an extension of an existing field. Instead of describing this case as one of a newly emerging field, it appears more as a case of a novel solution being created within an existing field of dispute resolution. That field already has an extensive set of institutionalised professional practices and field norms originating in the mainstream judicial system. Based on their account, it also seems that the actors

have acquired resources from other established fields. Conceptualising their terrain of operations as an existing field for which actors are introducing a novel practice makes the framing appear more logical also because the struggle for resources occurs between the incumbent actors and the challengers. The extant incumbent organisations implies that the field has been in existence for some time, during which some organisations have had an opportunity to develop dominant subject positions. However, if the case concerns a completely new field, few resources may be available in the new terrain. Instead, the surrounding environment is likely to consist of various existing fields, which may serve as "*source fields*", supplying needed resources. Further specification of the relationship of new fields with source fields is then required.

One approach has been to discuss the development of new fields but draw extensively on broader institutional elements. For example, Aldrich and Fiol (1994) discuss extensively the institutional context for gaining cognitive and socio-political legitimacy. They position their study as focusing on "*industry in its formative years"* (p.645), yet they make extensive references to institutionalised actors ("*industry councils, cooperative alliances, trade associations, other vehicles for collective action are in place…"* p.659). Clearly, these types of actors, such as industry councils or trade associations may exist at a broader level, while the specific field in question may be lacking in such institutionalised organisations. These may then be conceived as what Lynn, Reddy and Aram (1996) call a "*superstructure"* (p.98) that consists of professional and trade associations, as well as various state agencies. Such a superstructure could be conceived to cover many fields that have more spe-

cific membership and its bespoke practices. Yet, this approach complicates the definition of a field.

Another perspective is to consider the field to require a certain level of maturity. Beckert (1999) has argued that a certain level of institutional development is needed for strategic action. Echoing Maguire, Hardy and Lawrence (2004), he claims that actors need some basic amenities before they may pursue strategic aims. On the other hand, if organisational boundaries are to be considered "*porous*" (Suchman, 1995, p.571), new fields could be exposed to ideas, or "*institutional referents*" of other fields (Dorado, 2005, p.385). Schneiberg (2007) adds also a temporal perspective: He has suggested that already settled paths may leave remnants of paths that may serve as elements to build new systems. These remnants may be "*theories of order, community associations, political networks and organisational templates and forms*" (p.48) from earlier projects that were either abandoned or only partially realised. This argument suggests that field conditions, or existing institutional settings, may support efforts at transformation or even the introduction of wholly new systemic arrangements.

2.3 CONCLUSION

I have reviewed here theoretical literature that uses the construct of institutional entrepreneurship. This is a construct that has been developed by scholars working in institutional theory to theorise the efforts for creating novel arrangements and

for changing existing practices. Institutional theory literature, that tends to see modern Western societies as made up of a complex web of institutional arrangements, is particularly fitting as basis for analysing a case related to the health care sector. I have explored the literature in order to draw insights for the analysis of the mobile health case. However, while the construct of institutional entrepreneurship has been extensively investigated and employed, there are some limitations in the theory. The mobile health case provides alternative perspectives to complement the current theoretical knowledge.

I sum up the limitations of the institutional entrepreneurship literature from the perspective of studying early moments, in four specific points that the four aspects of *structuration*, *agency*, *theorisation*, and *field conditions* I have exhibited. First, in regards agency the recent institutional theory literature has closely held on to its view of the world in which changes are effected at two levels, the cognitive and the social. As a result the material effects have been neglected as elements that may impact the introduction of new solutions and field development. For example, theorisation of new solutions has a prominent place in institutional theory and agency. Yet, in an empirical case, prior to the creation of new cognitive framing the new solutions themselves need to be developed. Particularly in the case of technical solutions, as the mobile health case shows, the technical development has a significant impact on how the new devices or services are received or implemented by their users.

The extant literature on institutional entrepreneurship has also emphasised the impact of social aspects, either through focus on the more powerful actors or through collective action. On the one hand, it is likely to be common that entrepreneurs seek collaborations for new projects, especially when there are many actors that are small organisations with limited resources as in the mobile health case. However, the ability of powerful actors to promote their initiatives is far less certain. Maguire, Hardy and Lawrence (2004) argued that the successful institutional entrepreneurs tend to occupy subject positions that provide them with legitimacy and the ability to bridge various stakeholders. In other words, these are actors in positions of power and influence. Yet, even if these actors are in powerful positions in their existent fields, in the new, developing field there are, by definition, no dominant actors yet. By describing the efforts of small and large organisations, the mobile health case provides also in this respect a new perspective to institutional entrepreneurship.

Thirdly, many of the arguments I have reviewed rely on the presence of existent institutional arrangements, which is in some conflict with the early moments scenario. For example, the two arguments about what may prompt and enable agency, i.e. endogenous and exogenous catalysts of change, presuppose an institutional framework that institutional entrepreneurs set out to disrupt. Early moments stage of field development denotes the absence of bespoke institutional arrangements, but surrounding the developing field there are likely to be other fields of fully developed institutional structures. Thus, the mobile health case enriches the

institutional entrepreneurship concept by adding a perspective about initiating new projects under the pressures and constraints of various surrounding fields.

As a fourth point I note the lack of detail in some of the arguments regarding action by institutional entrepreneurs. This is a methodological effect that is in most cases related to conducting retrospective research. These studies, as I will elaborate in chapter three on research design, have been constrained by retrospective data collection that limits the possibilities to obtain rich, early stage data. Thus, authors have noted the episodic nature of field development, and the overall importance of context, but have been unable to provide much detailed evidence for these claims. The research design I have employed has emphasised data collection at the early moment stage in order to ensure the availability of detailed description of the efforts of actors and of the context for those efforts.

Finally, literature tends to consist of streams in which scholars in one stream may discuss extensively a subject, such as legitimacy, but miss the debate on the same subject of another stream (Suchman, 1995). Suchman (1995) notes that in studies of legitimacy there has been work in the "*strategic tradition*" (p.576) that has a managerial perspective emphasising the ability of organisations to manipulate and deploy symbols to garner support. Another stream exploring legitimacy has been the "*institutional tradition"* (p.576) where sector-wide cultural pressures preside over any single organisation's capacity to act. In other words, whereas the former pay attention to the ability of organisations to pursue novel solutions, the latter focus on the collective structuration of fields. Suchman argues that both approach-

es on their own have shortcomings, but that because in the real-world organisations face both operational challenges as well as pressures from the institutional environment, an analysis ought to incorporate both perspectives.

So far institutional entrepreneurship has been discussed from the perspective of cognitive effects. Many have argued for the importance of including political or social effects. While some have already made the case for the inclusion also of technical effects (Munir and Jones, 2004), I will show with my case study how early moments analysis raises some other perspectives. In the next chapter I describe my research design and related considerations to study institutional entrepreneurship in a developing field in an environment where the surrounding source fields are highly institutionalised.

CHAPTER 3: RESEARCH DESIGN, METHODS AND DATA FOR STUDYING INSTITUTIONAL ENTREPRENEURSHIP AT EARLY MOMENTS

3.1. INTRODUCTION

In the previous chapter on the theoretical framing of my research I have described how institutional entrepreneurship literature has conceptualised the efforts to introduce novel solutions. I noted that much of the literature has focused on *institutional change*, which in strict terms considers existing institutional arrangements, and how they may be altered or remodelled. There has been some interest in investigating the creation of new institutions, e.g. under the label *emerging fields,* but these studies are few and far between. It has been suggested that studying such cases of emerging fields, or the emergence of new institutions, is particularly complicated (Barley and Tolbert, 1997):

> *"An enormous amount of luck or prescience are required to recognize an emerging institution and then gather data on relevant, on-going actions and interactions. Moreover, historical or archival material will rarely contain the detailed data necessary for documenting the link between everyday acts and the creation of an institution" (Barley and Tolbert, 1997, p.100)*

As the quote above suggests, one of the empirical challenges of studying these cases is to recognise an emerging field, i.e. the on-going actions and interactions that are may one day constitute a distinct area of actors and patterns of behaviour. An alternative to such an approach of studying currently occurring phenomenon is to attempt to study emergence retrospectively, which has been the approach of much work in organisation studies. Herein lies one of the distinctive methodological features of this study: In order to capture the experiences of actors in technology-in-the-making (Garud and Rappa, 1994), before some forms have become institution-

alised and will affect the responses (Bijker, Hughes and Pinch, 1987; Latour, 1987; Meyer, Gaba and Colwell, 2005), I sought for a subject whose development is still at the early moments stage. Mobile technology in health care has presented itself as such a case.

While recognising that methodological decisions are always compromises between diverse considerations, such as available resources, time, data access, effectiveness of method and focus of study, I argue in this chapter that the study of institutional entrepreneurship and efforts to introduce novel solutions benefits from a different research strategy than what conventionally authors in this area have employed. The earlier work has produced useful insights on the efforts of institutional entrepreneurs, yet their emphasis on the cognitive and social type of efforts suggests they have focused on latter stages of these processes (Strang and Meyer, 1993; Lounsbury and Crumley, 2007).

This chapter is divided into three sections. In the first section I discuss how scholars have studied efforts to introduce novel solutions in the past, in order to highlight how my design is a distinct and advantageous approach for a study focusing particularly on early moments. I then follow with two methodological considerations that have guided this research project: a) the perspective of organisational fields, i.e. the question of breadth of sampling, and b) of taking into account the retrospective and presentist critiques. In the third section I describe how this research project was executed: What was the sampling frame; how the data was collected; and how the data was analysed. I conclude by noting the methodological

novelty of this research project in terms of extant research on institutional entrepreneurship.

3.2 METHODS FOR STUDYING THE INTRODUCTION OF NEW SOLUTIONS

Past work to study the efforts by institutional entrepreneurs to introduce novel solutions has applied a mixture of methods, but mostly emphasising archival methods. Researchers have predominantly employed qualitative methods, and within those archival, interview and participant observation, which I describe in the following. When instructive, I will also highlight how authors have formulated the focus of the study, to show the range of wordings around what is mostly a similar phenomenon.

3.2.1 Use of archival methods

The advantage of archival methods approach has been the availability of variety and large quantities of certain types of retrospective data. One exemplary study of the usefulness of archival research is by Garud and Rappa (1994), which shows the potential for the variety of archival sources. They argue that a longitudinal approach is required for the study of "*technology evolution"* (p.348). In order to track the beliefs, artefacts and evaluation routines from the time before they have be-

come affected by "*post-hoc efficiency and functional explanations*" (p.348). Their study traced the emergence of cochlear technology as the dominant solution for hearing deficiencies, in a process that began in the 1980's. Their focus was the formation of certain evaluation routines among the individual researchers and their communities. In their longitudinal study these authors used a wide range of methods: By virtue of the significant role of scientific work on this technology, archival data of scientific and other technical papers were available, with which they were able to construct a chronological baseline analysis to understand the evolution of the technical debates. With a content analysis they drew out the more important themes. They also accessed research files and personal notes of one of the key individuals in the field. In addition, over their multi-year research project, they also conducted interviews and observation, sent questionnaires, and attended steering committee meetings as well as conferences. This is an example of thorough use of archival methods, but for studies with considerable resources and time.

Another example, by Lounsbury, Ventresca and Hirsch (2003), shows other types of archival data sources, particularly in the political arena. They studied the emergence of the concept and practices of recycling as the "*emergence of new economic institutions"* (p.71), in a process that evolved since the 1970's, as the dominant approach to waste management over the previously primary approaches of resource recovery and waste-to-energy. The authors used extensive archival sources such as Congressional Hearings (of the USA), governmental reports, industry and consulting reports as well as trade press, for a time period spanning three decades. As

one part of the archival work, the authors coded 2500 Congressional testimonies, which allowed them to assess the different conceptualizations of competing waste disposal strategies in the very beginning of the formation of the recycling field. By applying these archival techniques also on the trade press allowed them to track the uses, and the shifts in use, of industry terminology in waste management over three decades. This is another study with strong archival data emphasis, and where the influence of political forces on the development guided attention towards these data sources.

Archival research can thus produce a voluminous data corpus, but this is predicated on the existence of a large number of such documents concerning the subject matter. Both abovementioned studies verify the value of archival sources: Garud and Rappa's (1994) example shows how documentary evidence can provide a veritable backbone for a study, by helping them to reconstruct the historical development of the technology. Also Lounsbury, Ventresca and Hirsch (2003) built their argument by and large on archival sources. But these cases highlight some central challenges that a study of early moments would be concerned with: what data exists, and how to find it. Both of these cases look back some decades, and therefore extensive records in these cases exist, while for a study of early moments there may not be many, or easily retrievable, documentary sources. Thus, while documentary sources have been shown to be useful, a student of early moments needs to prepare for potential difficulties in finding archival data.

3.2.2 Use of ethnographic methods

Similar phenomena have also been studied by participant observation (Barley, 1986; Garud, 2008; Meyer, Gaba and Colwell, 2005), which has an advantage of providing a certain type of detailed and rich data on a specific phenomenon. For example, in a study on "*technology's relationship to structure"* Barley (1986, p.81) used observation to study the changes in occupational roles when CT scanners were introduced in three hospital organisations. In order to observe changes in roles and behaviour, he attended individual examinations in hospitals, and took careful notes on staff behaviour with regard to each procedure. He also recorded the conversations that took place between participants in these situations as well as how they interpreted the events shortly after the occurrence. Barley was able to collect very detailed data on how staff commented on the changes as well as how he perceived that they behaved as a result. The detailed data is an advantage of this method, albeit this tends to limit the number of subjects studied, as this case also shows.

Ethnographic data collection can also be used to collect data on many field participants, but this may be at the cost of neglecting other events and non-participating actors. While Barley's (1986) study focused on a small sample of two hospitals, Garud (2008) attended conferences to study the "*configuring of the emerging organisational field"* (p.1061) of the cochlear implant field. In other words, he used conferences as a venue for interviewing a large number of participants, attended various meetings within conferences and generally observed all activities in the conferences. Based on his report, his data collection appears to have omitted archival data and any other interviews, and focused solely on spending time at con-

ferences and talking to people. Garud's approach had an advantage of acquiring a broad view of the field: In conferences he was able to reach many organisations, of diverse backgrounds, who had arrived to converse around a specific topic. Thus, observation in field related events, such as conferences, workshops and seminars appears as one potentially useful approach to reaching large constituents for a study.

However, there are some shortcomings to field event observation as well. One may ask whether the usually hectic conference environment enables appropriate data collection, and whether with a conferences-only approach one may be neglecting evidence from actors absent from these events. While Garud certainly would be well versed in the historical background of the cochlear implant field, thanks to having conducted earlier studies on the exact same subject (Van de Ven and Garud, 1993; Garud and Rappa, 1994), he may have missed out on the perspectives of some key organisations: for example, his report suggests regulatory agencies and the media played little or no role in these conferences, and thus are practically neglected in the analysis. For any other student of an emerging field, potentially less well versed in the earlier field development, the risk of missing out on any key informants or other key data means that observation ought not to be the sole method of data collection, even if useful to collect some part of the data.

A further argument in favour of observation comes from Meyer, Gaba and Colwell (2005) who suggested that as the more traditional tools such as interviews and documents with their somewhat fixed data collection processes cannot cope well in a fast changing research environment, but that observational data may be more

suitable in these situations. They discuss the difficulties they have had in investigating "*change in organisational fields*" (p.456) over the past three decades through four different studies in which they conducted interviews and archival data collection. However, over time their approach became more and more ethnographic in nature, as they noticed that it was difficult to track changing conditions with such 'pointy tools' as interviews and document records, which in their view are capable only to record singular occurrences in time. Thus, they began attending conferences and other networking events, whereby they could combine interview type of discussions with observations over a longer time period. However, their advantage has been that their studies have spanned three decades, and their fourth one, on nanotechnology, was still ongoing at the time of writing.

Thus, here are three examples of ethnographic data collection, each with different strengths and weaknesses. Barley collected in-depth data, but had very few organisations. Garud gathered data from many organisations, but needed to be well learned on the subject and ran the risk of missing some actors and events other than conferences. Meyer et al. gathered also conference data, but needed a relatively long time for data collection. Moreover, when studying the early moments, there has also been the question whether any events yet exist for observation. However, the prospect of needing either a long time frame or a strong background on the subject matter, or being able to focus only on a few organisations has relegated observation to a minor role in this study, even if its promise of one kind of rich data has kept it as part of this study.

3.2.3 Use of interviews

Lastly, conducting interviews has been a widely used method in studies on the introduction of novel solutions. All of the above-mentioned studies have employed interviews. As noted above, the strength of interviews is to allow one to gather detailed data from respondents. This method stands out particularly in studies of emergence, as interviews enable the researcher to formulate the questions freely and receive detailed responses. Archival data collection may be detailed as well, but the data comes as given, i.e. it does not allow for the researcher to influence much the data responses. Likewise, observation is more or less limited to what may be seen, and how the observed decide to behave and to say. As already noted, emergence processes, and particularly early moments, tend to be mired in ambiguity and uncertainty, in which situation the flexibility of the interview method is an advantage. The researcher is able to pursue either very specific issues with structured questioning, or try to gain a broader view with more open-ended protocol. However, the flexibility also has its implications: With interviews, in order to obtain data with high information value, the researcher needs to plan well the protocol and be well focused, as ineffective questions or letting the respondent wander outside of the topic may lead to data that has little value. Thus, when well planned, the interview method is particularly suitable for emergence studies, with the highest potential to yield rich data specifically aimed for one's research questions.

3.3 TWO RESEARCH DESIGN CONSIDERATIONS

3.3.1 Organisational fields -perspective

Past studies on the efforts by institutional entrepreneurs to introduce novel solutions have commonly employed a retrospective approach, which tend to depart from a currently known successful outcome of technical change and work backwards to determine the causal factors, often emphasising the use of archival sources. As a consequence, these studies have typically focused on a narrow set of core organisations that were behind change - but thereby providing a rather narrow view of the range of organisations that contribute to the process.

A few examples highlight this narrow approach. DiMaggio's (1991) investigation of the "*institutionalisation and structuring of organisational fields*" (p.267) through the case of how American art museums became organizations of collection and connoisseurship of fine art is one of the landmark studies of institutional change. The construction of art museums in the sense and form they are now understood was found to be largely dependent on professionals, i.e. museum workers, who worked within local organizations but were able to influence the field through national organizations. To study the activities of the museum professionals, DiMaggio collected data at two organizations and levels. At the field level he studied a national philanthropic foundation, which gave support to museum professionals, thereby promoting interorganisational coordination and change in the field level. In order to follow changes at an organizational level he also studied the debates within one local art museum, which also had field influence. DiMaggio's conclusion was that the accomplishment of instituting the art museum as place of connois-

seurship was achieved by a key professional group of museum professionals. For this discussion here, the important observation is that DiMaggio's organisational field study of institutional change consisted of merely two organisations, one at a broader national level, and another at local level.

In another example of a study of a "*structuration of organisational fields*" (p.27), Scott et al. (2000) studied the transformation of the San Francisco Bay area healthcare system, with seven different types of health care related organisations. The authors emphasise the importance of organisations around the field core and as one of the motivations for their work they note that only a few studies have been interested in how the surrounding material-resource and institutional environments affect healthcare organizations. Their study was extensive, consisting of interviews and of particularly sizable archival material, as they investigated the changes in the field in the types and numbers of individual and organisational actors, in the institutional logics as well as in the governance structures. While they sought to take account of actors and contextual factors at the state and national level also, their organisational field study examined in fact only seven organisations.

What is striking in these examples is the small number of organisations included, despite the references to the concept of 'organisational fields'. This is a frequently used concept in organisation theory, with a much-cited definition by DiMaggio and Powell (1991), already referred to in chapter one, but restated here due to its pivotal role for the study:

"By organisational field we mean those organisations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies and other organizations that produce similar services or products" (1991, p.148).

This concept aims to help explain processes of emergence and change, by providing a framework that ties in organisations of various geographical and sectorial backgrounds that potentially influence the outcome. Many studies refer to this concept, but as with the abovementioned studies, not quite to the letter or true spirit of its definition.

Three important observations need to be highlighted about this definition: Firstly, the wording of the definition suggests that an organisational field is made up of many organisations. With that, this wording follows in the tradition of open systems (Morgan, 2001) whereby change is a sum result of many organisations taking action. Secondly, this definition also suggests that the organisations included *together* form an entity ("constitute a recognised area"), and thus that they are connected at least by some specific issue. In other words, the issue at hand is the pivot that brings together these potentially varied organisations, that otherwise might not meet. Thirdly, logically following from the previous point, this definition also implies that these organisations may be of different types.

There is little conflict between the two exemplary cases above and the latter two out of the three observations concerning the DiMaggio and Powell definition. The participating organisations come together around the issue in question quite naturally: In DiMaggio's study both organisations studied were created to enable the

enjoyment of arts, while in Scott et al.'s study the organisations were created to further the provision of health care services. Also, arguably the organisations in the above studies fulfil the criteria of variation in organisation types: DiMaggio's organisations are an art museum and a charitable foundation, i.e. different kinds of organisations, and while Scott et al.'s organisations are all basically serving the health care sector, they are in fact different kinds of organisations.

The most important element, that organisational fields consist of many organisations, is conspicuously missing in these studies of institutional change. This raises the question whether factors influencing a field level change can be observed in such a small number of organizations. The design of DiMaggio's (1991) study could be defended by suggesting that the research is about institutional change as *a refocusing of purpose within existing organizations*, and if a domain can be influenced by only a few actors, it could be enough to focus on such a narrow set of organisations. Indeed, DiMaggio has chosen to observe the changes in art museums through the prism of a central organization in the museum sector, a funding body, which supports museums throughout the nation and thus can wield wide influence. Scott et al.'s (2000) attempt has been to track the changes in some key organization populations in a specific geographical area. The researchers have chosen to study the changes more in depth by looking at four specific organizations of the Bay area healthcare system that represent these populations, and to support that with a large set of contextual evidence from other archival data. Nevertheless, these studies leave a suspicion that a study with a broader design would find also other types of organisations, e.g. industry associations, media or complementary service pro-

viders that influenced the process of transformation. While internally consistent as studies and with other advantages from their longitudinal, retrospective research design, I argue here that institutional change ought to be studied as organisational fields in the true sense of the foundational definition referred to above, i.e. with a large number of actors.

3.3.2 Critiques of retrospective and presentist studies

It is evident from the description above, much research on the introduction of novel solutions has been longitudinal and backward looking. As I alluded in the introduction to this chapter, such designs risk falling into the "*retrospective rationality trap"* (Garud and Rappa, 1994, p.348) of employing "*a stock of culturally legitimating accounts"* (Powell and DiMaggio, 1991, p.21).

Although retrospective study is a standard methodological strategy in organisation studies (Ventresca and Mohr 2002), there are two concerns here. The first is the potentially faulty memories or partisan views by respondents. Aside from inaccurate recollection, respondents may resort to oversimplifications or rationalisations in their accounts (Golden, 1992). They may also descend to sub-conscious attempts to protect their reputation or self-image (Wolfram Cox and Hassard, 2007). In efforts to "*controlling the past*" (Wolfram Cox and Hassard, 2007, p.477) authors that have recognised a potential, respondent-related, retrospective bias have attempted to mitigate against that by either collecting a broad range of data (Garud and Rappa, 1994), by collecting real time data (Granqvist, Grodal and Woolley,

2013; Kaplan and Tripsas, 2008; Zietsma and Lawrence, 2010), or by triangulating any retrospective data with some real-time data (Santos and Eisenhardt, 2009).

The second concern is what I call the 'presentist critique'. Instead of the respondent-related bias I have described above, this is author-related distortion to investigate a past phenomenon from the perspective of present outcomes. The foundation of this argument is in historiography and Butterfield's criticism of the "*Whiggish interpretation of history"* (1931). Butterfield argued that a "*presentist"* history is to explain the present state of affairs by studying its origins, but without properly appreciating the events of the past. Butterfield emphasised the need to study the past for the sake of the past, by "*attempting to see life with the eyes of another century than our own*" (Butterfield, 1931, ch2), while arguing that a presentist approach produces a linear description of progress, over-simplifying the past. For Butterfield, this implied conducting a rather positivistic form of 'technical history', in order to collect the broadest possible range of detail, and to paint a complicated picture of what he saw as complex events. He favoured these over the clear, teleological outcomes, provided by the presentist or even Marxist histories (Jardine, 2003; Sewell, 2003).

As a result, I have chosen to follow a non-presentist approach in my research design. This has meant choosing a case where no outcome was visible, thus avoiding the risk of the outcome tainting either the respondent views or author analysis bias. The data collection may involve a variety of methods, including archival, interview or other ethnographic methods, but the distinguishing feature is to gauge the phenomenon prior to clear outcomes that may colour responses or analysis.

This approach has provided an opportunity for an 'uncontaminated' examination of "*technology-in-the-making*" (Garud and Rappa, 1994, p.345).

3.4 IMPLICATIONS FOR THIS STUDY

I have developed a research design for this project based on the above considerations and reflections on how organisation theory scholars have studied technological and institutional change in the past. Beyond the necessary compromise between time, resources, focus of study and effectiveness, the most appropriate methodological approach for a study on early moments is a mixture of methods with an emphasis on interviews, archival data in the form of organisational documents and other historical records, and some participant observation. This combination of methods has been typical for case studies (Eisenhardt, 1989) such as this.

The focus of the study on early moments forces a specific role for each data source in this design. An emphasis on interviews allows one to study the early activities of organisations with a relatively high level of detail. As Barley and Tolbert (1997) have noted, in studies of "*emergence of a new institution"* it is necessary to collect data on on-going, everyday actions and interactions, and to link them to institutional principles. For this, they argue, archival material will rarely be sufficiently detailed.

Aiming for a high variety and number of participating organisations, as the organisational field perspective suggests, might imply the use of a survey tool, which however is inferior to interviews in terms of level of detail. Contemporary organisational documents can supplement the interview data on broader level aspects as the activities, products and organisational partnerships. Observation of field events, e.g. conference or seminar proceedings, as well as news articles can provide useful data on the current debates of the field, such as what are the going concerns, what are the key concepts in these debates and who are the key actors.

3.4.1 On epistemological considerations

Formally my methodological approach could be labelled 'small-N analysis', following Abbott's (2004) discussion of the categorisation of research methods. As Abbott notes, '*there is no one basic way to categorize methods'* (p.15), and while most of them are hybrids of some extent of few matching elements, this approach is arguably the most hybrid of all. My study of two country cases of Finland and England, and 54 organisation sub-cases, does not neatly fit into one 'basic' type, of studying either a unique case in great detail or large number of randomly selected cases. However, the key characteristic of my study is the case detail richness of ethnographic approaches, which suggests the label of 'small-N analysis' to be most appropriate. While not committed exclusively to any extreme positions - either individualist or the group perspective, and behaviour or culture - using this methodological approach is an attempt to produce explanations that are both situated and

universal (Abbott, 2004). Therefore it stands somewhere between the highly detailed ethnographic and highly generalist formal modelling.

Epistemologically I have chosen to subscribe to the constructionist perspective. By this I mean that I have taken the accounts by individual respondents to be socially produced and reproduced from the organisational and broader socio-cultural context (Braun and Clarke, 2007). This approach has seemed logical particularly in this case of high level of ambiguity at the early moment stage. Actors engage in sensemaking (Weick, 1995) in order to create an understanding of the surrounding source field context, i.e. of what mobile health is and what the activities and events in mobile health mean.

3.4.2 Case study

This research employs the case study approach. Case study is a common approach, yet there appears to be many diverse views of what it consists of (Lincoln and Guba, 1985). Denny (1978) has defined case study as "*intensive or complete examination of a facet, an issue, or perhaps the events of a geographic setting over time*" (in Lincoln and Guba, 1985, p.360). For a study of early moments and entrepreneurial efforts, case study has advantages as it is "*suited to description of ... and ... demonstrating the variety of mutually shaping influences present*" (Lincoln and Guba, 1985, p.42). It tends to focus on an examination of either one or a few distinct units, and to consist of a deep investigation that produces a large amount of contextual and processual details (Flyvbjerg, 2011). Case study method is also flexible,

as making changes in the research questions, constructs and research focus is possible after data collection has begun (Eisenhardt, 1989). This is an advantage when studying an ambiguous entity like a field at the early moments stage, where new insights may raise alternative research interests.

Case studies have often investigated single cases, but studying multiple cases has advantages. Single case studies have been considered a design that has limitations in terms of generalizability (Maguire, Hardy and Lawrence, 2004). For this reason, this study employs a design of two country cases, where the interest is to go beyond the likely idiosyncrasies of a single case. While often multiple cases are used for comparative studies, this research aims to take advantage of multiple cases without emphasising the comparison. In principle, comparison of cases allows making stronger theoretical claims relative to single case studies as the similarities and differences across cases can suggest patterns within a population, which can then lead to concepts (Glaser and Strauss, 1967). However, instead of a comparison, the main objective in this study has been to draw analytical insights from both cases individually, as phenomena in its context. The tentative themes, concepts and relationships that emerge from the data are measured against both cases, in order to verify how well the theoretical insight fits the cases (Eisenhardt, 1989). An essential objective of case study research is theory building through comparison of emerging concepts and hypothesis with the existing literature (Eisenhardt, 1989).

3.5 RESEARCH DESIGN AND EXECUTION OF THE MOBILE HEALTH STUDY

3.5.1 Sampling for the various data collection activities

Sampling for case countries and organisations for data collection

My sampling was purposive on two levels. First, instead of the currently more common developing country focus in mobile health (Donner, 2008), I chose to study the efforts to introduce mobile health in an industrialised country context. To begin with, much of the theoretical work on technical and institutional change has been generated in these contexts of well-developed countries and I was keen to speak with my study to this body of literature. Industrialised country setting is distinct, with its institutional environment of a high level of formal structure in all sectors of society as well as generally good availability of resources. It stands in contrast to a developing country setting, which is often characterised as a context poor in resources and formal structure. Acutely aware of this dichotomy, I chose to study two industrialised countries, Finland and England, which both have already highly developed health care systems and high levels of mobile technology penetration. These two circumstances are particularly interesting from the perspective of the research problem here. The familiarity of population with mobile technology would suggest good receptivity of the technology, whereas highly institutionalised practices and norms in health care imply that to penetrate with novel practices and norms may be difficult or at least a lengthy process (Greenwood, Suddaby and Hinings, 2002).

Secondly, my sampling was purposive also on the level of organisations. As my initial scoping revealed that the field of mobile health is still in its emergent state and that there are no field level structures for mobile health, it became necessary to search for activity at a lower level, i.e. to find those organizations that have been active in the mobile health space. My initial strategy consisted of four ways to locate such organisations: I conducted web searches on the Internet, I looked at online journals and newsletters in the areas of eHealth and health care in general, I searched on websites of technology and innovation promotion organisations, and particularly of those that are related to mobile technology, and I searched the relevant industry association websites. This strategy produced already an initial set of a quarter of the total of organisations involved that enabled a more detailed planning of the interview part of the data collection. Subsequently, similar web searches were repeated even after the interview process had begun. These web searches were complemented with the snowballing technique in interviews, by which I was able to take advantage of the industry or field knowledge that the respondents have.

The organisations were chosen and approached systematically. I set specific inclusion criteria for organisations to be eligible for this research. My inclusion criteria for organisations were: a) has taken action (e.g. has started a project, has given funding to a project, has founded a new business unit) that relates to mobile phone use in health care, or is expected to take action (e.g. regulatory organization in this field), and b) is located in Finland or England. I looked for organisations of four categories, as guided by earlier industry emergence work literature on health care

(Scott et al., 2000): technology organisations, health care organisations, regulatory organisations and intermediary organisations. Overall, this sampling approach was successful. I located 54 organisations in total for this research and conducted 56 interviews.

Sampling for articles produced by historical database search

I conducted searches in databases to gather articles on mobile health. My purpose was to find responses to four questions: when was mobile health begun to be used as a term; what were the projects or other activities that this term was associated with; what were the ideas behind this term (what devices did it imply, what were the functions for the devices and who were the users of the devices); and what were the contexts, and particularly the challenges, for mobile health that were described in these articles.

My sampling parameters were wide for this search. My interest was to use a news database that provides a broad international perspective on mobile health, with a strong presence of newspapers but also possibly other journals and magazines. I preferred to use one database instead of many, as this would limit the risk of overlap, i.e. that any article that was mentioned in more than one database would be counted twice. I used Nexis UK database for this search – I will elaborate on the collection of this data below.

Sampling for documents collected from participating organisations

I also attempted to collect documentary data material from the organisations participating in this research, i.e. those that agreed to be interviewed. The purpose of collecting the documentary evidence was to strengthen the organisational evidence by adding to the interview data. I planned to collect documents in three ways: By requesting documents from respondents during interviews, and by searching for documents on the Internet, and particularly on the organisations' websites.

The documents were to be subjected to the same scrutiny than the other sources: they needed to provide data on mobile health activities, ideas, challenges and other contextual aspects, along with the timeline for all of these. I remained open to the potential data value of a variety of possible types of documents, such as project plans and reports, sales brochures, research reports, websites, workshop/conference presentations and product or service manuals.

3.5.2 Data collection activities

Research questions

I restate my main research question for this project:

- *How does the early moment perspective impact the conceptualisation of institutional entrepreneurship?*

My supporting research questions are:

- *How do the efforts of institutional entrepreneurs differ at early moments from those described by the extant literature?*
- *How do the perceptions of context at early moments differ from how context is perceived in the extant literature?*

Interview data collection

I was able to find organisations relevant for my sampling criteria in both countries. Altogether, for the two countries, my sampling strategy produced a total of 54 organisations that participated in this research, categorised in table 3.1:

Table 3.1: Organisations participating in the research by category

	England	**Finland**	**Total**
Incumbent type of organisations	**7**	**12**	**19**
Challenger type of organisations	**13**	**12**	**25**
Health care organisations	**6**	**4**	**10**
Total	**26**	**28**	**54**

These numbers reflect what types of organisations have become active in mobile health in the early moments. Challenger type of organisations, such as research, technology or innovation promotion and industry associations have been particularly active, along with technology providers, such as software and system providers. In contrast, there have been relatively few health care organisations that have taken any mobile health related action. Table 3.2 shows the organisations by type, placed in four compartments to indicate groupings by type. Appendix 1 contains a

list of these organisations, with their short codes that are used in the empirical

Table 3.2: Organisations participating in the research by type

Software and system provider	**12**	Device manufacturer	**2**	Technology service provider	**1**
Service solution provider	**1**				
National health information provider	**3**	Local health care organisation	**5**	Specialist health service	**2**
Ministry	**2**	Ethics advisory council	**1**	Data protection ombudsman	**1**
Professional association	**2**	Technology promotion agency	**1**	Industry association	**4**
Consultancy	**3**	Innovation promotion agency	**5**	Research organisation	**4**
Innovation fund	**2**	Educational organisation	**2**	Law firm	**1**

chapters and a justification for their placement in the respective categories.

I approached these organisations in a systematic manner: first I sent an interview access request by email, with an information sheet about the research. In cases of no response, I sent another email a week later. In cases of still no response and if the organisation was particularly interesting, I would look on the Internet for a name of a person in the organisation who is relevant to the topic and make a follow-up telephone call to request interview access. Almost all organisations were open to be interviewed, while few declined participation, mainly for three reasons: for not being active in this area; for not having sufficient time for an interview; or other non-specified reason. Also, some organisations never replied, and if attempts

to telephone relevant persons produced no results, these organisations were left out of the research. With the organisations that agreed to be interviewed I agreed the interview time and location by further emails, which also contained the consent sheet for the interviewee to see in advance. In face-to-face interviews the consent sheet was signed by both the interviewee and the interviewer. In telephone interviews the interviewee would state before the beginning of the interview whether they agreed with the terms on the consent sheet, and this would be recorded on the recorder.

The research design aimed for a broad field perspective, which meant that the emphasis in data collection was on gathering data on a large number of organisations rather than in-depth investigation of only few organisations. One implication of this approach was that instead of many interviews in each organisation, in each participating organisation only one person was interviewed, with the exception of two organisations, where two people in different roles were interviewed. The interviews were between 30 and 90 minutes in length, most of them around 60 minutes. Half of them were conducted onsite, while half were conducted over telephone, as requested by the interviewee. All interviews were recorded with a digital recorder, and subsequently transcribed by myself. The interview languages were Finnish (for Finnish organisations) and English (for English organisations), the first of which is my mother tongue, and the second of which I am practically a native speaker. The interview protocol consisted of nine semi-structured questions, of three broad areas, presented in table 3.3:

Table 3.3: Mobile health interview protocol

Broad topic of the question	Interview questions
Mobile health activities and their origin	•What activities has your organisation engaged in with regards to mobile technology and health care, and when? •How and why did your organisation become active in mobile health? •Have these activities been successful and what have been the outcomes?
Experiences in implementing mobile health initiatives	•How is the term 'mobile health' understood in your organisation? What kind of devices, users and functions does it refer to? •Has your organisation faced any challenges with these activities? •Has it been difficult in the experience of your organisation to match mobile technology with health care processes and practices?
Development of mobile health field	•What other organisations do you see being active in mobile health besides your own? And which ones are likely to become active? (drawing) •What do you think is the near-term (next 5 years) future in mobile health, and what is your organisation most likely to do in that time?

The design of the interview questions was a balancing act between two interests. First, the particular advantage of qualitative study is in the ability to gather rich data, which is provided by the open-endedness of semi-structured questions. As this was a study of a mobile health field where there were still many uncertainties, such as in terms of regulatory regime and business models, I encouraged answers in the spirit of Geertz's (1973) 'thick description' in order to capture as much richness of the early moment phenomena as possible. Second, without clarity of business models or dominant technologies, I expected much speculation of how the field will or should develop, and thus sought to guide answers towards more de-

scription of actual, concrete activities by maintaining some specificity in the wording of questions.

I employed an additional heuristic device for obtaining more comprehensive data: a drawing exercise. I asked the face-to-face interviewees to make a drawing of how they view the 'mobile health field or ecosystem'. Specifically, as the table 3.3 specifies, the interviewees were instructed to express in the drawing which organisations they think are active in mobile health at the moment and which ones are likely to become active. In the telephone interviews there was no drawing exercise, but the interviewees were asked to respond to similar questions, i.e. which organisations they see to be active in mobile health or are likely to become active.

Observation data collection

I also collected data by observation. As discussed above, in-depth participant observation in organisations would have limited the number of subject organisations, and therefore I chose instead to attend mobile health related events where I could observe the field being discussed. At this early moment stage there were not many of such events, but I was able to participate in eight mobile health related events that were conferences, workshops, exhibitions or seminars. In these events I sought to gather data on the following types of issues: how people, representing organisations active in this area, talk about mobile health, i.e. what specific terms they use and how do they conceptualise mobile health; what organisations are active on mobile health; what concrete activities are mentioned; and what challenges are discussed in relation to mobile health. I wrote notes during and after these

events on these issues, as well as on other more general aspects, such as how many organisations were represented at the event, what kind of organisations the participants were, who were the exhibitors at these events if any and what mobile health related presentations were made if any. Two of the events (the two Westminster Health Forum seminars) provided a transcript of the discussions. Table 3.4 is a summary of the attended events.

Table 3.4: Summary of observation events attended

Event name, place and time	Focus of the event	Types of participants
Westminster Health Forum seminar, London, February 2010 - 1 morning	Seminar presentations on "Telehealth, telecare and new technologies in UK healthcare"	Academics, technology entrepreneurs, public sector agency representatives, corporate representatives.
mLife conference, Brighton, October 2010 - 2 days	Conference with presentations of the many potential and practical applications of mobile technology in society	Academics, technology entrepreneurs, public sector agency representatives, corporate representatives.
Mobile Monday panel and networking, London, November 2010 - 1 evening	Panel discussion and networking event that focused on mobile health	Software developers, small business entrepreneurs
Healthcare Innovation Expo, London, March 2011 - 2 days	UK Dept. of Health sponsored large exhibition on technology and other innovation in health care	NHS organisations, technology companies, government agencies, third sector organisations, academics, consultancies, innovation promotion organisations
MC ThinkCamp - mHealth, London, June 2011 - 1 day	Presentations, workshop group meetings, networking to brainstorm solutions to implement mobile health	Technology developers, entrepreneurs, researchers and venture capitalists
National Telehealth and eHealth Association's annual conference, Joensuu Finland, April 2011 - 2 days	Presentations on telehealth, eHealth and mobile health	Technology providers, representatives from health care, government, technology and business development as well as from academic organisations
Intel Mobile Health Innovations workshop, Manchester, November 2011 - 1 day	Presentations and a workshop on mobile health solutions	Technology providers, local and regional health care organisations, researchers, representatives of economic development organisations

Westminster Health Forum seminar, London, November 2012 - 1 morning	Seminar presentations on "Accelerating innovation in healthcare"	Academics, technology entrepreneurs, public sector agency representatives, corporate representatives.

Archival data collection 1: Historical database search

Based on the sampling strategy described above, I decided to use the Nexis UK news database, which consists of 20.000 sources for newspaper and magazine articles, as well as company and market reports. This database has a global coverage despite the name, and thus includes England and Finland. But in order to gain a view of the broader field debates, I ran the searches for European news for articles within the time period of 1990 and 2011. I used search terms 'mobile health' and 'mHealth'. In chapter five I present and discuss the results for this search, which show that writing about mobile health began in 1996, but has since increased considerably.

Archival data collection 2: Organisational documents

In the second archival data collection part, I collected mobile health related organizational documents in two ways: by asking the interviewees directly in the interview situation for suitable documents, and by downloading documents from the organisation's website. Document requests directly to interviewees produced only a small amount of documents – approximately 1/6 of organisations had or were willing to submit suitable material. Searches on organisations' websites produced some more documents. Approximately 1/3 of organisations had mobile health re-

lated documents on their website. Altogether these amounted to 25 pieces of documents.

Overall, this sampling strategy produced a relatively small amount of documents. Often the documents that were available were sales brochures and websites, the content of which had little to offer in terms of the research questions. I return to the issue of the small contribution that the organisational documents made in this research in chapter ten, in the section '10.3 Limitations of the study'.

3.6 DATA ANALYSIS

Analysis process

Qualitative research methods tend to produce data that is "*unstructured and unwieldy*", requiring the researcher to furnish "*coherence and structure to the cumbersome data set*" (Huberman and Miles, 2002, p.309). With data that is often descriptive or exploratory, the qualitative researcher's ultimate interest is to use the data to explain or evaluate phenomena (Ritchie and Lewis, 2003). This means that the essential function of qualitative analysis is about "*detection*", for which a researcher needs to define, categorise, theorise, explain, explore and map (Huberman and Miles, 2002, p.309). The essential function of analysis is coding in which the researcher performs the act of defining and categorising (Miles and Huberman, 1994). The coding schema was devised to provide answers to these questions:

- What are the early activities and events around mobile health?
- What are the early meanings and understandings attached to mobile health?
- What are the contextual elements within which mobile health is pursued, and particularly what are the challenges?
- What is the timeline for these aspects of early moment mobile health?

I followed Miles and Huberman's (1994) suggestion to create at first a "*general accounting scheme*" which is situated between a deductive, or *a priori*, coding scheme, and an inductive coding scheme (p.61). This general accounting scheme was the first level coding. In order to maintain a connection to the extant literature, and to be able to produce a theoretical contribution, I was keen to keep this deductive element in the initial coding scheme. In particular, my initial coding scheme drew on Van de Ven, Angle and Poole's (2000) work on the methods for studying innovation processes. Thus, I considered activities, ideas, context and obstacles to be appropriate for this study as first level coding categories. The second level is inductive in nature, as it consists of types of activities. At the third level I assign labels to these activities, i.e. technical, structural, social and cognitive activities. At the fourth level of the coding structure I assess the extent or weight of each item. In other words, I drew the initial categories from literature, allowed the richness of the detail to arise from the data at the second level, which I then sorted with my own classification scheme at the third level, and then assigned a measure of significance to these detail items at the fourth level. This approach allowed a structured departure in coding at first, whereas the second level enabled for me to stay open to the variety that existed in the data.

I produced coding structures for each initial category. Table 3.5 is the coding structure to analyse the activities by which organisations have attempted to introduce mobile technology to health care. The other coding structure tables, i.e. for mobile health ideas, and for the obstacles that organisations have perceived in their mobile health efforts, I have placed in Appendix 2. The results of these analyses, i.e. the fourth level in these tables, are provided in summary tables in empirical chapters six, seven and eight.

Table 3.5: Coding structure for data on the activities to introduce mobile technology to health care

1st level: general scheme	2nd level: various activities proposed by respondents	3rd level: classification of activities	4th level: the extent of activity
Activities to introduce mobile technology to health care	Development of technologies and products	Technical activities	
	Development of service and business model concepts		
	Research on mobile health		
	Provision of funding mechanisms	Structural activities	
	Establishment of mobile health related organisational units		
	Creating partnerships for specific projects	Social activities	
	Participation in others' mobile health initiatives		
	Publicity for mobile health	Cognitive activities	
	Knowledge and data sharing with other orgs to push for issues		
	Various forms of other support to org users and developers of mobile health, e.g. training		

As part of the analysis, after coding the material I ran coding queries on NVivo. I sought to find out the extent or weight of the classes and items of activities, ideas, obstacles and other contextual aspects by querying their frequencies. I also made

queries about when they had occurred, based on the timestamp I assigned on items when possible. In order to highlight the findings I used the queries to produce tables and graphs, which I present in the empirical chapters.

The classification and categorisation of the data, and the extraction of rich details about the efforts, the ideas, descriptions of context as well as the obstacles to the efforts allowed me to respond to my supporting research questions:

- *How do the efforts of institutional entrepreneurs differ at early moments from those described by the extant literature?*
- *How do the perceptions of context at early moments differ from how context is perceived in the extant literature?*

Consequently, providing answers to these questions has enabled me to discuss my main research question of - *How does the early moment perspective impact the conceptualisation of institutional entrepreneurship*? - as well as address the intellectual paradox of why, even after so much research on the topic of innovation and technological change, introducing solutions that have been proven in other sectors seems to be so complicated. I take up these themes in the 'Discussion' chapter nine and 'Conclusion' chapter ten.

Analysis tools

For conducting the analysis I used the qualitative data analysis software NVivo version 9 and version 10. Such software allows for a process of analysis that is clearly structured while being flexible at the same time, in case a different ap-

proach becomes necessary. Analysis software also provides a useful way to organise one's data, all in one place. Once all data is saved in analysis software, the researcher can easily go back and pursue new avenues of analysis.

Timeline for phenomena

The aspect of time is of importance in this thesis, and therefore I present a timeline of phenomena for mobile health efforts, despite the limitations that the timing data has. It has been argued that much traditional, variable-based social science analysis has neglected the aspect of time in their study of phenomena, with a criticism that these studies imply the unlikely scenario that the variables operate all at the same time (Becker, 1998; Hammersley, 2008). As this research concerns a distinct period of time - the interest here is not on a specific decade, but on the early moments period in the development of a field - it has been important to include a temporal reference in the analysis. In order to explore this temporal dimension, my aim was to insert a timestamp in all possible data during data collection.

However, this chronological dimension of data is only indicative. Some timing data, e.g. for documents, is unambiguous while other data, namely from interviews, do not always have time references. Publication dates of documents have been an obvious source of timing data. Yet, despite requests during the interviews for the respondents to specify the timing of their activities, ideas and perceptions, many comments have been left without a time reference. As this part of data corpus is not comprehensive, the presentation of time graphs serves to suggest merely the

general trend. In other words, I present graphs in empirical chapters at the end of sections when data on the timing of phenomena has been available.

3.7 ETHICS IN DATA COLLECTION

Planning for ethical clearance of my research design was a major part of my study. Since I wanted to gain a broad view of how the mobile health field is forming, I considered it to be necessary to gather data at a wide set of organisations – the broad range of organisations participating in this study is evident from table 3.2. The health care provider organisations included NHS organisations, and therefore I was obliged to complete the NHS research ethics procedure, in order to request access to individual NHS organisations. This very thorough and intense process lasted for nearly three months, which in addition to filling out an extensive online form involved preparing a research protocol, a research passport, a peer review form, a consent sheet and participant information sheet, as well as providing a departmental ethics funding letter and obtaining a university insurance confirmation and letter of sponsorship. With these documents I was able to gain NHS ethics committee approval in March 2011, which is recognised by the University of Oxford as an appropriate alternative to its own CUREC ethics procedure. With this approval gained, I proceeded to pursue my interview data collection, armed with the NHS ethics procedure -specified research participant information sheet and the consent form that I provided to the interviewees prior to each interview.

3.8 CONCLUSION

I have described in this chapter my research design, its foundations, and how I proceeded with the investigation and the analysis. I have argued that the past efforts to study emergence have been limited to some extent by their retrospective design, as has been noted by many authors. My research has, instead, been an exercise in the collection and analysis of a different type of a case. Mobile health has so far not materialised into any outcomes that could be recognised as a winning business model, a dominant concept of technology application or a supreme service concept. I thus argue that this is a case of on-going stage of early moments, where neither the respondents' views nor the researcher's analysis have been tainted with views of successful outcomes.

Also, I have aimed to collect data across a wide range of organisations, in order to attain as broad as possible a perspective on mobile health. Aside from the intention to gain a thorough view of the early moment stage and the efforts to materialise mobile health ideas, the purpose has been also to find out whether this type of data collection procedure produces different, and in some ways advantageous, corpus by which to understand these processes. The next chapter provides a broader contextual view of the two empirical country cases, by statistical and other data from health care and telecommunications sectors, as well as the economies in general.

CHAPTER 4: MACROECONOMICS AND SOCIAL WELFARE SYSTEMS: CASE COUNTRIES FINLAND AND THE UNITED KINGDOM / ENGLAND

4.1 INTRODUCTION

The case study method requires a strong view of the case context. As analysis and interpretation of data is dependent heavily on local phenomena, the contextual factors need to be considered (Lincoln and Guba, 1985). Chapter one lays out the research problem of this study – to understand why taking advantage of proven technology appears to be so difficult - but it also introduces one of the contextual factors. I made brief reference to the rapid increase in the use of mobile phones. In this chapter I discuss in more detail the macroeconomic elements and the health care systems of the two countries of this research: For example, the level of investment on promoting innovation, the level of regulation on entrepreneurship, proportion of spending for the provision of health care services, the extent of technology use in care, and the structure of the health care systems. I also show the levels of patent filings in ICT and medical technology, and the degree of mobile phone and Internet use. By these, and other particulars in this chapter, I provide descriptive contextual detail about the cases of this study.

As my introduction, review of theoretical literature and research design chapters have suggested, one of the challenges in studying fields that are in early moment stage is the difficulty of drawing the boundaries of the study, namely, what to include in the study. This dilemma extends also to the description of context. I have tackled this challenge in the following way. Since my study concerns mobile telecommunications industry and the national health care systems, I take these two

fields as the departure points for context. From these I expand to macro level factors of national economic development and individual use of technology at aggregated, national level. I present the contextual factors in four sections, for both England/the United Kingdom (henceforth England/the UK, or the UK[2]) and Finland: 1) Economic indicators relevant to telecommunications and funding of new development; 2) structure of health sector and technology use within; 3) development of new ICT and medical technology; 4) general technology use among the population.

I present this research not as a comparison but as a case study. As I have indicated in the introductory chapter one and research design chapter three, my intention has not been to focus on comparison between Finland and England/the UK, but to use them as separate case studies on early moments. As a consequence, I provide economic and health care system macro-level data in order to draw profiles for the cases, which then help to understand the local particularities of the cases. Since the objective is not to make a comparison of these cases, I set statistical data of the case countries against other countries or groups, as is provided by the OECD and the Eurostat. Furthermore, while in the empirical chapters I present the cases in separate sections, i.e. one after the other, in this chapter the cases are presented side by side. In the many charts I present in this chapter, both case countries are displayed, and the accompanying text will highlight key aspects for both.

I provide comparative statistical data that can make a clear contribution to case profiles. Depending on availability, these comparative statistics are either a total of

[2] Health care is one of the devolved politics in the United Kingdom, which means that England, Scotland, Wales and Northern Ireland have separate national health system organisations. Since some of the policies are enacted by the United Kingdom government, and some concern only England, I will use in the text 'England/the UK' and 'the UK' when deemed appropriate.

OECD countries ('OECD total') or various number of EU countries ('EU27', 'EU15' or 'EU12'), or individual reference countries, when these OECD or EU averages are not available. These reference countries for Finland are generally Sweden and Norway, due to their similarity in population size, economy and systems of public services where access is based on residency, whereas for the England/the UK they are France and Germany due to similarity in population size, and the United States due to similarity in economic model, namely the liberal market economy model (Hall and Soskice, 2001). As the data in the empirical chapters on mobile health initiatives begins roughly at the year 1990, the timelines in the charts have been set to begin from that year and to extend to 2011 when possible, or the years of earliest and latest figures.

My main finding here is that Finland and England/the UK have distinct contextual profiles in terms of the aspects I have considered relevant for mobile health development. The contextual data below shows that Finland has a high level of technology use, both by general public and by health care organisations, as well as a high level of government involvement in industrial and technological development. For England/the UK the use of technology is high among the general public, but slightly lower in health care. Low public involvement in industrial and technological development, complemented by relatively low level of regulation for entrepreneurship, are contextual aspects suggesting an environment where market mechanisms are emphasised more for finding solutions. The graphs I present below also show that there have been distinct phases of development. I will refer to these distinct phases in the graphs when they are most visible.

4.2 ECONOMIC INDICATORS RELEVANT TO TELECOMMUNICATIONS AND TO THE FUNDING OF NEW DEVELOPMENT

The conditions for developing and implementing new solutions in the two countries have been different as suggested by various R&D indicators for national economy. By these development of industry and technology indicators Finland appears as a country of distinctly strong state involvement in the economy whereas England/the UK has a low level of government involvement.

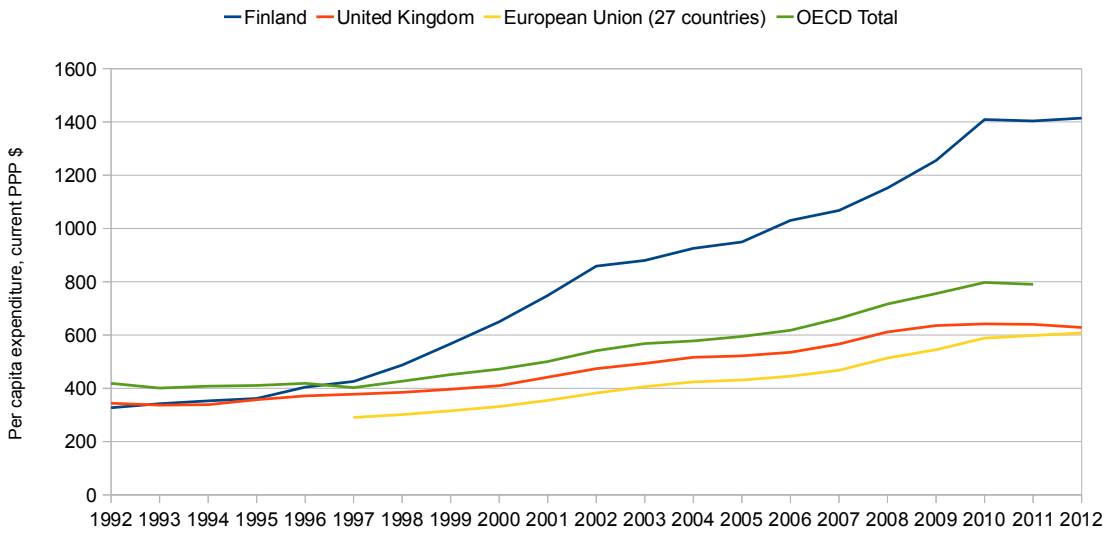
4.2.1 Investment in R&D

Level of overall national investment

First contribution to the profile of the two cases is the national investment in innovation. One of the core functions in industrial development is research and development. I use investment for research and development as a proxy to indicate how much a country invests in innovation. In more specific terms, I take gross domestic expenditure on R&D as an indication of a country's general level of investment into R&D and for its predisposition to support the development of science and technology. Graph 4.1 on the gross domestic expenditure on R&D per capita shows the respective R&D investment for the two countries, weighted by purchasing power parity. Within the last two decades, Finland has invested at a remarkably high level

into research and development whereas the UK's investment has been roughly at the level of other industrialised countries, at between the EU27 and OECD averages.

GRAPH 4.1: GROSS DOMESTIC EXPENDITURE ON R&D



Source: OECD Statistics (Main Science and Technology Indicators dataset)

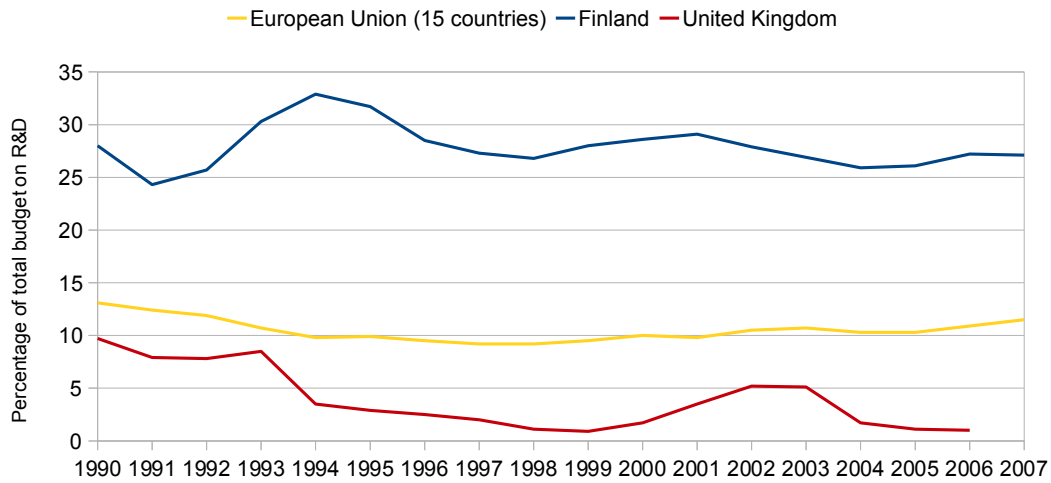
Based on graph 4.1, Finland invests a high share of its GDP on R&D, while the UK invests only a moderate amount. It is clear from the graph that Finland has had a clearly higher expenditure on R&D than the averages for OECD total or EU27, while the UK's expenditure has been only at slightly above the European average. Furthermore, the pace of change has also distinguished the two countries. The UK's expenditure has mostly increased by a relatively steady rate and measures a respectable 50% increase in its most rapid period of change between 2000 and 2008. Finland's record of investment into R&D displays three periods, of which two -

those between 1992 and 1997, and 2010 and 2012 - were relatively flat, while the period between these two was one of phenomenal growth at the rate of 350%.

Government spending on industrial R&D

Another contribution to a profile of a country is the extent of government involvement in the economy. On the one hand, all advanced economies have relied on substantial government support in "*investment in the knowledge base, state sponsored protection of markets and intellectual property rights, as well as state subsidies to support business investment strategies*" (Lazonick, 2008, pp 2-3). Yet, quite significant differences at the level of this support may persist. I show some of these differences in graph 4.2, in which I use the level of public funding for industry and technology to represent the level of government involvement in the economy.

GRAPH 4.2: GOVERNMENT BUDGET APPROPRIATIONS OR OUTLAYS ON R&D: SHARE OF INVESTMENT IN INDUSTRIAL PRODUCTION AND TECHNOLOGY



Source: Eurostat (GBAORD by NABS 1992 database)

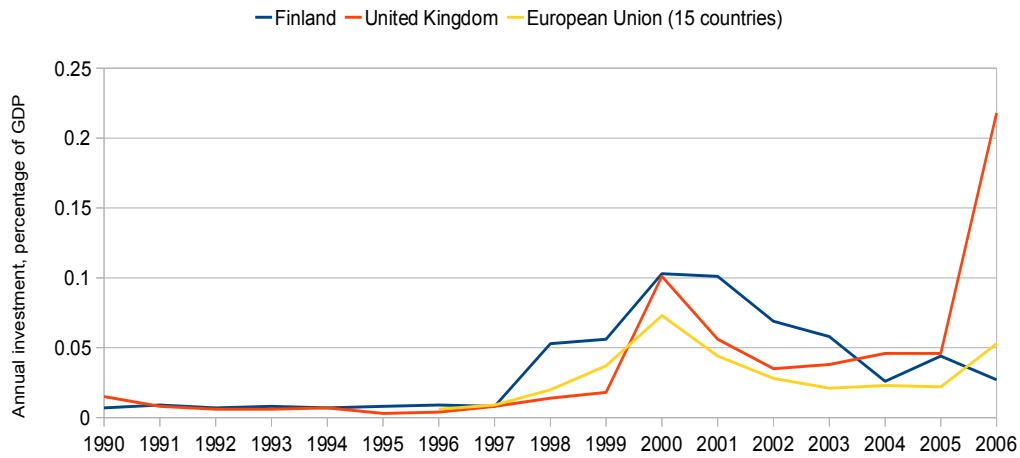
In this respect, Finland has exercised a high level of government support to industrial production and technology, whereas the UK government has directed its R&D budget outlays on other objectives. Graph 4.2 conveys clearly the high level of involvement of the Finnish state in industrial production and technology related R&D. The level of Finland's investment has been between 25% and 33% throughout the period in question. At the same time the EU15 average has been relatively stable between 9,5% and 13%. In contrast, the share that industrial and technology objectives receive from the public R&D support has diminished for the UK in this period. Reduced from 10% to 1%, and not having reached even the EU15 average in any of the years of this period, this development suggests that industrial and technological R&D has been left to be funded by private business enterprise and other sources.[3] Thus, Finland emerges from this graph as a country of high state involvement in industrial development while the UK government seems to have left it to private resources to manage.

Venture capital investment

One of these 'private' funding sources is venture capital investment. The level of venture capital investment, as contrasted with the level of GDP, can imply the level of willingness for risk taking in the national (market) context, or the lack of other funding options, such as national public investment into the sector.

[3] One explanation to the radically different figures for Finland and the UK in respect of R&D is defense spending. As a separate category of 'socio-economic objectives', e.g. in 2001/2003 government spending on defense amounted to 2.9% and 30.3% respectively. (Wilen, 2008)

GRAPH 4.3: EARLY STAGE VENTURE CAPITAL INVESTMENT



Source: Eurostat (Venture Capital Investment by aggregated stage of development)

The graph 4.3 of early stage venture capital investment suggests two things. Firstly, the comparison of Finland, the UK and EU15 shows three distinct periods. Until 1997 Finland and the UK have seen practically an equal level of this type of investment in the economy. From the late 1990's venture capital investment was, in almost all years, considerably higher in Finland until 2004, at which point it was surpassed by the UK, first only slightly but in 2006 by a radical difference. Secondly, all three datalines follow a roughly similar curve for early stage venture capital investment - most of the 1990's displayed relative stability, late 1990's saw a strong increase, clear decline in early 2000's, and finally a return to growth around mid-2000's, with the exception of a mild decline in the case of Finland for this last phase.

Inasmuch as the first graphs above suggested the level of state involvement in R&D funding as strong in Finland and weak in the UK, the graph 4.3 does not complete the picture by showing the reverse in venture capital funding. Private funding for industrial development has mostly been comparable in the two countries, and Finland and the UK also more or less confirm the general pattern of the EU15. It is only in the second half of the 2000's that in the UK venture capital funding increases to a significantly higher level. This change coincides, with a slight delay, with the further reduction in government budget support for industrial and technology R&D, as depicted in graph 4.2. It is also noteworthy that the level of venture capital investment appears to have followed some of the changes in the general economic climate - the surge in ICT technology development in the second half of the 1990's coincided with an expansion of available risk capital funding, some of which the subsequent downturn in ICT in the early 2000's later retracted. Thus, the profiles of the two countries are appended by a somewhat mixed story: of Finland enjoying higher than average venture capital investment during both sides of the millennium but with a clearly diminishing trend since then, whereas the UK has become a country of outstanding venture capital investment level in the last years, after many years as an average member of the EU15 group.

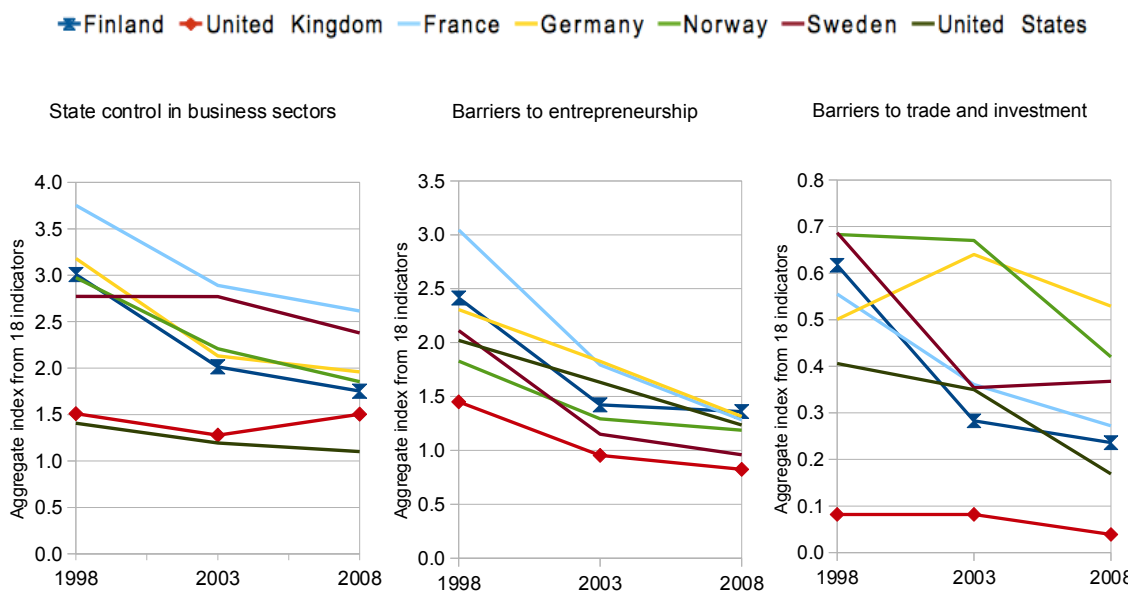
4.2.2 Regulatory constraints on entrepreneurship and the economy

Another indication of high or low government involvement in the economy is the level of regulation. Display of the regulatory frameworks in these countries further

confirms the view of Finland as an entrepreneurial environment of relatively high state involvement, and the UK as one of relatively low state involvement. Three aspects of product market regulation represent here the regulatory environment for entrepreneurs. These statistics, in graphs 4.4, show the level of state involvement in business sectors[4] and the extent to which various regulatory imperatives are considered as barriers to entrepreneurship, trade and investment. These graphs are based on OECD indices that are calculated from 18 indicators, measured at three intervals of 1998, 2003 and 2008. These regulatory aspects imply the ease by which new entrepreneurial ventures may be launched within a national economic context. The UK emerges from these graphs as a distinctly low-regulated environment for entrepreneurship whereas Finland appears as a moderately highly regulated country for entrepreneurship.

[4] 'State control in business sectors' indicates the pervasiveness of state-ownership across business sectors, by measuring the proportion of sectors in which the state controls at least one firm (OECD Statistics - Product market Dataset)

GRAPH 4.4: PRODUCT MARKET REGULATION - STATE CONTROL, BARRIERS TO ENTREPRENEURSHIP AND BARRIERS TO TRADE AND INVESTMENT



Source: OECD Statistics (Product market regulation dataset)

The three graphs above show a clear distinction between the two countries - in relative terms, Finland appears as moderate in product market regulation, while the UK is clearly a context of low regulation in regards entrepreneurship. In comparison to its reference countries, Finland comes across as a mixed case. It has slightly less state involvement in business sectors than its reference countries Sweden and Norway, but slightly more barriers to entrepreneurship. Finland also has slightly fewer barriers to trade and investment than Sweden, and significantly fewer than Norway. The UK on the other hand scores clearly lowest of all countries in two of the graphs, and has only slightly more state involvement in business sectors than the United States. Also, it is noteworthy that Finland has had a relatively clear overall trend in these graphs, with a more rapid decrease in regulation first

between 1998 and 2003 and then more moderate decrease until 2008. The UK graphs display no such uniform trend across the three graphs, with two graphs relatively stable and only the 'barriers to entrepreneurship' graph with a clearly descending line. Overall, these graphs suggest that the UK has a relatively liberal regulatory environment for pursuing entrepreneurial opportunities, whereas in Finland entrepreneurial activity is restricted at a moderate level by state control of industry and by barriers to trade and investment.

4.2.3 Historical and current aspects of industrial and innovation policy

Finland

The evolution of Finland's economy is most often described positively, implying a path from relative poverty to a modern-day high performer with an industrial and innovation policy to support the demands of a contemporary knowledge economy. This straightforward, linear narrative may be excessively attractive due to its simplicity, concealing a tangled and difficult route to recent successes. Nevertheless, considering that population wise Finland has been and still is a small country, its ability to construct and maintain a relatively well-functioning knowledge economy at end of the 20th century and at the beginning of the 21st is reasonable evidence of success.

The defining factor of the industrial and innovation policy has been state involvement in the Finnish economy which has roots in its long and short term history. Longer term roots for this policy are in the post-war years. Prior to the war Finland was a relatively poor country, with a small population, at a distance from larger markets, with a language that is very dissimilar to most languages in Europe (Davies, 1996), and of a national economy largely dependent on its agricultural and forestry resources. In the years after the World War II much needed industrial development was impeded by a significant shortage of private capital, exemplified by the rather marginal role of the national stock exchange until the 1990‘s. However, leading up to the policy reforms of the 1990’s it became recognised that the Finnish industry had become dominated largely by banks, other institutional owners such as insurance companies, and the state (OECD, 2005).

The short-term roots of Finland’s active public engagement in the economy and particularly in research and development are in its economic crisis of the early 1990’s. This crisis was the result mainly of the end to the trade with Soviet Union and of the liberalisation in international financial transactions, which made the national currency vulnerable at a time of economic downturn (Yla-Anttila and Palmberg, 2005). During the crisis unemployment rapidly rose up to 17% and GDP fell by 10% in two years. In order to support a restructuring of the economy, the state acquired a more active role. One of the elements of the new thinking in industrial policy was to integrate the previously distinct approaches to science, technology and innovation into one policy. One manifestation of this policy was to create a framework of a national innovation system, a strategic objective, which was based

on Porter's (1990) work. This national innovation system aimed to improve the connection between private sector enterprises and a host of actors that support entrepreneurship, such as publicly funded universities and other research organisations, public funding and other support agencies, as well as various other intermediaries that promote economic development and knowledge creation. A practical derivative of this framework was to increase funding considerably in all of the areas of science, technology and innovation (Yla-Anttila and Palmberg, 2005). This policy underscores the significant role that the government was to have in the development of all business sectors. In the background of this strategy was also a recognition that the level of entrepreneurship in Finland was comparatively low (Yla-Anttila and Palmberg, 2005).

In the regeneration of the Finnish industrial base knowledge-intensive industries became dominant. The earlier industrial structure had relied heavily on raw materials, energy and large-scale engineering such as ship-building. In only one decade (starting in first half of the 1990's), by structural reforms between and within industries, the industrial restructuring made information and communication technology a dominant part of the economy. While the competitive efforts by private enterprises, e.g. of Nokia, the largest mobile phone manufacturer in the world during the late 1990's and most of the 2000's, were important in this change, the fact that ICTs were recognised as one key focus in industrial policy already before Nokia's ascent demonstrate how government engagement in industrial development was a crucial factor (Yla-Anttila and Palmberg, 2005).

In the 2000's Finnish innovation environment has been further strengthened, with the continued focus on the knowledge intensive industries. The importance of this matter is reflected for example in the establishment of the Science and Technology Policy Council, which is headed by the Prime Minister, and where other members include other key ministers, representatives from key science and technology organisations, as well as private companies. Further down the hierarchy, the priorities of several different government agencies have been reoriented or sharpened to support innovation and development in knowledge-intensive industries by funding, expert advice for technology entrepreneurship, promotion of networking, support for protecting intellectual property, and other development of small and medium sized enterprises (SMEs) (Toivanen, 2011). Innovation and entrepreneurship has been tightly coupled in the support that the state agencies provide, one example of which is the requirement for large companies to cooperate with small ones as a condition for such aid (Toivanen, 2011). The success of these measures is arguably evident in the relative stability and strength of the economy in recent years, despite the global financial crisis since 2008 and the decline of Nokia's position in the mobile telecommunication industry.

Another key factor for strengthening the knowledge-intensive industries has been the long term investment into the education system, for which certain positive results indicate success: Over the decades there has been a steady increase in the number of graduating engineers and scientists, and 80% of US patent filings from Finland have been made by engineers (Toivanen and Vaananen, 2008); Finnish

youth have been placed in consecutive years among the top of the PISA[5] rankings which measures the proficiency of 15-year old students in specific subjects (OECD, 2005). However, while the overall innovation policy is generally considered to have been successful, attributing success to any one of these specifically seems to be difficult (Toivanen, 2011).

The United Kingdom

If Finland has been described with a type of 'rags to riches' narrative, the United Kingdom is more commonly described with a 'reverse' account - a route from the riches of the empire to late 20th centure struggles to maintain industrial competitiveness. With the former imperial wealth and position as the yardstick, the UK appears to have fared poorly, whereas contemporary comparisons with its equal-sized peers it appears as a relatively successful country of some weaknesses and strengths.

The strengths of the Empire gave the UK resources to dominate also in the 20th century, but most of the last century it has been going through a relative decline in its relative position in global economy. In the 18th and 19th centuries, the country maintained a position of industrial leadership through advances in transport, chemicals, engineering and electrical industries (Walker, 1993). Walker (1993) recounts three common arguments why the UK lost its industrial advantage in the 20th century and particularly the post-war years: The culture and institutions that were needed to fuel the industrial expansion in the 20th century were different

[5] Programme for International Student Assessment

from those of the development stage of previous centuries; earlier success breeded a rentier mentality by which industries defended rather than expanded their territories; and by openly exporting new capital and technology, such as rail transport to landlocked nations, the UK helped other nations to challenge its dominance.

The post-war industrial development was characterised by two distinct approaches. During the 1960's the state was strongly involved in the development of industry and innovation by supporting the management and investment in these areas, and to ensure the utmost economies of scale and innovativeness. This more managed approach to industrial restructuring and investment into R&D and education seemed to be the sources of post-war recovery. Opposite logic of free market capitalism applied in the 1980's, leading to privatisation of state owned enterprises, deregulation of industries and liberalisation of financial markets. While there were some signs of productivity improvement in industrial production and significant growth in service industries, the technological capacities continued their historical decline. The UK's spending on R&D stagnated, patent applications declined, and science and education systems suffered from various problems. It has been proposed that the strong capital markets encouraged the use of external financing, directing the focus on short-term gains, which then lead to a neglect of long-term investment. Only in few industries was the UK able to maintain a strong position, such as in defence, chemicals, pharmaceuticals, banking and some fields of engineering (Walker, 1993).

Since the 1980's, the UK has made efforts to improve its industrial and innovation capacity, but some concerns still remain. One area of continued concern is the level

of investment in R&D, whether through the science and education system or through private sector. After a government commissioned review in 2003, the most recent strategy for national R&D policy introduced a new framework for 2004-2014 with the aim of making considerable increases in the level of industrial R&D through public and private funding. Associated with the funding mechanisms, it also placed a strong emphasis on links between university research and private sector enterprises, an area that had earlier been considered somewhat underdeveloped. One of the findings of the 2003 review had been that some of the earlier funding to universities was too dependent on scientific peer review, which did not encourage cooperation with business (Hughes, 2007). Thus, knowledge transfer through collaborations became one of the main objectives of the new framework. Yet, so far the new framework has produced variable results. Despite the opposite intentions, in some cases businesses have interacted with universities less frequently than expected, as they have found other, more valuable, sources of knowledge for innovation (Hughes, 2011).

The current UK innovation system has strengths and weaknesses. Despite the abovementioned concerns regarding technology transfer, science, technology and design are considered some of the clearest strengths of the UK economy. Particularly the science and engineering base of the UK is said to be highly productive. The UK has a well developed capital markets that is an attraction not only for local firms but also foreign companies to locate to the UK territory. The regulatory framework is generally considered benign towards entrepreneurship. Moreover, the UK firms are considered in general to be strong in developing networks and

collaborations with other organisations, whether their science partners, suppliers or customers (Hughes, 2007).

Beyond funding and university-industry links, some have also been critical of the skills aspect of the UK industrial policy and innovation system. Some have questioned the skills capacities of the UK workforce, and whether this capacity is a hindrance to the transfer of inventions from basic research, i.e. from the science system to practical application in the private sector (Hughes, 2007). According to the OECD (2005, p.208), there is a "*generally low level of skills across the economy*", which results from an overall weakness in basic and intermediate skills, even though the proportion of workforce with a graduate level training is comparable with many Western countries. Similarly, studies have found that in various aspects of management, such as leadership skills, dealing with problems and providing adequate supervision, management in the UK firms score lower than managers in other large industrialised countries (OECD, 2005). Overall, while the UK has suffered decline in stature and wealth, it maintains some advantages relevant for innovation and industrial policy, and its apparent willingness to regenerate lagging industries is testimony of efforts to improve capacity for innovation.

In conclusion, both countries provide a context with some advantages for creating and introducing innovations. In the Finnish context there is more state involvement in the economy, which means on the one hand a higher level of regulation but on the other hand a high level of public funding and other support for industrial and technology development. In the UK context the entrepreneur is less con-

strained by the regulatory framework, but the state also provides less financial support and investment in industrial and technology development.

4.3 HEALTH CARE PROVISION AND TECHNOLOGY USE IN HEALTH CARE

Another set of elements for the country profiles is factors about the health care systems in these countries. In the following I present how the health care system is organised, what is the level of overall national expenditure for the system, what are the levels of use of labour, of technology, and of the physical care facilities in health care. Furthermore, both countries have recently undergone large IT projects to create national infrastructure for enabling secure and seamless communication and sharing of information between units of care throughout the country. I briefly describe the aims and the challenges of these projects in order to demonstrate some of the difficulties that technology implementation, albeit at a large scale, can face.

The evidence below strengthens the impression that the two countries have dissimilar profiles. This dissimilarity in these systems emanates from how decision-making and funding controls are structured, and at what level technology is used in health care processes. The Finnish health care system is largely decentralised, including local control for funding, whereas the English system is controlled from the centre. In terms of statistics on technology use in health care, Finland appears

as a country where new technology is perceived relatively favourably, whereas the UK/English health care system appears as less receptive to new technology.

4.3.1 Structure of health care systems

One important building block for these country profiles is the structure of the national health care system. The systems of health care for Finland and for the UK/England bear resemblance, but they are for the sake of this profile different in important ways. The following will highlight the differences, but few main elements of similarity are worth mentioning at first: they both rely mostly on public organisations in the provision of care, and their core premise is universality of access. At the same time, they have both retained a gate-keeping function for the care professionals, i.e. access to more specialised services is free but to a certain extent controlled and restricted (OECD, 2010). Nevertheless, aside from these aspects, they have fundamental structural differences which make the two systems dissimilar. This in turn potentially has a large impact on the adoption of new technology, to which I will return in the discussion of Chapter 8.

I argue that the Finnish and the English health care systems are characterised by two opposing features. Whereas Finland has a largely decentralised system, the English health care system is essentially centralised. During the period in question in this study, the two decades of the 1990's and the 2000's, these central characteristics have still remained essentially the same, even if there have been efforts to make some structural changes.

Finland

Ever since its inception, the Finnish health care system has been designed to be a very decentralised system. The central governments have wanted to place the burden of health care provision on the local governments, and this design has continued until present day (Mattila, 2011). The role of the central government is to legislate, to offer guidance and to provide block grants to help fund the local arrangements. Municipalities are tasked with organising, funding and providing care. The funding is divided between three sources: municipal taxes, state subsidies and locally determined user charges. The publicly provided care is complemented by the occupational health system, which plays a rather significant role, and some private provision in a minor role (Jakubowski and Saltman, 2013).

Due to the population being widely dispersed in a relatively large country geographically[6], local decision-making has been an important value in Finland. In practice this has meant that in 2008 75% of the total of 415 municipalities had less than 10.000 inhabitants, and 20% had less than 2.000 inhabitants. In 2008 a reform process was begun to reduce the number of municipalities, which can arguably be seen as a move towards centralisation (Jakubowski and Saltman, 2013). These reforms follow the recognition that it is difficult to organise good quality services for localities of such small population, and of tax income, base. However, these reforms are not aiming to alter the different roles of the central government

[6] Finland has a population of 5,4 million in a territory that is approx. 36% larger than that of the UK, with density of 16 people / km2 (Statistics Finland, 2013). England has a population of 51,8 million (2009) with a population density of 401 people / km2 (Boyle, 2011)

and the municipalities vis-a-vis the health care system, wherefore it arguably is centralisation at the local or regional level.

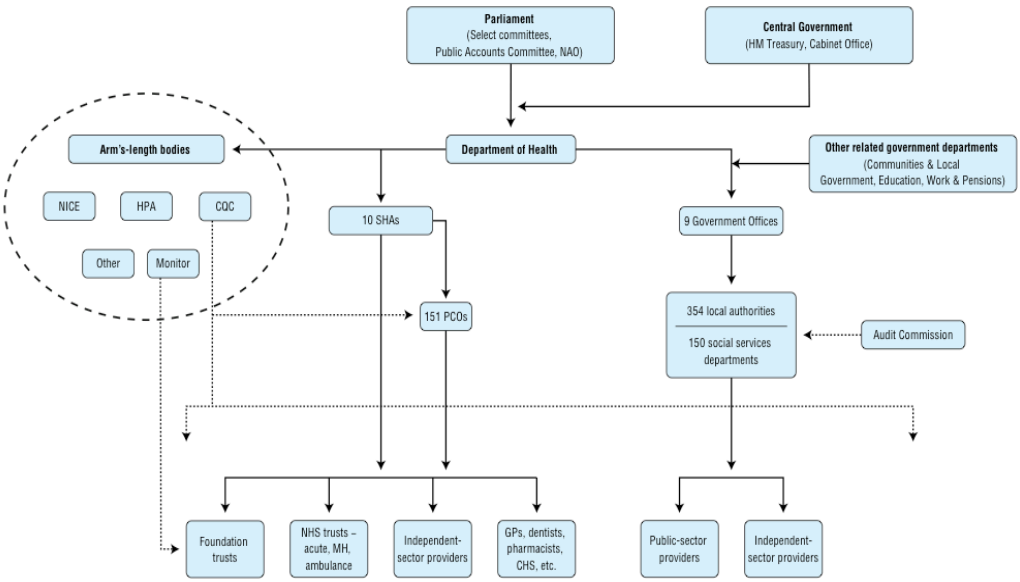
It is noteworthy that in the Finnish health care system the municipalities have a high level of independence, which is unique in international comparison. While in many European countries the funding for health services is ear-marked, i.e. protected, in state budget, in Finland health care is one of the many items to be funded from a municipal budget. Health care does not have a formally recognised preferential status in these budgets, but rather it competes for funds with other items of legal obligation, such as education and social care, as well as with those of non-legal obligation, as any capital repairs, new investments or support for local enterprises for example. As noted above, while these budgets provide the largest part of the funding for local health care, the state provides supplementary grants, and users pay some charges for visits to doctor (Mattila, 2011).

England

The English health care system in contrast can be described as a centralised system. Seemingly paradoxical, but at the level of the United Kingdom, health care is one of the devolved politics. However, within England the health care system is highly centralised, overseen by the UK Department of Health (henceforth UK DH). Under the policy guidance of the UK DH lie the many organisations that compose the English National Health Service (NHS), depicted in figure 4.1 below. As the figure indicates, the UK DH governs over the local providers of health care through the many organisations under its contractual or managerial control, the main one

of which is the strategic health authorities[7] (SHAs). The "Arm's-length bodies" assist the UK DH to regulate and monitor various aspects of care, such as the quality of care, the financial viability of the care provider organisations and the improvement of medicines, treatments and procedures (Boyle, 2011, p.22). The Primary Care Organisations (PCOs) have commissioned services from General Practitioners (GPs) and other service providers, but under the central control of the SHAs. The position of the local governments in figure 4.1 highlights the centralised structure of the English system, and the contrast with the system in Finland: local governments (the "354 local authorities" on the right hand side) contract services from public and private providers for social care, but have no link to the providers of health care.

FIGURE 4.1: THE STRUCTURE OF THE UK/ENGLAND HEALTH CARE SYSTEM



Source: Boyle, 2011

[7] These are being abolished under the current UK government's plans, and a new system of central NHS Commissioning Board and Local Commissioning Groups is being implemented.

Funding also indicates how the English health care system is governed and controlled from the centre. Funding for care is provided in the national budget, and allocated to the organisations providing care, namely the PCOs. The PCOs then purchase the various types of services (primary, community, intermediate and hospital-based services) from mainly public but also private and voluntary-sector providers. The funds of the national budget to be allocated to cover health care are collected up to 95% in general taxation and in national insurance contributions as an 'NHS item', with the remaining 5% obtained from various other charges and NHS income. Thus, the central origin of the funding also suggests that there remains a high level of central control over the allocation of resources (Boyle, 2011).

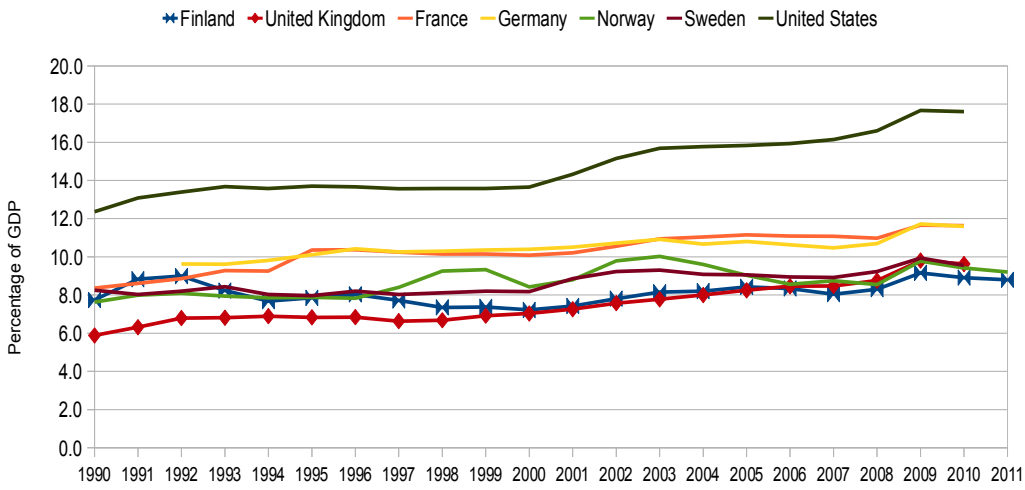
4.3.2 Variety of indicators for health care systems

Health care expenditure

The level of national health care expenditure implies to a certain extent the importance of health care in a society, i.e. what share of the national resources is dedicated to providing care. A comparison with reference countries indicates a general trend, and deviations from the trend may suggest an important shift in national programme. However, data on total health expenditure isolated from other indicators may give an inaccurate impression, as high expenditure may be a result of a costly system, while low expenditure may imply a cost efficient system. Here I present health expenditure data as part of a set of indicators, and argue that Finland

has made a moderate investment in health care while England's investment has been comparatively low.

GRAPH 4.5: HEALTH EXPENDITURE



Source: OECD Statistics (Health expenditure and financing dataset)

Graph 4.5 shows the level of health expenditure relative to the size of the economy (measured as percentage of GDP). The first impression is that there has been no vast difference between Finland and England in health spending during most of this period. In the early 1990's Finland's expenditure was considerably higher than that of England, but since 2000 the two have spent almost an identical share of GDP on health. Yet, the two countries have had a different trend. Whereas Finland's health expenditure has alternated between increase and decrease in the last two decades, England has had a rising trend. Finland's health expenditure as share of GDP indicates remarkable long term stability as it was in 2011 at the same level

as two decades earlier. At the same time, England's share of health expenditure has gone from 6% to almost 10%, an increase of over 50%.

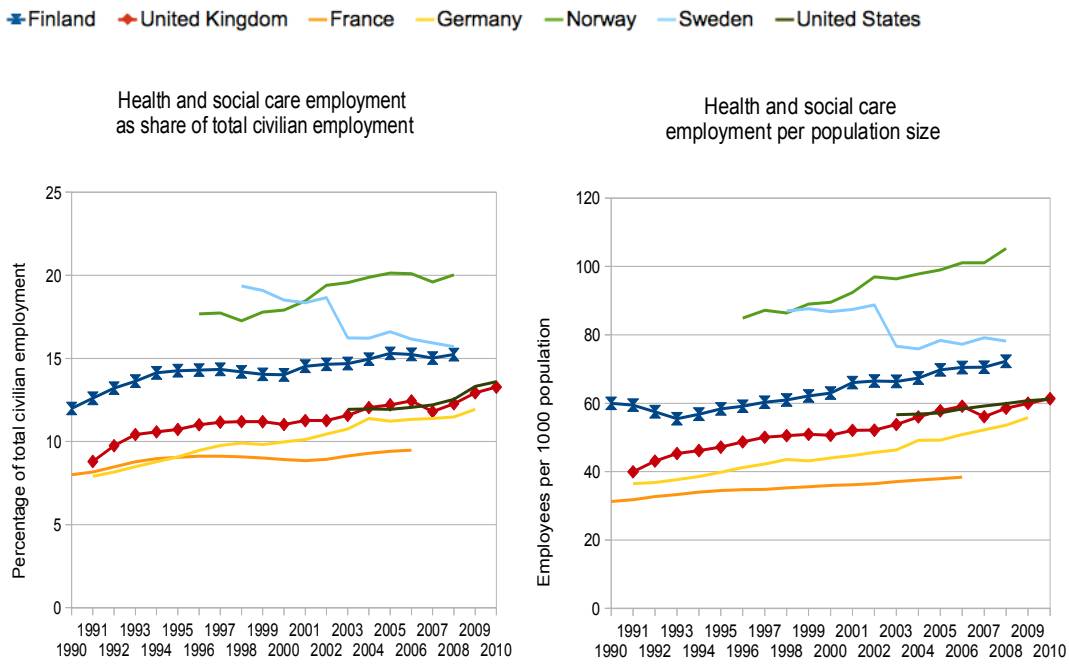
These health care spending statistics make a clearer contribution to the profiles when the countries are compared with their referents. Norway and Sweden have had health spending levels that mostly have resembled those of Finland's in this period. Comparing the UK with its reference countries France, Germany and the United States shows that the UK has had a relatively low health care spending during this period. France and Germany's relative health care spending level has throughout the period been at least 2% higher, and that of the United States 6-8% higher, than the level of the UK. In this comparative light, Finland appears as a moderately spending country whereas the UK appears as a low spending country. Noteworthy is also the overall trendline. While the notable shifts have not been exactly simultaneous, one can see a pattern in most of the lines that is exemplified by that of the United States: A horizontal line, with two gentle lifts to a slightly higher level, is a demonstration of development in somewhat distinct phases.

Health care employment

The level of employment in the health and social sector indicates two things: The extent of investment in the health care sector, as well as the labour intensity of the national health care arrangements. In general, health care services tend to be rather labour intensive, as suggested by the fact that the NHS of England has 1.3 million employees, making it one of the largest organisations of any kind in the world (Clegg, Harris and Hopfl, 2011). The levels of health and social employment, in

graphs 4.6 below, show the relative labour intensity of a health care system. These levels are measured here in relation to the number of population and as share of all civilian employment. In turn, this hints at the level of technology use in care. Coupled with other related data, labour intensity data adds to the profile of these country cases, and contributes to the view of how receptive the system may be for novel technological solutions in care.

GRAPH 4.6: LEVEL OF HEALTH AND SOCIAL CARE EMPLOYMENT



Source: OECD statistics (Health care dataset)

As the two different perspectives in graphs 4.6 show, health and social employment for these two cases have evolved in parallel, even if there has remained a rather significant difference between their levels. Finland employs more staff in relative terms in health and social care than the UK, both calculated per total population as well as per total civilian employment. In relation to their reference coun-

tries, for most of the period in question Finland has employed clearly less staff than Norway and Sweden, although in recent years it has come close to the latter. The UK has steadily employed more staff than its two European referent countries France and Germany. The United States employs staff roughly in the same proportion than the UK. The conclusion of these comparisons is that the level of health and social care employment in Finland is rather low as compared with its referent countries, while that of the UK is moderately high, as compared with its referent countries.

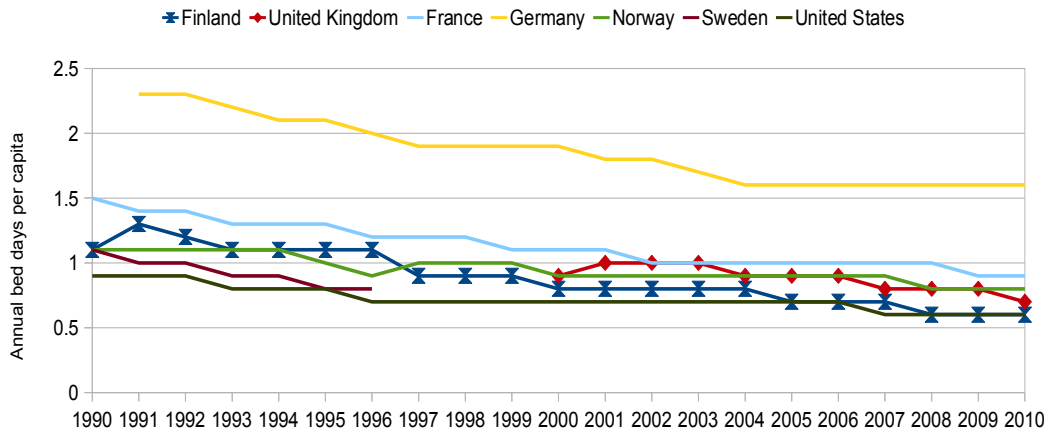
Both comparisons show a slightly rising trend over the last two decades. It is noteworthy that the rate of increase over the period has been roughly twice as fast for the UK: Whereas the rate of increase for Finland has been 20% and 27% respectively for these two perspectives, UK health and social employment has increased over 50% for both. Overall, despite some deviation by Sweden from the trend, there seems to have been fairly consistent gradual increase among these countries.

Use of care facilities

Data on the use of health care facilities, in graph 4.7 below, indicates the level at which care is administered in care facilities. A trend line implies whether care in facilities is either increasing or decreasing and the comparative data allows one to infer a general trend in care facility use. Facility use data is particularly useful when combined with other data on health care resources, such as expenditure and employment data, to which point I will return below. I propose here that both

countries are moving away from the model of care provided mainly in facilities. Together with the increases in expenditure and staff as seen in graphs above, there may be a trend of moving care out of facilities and to be provided remotely, such as in forms of community care.

GRAPH 4.7: USE OF CARE FACILITIES: IN-PATIENT ACUTE CARE BED DAYS



Source: OECD Statistics (Health care utilization dataset)

The main observation regarding this graph 4.7 stands in some contrast with the statistics on overall expenditure and care employment. First, for both cases of Finland and the UK, as well as for the reference countries, there has been a clear and slowly decreasing general trend in in-patient bed use. For Finland the overall shift has been large, decreasing from the high of 1.3 annual bed days per capita in 1991 to less than half of 0.6 days per capita in 2008, whereas the UK has experienced a significant but less dramatic decrease of 30% by 2010 from the highs of 2001. Considering the statistics presented above of increases in health care spending and in health employment, it is fair to assume that demand for care has not decreased in equal measure to the decrease in facility use in these countries. Thus, the decreas-

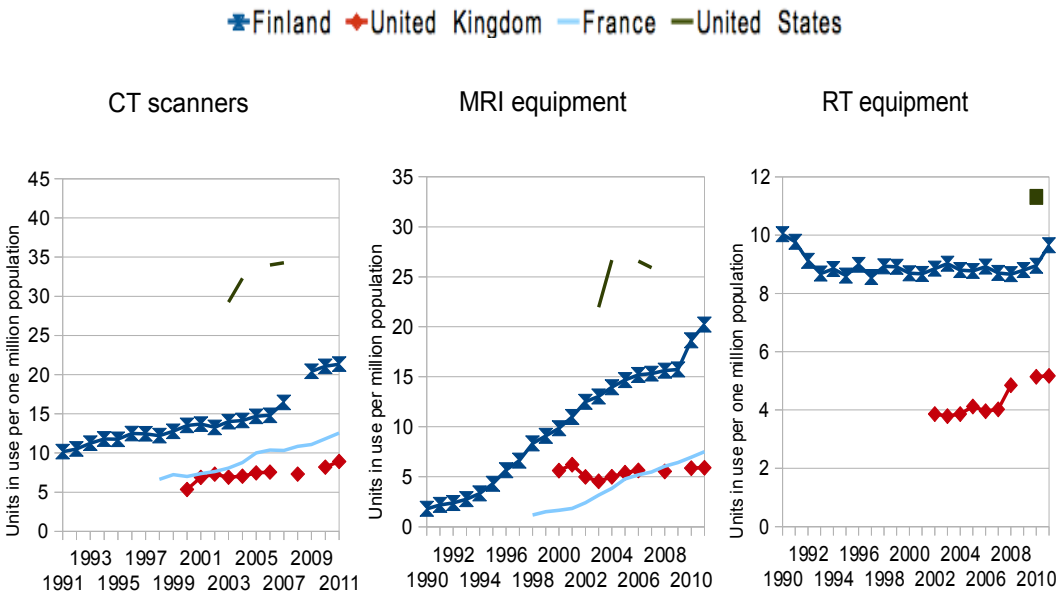
ing trend in care facility use suggests that in both countries there has been a shift away from hospitalised care, towards forms of care that happen outside of care facilities.

It is also noteworthy that both Finland and the UK appear to place at average level in care facility use as measured against their referent countries. Finland's trend level has for the majority of the period been only slightly lower than that of Norway's, while Sweden's figures of the first seven years of the period have been slightly lower than those of Finland's. In contrast, the UK has been slightly above the United States and slightly below France. Germany is a clear outlier in this group, far above other countries throughout the period.

4.3.3 Use of medical technology

National level of medical technology use in services of health care, indicated in graphs numbered 4.8, implies how open health care organisations in a country are for investment in technology. The OECD has employed adoption data on three purpose-built health care technology devices to proxy for the level of medical technology use: radiation therapy equipment (RTE), computed tomography scanners (CT scanners) and magnetic resonance imaging (MRI). The graphs 4.8 below include reference countries for which data was available, namely France and the United States. The values are given as unit per one million population.

GRAPH 4.8: USE OF MEDICAL TECHNOLOGY - COMPUTED TOMOGRAPHY (CT) SCANNERS; MAGNETIC RESONANCE IMAGING (MRI); RADIATION THERAPY (RT) EQUIPMENT



Source: OECD Statistics (Health care resources dataset)

Two observations are noteworthy. First, the adoption of these medical technologies has had an upward trend in Finland, except for the RT equipment for which the trend line is relatively flat. For the UK, there has also been a mildly upward trend for CT scanners and for RT equipment, while for the MRI equipment the trend line is rather flat. Second, in relative terms, the UK has employed CT scanners and the MRI equipment at roughly equal level to one of its reference countries, France. Another reference country, the United States, is placed in the graphs far above the others (on the RT equipment graph the United States appears as a square, as data is available only for one year), and I consider it to be an outlier for this group.

These graphs further reinforce the profiles for these two countries. While Finland does not have its reference countries of Sweden and Norway in this graph, in comparison with the UK and France it appears as a relatively high user of these medical technologies. Considering the trend line, it appears that the health care sector in Finland has also been continuously increasing the level of technology use in order to improve its service processes. The UK's mostly flat curves suggest that its health organisations are less eager to increase the use of technology in their processes, even if it is showing relatively equal level of medical technology use as compared with its reference country France.

Taken together, these four graphs of health expenditure (4.5), health employment (4.6), care facility use (4.7) and medical technology use (4.8) suggest an overall pattern that is similar for both Finland and the UK. The use of care facilities has been decreasing, while expenditure, use of staff resources and technology have been increasing. This may imply that remote forms of care delivery have increased, but further evidence is needed to confirm this as a finding. However, these four graphs suggest favourable conditions for implementing technology such as that of mobile devices to enable remote forms of health care.

4.3.3 Implementing IT in national health care systems

At a broader level, health care sector has always been highly dependent on technology, e.g. in the form of devices, for purposes of diagnosis and treatment. In the last few decades information technology has been brought into health care as well.

At first, roughly a half century ago (Boyle, 2011), computers began to be used in accounting and billing. Gradually they were adopted in patient related functions, such as admission, transfer and discharge. Already before the rapid diffusion of the information and communication technologies more widely in the 1990's, there were health IT applications such as information systems for laboratory, order entry and decision support, as well as early electronic health record systems (Saranummi, 2013). Diffusion of information technologies enabled new remote care practices that became labelled as telehealth, telecare and telemedicine. The introduction of these systems was motivated primarily by the incompatibility of the antiquated and inflexible prior systems with what are seen as the needs of modern health care.

As an exhibit of potential challenges of technology implementation in health care, I briefly describe the experiences and particularly the difficulties of the latest large-scale health ICT projects in the two countries. The two case countries have attempted to implement important new ICT infrastructure for their health care systems, which is relevant both for mobile health emergence as a technical project and a context for implementation, as well as for the general profiles of both Finland and England.

Finland

The very decentralised structure of the Finnish health care system has had the effect of complicating any efforts to create national infrastructure for health information exchange. First steps to consolidate the local health information systems

were taken in the 1990's in the form of projects to construct regional information network systems. These systems enabled care organisations to exchange information, and particularly to gain access to electronic patient record data across organisations. As in the Finnish model the local health IT system was usually part of local government IT systems, this entailed great variety in these systems, and resulted in insurmountable difficulties in the efforts to integrate further these local and regional systems faced. These complications highlighted the need to create a national system of health information exchange, which lead to the first project to define the architecture for a national system in the early 2000's (Saranummi, 2007). The national project to put in place this infrastructure was designed to provide certain national level services for all, and to ensure the ability for improved information exchange capacity between local health care organisations. As a government funded project of national ICT infrastructure, a broad set of public sector actors were involved in the project from the beginning, with representatives ranging from local government, health care organisations and IT providers to the Ministry of Health and Social Care and the Ministry of Finance. The new system would be composed of three core services which the regional systems would link to: 1) archive of patient documents and images, 2) ePrescription service, enabling electronic transmission of prescription data, and 3) eView service, which enables patients and care professionals to view records in the archive.

What has been the calling for this national project has also been its curse. The national project was intended to be completed by 2007, but in 2013 work still continues. The ePrescription service has been rolled out in public health services,

while private sector health clinics are still building up their capacity. The implementation of the eArchive system will take place during the years of 2013-2016[8]. The main reason for early delays in the project has been difficulties to establish consensus among the many participants about the system specifications. This has been seen as a consequence of the decentralised structure of health care, which has left the process without powerful leadership, e.g. from the Ministry of Social and Health Care that has only sought to gently steer the process (Saranummi, 2007).

England

In the UK the national infrastructure project has also faced difficulties, which appear to be the result of the excessively large scale of the project, as well as of the poor project management skills of the managers involved. Also in England, prior to the national project, local primary care trust organisations were left to decide how much to spend and on what type of IT systems. Generally this spending was low, and due to lack of any common standards the different local systems could not communicate. In 2002 the Department of Health initiated planning for a national program for IT (christened as such, with the acronym NPfIT) which would develop and implement a system that includes electronic patient records, online access to these records, electronic prescription service, picture archiving as well as integrated system for communication across the general practices, hospitals and communi-

[8] "Electronic prescription makes life easier at home, health services and pharmacy." Website of Kanta, the Finnish national health infrastructure service: http://tinyurl.com/nn42esz (accessed 11.7.2013)

ty services (Boyle, 2011). These were originally scheduled to be delivered by 2010, but despite advancement in some areas, so far overall success has been limited. Progress in the program has faced criticism and after a highly critical review by the National Audit Office (NAO, 2011), the program was partly dismantled to allow for local solutions to be developed by local NHS organisations (Nicholson, 2011).

Some of the reasons for the failure of the NPfIT have been outlined by Keen (2011). He argues that one of the main sources for failure was the lack of project management skills that has been evident already before with the NHS. Part of this are the poor skills that the NHS and the Department of Health managers have for negotiating with large private IT firms. The review by the NAO (2011) emphasizes the technical complexity of the project, accentuated by the large size of the NHS and the NPfIT project. Another factor, in Keen's view, was the disconnect between policy and the complexities of health care delivery at the local level. By this he refers to the attempt to create a number of nationally standardised systems at one stroke, instead of adopting the approach of providing merely standards to aid local initiatives. Thus, Keen seems to suggest that the failure of the English approach resulted from attempts to over-centralise health IT infrastructure.

4.4 INVENTIVENESS IN ICT AND MEDICAL TECHNOLOGY INDUSTRIES

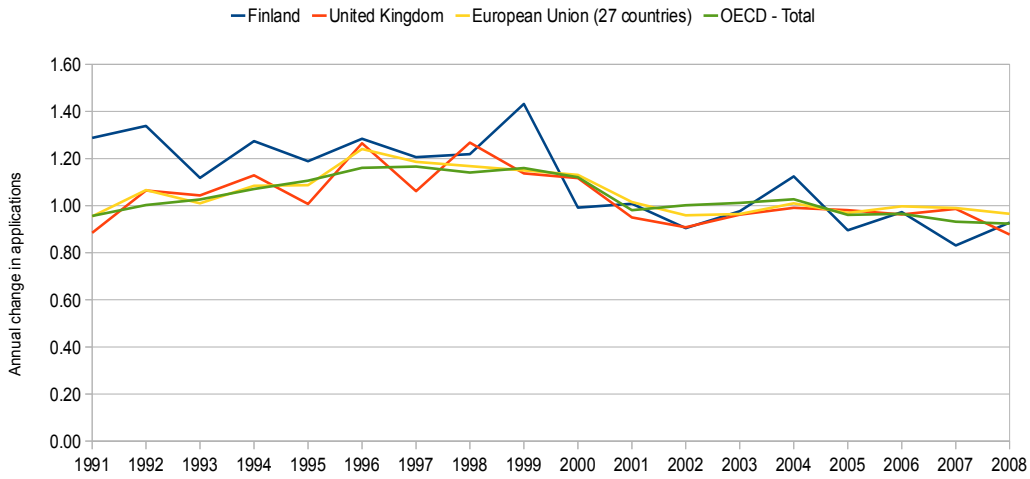
Beyond aspects of national economic development and the health care system, I present various indicators from ICT and medical technology industries that contribute to the country profiles and help understand national attitudes towards technology as a solution.

4.4.1 Industry inventiveness as patents

Patents in ICT

Patents are one of the more typical indicators used to mark the general inventiveness of a nation. One approach to measuring patent output is annual change in patent applications, which suggests a continuing inventiveness in a country (annual change in applications above 1.00 indicates increasing output and thus increasing inventiveness). I take the patent output for ICT, in graph 4.9, to imply how well the national context supports continued creation of inventions.

GRAPH 4.9: ICT PATENT APPLICATIONS



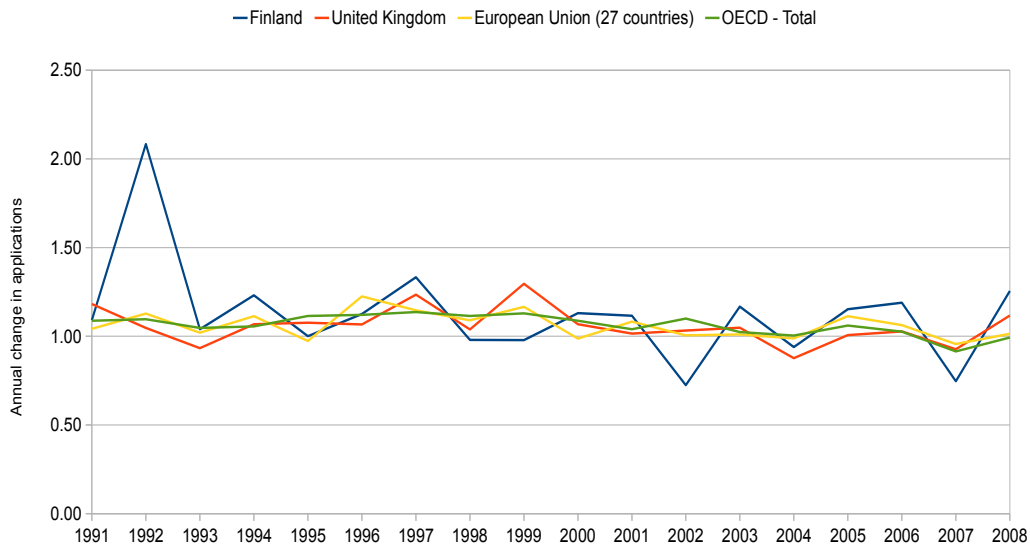
Source: OECD Statistics (Patent statistics)

Graph 4.9 indicates the overall, and rather uniform, trend in patent applications for Finland, the UK, EU27 and OECD. The first observation from the graph is the slightly upward trend in ICT patent applications during the 1990's for the two countries and two groups, and their general downward trend in the 2000's. Secondly, the UK has followed particularly closely the trend lines of the EU27 and the OECD. While during the 2000's it has followed the others quite closely, during the 1990's Finland has had a distinct trend line that has mostly been significantly higher than those of the others. Overall, this graph confirms the well-known phenomenon of rapid development of the ICT industries in the 1990's while downward sloping curve of the 2000's testifies to the more cautious economic atmosphere in those years.

Patents in medical technology industry

Likewise, medical technology patent applications can imply the innovativeness of a nation in the medical technology field, and in particular how vibrant is the local medical technology industry.

GRAPH 4.10: MEDICAL TECHNOLOGY PATENT APPLICATIONS



Source: OECD Statistics (Patent statistics)

As above in the graph 4.9 for ICT patent applications, the main observation from graph 4.10 is that aside from Finland's trend line in the early 1990's, the graph's group has experienced a relatively uniform evolution. Furthermore, much like in the graph 4.9, Finland has experienced more volatile changes year-on-year, but has nevertheless more or less followed the general pattern that the lines for the EU27 and the OECD countries indicate. Both of these graphs suggest that in terms of innovativeness Finland and the UK are rather median countries within the EU27 and the OECD, and thus can be assumed to provide average conditions for the development of inventions in ICT and medical technology.

Two findings are significant from these graphs. The contribution of these graphs to the country profiles is the less remarkable finding. Except the 1990‘s for Finland, both countries have followed the general trends in patent output, and thus do not appear as particularly inventive countries. The decade of the 1990’s for Finland appears as a period of more robust development, which could have also supported the development of mobile health technologies.

The more significant finding is that there are two discrete periods in these graphs. For all the entities depicted in both graphs, the 1990’s has been a decade of overall upward development, indicating a more vigorous period of developing new technologies, part of which was the rapid growth of the ICT related industries. In the 2000’s the general trend has been of a slight decrease, as the curves generally point downwards or alternate at a lower average level. This observation suggests that inventiveness, at a national level, comes in waves. These may be waves of creativity of the scientists or companies developing new products, but they may be also waves of opportunity provided by funding arrangements, promotion programmes for innovation, or even the pull effect of large companies that encourage and support smaller companies to develop new technical solutions.

4.5 GENERAL TECHNOLOGY USE

As a fourth contextual aspect I present the general technology use in these countries. Albeit the focus of this study is on organisations as the actors driving the

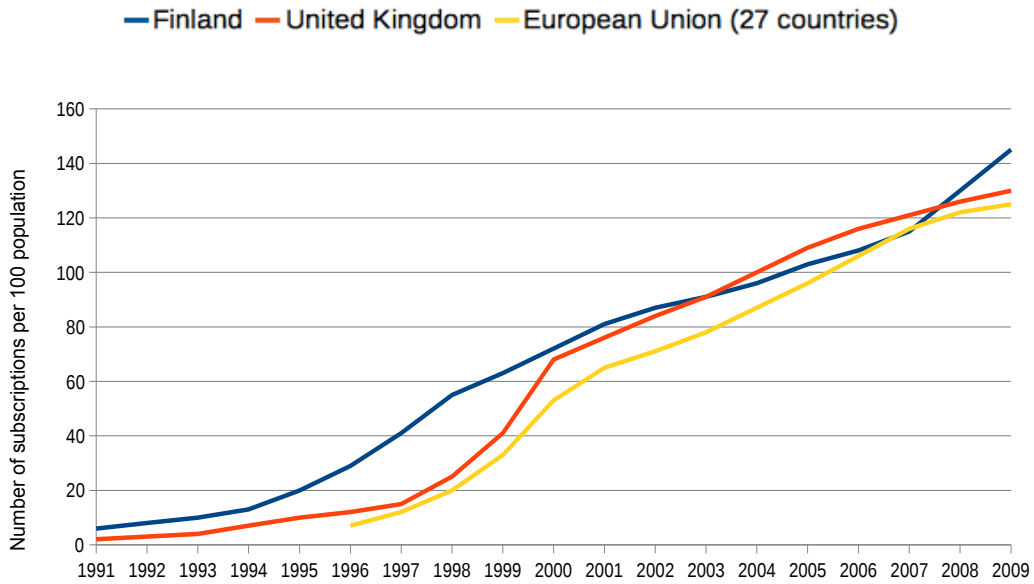
emergence of mobile health, I consider the level of general technology use as one key contextual element that has an influence on how mobile health is to be perceived and potentially adopted. My overall finding is that the level of mobile and other information and communication technology use, such as the Internet, is comparatively high in both Finland and the UK, providing a favourable context for accepting mobile technology use in health care.

4.5.1 General use of technology

General use of mobile phones

The rate of mobile phone subscriptions, in graph 4.11, indicates the level of mobile phone use, in terms of the size of population. I take the level of subscriptions of either high or low as an indication of the degree of acceptance of mobile technology in general, including also the potential for use in various new tasks.

GRAPH 4.11: MOBILE SUBSCRIBERS AS SHARE OF POPULATION



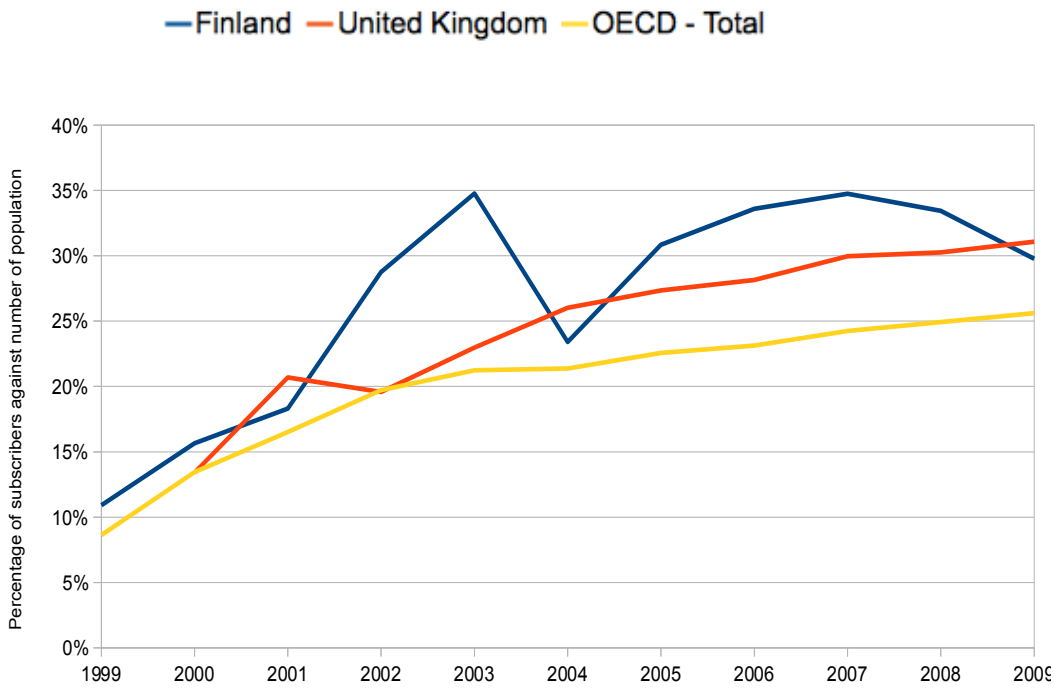
Source: Eurostat Statistics (Telecommunication services dataset)

Graph 4.11 shows that overall Finland and the UK have experienced a rapid increase in the uptake of mobile phones, increasing in just over ten years from less than 20% to 100% by 2004. In the mid-1990's Finland was first to begin a rapid increase in the number of subscribers but since the beginning of the 2000's there has been little difference in the subscription rates between the two countries. While Finland's trend line is relatively constant, the UK has seen three distinct phases of development: most of the 1990's saw slow increase, in the late 1990's there was a rapid increase, and from the year 2000 onwards growth has been relatively steady.

General use of the Internet

Complementing the above mobile subscription data, the level of Internet subscriptions, below in graph 4.12, indicates further the general level of telecommunication technology adoption and acceptance. As in the previous graph, the data in the graph below shows the subscription rates in terms of population.

GRAPH 4.12: INTERNET SUBSCRIBERS AS SHARE OF POPULATION



Source: OECD Statistics (OECD Telecommunications and Internet statistics)

This Internet subscription data in graph 4.12 also implies high use of ICT use in these two countries. Although these rates overall are considerably lower than those for mobile phone subscriptions, these countries have both been quite consistently above the OECD average. Finland has been above the level of the OECD average throughout the period, with an enormous jump in the early 2000's. The UK has also mostly been clearly above the OECD average level, with the exception of a

few specific years of 2000 and 2002. The UK's development curve has been rather steady, while that of Finland's exhibits four distinct periods: rapid increase between 1999 and 2003, rapid decline for the year 2004, and second period of increase, and finally a slight second decline for 2008 and 2009. Somewhat curiously, these profiles are reverse from the mobile health data: The UK has the steady slope, whereas Finland has the periodic shifts in speed of adoption.

The data in the two graphs - of mobile phone and Internet use - suggests that new technical solutions may be received favourably in both countries. Both graphs indicate that people in these two countries have shown increasing familiarity and interest to adopt these information and communication technologies.

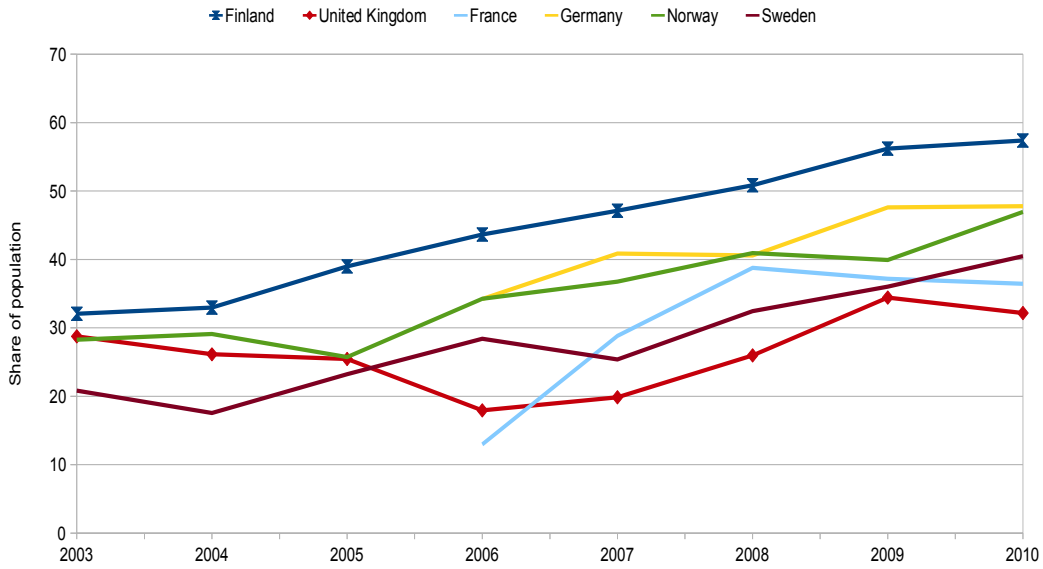
4.5.2 Use of ICT technology for health related activities

Citizen use of ICT for seeking health information

Beyond the overall scale of use of these technologies, the extent of their use for a specific health related purpose signifies the potential interest for their broader adoption in society. One of the many uses for the Internet is information search and retrieval in general. A specific category in the OECD statistics is 'Internet use in search for health information', which offers a direct view of what is the level of use of the new communication technologies in health care related activities. This data does not differentiate between devices, and therefore may not be taken as a direct

reference of mobile technology use, as such non-mobile devices as desktop computer are included in this data. At the same time, mobile devices such as mobile phones as well as laptop and tablet computers are increasingly used for information search on the Internet, and therefore this data is useful to add to these country profiles. Finland appears here as a country in which the Internet is used at a very high level comparatively, while in the UK that use is still low relative to its peers.

GRAPH 4.13: INDIVIDUALS SEARCHING FOR HEALTH INFORMATION ON THE INTERNET



Source: OECD Statistics (ICT database)

Graph 4.13 shows that information search on the Internet on health related issues has been increasing for most countries included in the graph, but that Finland and the UK display somewhat different levels in this respect. Finland scores clearly higher than other countries, including its reference countries Sweden and Norway. Despite their similarity in various other areas, e.g. health expenditure (graph 4.5),

Finland here scores almost 50% higher than Sweden and almost 30% higher than Norway still in 2010. The UK on the other hand is placed at the lowest level of this group for most of the period. It is clearly lower than Germany, and most of the period far lower than France. Furthermore, while the UK's level of Internet use for health information search has increased in recent years, its level in 2010 was only slightly above its 2003 level. Thus, Finland appears here as a country keen to use new communication technologies for this general task, while the UK seems to be a country where new communication technology is only slowly adopted for it.

The data presented above on the use of communication technology by the general public suggest that these two countries both provide a favourable context for introducing new forms of care provision with the aid of mobile technology. The above comparisons with other countries support a view that people in Finland are particularly ardent users of modern communication technology. The subscription data for mobile phones and for the Internet indicate that they take up new communication technology relatively quickly, and the health information search data implies that they adopted the Internet for this new use more rapidly than people in the reference countries. Thus, the behaviour of the Finnish people in regards communication technology complements the other data presented above about Finland as a particularly receptive country for the use of information and communication technology in health care.

The image of the UK that emerges from this data is largely similar to that of Finland, even if slightly less convincing. In terms of mobile phone and Internet adoption, people in the UK have been relatively quick to embrace new technology, as

compared to OECD countries in total. In the new area of using information and communication technology for seeking health information they have been slower to react than their peers in the reference countries. Yet, overall the people in the UK appear receptive to new communication technologies, thus supporting the view of the UK as a relatively favourable context for mobile health to develop.

4.6 CHAPTER CONCLUSION

I have made a detailed presentation of a selection of contextual factors that I consider significant for my study on the introduction of mobile technology to health care. These factors enable one to derive distinct profiles for these two countries, against which I will assess the findings of my analysis. In table 4.1 I lay out a summary of the findings from the graphs presented above. I pay particular attention to the extremes, i.e. the one and three notch categories, to point out salient factors in the country profiles.

Table 4.1: Summary of macro-level findings

Chapter 4 graphs	Finland	England / the UK
4.1 Gross domestic expenditure on R&D	✔✔✔	✔✔
4.2 Government investment on industrial production and technology	✔✔✔	✔
4.3 Early stage venture capital investment	✔✔	✔✔
4.4 Product market regulation	✔	✔
4.5 Expenditure on health	✔✔	✔✔
4.6 Level of health and social care employment	✔✔	✔✔

4.7 Utilisation of care facilities	✔✔	✔✔
4.8 Use of medical technology	✔✔✔	✔✔
4.9 ICT patent applications	✔✔	✔✔
4.10 Medical technology patent applications	✔✔	✔✔
4.11 Mobile phone subscriptions	✔✔✔	✔✔✔
4.12 Internet subscriptions	✔✔✔	✔✔✔
4.13 Use of internet to search for health information	✔✔✔	✔
Scheme to interpret graph findings ✔✔✔ = clearly above the values of reference countries ✔✔ = on par with the values of reference countries ✔ = clearly below the values of reference countries		

These two countries appear middle of the road Western industrialised countries on several counts, indicated by the categories with two notches in the table. The three core factors by which the two countries are distinct are aspects of centralisation, the level of technology use and the level of investment into industry and innovation. Finland's profile consists of a highly decentralised health care system with the local government deciding upon, funding and organising the services. On the other hand, support for industry and innovation is highly centralised, with the central government providing ample funding through different funding mechanisms. Finland also has a high level of technology use, both by the general public and as part of health care services. In short, the context of Finland appears to provide relatively good prospects for introducing mobile technology into health care, with potentially large public support for implementing new technology solutions. However, the decentralised nature of the health care system would appear to favour either local or regional commercial strategies for technology providers, or a national commercial strategy with attachment to any of the national ICT infrastructure projects. The evidence that I present in the following chapters reveals

that institutional entrepreneurs have partly taken advantage of these good prospects, e.g. by using public funding for initiating mobile health projects, and by pursuing these at local levels. However, there have been other obstacles that have overshadowed these favourable circumstances.

The profile of England/the UK also consists of particular aspects in terms of centralisation, technology use and government support for industry. England/the UK has a centralised health care system where the (UK) central government effectively controls how the English health care is provided and funded. On the other hand, the government does not provide much financial support to industrial production and innovation, which therefore is dependent to a large extent on private sector capital markets for funding. Coherent with this is the vitality of the private capital markets, as well as the low level of regulation regarding entrepreneurship, which both favour market based attempts for creating new solutions. The UK also has a relatively low level of technology use in its health care services, but a high level of information technology use by the general public. In short, the UK context is more market oriented than that of Finland, suggesting that new solutions would need to rely on private funding and on the keen interest of the general public to adopt mobile technology in health care. In fact, somewhat surprisingly, England and Finland are in respect of centralisation the polar opposites: England has a centralised health care system and decentralised (market based) approach to industrial development, whereas Finland has a very decentralised health care system but a centralised approach to industrial development. This provides one potential opportunity to observe the effect of context, its magnitude and type.

Aside from the country profiles, I draw a finding that there have been discrete phases of development, which is relevant for a study with a temporal dimension. In many graphs there are distinct periods or waves of development. These are trends that cluster activity in a chronological phase, followed by another period of distinct behaviour. While not present in all graphs, and therefore not a completely uniform phenomenon, this is nevertheless a finding that stands in contrast to the characteristic steady and linear progress of evolutionary arguments of development. I will return to this subject of 'episodes', in the discussion chapter nine, when I will discuss all the findings of the research, the contexts outlined here, and the theoretical literature of chapter two.

CHAPTER 5: THE CONCEPTIONS ABOUT MOBILE HEALTH

5.1 INTRODUCTION

In this chapter I report my findings and analysis of the early moment ideas around mobile technology use in health care. I have investigated what is meant by the concept of mobile health at the level of public talk (with evidence from newspaper articles and from a variety of events related to the subject) and at the level of an organisational field (with evidence from the organisations participating in this project). In the analysis I have used data from a newspaper database Nexis UK, from observations at various events I attended, and from organisation interviews. I have found that at this early moment stage mobile health means many things: it means a variety of devices and device combinations, it means many different functions, and it means three types of users. The summary tables 5.2, 5.3 and 5.4 at the end of the chapter illustrate this clearly. My argument in this chapter hence is that this concept has so far no clear definition. There is no agreement on what mobile health means, and there is no category of mobile health yet.

I present timeline graphs for the case countries at the end of the country section in order to provide a clearer temporal view of mobile health development. They are another showcase of institutional entrepreneurship at early moments, another window to how the first efforts, ideas and relationships take shape. Drawing on the graphs in this and the other empirical chapters I argue that at early moments events occur in waves, or *episodes.*

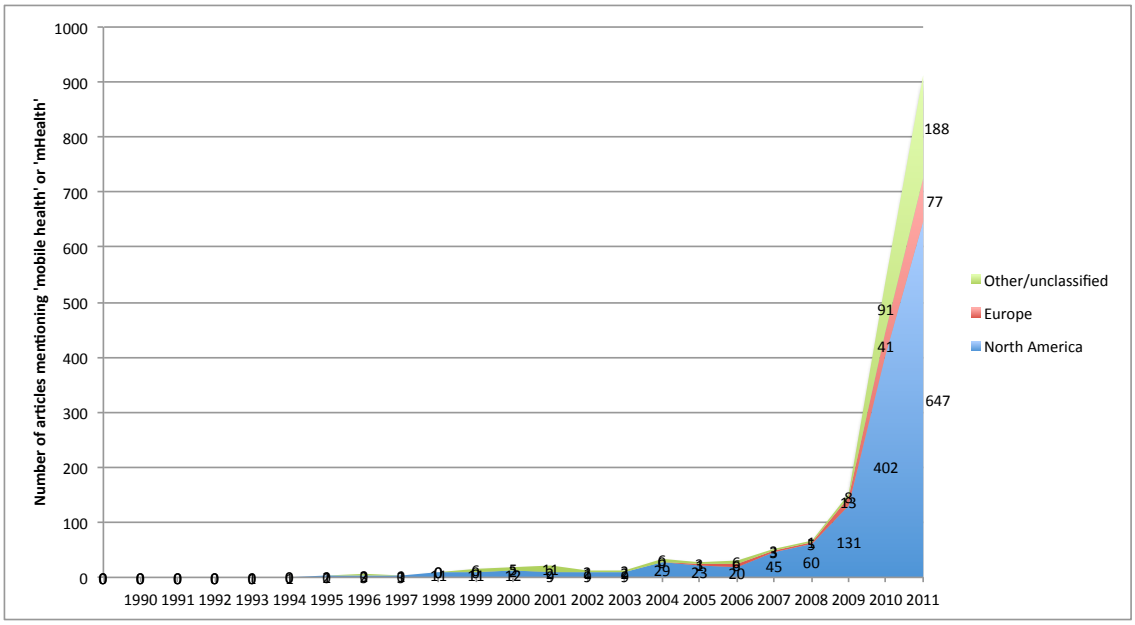
5.2 PUBLIC TALK ABOUT MOBILE HEALTH

Public talk of mobile health has been on the increase, but the evidence here suggests it is not yet nearing a well-defined, bounded concept. As my evidence I consider two types of 'public talk' in an effort to map out the use of the term 'mobile health' at a more general level: One type is the general news, directed at the general population. Another type is the public talk at conferences, workshops and seminars, several of which I attended during my data collection. In these events entrepreneurs, government officials, academics, software developers, consultants and technology journalists gathered to publicly voice views of the development of information technologies and health care.

5.2.1 Public talk about mobile health in news media

For the first type of public talk observations, I studied the Nexis UK database of news sources for the appearance of terms of communication technology in health care. In my analysis, I take the number of articles written about a topic in news media to be a proxy for, and to have a direct correlation with, the level of public interest and awareness regarding this topic.

Graph 5.1: Term ‘mobile health’ or ‘mHealth’ in news data



Source: Nexis UK news database, 1990-2011

Graph 5.1 shows how the use of the terms ‘mobile health’ and ‘mHealth’ has soared during the second half of the 2000’s. Although not appearing in the graph, first articles on mobile health appeared in England and Finland in the year 2000, but as with rest of Europe, writing on mobile health was at a very low level. In the years 2010 and 2011 with a significant increase (41 and 77 items respectively) articles that appeared in the United Kingdom constituted approximately one quarter of the European articles on mobile health.

Overall, my analysis of the database results shows that there has been a dramatic increase in the public interest and awareness towards the use of these technologies in health care. Graph 5.1 on mobile health, and the two accompanying graphs in the appendix on ‘digital health’ and ‘electronic health’ show clearly this surge in interest. Mobile health has surged relatively recently, whereas ‘digital health’ and

'electronic health' became topics in news media earlier. The scales in the graphs reveal that 'digital health' has remained a very marginal term. In contrast, 'electronic health' or 'eHealth' has been the most commonly applied term, with over 150 articles on this topic in 1996 and over 9000 in 2011. All three graphs show clearly the predominance of North American news media in this respect. The data has a language bias towards English, and therefore potentially many articles regarding the subject from Europe or elsewhere (the 'other/unclassified' category) in languages other than English are not included. The graph nevertheless shows a general, public talk level of interest and the timing when this interest towards mobile health has risen.

Thus, the idea of employing communication technologies in health care has been discussed already for many years, especially under the label 'electronic health'. This increasing general interest serves as a backdrop for the many ideas that the actors of this study have for what mobile health signifies, as well as for the efforts and complications to materialise those ideas. However, the general interest appears to have had little sustaining impact, as the struggles of institutional entrepreneurs still at the time of data collection in 2011 imply.

Closer study of the content of these articles shows no clear indication of what the concept of mobile health is. The dichotomous impression from these articles is that mobile health has been discussed both in some more familiar terms to the current organisation of health care services, as well as with other less familiar terms, that are mostly related to business and communication technologies. Below figure 5.1

shows the most frequently used words in these articles, with larger size of the term indicating higher frequency.

FIGURE 5.1: WORD CLOUD OF MOST FREQUENT WORDS IN 1917 ARTICLES ON MOBILE HEALTH



Source: Nexis UK news database, 1990-2011

Below, in table 5.1, based on the sentence associations of these words[9], I have drawn out four categories into which I have placed these words, with further explanation in brackets.

Table 5.1: Keywords in news articles 1990-2011 on 'mobile health' and 'mHealth'

Health care	Business, market	Technology	Patient view
- Access (gaining access to healthcare) - Children (relat-	- Company (telecommunications) - Market (growing market)	- Support (technical) - Solutions (mobile technology	- Patients (diabetes patients) - People (vulnerable people)

[9] NVivo's 'Text search' analysis allows for the creation of a word tree for key terms, which highlights all associated words in the sentences of the key terms.

ed to developing countries) - Clinic (health clinics) - Services (essential services for care) - Support (for rural services) - System (welfare system) - Monitoring (of disease) - Including (health)	- Sector (private vs. public sector) - Services (telecommunications) - State (market regulation)	solutions) - Technology (information technology)	

Source: Nexis UK database search 1990-2011, with keywords 'mobile health' and 'mHealth'. Terms placed in the categories based on words that surround them, drawn from NVivo word tree.

This table indicates that these 1917 articles have discussed mobile health in rather conventional terms: Under the category of care, the largest of categories in this group, authors have considered whether mobile health could provide solutions for some of the issues in access to care, whether they may help ensure the provision of essential services, and what support they may offer for more remote, such as rural, services. Another traditional category for health care related articles is patients. Diabetes patients have been an often-used example for potential target group of mobile health services, along with speculation of how well these applications may serve the most vulnerable people.

On the other hand, the two other categories of most common words in this corpus of text are less common in health care context. Under the category of business and market, these authors have discussed market growth, the roles of private and public sector as well as state regulation. Technology is an integral part of health care services, but still perhaps less commonly in focus than other aspects of care. Under

the technology -category the concerns in these articles have been about technical support and what kind of solutions these mobile applications actually are.

Unsurprisingly, health care is the most prominent category for the language in mobile health articles, but business and technology terminology also make a relatively strong appearance. In table 5.1 most of the top 18 terms appear in the health care category. However, I draw attention to the ordering of the words in the word cloud, and point out that the prominence of business and technology suggests the emergence of new elements in health care. In the middle, and in largest font, are the words “services”, “company”, “technology”, “people”, “patients”, “access”. The first three of these six words are either in the business or in the technology category, suggesting that these categories are in the ascendance in the emergence of mobile health. I thus argue that the centrality of these words, resulting from their highest relative frequency in the dataset, indicates that mobile health introduces potentially a new focus in health care, namely that of business and technology. Thus, based on this evidence the public talk about mobile health consists of elements old and new to health care. Also this evidence suggests that, as no clear impression emerges of what mobile health is, this concept is still unsettled and in a period of transition.

5.2.2 Public talk about mobile health in conferences and workshops

Observation at several mobile health related events produced an interesting array of topical concerns among entrepreneurs, developers, public sector officials, aca-

demics, and other interested. Some of these events were specifically about mobile technology in health care, while others had a broader focus of either telehealth, information technology in health care or technology innovations for health care. Mobile health featured in all of them, either in presentations, in workshop activities, or in comments from the floor. Aside from the discussions on mobile health specifically, all of these events covered general issues of what are the areas of health care that are in need of reform, how to take advantage of novel technologies in care, and what strategies may achieve these changes.

One of the concerns expressed in these events in relation to mobile technologies and their integration to care information systems is that of standards development. In many comments it was noted how the technical standards are not uniformly adhered to, thereby hindering efforts to achieve interoperability. As a normal part of industry development there are continuous efforts to create technology standards that will, in principle, allow for interoperability across manufacturers and devices. Commentators in these events lamented the 'wild west' of mobile technology development, and some suggested that attention ought to be directed to other efforts for taking the field forward. One consultant commentator articulated the need to pursue interoperability nevertheless, but through smaller scale:

"I don't think standards, particularly the way we have approached them in Europe, are going to deliver the perfect solution, because available standards aren't good enough and they are not widely enough adopted. … But the key issue now is not just adoption of standards, it is interoperability. This implies getting together, groups of people working together and making the trade-offs and compromises needed to achieve a satisfactory result." (Consultant in a seminar *Telehealth, Telecare and new technologies in UK healthcare*, London FEB 2010)

Another frequently expressed concern in several events was that of trials and pilots. On the one hand, many criticized the proliferation of pilot projects, which often fail to produce genuine changes. In some comments speakers called for increased commitment on the part of organisations taking on technology pilot projects, to ensure adequate resources and continuity for the period after the pilot. Another concern regarding health related pilots is their inability to provide most of the time adequate evidence of positive health or cost outcomes. These trials tend to be small in size, as large trials are costly and time consuming. Third concern that was widely expressed was the weak interaction between technology firms developing new solutions and health care organisations being the users of these technologies. Some of the health care organisation speakers noted that new solutions have often been developed without involving clinicians in the process, wherefore the solutions may fit poorly the actual care processes. Several participants pointed out in related comments that many technologies exist that could be made useful in care processes, and that they could be considered as proven technologies, as they have been extensively used in other contexts.

An overriding theme in these seminar and workshop comments was a turn away from large scale towards smaller, integrated efforts. Whether in relation to implementation projects, or to efforts for diffusing technology standards throughout the industry or field, commentators urged technology and health care organisations to avoid large scale projects and implementations. This may partly be a reaction to UK's large scale National Programme for IT project, mentioned above in chapter four, the failures of which have been attributed to excessive scale (Keen, 2011). As

one speaker from these events suggested in the quote above, many speakers encouraged a more modular, local approach to development projects, where technology providers and users come together to work out solutions for practical needs. Many also stressed the need to keep the patient perspective in mind in these local solutions. Interoperability, or integration, were key terms in these comments and in this thinking. It was proposed that integration is better achievable through localised efforts, that are more likely to respond to local needs and that are better manageable.

5.3 MOBILE HEALTH IDEAS IN ENGLAND

Just as the previous section indicates that among journalists there has been no uniform concept of mobile health, organisations engaged in mobile health activities seem to have equally varied understandings of this concept. Among the English organisations participating in this research, there has been a range of views of what mobile health is, what its uses are, and who is the primary user of its devices. The breadth of terms with which these organisations describe mobile health indicates that in England there is no distinct, well-bounded definition for this concept – the category of mobile health is yet to be formed. In the following I report their views of mobile health in more detail.

5.3.1 Mobile health as a device

There has been significant overlap as well as diversity between the views on what mobile health means in terms of devices between the English incumbent, challenger and health care organisations. Among all three sets of organisations, the mobile phone has been the typical mobile health device, but there have been also other perspectives. These other perspectives have emphasised a more 'systemic view', in which there are a variety of devices which connect either between themselves or by a back-end server. I describe these perspectives in the following in more detail.

Mobile phone as a mobile health device

For the incumbent organisations, mobile health has appeared as largely a mobile phone[10] focused affair. One industry association (EN IA1) representative listed various reasons for the plausibility of the mobile phone: mobile phone can bring down the cost of delivering a service by being pervasive. It thus can facilitate addressing the health conditions of a larger population, either of earlier stages of disease progression or of unhealthy lifestyles. On such larger scale, the economic case for delivering services requires lower cost methods, which the mobile phone can deliver. One example, provided by a consultancy (EN CO2) respondent, of this is the GPS tracking technology of contemporary mobile phones, which allows for the remote monitoring of patients. This provides the advantage of not only being able to track the movements of elderly patients, but also that the patient would know that the carer can be immediately available at the push of a button. Other applications, for example on the iPhone, allow the measurement of walking pace and heart rate, which can then be stored or sent to a personal trainer or a carer for analysis and training advice. But also less sophisticated phones have basic functionality, such as sms (short message service), i.e. text messaging, which can serve well in certain situations. A consultancy (EN CO2) respondent highlighted with a case from Africa how mobile phone enables the critical communication facility by sms to notify a central warehouse before supplies of medicine run out in a more remote location.

[10] Mobile phones are often divided into two groups: The first, the 'smartphones', are usually distinguished by their touch sensitive screen and by their ability to use sophisticated applications. The second type are the more basic phones, which allow for calling and text messaging but have no touch screen nor use of more sophisticated applications. Both of these categories are included in the responses representing this view.

Mobile phones are used widely also among care professionals in England. A professional association of doctors (EN PA1) conducted a small survey among its members to investigate the extent to which doctors are in contact with patients by mobile phone. They found that "*a significant number*" of their members in fact do communicate with their patients by mobile phone. In most cases doctors would phone their patients, but in some cases also they would use text messaging. For this professional association the focus with mobile phones is largely on smart phones, which allow also taking high quality pictures or video of various conditions, such as skin rashes or limb movement.

The challenger organisations also emphasised the mobile phone as a core device in mobile health. For some of these organisations, in the words of a software developer (EN SP6), mobile phones are an "*intimate tool*" that facilitates a "*new form of intervention*". Some of the challenger organisations explained their emphasis of the mobile phone by the broad coverage of the mobile networks and high level of mobile phone subscribers, which make it a likely device for communication delivery between patients and health care professionals.

The health care organisations were most clearly in favour of the idea that the mobile health device is the mobile phone, save for one respondent for whom it meant a broader set of devices. In their view, the mobile phone has many advantages in health related use. One of these advantages is that due to its relatively low cost and popularity, it has become a universal device, which thereby offers "*equity of access*" to health services. One respondent from a national health (EN NH1-2) related service explained:

''And so one of the sort of rhetoric around the digital divide in health care which often comes out when people talk about digital health care, people are worried about who misses out. And this is because NHS particularly in England is obsessed with equality, and one access for all, and that is a good obsession to have,… But the problem with that is that it does tend to stifle innovation a little bit because innovations are not equitable often. They start with the people who are most educated, because they are the early adopters. So I think moving to mobile helps, because you can say, 'actually, everyone has got a mobile, or most people have a mobile'.'' (EN NH1-2)

This is coupled with "easy access" in the sense of flexible use. Pointed out by a representative of a national health information service (EN NH1-1), in principle mobile phones can be used at any time and any place. Certain functions may require network connection, such as seeking for health information online, or receiving appointment reminder messages. But even if one were to be temporarily beyond network coverage, once one returns to within the network's range, this data is usually automatically forwarded to the phone. Other functions are available even without network access, such as capture of data on movement or on other vital signs.

Another respondent, of a psychiatric care organisation (EN LH1), makes a comparison with using simple text messages and using email on computers for sending health related messages. In their view, even if email is more sophisticated with the ability to include website links in messages, the fact that individuals tend to keep mobile phones with them at all times makes these devices advantageous. When a care organisation sends a message, the respondent will receive it instantly. But also, unlike in a phone call, if one is unable to respond immediately, the information will remain with them in their message box and they are able to reply when they want. In their service this psychiatric care organisation (EN LH1) sends mes-

sages periodically to their patients, and if they do not respond immediately, they will be sent a reminder a day or two later. Moreover, this respondent added that although someone might consider communicating by text messages "*clunky*", when there is also functionality for more automated communication, the act of putting data in and composing a response message on a mobile phone will in fact activate the patient's brain and enact in them a higher sense of responsibility and participation in the care process.

Yet another national care information organisation (EN NH1-2) respondent emphasised the advantages of the more sophisticated mobile phones, i.e. smartphones. Because of their high technical capacity to measure easily an individual's physical activity behaviour and to collect that data, they can offer more functionality compared with many other devices, such as desktop and even laptop computers.

In addition to ubiquity of access, mobile phone also has an advantage that it can appear to offer more privacy of use than other devices. A respondent from a help service directed at young people (EN SH1), where text messaging is the primary method of communication, emphasised the sense of privacy this mode of contact offers. They note that the young people that they have as their clients are reluctant to use a regular telephone due to the sensitivity of the issues for which they seek advice. In contrast, mobile phone offers a simple, quick and easy access for all young people, but in particular it protects their privacy:

''Everyone has potentially access to mobile phone, so we can access lots and lots of people by text. And no-one has to know that conversation, it can not be overheard,

and information can be deleted. So it overcomes quite a lot of barriers for young people. In particular, it was a way of getting young men to the service...'' (EN SH1)

Mobile health as a set of mobile phones, laptop and tablet computers

There are also other, less prominent views that have suggested that mobile health devices consist of mobile phones, laptop and tablet computers - "*something you can carry easily*", in the words of one software provider organisation (EN SP1). This interpretation of mobile health came exclusively from the incumbent organisations. This perspective, exemplified by observations of an industry association (EN IA1) representative, emphasizes the use of devices by care professionals, whether at the point of care in patient's home or at the hospital. A consultancy (EN CO2) respondent added that a core feature that supports this perspective is the interconnectedness of these devices, which adds flexibility to the care professional's work.

Mobile health as a system of connected devices

There is some support for a third view, that mobile health is more about a whole system of devices for measurement and communication. This view was articulated by organisations of all three - incumbent, challenger and health care - types. In one example, provided by an incumbent software provider organisation (EN SP2), it is about connecting an ambulance and a hospital to transmit in advance critical data, such as blood oxygen level, heart rate, blood pressure as well as other vital signs. According to this large telecom respondent, the software solution and sim -card connectivity that this organisation provides make this a mobile health solution as

well. Furthermore, a more holistic system view of mobile health includes also the patient and care professional interactions, as in the words of one industry association representative:

"It's just a new industry, waking up to the same problems that the fixed connectivity aspects of health have already understood. That actually is not so much about the mobile handset and getting a blood pressure meter talking to it, it's much more about the back-end integration, the workflows, and dealing with this complex interaction between citizens and doctors which is not a one-to-one, it's a many-to-many relationship." (EN IA1)

Most of the challenger organisations also hold this broader conception of mobile health, where any device that has access to network, whether a communication device or medical technology device, can be part of a mobile health solution. They would be included as long as they have the ability to send patient data. They could thus be devices that are more traditionally considered as remote care medical technology, which are bespoke designed for certain remote care purposes. An example of these types of devices is a monitor to measure vital signs. One typical device mentioned by several respondents is the HealthHub by the Docobo Corporation, which allows the measurement of blood pressure and the input and tracking of body weight, alcohol intake and medication use, and which is connected through a server to the Internet (Docobo Ltd, 2013). One technology provider (EN TP1) respondent explained that including these devices in this definition is linked to the relatively long tradition in England of remote care solutions, commonly referred to with terms 'telecare', 'telehealth' and 'telemedicine'. This connectedness to communication networks is a core aspect, which allows then for a more inclusive conception of the term 'mobile health'. One pivotal element of this thinking is modu-

larity, where the interoperability of the modules, i.e. of the devices, is a critical feature. They perform related tasks independently, but are connected by network technology.

Among the health care organisations, one respondent from a national health advice service (EN NH2) saw mobile and other connected devices as parallel in their adopted "multichannel strategy" which includes a website, a mobile web service and an application for smartphones. Being a national service, their priority has been to be available to all citizens, wherefore they consider it important to use different channels, even if all channels have same content.

5.3.2 Mobile health as function

Mobile health as disease management

The ideas about what function mobile health devices fulfil is more varied than the ideas about the devices. The view that mobile health devices enable disease management was the only idea that was shared across all the three organisation types. One industry association (EN IA1) organisation respondent suggested that mobile technology can serve as a tool to control long-term conditions, and because it can be personalised, it may be more cost effective than other forms of care management.

"So no longer is the health care system just about sickness, it's increasingly about promoting and engaging the management of long-term conditions and maintenance

of healthy life style, and support for people as they are getting old… What mobile does is by being pervasive it offers at least one order of magnitude lower cost to deliver a service and in some simple cases maybe several orders of magnitude. So actually that changes the economic case for actually delivering services and that economic case is really important." (EN IA1)

A comment by a challenger software provider organisation (EN SP7) respondent specifies this image of disease management tool with a link to care pathway. Management of health conditions by mobile devices would involve regular observation of the patient's state of health, and alerting care staff in case of an abnormal reading. Mobile devices enable this monitoring to be conducted either by care professionals or by patients alone. A technology provider suggested that such use of mobile technology in fact does not require much new thinking:

''…, because the pathway already exists, and what we are doing with this system in that case, is we are just prompting the patient to do what they should do already, … changing the patient's behaviour to become more aware what they need to do, how often to do it, and what action to take if it is higher or lower.'' (EN SP7)

Another challenger organisation view in this category is the management of wellness, of which one technology provider (EN TP1) respondent highlighted that mobile health may be a form of health care for the "worried well" instead for the actually ill. This perspective expresses perhaps one of the more typical situations where the patient is mobile and needs access to health information, or where they rather choose to remain at home instead of travelling to a care facility for treatment.

Comments by health care organisation respondents indicate that disease management does not require sophisticated devices. Even the more simple types of mobile devices, that have no ability to track movement, have been used to monitor the progression of a patient's health condition. A health information service (EN NH1-2) respondent argued that instead of employing any advanced automated technology, health condition monitoring could be accomplished by using the phone's simple text messaging function. With a mere text message, a care professional can keep occasional contact with a patient or a customer that wants to improve their lifestyle habits or wants to maintain their health regime. Text messaging can be, and has been used also to keep frequent and continuous contact with patients of a chronic disease. Described by a respondent involved in psychiatric treatment (EN LH1), in a case of long-term illness, regular text messaging to request for daily or weekly symptom reports has allowed the capture of longitudinal data of disease progression. Despite its simplicity, text messaging has in fact been able to provide quite a profound effect in health improvement, as explained by one director of the service:

''… we have designed this kind of system of self management…. Which gives the patient a longer term ability to look after themselves and self-manage it. … In bipolar disorder the problem is that people don't have any longitudinal sense of self. When people suffer from profound mood swings, where they may last for weeks at a time, they never really kind of know who they are. So in a way looking at these [weekly mood reports] *allows people to remember how they were at particular times and they can build up a better sense of longitudinal trajectory through life. We have gone from text message to some kind of existential understanding of the self. Amazing.''* (EN LH1)

Mobile health as onsite care

Another view is to see mobile health enabling onsite care, with an impact on the role and tasks of primary and community care. An industry association (EN IA1) respondent noted that many of the tasks that used to be performed at hospitals, where the patient records have been, could be performed by community matrons, with access to information via mobile technology. Also mobile technology may facilitate orthopedic consultations. As explained by a respondent from a professional association (EN PA1), traditionally patients would visit the doctor to show the improvement in the movement of recovering limbs. A computer with a web camera enables video consultation, with the patient able to remain at home while interacting with the doctor. In fact, as emphasised by a software provider (EN SP2) respondent, by using the video functionality of a mobile phone the patient is able to be completely location independent, as long as there is eventually a possibility for sending the video over a mobile telecommunications network.

Possibilities for onsite care were important also among challenger organisations. One software provider (EN SP3) emphasised that mobile technology enables the transmission of much greater variety of data than the traditional telephone in remote care, either between health care practitioners or between the care practitioner and the patient. Furthermore, to enable such remote treatment, this technology may also engage new organisations in the process:

"If you are an insurance company for example, we have a role [for you] *whereby you can not look at the patient's record, but you can grant people access* [to the patient record] *on behalf of the patient."* (EN SP3)

Mobile health as measurement of vital signs and capture of data

Another service that one of the incumbent organisations sees mobile health devices providing is the possibility to gather data on various vital signs. As one consulting (EN CO2) respondent noted, for example higher end mobile phones are able to measure heart rate while walking, which can then easily be shared with a care professional or a personal trainer. Or, the modern smart phones may detect changes in their environment, such as to how many phones the phone has been near during a day, as pointed out by a health service provider (EN NH1-1) respondent.

Mobile health as resource planning and logistics

One view is to see mobile health as an enterprise resource planning (ERP) function. It is not surprising that it was several incumbents, some of which are large organisations, who noted this aspect. Efficiency in organisational processes tends to be a key concern for them, whereas for example the challengers, often small organisations, tend to be less apprehensive about operational process issues. In this perspective, mentioned by industry association, consultancy and software provider (EN IA1; EN CO2; EN SP2), it is mostly the mobile phone that is used over the hospital wireless network to enable logistical support, although in the arguments of other organisations (EN IA1; EN SP1) the device for this function shifted from mobile phone to tablet computer. In other words, whether it is information about available stock in the warehouse or providing access to personnel, mobile technology can serve as a logistical tool, to facilitate the flow of information.

Mobile health as care in emergency situations

Incumbent organisations also remarked that mobile technology may be used in emergency situations. A consultancy (EN CO2) respondent suggested that an Alzheimer's disease patient may be tracked more easily if they carry a GPS equipped mobile device, and they can also themselves contact a carer easier in an emergency. A telecommunication operator (EN SP2) respondent described how mobile technology is in use to facilitate regular emergency situation processes, by enabling the delivery of vital patient information in advance from an ambulance to hospital.

Mobile health as decision support

Yet another perspective of functionality was provided by one incumbent organisation, a consultancy (EN CO2), for whom mobile health's core use is to enable decision support. A more systemic view of mobile health, this idea includes a back-end data management system and a mobile device. The device may collect data of the patient's vital signs or movement, and deliver the data to the back-end system, which then produces analysis from the data. The analysis is then made accessible on the devices that care professionals use.

Mobile health as delivery of health information and reminders

Finally, there were organisations from both incumbent and health care organisation groups that suggested mobile health to be suitable for the delivery of health information and to help remind patients of appointments and medication. A respondent from a professional association (EN PA1) mentioned one typical example of how mobile devices are used to pass on information about laboratory results. A

health information service provider (EN SH1) described how they have used text messaging in two ways: In their helpline type of service, one form of use is a simple and easy automated request-reply function for providing health related information, such as the location of the nearest health clinic. Another form is a type of chatting by text messaging, where the client sends text messages from their phone and a helpline agent at the other end responds by using a desktop computer.

Two further health information functions are offered with the use of mobile health devices by these health care organisations. A health information service (EN NH2) respondent describes that in one an application may be downloaded with a mobile device from the organisation's website that then provides information even when the user is offline. Online use of the application provides access to further services. Another function is to provide a website on the Internet customised for mobile devices which is an online service available for anyone. In both of these functionalities, mobile devices may be used for health information retrieval on the move, more flexibly than using other devices such as a desktop computer.

5.3.3 Users of devices in mobile health

The third area of mobile health ideas is the question of who is the user of devices in mobile health. There were three alternatives that were suggested: the patients, the care professionals and automated use, where the function was said not to require human intervention.

Patients as the users of mobile health devices

Most common position, with strong support in interviews across all three types of organisations, was patient use of mobile health devices. One incumbent view, expressed by an industry association representative (EN IA1), is that patients ought to be using devices to manage their own health. In their view, this is the true promise of mobile health, i.e. in turning the current emphasis on clinical systems into consumer systems, where patients are more in the focus of care. According to a professional association (EN PA1) respondent, patients already do contact doctors and other care professionals to some extent for results, or to notify their doctor when their condition has changed. As described by a industry association (EN IA1) representative, one of the functionality scenarios is that patients use mobile technology to manage their long-term conditions and to maintain a healthy life-style. One feature that has been cited to have much promise for self-management is location based services. GPS technology in mobile phones, and in laptop and tablet computers, allows the patient to receive instant information about their own movements, and thereby gather data and monitor their improvement in exercise. According to a consultancy (EN CO2), this is one of the more likely features to shift the use of devices towards the patient's end.

Also the challenger organisations saw patient as the natural user of mobile health devices. Alike some of the incumbents, they saw that mobile devices can give patients the opportunity to monitor their own health and react to abnormal changes - already referred to above in terms of management of health conditions. At a more fundamental level, by using mobile devices to care for their own health patients may become more

empowered and engaged. According to a software provider (EN SP5) and innovation promotion (EN IP3) respondents, patient use of mobile health devices can have a "*massive role in including people…. and supporting people's actions*" (EN SP5), and that "*… it is about the opportunity for mobile technology to empower patients. And prevention and screening, making people more aware*" (EN IP3).

In all of the health care organisations, which have adopted these technologies, respondents saw the patient as the user of the mobile health device. Three health information services (EN NH2; EN NH1-1; EN SH1) described how the patient may use mobile devices to seek health information, that they may contact a care professional or download an application for monitoring their own health condition or to improve their lifestyle habits. For a psychiatric care organisation (EN LH1), it is the patient that uses a mobile device to send regular reports on the progress of their condition to the care organisation. According to these respondents, at the other end of this communication there either is an automated service, i.e. a server, providing responses to the health queries, or in some cases a helpline agent. These care service organisations did not propose professional nor automated use of mobile health devices.

Care professionals as the users of mobile health devices

There were incumbent and challenger organisations that consider care professionals as the natural users of mobile health devices, but perhaps somewhat unexpectedly none of the health care service provider organisations suggested professional use of these devices. None of the organisations in the user group offer community

care services nor are they large-scale care facilities like hospitals, which may explain this finding.

Incumbent organisations found professionals equally likely users of mobile health devices as patients. These respondents were particularly loquacious in describing two types of professional use. First is the use outside of the traditional care facilities. Industry association (EN IA1) respondent explained that with mobile devices, during their rounds at patients' homes, community matrons have access to patient records and they can input new patient data. Previously matrons would need to retype their hand-written notes into the patient database upon their return to office at the end of the day. Another formulation, by a consultancy (EN CO2) respondent, is that while of significant time saving benefit to professionals when used in this way, it may also be seen as delivering health care at the most convenient place for the patient. An additional perspective to this point, by a software provider (EN SP4), is that such work outside of a care facility may not always be able to presume a network connection, as there may be shadow areas. Yet, the ability to transfer data subsequently by synchronisation with the hospital IT-system can ensure that no work effort is lost as data transfer is merely delayed, while still offering the impression of on-site care.

Secondly, incumbents also noted that other professional use of mobile health devices takes place in the traditional care facility environment, such as a hospital or a health centre. Professionals, while at their office, may be in contact with patients by calling or text messaging regarding results of patient investigations. A professional association (EN PA1) respondent explained that aside from merely inform-

ing patients of their results, they can also provide patient consulting over the phone, and with a live video image. A software provider (EN SP4) respondent described how a wireless Internet network coverage throughout a hospital facility provides an improved reachability of care professionals even if they are not outside, but only at a different section of the hospital. For a speedy comment on a condition, they may be sent a message with an image of the condition that requires an opinion.

Also some of the challenger organisations considered the professionals significant users of mobile health devices. In their comments respondents emphasised efficiency and time management benefits of mobile health for professionals. Using mobile health devices opens up possibilities for "*gathering data, processing data and feeding it back…*" (EN EO1), and to "*help staff save time, it can avoid mistakes, it can help diagnosis…*" (EN IP3), and "*the ability to monitor and manage patients, and treat patients in a remote, mobile setting, ….*" (EN IP1). As is evident from these quotes, the respondents saw quite a variety of advantages in the use of mobile technology devices for professionals engaged in care duties. Even a software provider organisation (EN SP5), whose own work focuses on the patient, acknowledged that "*mobilising professionals*" is a "*big mHealth area*" (EN SP5).

Automated use of mobile health devices

Lastly, there was an incumbent consultancy (EN CO2) according to whom it is sensible to think of mobile health also as automated use of devices. For this respondent, mobile health may include back-end systems performing data analysis. They

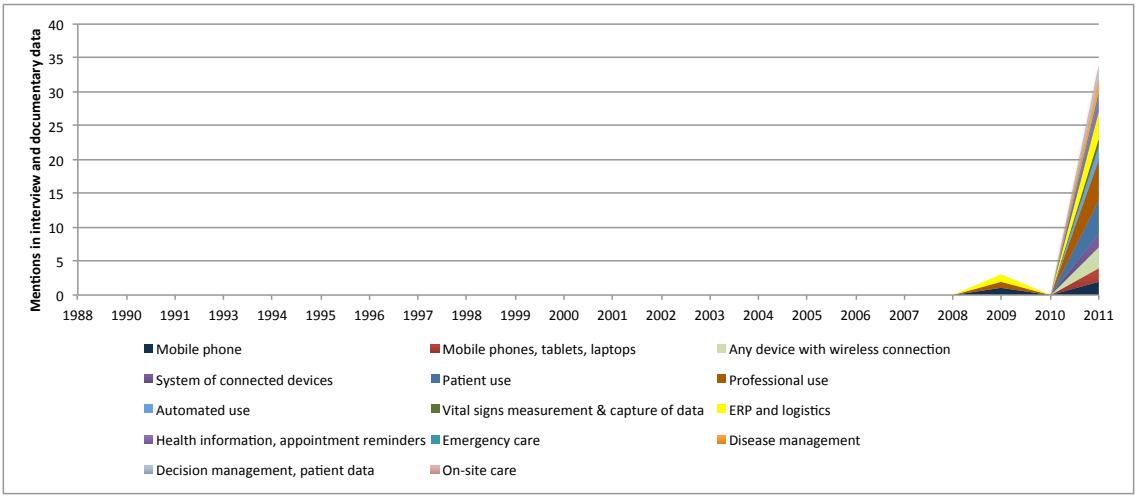
are given the task of 'number crunching' with the patient data that has been input, in order to calculate values for decision support for care professionals. This is seen to facilitate a quicker and more timely decision making - even if it may not replace care professionals.

5.3.4 Timeline of mobile health ideas

Overall, the ideas by the incumbent organisations in England about what mobile health is have developed relatively late. Graph 5.2 shows a timeline of the various ideas. The graph is only indicative, as not all data was available to be time-stamped. In 2009 mobile health was seen as an enterprise resource planning and logistics process, in which mobile phones are used to manage more efficiently the work of care professionals such as community matrons. In 2011 many more functions, devices and users were added, broadening the definition of mobile health, while at the same time making it less clear what mobile health is and is not.

I will argue that the emergence of new forms of organising proceeds in episodes at early moments. Graph 5.2 gives only a small hint to substantiate this argument, whereas other timeline graphs in these chapters will offer more robust support. Nevertheless, already in this graph it is possible to see that rather than a linear evolution of contesting solutions – as some of the theoretical literature has suggested as the nature of emergence processes - there has been wave-like change in perspectives.

GRAPH 5.2: MOBILE HEALTH IDEAS BY THE ENGLISH RESPONDENT ORGANISATIONS



Source: Interviews and organisational documents

5.4 MOBILE HEALTH IDEAS IN FINLAND

The Finnish organisations of this research also described mobile health in a wide range of terms. Also their comments suggest that there is no clear definition of mobile health, but that so far it has signified a broad variety of things. In other words, no category of mobile health has emerged as of yet in Finland either.

5.4.1 Mobile health as a device

There have been four distinct perspectives of what mobile health devices are. The most prominent view in this group has been to consider mobile health as the use of only mobile phones. For some others this term has signified a distinct set of devices (mobile phones, tablet and laptop computers) or large data systems that include a whole range of technologies from back-office data management technology to a variety of end-user terminals. Still a fourth group has taken this term to signify any network connected device to enable transmission of health related data and communication.

Mobile phone as a mobile health device

Mobile phone was considered the most typical mobile health device among the English organisations, and the same was the case for the Finnish organisations. While other devices were also considered, organisations from all three groups

thought that mobile health was quintessentially about using a mobile phone. Among the incumbent organisations one industry association (FI IA1) respondent noted that the ubiquity of the mobile phone may provide a high degree of access to health services, even from remote areas, and particularly in developing countries. Another regulatory agency organisation (FI DO1) representative saw extensive possibilities for mobile phones despite the first applications of mobile phones in diabetes care having failed to become widely commercialised. A device manufacturer (FI DM2-2) and service provider (FI SS1) emphasised that the mobile phone is the pivotal device at the centre of an ecosystem of sensor devices and associated services by specialists.

The challenger organisations provided largely similar reasoning for their suggestions that mobile phone is the core mobile health device. For an innovation promotion organisation (FI IP1) the fact that mobile phones are so ubiquitous makes it the obvious choice as the tool by which health solutions should be distributed. For an innovation fund organisation (FI IF2) it has the necessary technology for multiple functions, while providing ultimate mobility. Aside from the ability to deliver information between devices, another example of such technology is an accelerometer, which enables the measurement of movement. In addition to being ubiquitous, more importantly they tend to be carried always by both patients and care professionals, which extends the potential market for a software developer (FI SP1).

Also for the health care organisations in Finland, the mobile phone was the most obvious choice of mobile health device. One health care provider (FI LH2) re-

spondent argued that since the mobile phone is ubiquitous, it provides the most logical platform for delivering and sending messages regarding appointments. Patients send messages from their mobile phones, whereas the nurses at the health care organisation respond with the hospital's IT-system application - in other words, only the patients use a mobile phone. Another hospital organisation (FI LH4) in fact had not implemented any mobile health systems yet, but at the time of the interview there were plans to introduce an appointment reminder service within a year, with a mobile phone as the device of use.

Mobile health as a set of mobile phones, laptop and tablet computers

Other views suggest that the mobile health device need not be a mobile phone, but that there are other mobile technology options to be included in this concept. In fact, according to a technology system provider (FI SP3) respondent, the focus would be misplaced if it were solely on the mobile phone. Some other organisations, of the challenger and health care organisation types, view mobile health as a slightly broader set of devices, complementing the mobile phone with a tablet and a laptop computer, for which set one innovation fund (FI IF1) respondent, from the incumbent group, prefers to use the term 'end-user devices'. One rationale for this view, expressed by a challenger software developer (FI SP4), is that these devices are relatively interchangeable, and similar software may be used to run either applications or use them to access websites. The approach that this set of organisations has towards mobile health devices emphasises the idea of mobility, i.e. the ability to access health data on the move. In comparison to mobile phones, tablet and laptop computers provide almost equal freedom from fixed location. Some in

this group refer to the convergence of these types of devices, which has become a topic of some attention among technology enthusiasts (Economist, 2010; Leber, 2013).

This perspective also has basis in actual service practices. When asked about the use of mobile health devices, one health service provider (FI LH1) explained that laptop computers are used by community matrons in home care visits, as well as by most on-call back up doctors (doctors that serve in a back up function from home for the on-call doctors in the hospital), and also in ambulances. In addition, the organisation uses also smartphone mobile phones. On-call back up cardiologists, that need to be quickly reached for second opinion, carry smartphones where it is possible to display ECG images. There are also hospital doctors that carry mobile phones, for easy reachability within the hospital.

Mobile health as a system of connected devices

Some challenger organisations suggested mobile health to be a whole system of devices, including the back-end IT system, which would draw attention away from any one device, and particularly from the most obvious, the mobile phone. As a software provider (FI SP2) described it, the argument is that while mobile phone may be the end-user terminal, and in some cases the most viable option for an end-user device, it is the whole system that performs the function that may be then labelled as 'mobile health'. In their words:

"The fact that mobile phone happens to be the way to use this solution is sort of beside the point. Without a mobile phone the solution would not work, but it is not rele-

vant that it uses a mobile phone, but what the solution does. The [mobile phone] *technology and device is sort of just in the background…. Hard to think of an analogy, but say, if you are digging a hole, it is the hole that is relevant, not the spade. It is one important tool there, but nobody will buy the solution because it is in the mobile phone."*(FI SP2)

In other words, according to an innovation promotion agency (FI IP2) respondent, mobile phone merely facilitates data transmission as part of a larger data system where data is forwarded from one device or system to another device or system, preferably automatically. A Manager from a research organisation (FI RO1-1) pointed out that the boundary between mobile and other web based technology has become less clear, as these use same technologies. Furthermore, some consider an automatic decision support to be an integral part of a mobile health system, with mobile phone or other such device as only an end-user terminal.

From among the user organisations, this interpretation of a system with a mobile phone at its apex is also supported by a city official who is in charge of care services (FI LH3). For this respondent, mobile health devices signify a software platform upon which electronic services are built, and in which the mobile phone has a central role as an end user device. This approach has been taken in a city, which is particularly identified with mobile technology manufacturing and software development. This is reflected in this city's strategic plans where mobile technology has an important role whenever new services are considered.

Mobile health as any connected device

Lastly, for a few challenger organisations mobile health denotes a variety of devices, which fulfil the criteria of measuring vital signs type of data, and being able to transmit information to other devices and systems. For one software provider (FI SP5), an example of such a device is a step counter for wellness, whereas for another software provider (FI SP2) such a device could be an RFID equipped wall board that enables the sending of messages by touching a picture on the board with a mobile phone.

5.4.2 Mobile health devices as a function

The functions that mobile health devices serve is the second aspect of mobile health ideas. Among the Finnish organisations, there have been five different perspectives to what mobile health devices do, with the most emphasis on the measurement of vital signs and capture of data.

Mobile health as measurement of vital signs and capture of data

One prominent application of mobile health devices is the measurement of vital signs and the capture of data. Some incumbent organisations, a regulatory authority (FI DO1) and a service solution provider (FI SS1), have emphasised the ability of these devices to automatically capture data such as steps and other movement. Likewise, some of the challenger organisations, such as an innovation fund (FI IF2), have similarly noted the capability of the accelerometer in these devices, i.e. technology to measure acceleration of movement, to collect basic data of the person's

movements. Respondents from two software providers (FI SP5; FI SP1) and an innovation fund (FI IF2) have described how in wellness and rehabilitation related solutions, the device, either mobile phone or another bespoke measuring device, would count steps or monitor walking or movement of limbs of Parkinson's or MS-disease patients. The data on these matters may be gathered by motion sensors, which would be included not only in bespoke devices but also in recent models of mobile phones. One of these software providers (FI SP2) described that in applications for health care, mobile health devices may gather data on such aspects as blood sugar level and blood pressure, which they may then transmit onwards to servers of care organisations. Two software providers (FI SP1; FI SP2) noted how the monitoring of blood sugar, for diabetics, was perhaps the most common application around 2010 in mobile health locally and even at the global level.

Mobile health as delivery of health information and reminders

Mobile health devices may serve also to deliver more general health messages, as well as serve to send reminders for appointments and medication, as one incumbent industry association (FI IA1) respondent argued. Challenger type of organisations placed more importance on the information delivery function, with different aspects highlighted. For example, according to one software provider (FI SP1) there are a number of reminders that may be sent to patients' mobile phones, such as those about appointment times, or when to take or buy more medication. Other software providers (FI SP4; FI SP2) added the delivery of health related information, such as laboratory results or more general health campaign information.

Also some health care organisations have noted how the more flexible and faster communication of health and appointment information has enhanced interaction between care professionals and patients. Appointment bookings for patients to see specialist doctors have seen a radical overhaul in one care organisation (FI LH2). A representative of this general care service organisation described that in the past, appointments, based on a referral, were sent to patients by regular mail. Regularly in one third of cases patients called to change the appointment time, causing additional work in the form of forcing to reopen the already closed slots. Now that patients are informed of the appointment times by text messages, they are given 24 hours to confirm the appointment time by a reply text message, at which point the time is closed with or without a response. Text message communication has made the process on the one hand more flexible, and on the other hand more stable. Also another regional care organisation (FI LH4) was planning to introduce mobile devices and text messages in the year following the interview to improve the appointment making process.

Mobile health as resource planning and logistics

A third view of function adds a logistical aspect to the discussion of mobile health functions, where the mobile devices act as part of an enterprise resource planning (ERP) system. Besides the use of mobile terminals for entering patient data, some initiatives have involved mobile devices in the management of workflow. For most of the incumbent organisations this logistical function was less important. Nevertheless, two of them, representatives from a care services solution company (FI SS1) and a device manufacturer (FI DM2-2), remarked that these devices may be

considered as end-user terminals for data entry and instant feedback. As such, they may be employed for the collection of data for the planning and directing the use of workforce resources.

Also one of the challenger organisations stressed the usefulness of this logistical function. A researcher from a research organisation (FI RO2) remarked that aside from providing critical access to information for a community matron, most recent mobile devices allow the automatic recording of location and time of movements of the care staff in the community, thereby providing a highly useful tool for work-flow management.

''Without this enterprise resource planning system this mobile management system does not have a very significant role - sure, it can be a portal to input data,... - but neither does this enterprise resource planning system work quite in real-time as a tool of resource planning and overall management if one does not have the mobile device integration there.'' (FI RO2)

Another example of how mobile devices may function as a logistics tool is the ability to use them as an access key. This researcher (FI RO2) added that latest mobile phones may include a software application by which care professionals are able to access patients' homes, and which also leaves a log mark to register the entry. The respondent considered this logistics solution as a significant improvement to recording the movement of care staff, and thereby in the management of the processes of care and work.

Also from the perspective of the health care organisations, mobile devices serve a logistical function, a means to a more flexible and faster communication between

care professionals. One Director of a regional health care provider (FI LH1) praised the new possibilities that these technologies offer. While in the past the back-up on-call doctor would need to remain in the close vicinity of their home telephone in case of emergencies, now second opinions can be obtained swiftly on e.g. radiology images that are sent to their mobile device, regardless of their location. Equally, doctors within hospitals were in the past first paged, and then called on their mobile phones. Now, with them using smartphones, it is also possible to send them patient information, and even high resolution images, or merely request them to open direct access to the patient record from their mobile phone, for a fast consultation. Another care organisation (FI LH3) noted that mobile devices have significantly streamlined the care process related to home visits. In the past information for any care that was given, medication that was required and appointments that needed to be booked were recorded on paper during home visits and then retyped at the end of the day into the care organisation's IT-system at the office. Now the community matron is able to handle all these matters during the visit with an online access to the IT-system by their smartphone, laptop or tablet computer.

Mobile health as disease management

One incumbent and one health care organisation also mentioned the use of mobile health devices for disease or wellness management. A mobile device manufacturer (FI DM2-1) respondent suggested that e.g. connecting a mobile phone wirelessly to a weight scale allows an easy, regular monitoring of one's weight. One local care organisation (FI LH3) has sought to expand the range of mobile device functions available for patients. Their electronic platform on the Internet has a modular in-

frastructure, which enables the introduction of new services that may be used by mobile devices. The services available include keeping a diary of wellness activities, of recording various vital signs, of reading laboratory results and making appointments.

Mobile health as on-site care

A fifth view has mobile health devices being used for accessing information, such as patient data, in order to allow for the delivery of care on-site. Among the incumbents, one service solution organisation (FI SS1) mentioned that they have changed their care pathways for home care to include the use of mobile phones by care professionals. The same imagery was offered by two challenger organisations, one of which (FI SP2) remarked the importance of mobile devices to the flexibility in the work of community matrons. With these devices they are able to access patient information and input new information during their visits to patients. Another software provider (FI SP1) suggested that the core idea of mobile health as a concept of "*health data on the move*" implies that data becomes unbound with place and time. For them an important part of this change is the ability to provide care where it is needed.

Functional limitation of mobile devices

On the other hand, one respondent for a hospital organisation (FI LH4) also noted that there are de facto functional limitations of some mobile devices, and particularly the mobile phone, for clinical work. Doctors and nurses, and particularly secondary care professionals, need to view large amounts of data on screen. This

makes excessive demands on the size and resolution of the screen for the device, thus rendering mobile phones and tablets de facto unusable.

5.4.3 Users of the mobile health devices

Across the three groups of organisations in the Finnish mobile health landscape, three alternatives of device users were proposed. The views for the use by patients and health care professionals were equally prominent, while completely automated use was clearly a less common idea.

Patients as the users of mobile health devices

Incumbent organisations emphasized patient use particularly in regards disease management functions. One industry association (FI IA1) respondent described the self-care process in diabetes solutions, where the patient obtains the blood sugar level data with a measurement device, transmits that to a mobile phone, and then sends the data onwards to a care organisation's server. A regulatory authority (FI DO1) mentioned having observed considerable general interest in the possibilities for new services that mobile phones may enable for patients, whether as a device to send a warning signal in emergencies or as an identification method to access services or own health records remotely. Equally, as representatives (FI DM2-1; FI DM2-2) of a mobile device manufacturer suggested, applications for fitness and wellness, as well as for disease management, are all aimed for patients or consumers that require feedback and reminders.

The views of the challenger organisations were spread quite evenly between the three user type options. Three software providers in this group (FI SP5; FI SP1; FI SP2) all commented on the patients' ability to use bespoke mobile phone applications to access data, to record and to send measurement results. They related this view to the broader concern about the increasing demand for care services relative to the number of care professionals available. As one of these software providers (FI SP2) argued, patients would need to adopt a more active role than before, and be able to independently perform some of the functions that have been the responsibility of care professionals until now.

Also some of the user organisations mentioned patients as the operators of mobile health devices. In one case, patients use mobile phones to respond to appointment offers made by staff at a local care organisation (FI LH2). In an example at another care organisation (FI LH3), patient-used services are at the moment provided on the Internet, but one municipality has plans to introduce mobile device access for these services. As these self-care services are intended to encourage citizens to take more responsibility for their health and wellbeing, adding mobile use possibility is seen as a logical step.

Care professionals as the users of mobile health devices

When the incumbent organisations discuss the professional use of mobile health devices, they often frame them as devices for organisational resource planning systems. In this parlance, an innovation funding agency (FI IF1) and a system provider (FI SP3) respondents pointed out that they place little emphasis on what the

actual device is, but rather tend to refer to an 'end-user' device, for which there is a variety of options. For a large back-end system provider (FI SP3), the focus of mobile health is on the resource planning system, connecting the core unit with the remote professional users like the community matrons. They may also be units like ambulances, as an innovation funding agency (FI IF1) observed, that use networked devices to connect to the back-office system. One extension of the resource planning functionality in professional use is how access for client home may be arranged with this technology. A provider of such systems (FI SP3) and an ethics advisory council (FI EC1) respondents described how a community matron's home visit customer may have a special locking system installed in their home front door. The carer has access into the home by identification software in the mobile phone - i.e. the mobile phone opens the door.

Also challenger organisations have viewed these devices to be used by care professionals. Some software providers (FI SP1; FI SP2) reported that care professionals have their own applications by which they are able to retrieve patient data on their mobile device while on the move. This applies to community matrons already discussed above, on their visits to patients at their home, as well as doctors and nurses either within hospitals or on-call duty.

The health care organisations being care service providers, the professional use of mobile health devices is naturally more prominent in their responses. Two local care provider organisations (FI LH1; FI LH3) explain that doctors use mobile devices to be reachable, as well as to give second opinions on patient analysis, and nurses use them on home care visits to record aspects of patient's condition and to

make appointments. On the other hand, within hospitals, the need usually to handle large amounts of data requires large displays and thus mobile devices are considered by one care organisation respondent (FI LH4) to be less useful for professionals.

Automated use of mobile health devices

Some interviewees, from the incumbent and challenger groups, also discussed automated use of mobile health devices, which would assume for no need to input data or to physically send messages. There have been efforts to realise such forms of mobile health. In one pilot project by an incumbent service solution provider (FI SS1), the aim has been to develop a care programme of automated use of mobile devices. In the first phase, nurses and community matrons were using a mobile phone application to feed in data about care in situations where they meet patients. This data has been converted to a software algorithm to enable mobile phone powered, automated self-care programs for patients in occupational health programmes. In the final phase this organisation has been marketing these services as automated care programmes, particularly in the occupational health care services sector.

There were also challenger organisations that argued for mobile health as automated use of devices. The argument in favour of automated use was made by providers of such software (FI SP4; FI SP2), which enables the automated delivery of health information and appointment or medication reminders to mobile phones, or confirmations of taken medication from mobile phones to a care organisation's server. A researcher from a research and development organisation (FI RO1-1),

with experience of several mobile health projects, described automated use as a solution for automatic decision support. The data has been acquired from the patient's device to the organisation's server, upon which a software application connected to the server receives an impulse to react, by sending an analysis and decision support response, either to the patient or to a care professional.

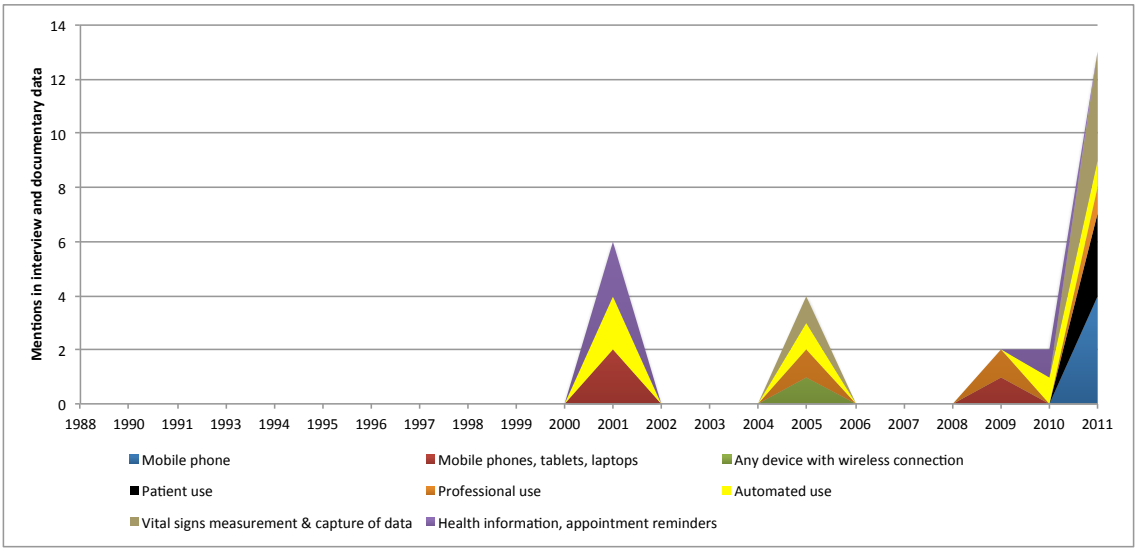
5.4.4 Timeline of mobile health ideas

According to the data, the Finnish organisations of this research have formed ideas about mobile health slightly earlier than their counterparts in England. Graph 5.3 indicates the ideas of the Finnish organisations – again, as they were available to be time-stamped. In 2001 mobile health meant the automated delivery of health information and appointment reminder messages to patients, who would receive them in their mobile phones and laptop computers. In 2005 there were other conceptions of mobile health, namely as the capture of vital signs data with any device that has a wireless connection. Respondents designated care professionals as the initiators of these practices, and the data would still be collected automatically. From 2011 onwards the conception of mobile health among these respondents broadened to include mobile phone use by patients.

Due to incomplete data only cautious conclusions may be drawn from this graph, but nevertheless one may see a pattern that is clearer than the one in the case of the English organisations (graph 5.2). This graph suggests that mobile health development has proceeded in periods, or *episodes*. The devices, functions and users

seem to have changed over time, some re-appearing at a later point. This pattern offers a hint that early moment emergence process has an *episodic* nature. By this I suggest that emergence, in this case, does not proceed as linear evolution, but instead changes character over time. I will return to this argument in other timeline graphs of the other chapters and in the discussion of chapter nine.

GRAPH 5.3: MOBILE HEALTH IDEAS BY THE FINNISH RESPONDENT ORGANISATIONS



Sources: Interviews and organisational documents

5.5 SUMMARY OF CHAPTER FINDINGS

It would be tempting to give a precise definition of mobile health, but as the evidence in this chapter has shown, it is too early for that. Tables 5.2, 5.3 and 5.4 below summarise the variety of views on what mobile health is, whether in terms of devices, functions and users.

In terms of devices, across the two country cases, there is no uniform view of what mobile health is, as the number of four alternatives of devices or configurations of devices implies. In both countries mobile phones received most mentions, and this was the most common way to view mobile health. In England, the challenger category organisations placed more emphasis on mobile health as a 'system of specific connected devices', which also were considered by some organisations in the incumbent and health care organisation groups. Also in Finland the challenger organisations considered the options 'mobile phone, laptop and tablet' and a 'system of specific connected devices' as relatively plausible conceptions for mobile health.

Table 5.2: Summary of findings of mobile health ideas: Which devices

	INC England	CHA England	HCO England	INC Finland	CHA Finland	HCO Finland
Mobile phone	✔✔✔	✔✔	✔✔✔	✔✔✔	✔✔✔	✔✔✔
Mobile phone, laptop, tablet	✔				✔✔	✔
System of specific connected devices	✔	✔✔✔	✔	✔	✔✔	
Any connected devices					✔	

INC – Incumbent organisations; CHA – Challenger organisations; HCO – Health care organisations, i.e. health care service providing organisations.
✔✔✔ = high frequency in data
✔✔ = medium frequency in data
✔ = low frequency in data

There were altogether seven different conceptions of what mobile health means in terms of functionality. In England, the views particularly among the incumbent type of organisations were scattered all across the spectrum of seven options, and almost all at equal frequency. Challengers on the other hand considered only two types of functions, and the health care organisations only three. Disease management by patients (e.g. diabetes) and onsite care by health care professionals (e.g.

home care visits) were the most frequently considered options. Also in Finland the incumbent type of organisations thought of mobile health in terms of a broad range of functionalities, with equal weight for all five options. The Finnish challenger type of organisations emphasised the 'measurement of vital signs and capture of data' function, while also mentioning three other options. Health care organisations were also spread in their views, between three options, with most emphasis on the logistical functionalities.

Table 5.3: Summary of findings of mobile health ideas: What devices do

	INC England	CHA England	HCO England	INC Finland	CHA Finland	HCO Finland
Disease management	✔	✔✔	✔✔	✔		✔
Delivery of care onsite	✔✔	✔✔		✔	✔	
Measurement of vital signs and capture of data	✔		✔	✔	✔✔✔	
Delivery of health information and reminders	✔		✔	✔	✔✔	✔
ERP, logistics	✔			✔	✔	✔✔
Decision support	✔					
Emergency care	✔					

INC – Incumbent organisations; CHA – Challenger organisations; HCO – Health care organisations, i.e. health care service providing organisations.
✔✔✔ = high frequency in data
✔✔ = medium frequency in data
✔ = low frequency in data

In terms of the users for the devices in both countries the views spread across three options. In England, while patients were the most frequently cited option for mobile health device users, the health professionals were mentioned almost as

frequently (and more frequently than the patients by the challenger type of organisations). Strikingly, the health professionals in England unanimously within their group considered only the patients as the users of mobile health devices. Also automated use received some attention among the incumbent organisations. Among the Finnish organisations the views were even more scattered. Both patients and professionals were frequently cited, and also automated use was considered. The incumbents cited patients and professionals frequently, and the challengers were more in favour of patient use of mobile health devices. In Finland the health care organisations considered mobile health as part of the tools for the professionals, in contrast with their counterparts in England.

Table 5.4: Summary of findings of mobile health ideas: Who uses devices

	INC England	CHA England	HCO England	INC Finland	CHA Finland	HCO Finland
Patient	✔✔✔	✔✔	✔✔✔	✔✔✔	✔✔	✔
Professionals	✔✔✔	✔✔✔		✔✔✔	✔	✔✔✔
Automated use	✔			✔	✔	

INC – Incumbent organisations; CHA – Challenger organisations; HCO – Health care organisations, i.e. health care service providing organisations.
✔✔✔ = high frequency in data
✔✔ = medium frequency in data
✔ = low frequency in data

Overall, the organisations in the two countries have described mobile health in equally broad terms. Both cases offer strong evidence of how mobile health is many diverse ideas for the organisations that are involved in it. It remains beyond a simple qualification and definition.

5.5 CHAPTER CONCLUSION

I have shown in this chapter that there has been a wide variety of ideas about what mobile technology in health care involves. I have analysed these views of research participants in terms of technology, functions and users at the early moment stage, and consequently no consolidation akin to a birth of a category of 'mobile health' has taken place yet. Table 5.1 on news data and 5.2 to 5.4 on interview respondent data present a summary of the findings for this chapter. These tables underline my argument that so far mobile health has signified a broad variety of things to organisations that are involved in it.

This finding has direct implications to the conceptions of institutional entrepreneurship that are found in the literature. As I have discussed in chapter two, the new institutional theory has emphasised the cognitive efforts in the processes of institutionalisation. The core task for institutional entrepreneurs has been described as to make efforts to influence the understandings of the novel solution they seek to institutionalise. This literature has a pattern in assuming that the material conditions are already in place. My interpretation of this pattern is that in temporal terms these studies have observed a somewhat later period of development when the more cognitive activities take central stage.

The early moments, in contrast, display an array of ideas about material and other pieces (technology, uses and people), strewn in front of the institutional entrepreneur, from which to construct the novel conception of mobile technology in health

care. As these pieces are less organised, the early moment task of constructing coherent abstractions becomes more formidable. From these available pieces, as I will discuss in chapter eight, actors have attempted to make some cognitive claims about mobile health through presentations in conferences, workshops and in printed and online materials. Yet, a more predominant finding has been that throughout this period a fundamental uncertainty has persisted. For example, as I describe in the next chapter on technical efforts, few respondents commented that nobody knows how to make money in mobile health. Or in chapter eight I report how another respondent noted that despite their several pilot projects so far, there are still many questions left open about the roles of different actors when setting up mobile health services. These uncertainties link back to this great variety of ideas of what technologies, uses and people mobile health involves, which the actors have not yet been able to narrow down towards a category description.

The timeline data of this chapter supports the core idea of variety at the early moment period. The graphs I have presented for England and Finland show, to the extent that the data collection has allowed, that the wide range of mobile health ideas have proceeded in episodes, periodically changing. On the one hand this describes the character of early moments itself, but also it relates to the task of institutional entrepreneurs, suggesting that they need to be attuned to the changing views of the emerging field in terms of technologies, uses and people involved.

CHAPTER 6: THE TECHNICAL EFFORTS TO CREATE MOBILE HEALTH OBJECTS

6.1 INTRODUCTION

The literature on institutional entrepreneurship has argued that the work of these entrepreneurs consists primarily of cognitive efforts. As I have described in chapter two, this literature has taken the view that putting in place novel entities, mostly in this literature referred to as 'practices' but also e.g. organisational forms, requires the shaping of meanings that are associated with these novel entities. The process for generating new institutions, whether 'new' in the sense of previously non-existent, or 'new' as a novel version of an existing institution as a result of "*institutional change*" (Greenwood, Suddaby, Hinings, 2002; DiMaggio, 1991), is then a question of label-giving and framing in specific terms to influence the impressions that the target audience will have of the entity. In short, institutional entrepreneurship literature offers a 'cognitive view' of institution creation that serves as an appropriate reference point for my following account of the efforts of institutional entrepreneurs at the early moment stage in mobile health. I report this multiplicity of activity over the next three chapters, under the labels of 'technical activities', 'structural activities', and 'social and cognitive activities'. Moreover, as some of the literature aptly reminds us (Maguire, Hardy and Lawrence, 2004; Beckert, 1999; Fligstein, 1997; Garud, Jain and Kumaraswamy, 2002), contextual factors are crucial in trying to understand the impact of these efforts. An important part of my report is formed by the corresponding obstacles and challenges that these entrepreneurs have faced in their efforts, in order to be able to discuss the relationship

between the efforts of institutional entrepreneurship and context at this early moment stage.

In this chapter I describe certain types of 'technical' or object-oriented efforts that various organisational actors, in England and Finland, have made to introduce mobile technology to health care. In contrast to the structural (chapter seven) and social and cognitive (chapter eight) activities, I refer to these as 'technical activities' as they produce outputs closely related to the technical objects of mobile health. They are about developing and producing technical devices and applications; about creating business models and service concepts that are dependent on the technology; and about producing research outputs that examine the efficacy of this technology use as well as the business models and service concepts. In relation to all of these activities, these actors have faced considerable and numerous obstacles and challenges from their operating environment. Part of the operating environment are for example organisations that provide health care services and those that provide IT services to the health care sector; part of it is the technical infrastructure, i.e. the mobile networks as well as the information infrastructure of health care units such as hospitals; and part of it are the different regulatory and operating logics that the two main sectors and source fields, telecommunications and health care, are governed by.

The previous chapter described the many ideas that actors hold in regards mobile technology use in health care. My conclusion there was that mobile health is many ideas, and has not in the two decades yet coalesced into a relatively stable set of conceptions about technology, its functions and users. In this chapter I will show in

detail what have been the technology related efforts to materialise those ideas. However, as the many obstacles and challenges described here also will attest, these efforts have accomplished so far little in terms of the institutionalisation of mobile technology use in health care. The timeline of these technical activities that I provide at the end of the section further confirms the finding of early moments period of development as one of episodes, proceeding in a wave-like manner. This effect is particularly visible in the Finnish data, in graph 6.2.

6.2 ENGLAND

TECHNICAL EFFORTS TO BRING MOBILE TECHNOLOGY TO HEALTH CARE

These English organisations have been quite active in initiating what I call 'technical' projects to establish mobile health – projects to develop mobile health technology applications, projects to create business models and service concepts, and research projects to investigate mobile technology use in health care and produce research findings. Incumbent and challenger types of organisations have been active in the technology development, incumbent and health care organisations have been active in the business model and service development, while research has been conducted by the challenger and care organisations. Thus, technical efforts have been a key pursuit of all three groups of organisations in England.

6.2.1 Technology development

Incumbent type of organisations

Technology development has been a core activity for incumbent type of organisations. They have sought to exploit their existing capabilities in regards communication technologies, and for the technology and capabilities they have not been in possession of, they have used their existing partnerships to gather these resources.

Those developing technology for mobile health can be divided into two: One set of technology for mobile health comes from the established technology companies in industries surrounding health care. As an example, a producer of software and hardware in the telecommunications industry (EN SP4) has expanded its portfolio to the production of new types of software and devices for health care that use mobile technology. In order to accomplish this, it has begun partnering with its previously known collaborators, in order to access some critical health care related capabilities. Another technology and service provider (EN SP2) has begun the development of technology for pharmaceutical companies and medical device technology companies. For some of these health care sector clients, this telecommunications operator has already been providing services in other areas. Despite possessing proprietary technology, it however is a newcomer to health care, and thus is taking advantage of the position of its clients near or inside health care, in order to gain entry into a new business area in technology.

Other technology development has come from inside the health care technology industry. A medical technology company (EN SP1) representative described how they are exploiting their clinical patient information system product by expanding it to mobile devices. Until now, they have provided health care information systems for other clinical end-user devices. In response to demand from clinicians, a new mobile application has been developed to allow sending the information to mobile devices, in order to enable instant contact between care professionals, and to overall facilitate more flexible working.

Other activity to develop mobile health technology has come from outside of technology development altogether. Mobile technology appears to enable 'greenfield development', i.e. development without strong background in the subject field, with outsourced software development. A case, that is an exception to my general argument of incumbents relying on their existing capabilities, is of a professional association (EN PA1) that is engaged in developing a mobile technology application. As noted above, incumbent organisations tend to be in possession of at least some resources, and since developing mobile software applications does not require extensive investment in capital equipment, it is possible that an organisation of clinical expertise may embark on technology development initiatives. This professional association has put in a funding proposal to develop an iPhone application for the handover process in hospitals. Their expertise is essentially the content of such an application, i.e. what information needs to be passed on from an outgoing medical team to an incoming team, but by engaging external software expertise they also are able to undertake technology development.

Challenger type of organisations

At this early moment stage, also challenger type of organisations have pursued technology projects. Four companies of the challenger organisation group have initiated mobile health projects, but unlike the incumbent and the health care organisations, they have sought novel solutions without a solid background in either mobile technology or health care. All four are organisations founded within the last ten years, with the specific intention to capitalise on the perceived opportunity of mobile technology use in health care.

Two of these organisations (EN SP5; EN SP7) have developed relatively simple applications, operable by all mobile phones. The messages that patients or citizens send may be simple text messages, while at the other end lies a server that dissects the incoming data. One of them (EN SP5) is a small enterprise that has created a range of mobile technology applications that facilitate communication between a local care unit and patients. The applications are able to send out individualised medication and appointment reminders, or health campaign messages at large scale. Another software developer (EN SP7) is a local NHS Trust supported venture whose application allows for individualised disease management by simple text messages. Patient takes vital sign measurements by other instruments, and when prompted by a daily, automated text message sends the data to the server as a response. At the other end a server analyses the data and alerts care staff in case of irregularities.

Two of these challenger type of organisations have engaged in the development of more sophisticated mobile technology applications. One organisation (EN SP6), a start-up in its early stages, has been developing mobile health applications to achieve two goals: to improve medication adherence in different therapy areas, and to enhance the collection of data on medication use, aimed at pharmaceutical companies as their client. Their approach has been to develop these applications for smartphones, thus taking a different strategy than the challenger organisations mentioned above. This enterprise, being a start-up, has no earlier history in health care or mobile technology, although the founders are able to draw on related fields, such as pharmaceutical industry and Internet related software applications.

The fourth start-up, a small technology company (EN SP3), has developed a platform for enabling care organisations to view electronic health records. Despite its neophyte background, consisting merely of the founder's medical doctor's degree and keen interest in programming, it has embarked on a venture to develop a systemic solution to the communication challenges between local NHS care organisations. The solution retains control of the electronic health record with the patient, who has the authority to give access to care organisations when necessary. According to the respondent from this organisation, the software development in itself has been complicated, but perhaps even more complicated has been to construct the data protection infrastructure, in order to fulfil the criteria that the NHS has, to allow integration into its IT-systems. In their view, it is a superior solution to the core problem of how to ensure patient consent when medical records are shared.

6.2.2 Business model and service concept development

The development of business models and service concepts has been another early moment activity in mobile health. Incumbents and health care organisations have experimented with new concepts, while the challenger organisations have been inactive in this area. Some of the new mobile services are about providing a mobile version of an existing service, while other services are completely new services.

Incumbent type of organisations

The incumbent type of organisations have engaged in business model and service concept development. They have been trying to draw on their existing capabilities in efforts to create new business models and service concepts. One telecommunications operator (EN SP2), for whom the primary business model is business-to-consumers (B2C) and secondary is business-to-business (B2B), has been trying to change the focus of health service from organisation centred to patient centred:

"What we are doing is we are trying to move the demand from the B2B side to the B2C side. So we are slowly trying to also develop solutions where the consumer sees immediately the benefit and is willing to pay for the solution." (EN SP2)

Another example of business model development by these organisations is about creating an analysis service for all the data that is ceaselessly generated in health care. Seeing health care as a nexus of data exchange, one company (EN CO2) specialised in business and data analytics has been advocating for the need to take advantage of the 'big data' in health care.

In early stage mobile health, part of the development of business models and service concepts has been the tension between the two main source fields for mobile health. As one industry association (EN IA1) representative described, on the one hand, from the perspective of financial flows health care is in many ways a B2B sector. In other words, payment of services is largely between organisations instead of between the patient and the health centre (except for small out-of-pocket share paid by patients in Finland). On the other hand, mobile technology and telecommunications industries have a different logic that is mostly B2C oriented. These comments from incumbents suggest that the tension between these two ap-

proaches that still seems to exist is complicating the development of business and service models even for the incumbent organisations.

Health care organisations

The health care service organisations have been particularly active in taking advantage of mobile technology and developing their services accordingly. Some have developed new services outside of their existing service framework, while other new services are extensions of existing services with mobile technology. One of the new services enables individuals to monitor some of their lifestyle habits with a mobile phone application, which is available as part of the range of health information that this service organisation (EN NH1-1) provides. The first applications available have been ones to monitor the intake of alcohol and the frequency of smoking cigarettes. These applications, freely available to be downloaded on a smartphone, aim to encourage individuals to take initiative to reduce overuse of these substances.

A typical example of extending existing services into the mobile realm has been to optimise the organisation's website for mobile viewing. Two of these care organisations (EN NH1-1; EN NH2) have described how they have improved citizens' access to health information by expanding the range of information channels from the traditional brochures, events and the Internet to mobile devices. However, taking advantage of their optimised website for mobile devices requires the patient to have a smartphone.

In other examples, two other organisations have employed the more simple technology of text messaging to broaden their range of services to mobile phones. One organisation (EN LH1) respondent described how their weekly report of health condition, previously hand-written, is now delivered by the patient by way of sending text messages. In another case, a helpline organisation (EN SH1), for which information was previously available by calling in on telephone, has expanded few of its services onto a text messaging platform: in one service, a standard format message will return an automated information message about health conditions or locations of health centres. In another service text messages are used to enable chat -type of interaction between a client and a service agent, more recently also made available as an online chat function.

6.2.3 Research activities

Organisations in England have also conducted early stage research on mobile health. In research activities it has been the challenger and the health care organisations that have been active, while the studies the incumbents have produced have been 'white paper' type of publications, described below under the heading 'Making publicity for mobile health'. Some of the research here has focused specifically on mobile health, while other work has focused on various related matters, with a partial contribution to mobile health questions.

Challenger types of organisations

There have been four challenger organisations that have conducted research on mobile health. Out of the four, one is an academic organisation, which has produced peer-reviewed studies, while the others have produced either policy related work, or studies on the different aspects of the mobile telecommunications industry and the health care sector. The academic research organisation (EN EO1) in this group was described by its representative as focused on mobile technologies and health especially. Its mobile health studies have examined how mobile technologies can assist mental health patients to cope with their condition and everyday life. However, its other work has investigated other uses of technology in everyday life, such as 'intelligent clothing', i.e. technology that is incorporated in clothing, as well as sensors related to falls prevention. Thus there is a significant diversity in its research even though mobile technology and health is in the title of this organisation. Some of the outputs of this research centre are used as the theoretical background to the efforts of the collective innovation promotion organisation (EN IP3) that is advocating mobile health regionally.

These challenger type of organisations have also engaged in two types of non-academic research that touched on mobile health. Their aim was generally to respond to certain practical challenges, such as appointment adherence, which has been a problematic area for GP practices (George and Rubin, 2003). One study, by an innovation promotion agency (EN IP1), investigated the efficacy of reminders, which patients received on their mobile phone. Patients were sent a reminder 24 to 48 hours in advance of the appointment, and those that did not attend received a telephone call to ascertain the reason for absence. In some cases patients were

even contacted in advance to inquire whether they intended to arrive for the appointment. Based on the findings of the study, e.g. that reminders may yield a 30-50% reduction in the non-attendance for appointments -rates, the agency developed a new process for monitoring and reacting to patient non-attendance. Thus, the study's direct arguments concerned patients' reactions to telephone reminders, and as such withheld from making any strong claims about mobile phone use, but it can be taken to have offered some insights also about mobile technology use in appointment processes.

An example of another type of research comes from an industry association (EN IA2) with more direct focus on mobile health. With its first study the industry association scoped the extent and content of current available research on mobile health. Its review of literature discovered that there are many studies that have focused on the functionality of the technology, but hardly any have attempted to examine the cost or health outcome impact. Their subsequent step was to conduct a survey among the relevant stakeholders regarding the evidence that health care professionals are expecting from the mobile technology industry.

Health care organisations

Also the health care organisations have conducted some research in regards using mobile and other communication technology in health related services. With a direct attention to mobile device use, even if not exclusively focused on mobiles, these studies aimed to produce new insights also about mobile technology use in health care. One of the organisations providing health information (EN NH2) con-

ducted user experience studies regarding their digital information platforms, which include a mobile web service. By using focus groups this agency sought to find out about the views of the general public in regards these platforms. They then had an agency test aspects of their online information service with actual patients, with the aim of confirming that the new services respond to the wants and needs of the public. A core part of the findings were thus about the usability of the mobile web services.

In a case of more direct research on mobile health, one of these health care organisations (EN SH1) also used focus groups to inform their design of the services on mobile phone. They invited representatives of their special client segment, as well as their partner organisations that already have offered services to the same clients in mobile devices, for discussion and brainstorming, prior to launching their own mobile services. Through these discussions many aspects of the service, e.g. how to ensure the privacy of communication and what mode of language the agents ought to use, were defined. Subsequently, whenever they have planned to introduce new features to their service, they have conducted further research among their client base in order to correspond as well as possible with the needs and interests of their clients. Thus, in England mobile health research has mostly focused on more practical questions of market development and usage experience, while academic research has played a minor part.

OBSTACLES TO THE TECHNICAL MOBILE HEALTH EFFORTS

The technical efforts to develop mobile health described above have also faced some obstacles. In England these obstacles have been mostly about technology, and more specifically about the user experience and attitudes in regards new technology, as well as they have related to market development. These challenges highlight how the efforts to develop technology and other objects of mobile health, such as service concepts, have been unable to ensure acceptance and adoption of this new concept.

6.2.4 Technical challenges

Incumbent type of organisations

In the course of the last two decades, there have been challenges that have hindered technical development of mobile health. Many of these frustrations were expressed by the incumbent type of organisations. One technology related challenge for mobile health has been the manner in which most health care applications work. As one industry association (EN IA1) representative explained, a fundamental problem is that health care applications have been built for large IT-systems, and they do not work in a "*mobile friendly way*". Thus, a distinct design approach needs to be taken with mobile, in the transition from services based on fixed line user terminals to mobile based services. So far, the view of fixed broadband capabilities in health IT-systems has enabled certain models of service. However, in a world of mobile applications, different conditions are in play:

"One is that if you come from a fixed broadband perspective, then power consumption and bandwidth are really not an issue at all, connectivity is not an issue. So you have a luxury of being lazy with all those sorts of things, whereas mobile forces different disciplines on designers." (EN IA1)

Some of these challenges for mobile have been evident in other respondent accounts, in the form of early problems e.g. with network coverage and battery power of devices. One technology provider for intensive care units (EN SP1) explained that until recently, technical features were still unable to respond to the high performance requirements of intensive care functions. At the time of interviews for this research in 2011, mobile applications for use in intensive care had only very recently appeared in the market. Until then neither devices nor networks were capable of handling and sending large data files, such as MRI or x-ray pictures.

Beyond technical capacity, unreliable standards have posed other difficulties. As witnessed by an industry association representative (EN IA1), early demonstrations of heart failure related technology would show that existing technology did work in principle, but in practice it was unusable. Bluetooth, a standardised application for short range data transfer, worked in slightly different ways in various connected devices, such as phones and weight scales. The unreliability of such data transfer standards is a problem particularly when technology providers have introduced intermediary components that use such transmission technologies. In one case, as described by this industry association (EN IA1) representative, in order to avoid the mobile device falling under the medical device regulation, a company had added a cradle between the blood sugar meter and the mobile device. In his view, this was a rather inferior solution as the mechanical or electrical interfac-

es of such components may not be necessary and may even create additional points of failure.

A proliferation of devices has also meant a more complex development process for applications. A health care IT-system supplier (EN SP1) pointed out that in more simple cases, like sending alerts, development for different devices may be relatively straightforward and uniform. But when more complex data about the patient is sent, the different devices require different lines of development. The usability in laptop and tablet computers may be vastly different from mobile phones, whether the use is for merely reading information off the screen or inputting data.

A respondent from an industry association (EN IA1) suggested though that in terms of integration with other services, while there are some problems on the handsets, there are many more issues in the back-end systems. This seems to be the case for companies both of mobile or telecommunications industry. In a practical example by one technology provider (EN SP4), installing mobile systems in an old hospital there were incompatibility issues with the old system, but there were also infrastructural issues. The back-end system issues arose as interoperability problems between mobile devices and the existing electronic medical records system, which were not designed for mobile working. A wireless network needed to be installed, which involved manual work of placing new access points and transmitters, as the old building infrastructure suited poorly for wireless network signal.

Thus, the early moment stage has posed genuine technical obstacles for mobile health development, with poor adherence to standards, constraints from building infrastructures, and mobile technology being incapable until recently of carrying the data loads required by health care practices. From the responses it appears that the last one has been mastered in time, but the first two remain as difficulties for some time still to be overcome.

Health care organisations

The health care organisations have also faced technical challenges, but these have related more to customer use of services, rather than technical integration as above. One example of customer facing type of technical challenges concerned the user interface of a service. When extending services from web to mobile devices, the technical challenge for this care organisation was to be able to refit the content to be displayed on the interface of the smaller device. A representative from this care organisation (EN NH2), which provides health information to citizens, noted that

"… there are some device specific challenges, when you try to reuse content from a web channel into a mobile device, and where the retail space that you are using is much smaller on a mobile device. The content that is appropriate and useful in a pc-screen, is perhaps a little bit verbose and lengthy for a mobile device, so there are some challenges around chunking content and ensuring that we get the pertinent message over on the device, … so that it becomes more usable whilst remaining clinically safe." (EN NH2)

Secondly, there is a view that much of technological development has not always been well focused to succeed. According to one director of a care provider (EN

LH1) that has developed a text messaging service, one mistake often made is that many technology-using services tend to aim too high with technology. Solutions built from an engineering perspective tend to be highly sophisticated, whereas simple solutions with minimum functionality are likely to be more useful and widely available. Another common mistake is to develop advanced systems but which lack usability. Third mistake, from this care provider's (EN LH1) viewpoint, is not to ensure the sustainability of the solution for the care provider organisation. The respondent uses an example of a web-based self-monitoring system for a long term condition, and notes that while many people seem to like the system, it is limited as a clinical tool, as it does not connect to hospital IT-systems. This respondent (EN LH1) concluded by saying that one general characteristic of times is that any solutions need to keep adding new features in order to continue to increase sales. In their view in this business context it is somewhat of a challenge to strive to maintain the optimum level of simplicity, wide availability and clinical usefulness.

6.2.5 Business and service model challenges

Incumbent type of organisations

Aside from technology, efforts to develop business and service models have also faced challenges. By the time of data collection in 2011, no clear business models had emerged. A comment from an industry association representative highlights how common the reservations about business models in the industry are:

"And someone used a joke about it last year that 'the only people making money in mHealth are the conference organisers'." (EN IA1)

One of the challenges related to business models is the traditional manner of procuring large, expensive care systems, which does not favour the current mobile offering. An industry association (EN IA1) representative argued that developing the business models and growing mobile health into a mass market proposition will require instead a shift away from "expensive fixed systems" as the only solution and to look at also other, more modular and thus less expensive propositions. This view is consistent with a comment by a government respondent (EN MI1) who suggested that a difficulty in the procurement of such systems is that attempts to transform the way services are delivered tends to have at least some and often significant amount of up-front investment, e.g. in the form of new equipment or training for staff. According to this respondent, there tends to be the expectation that any new investment will almost instantly improve cost efficiency. The procurement process at the moment is not able to accommodate well the return on investment that occurs much later. So a big constraint in trying to introduce new systems can be the need to demonstrate value for money, and to build a business case around it.

The question of who pays for devices is still open, which complicates development as well. One option could be to convince patients to pay for such systems and devices, whereas traditionally in most cases devices for monitoring and other care were paid by organisational payers or even insurance schemes. However, having the devices go through an approval process in organisations would take time, and

thus it might be preferable to offer the devices to be paid for by the patients. And in some cases, according to a survey by a consultancy (EN CO2) conducted in the US and UK markets, patients could be prepared to pay for such devices if they can be convinced of better health outcomes. An industry association (EN IA1) respondent suggested that perhaps more successful approach to speed up adoption would be one that distributes the burden of cost on both. In other words, a possibility for a model could be a separation of the consumer and the clinical end, at which health care organisations buy monitoring platforms and patients buy monitoring devices. Upon collecting their data, patients are then able to send it to the health care provider, which could be whoever a patient decides they want to use. But it seems this model will take some time still to develop.

However, there are other business model concerns than merely the question of who will pay for devices. A consultancy (EN CO2) view is that even if the demand would be there, there is still a middle part between technology development and payment, of bringing it all together and making it work. In the words of a respondent from an industry association (EN IA1) this middle part is less about just connecting a mobile device and blood pressure meter, but about the

"back end integration, the workflows, and dealing with the complex integration between citizens and doctors which is not a one-to-one, it's a many-to-many relationship." (EN IA1)

Comments by a consultancy (EN CO2) representative confirmed this view, and they added: "*And this middle part may still take five years to happen*". The issue of integrating the new solution into existing systems is one of the core themes of this

study. I will return to this subject in other empirical chapters and in the discussion of chapter nine.

Part of the business model dilemma is caused by the 'collision' of the two quite different sectors of activity. An industry association (EN IA1) respondent explained that mobile and telecommunications industries are highly focused on "commercial viability", and one of their characteristics is to be very precise about the cost effects of regulation. They market their products and services to mass markets and thus need to operate at cost levels that allow for relatively low prices for these markets. The priorities of the health care sector are elsewhere than cost, namely in patient safety and health outcomes, and thus cost points tend to be relatively high. At the moment the cost point that emerges from health care regulation poses a challenge for the mobile and telecommunications industry to provide mass-market solutions.

This difference in approaches may be a window of opportunity for mobile technology industry to make a difference in health care, by introducing new, inexpensive service concepts. According to a technology provider (EN SP2), larger presence of mobile technology in health care would be possible if the mobile and telecommunications industry could import this price consciousness to health care and thus make the solutions it can offer vastly less expensive than the current treatment options. The challenge then, particularly for the mobile and telecommunications companies, is to understand how health care as a sector works. Their inexperience in that sector may lead them to introduce products and services that technically serve a purpose, but nobody will pay for. According to this respondent, one way to

deal with this is to hire experts from the new area, but at the organisational level it takes time to learn the dynamics of a new sector.

Furthermore, linked to the business model dilemma, there may be some reputational risk from unsuccessful initiatives in mobile health. One industry association (EN IA1) respondent recalled a conversation with a representative from a mobile phone company, which highlighted the care that even large companies must take in a new area. The industry executive pointed out that none of the enterprise solutions that they had seen so far had been good enough for them to put their brand on. Moreover, the industry association representative described the executive as saying:

"… 'if we offered them as our enterprise solutions, we would lose retail customers'. Now I can't think of anyone else in the health IT space who loses retail customers on the back of what they offer at the enterprise. So I think there is a completely new dynamic that is coming in. They are yet to learn how to engage, and they are yet to really make an influence, but I think it is understood that there is a new dynamic coming in." (EN IA1)

Another significant type of challenge from an incumbent perspective relates to implementation of service models. According to a ministry (EN MI1) respondent, central government, and the ministries in particular, are responsible for planning in their respective sectors, and while there is much emphasis on innovation in government, as well as interest to stimulate that, it has not been easy to develop new services and spread them on a large scale. So far there have been few local service solutions, but the mainstreaming of these solutions has been problematic, for various reasons. One reason is that with the distance between central government and

local governments it is not easy for the former to know how solutions should be implemented so that they reach local organisations throughout the nation. On the other hand, the health care sector and the medical technology industry are the kinds of industries, which, especially for regulatory purposes, require large scale:

"And that leads specifically to activities around payers and policy, at least specifically to stuff around regulation and the way the regulation works. And trying to share those, so let's not do this once for the US and then in a different way for the EU, but actually recognise this tension that innovation in health care is delivered locally but the technology that enables innovation needs to be scaled globally." (EN IA1)

Yet, at a local level, one problem related to service development seems to be with the level of commitment of many health care organisations, as expressed by one technology provider incumbent (EN SP4). The local care organisations are happy to run pilot projects to trial new service solutions, but these are not sustained because no funds are made available when the project ends. Even solutions that in trial phase were unequivocally successful are merely abandoned and any momentum for transforming services is lost.

Third area of challenges from incumbent perspective is that many of the services have been built for the higher end mobile phones, i.e. smart phones, and thus do not adhere to agendas of equality in health care. One industry association (EN IA1) respondent noted that to be considered seriously as a solution to improve the health of the general population this may be problematic, as larger part of the population may not have these devices, but that they are purchased only by the more affluent:

"The smarter services actually require people to have smarter phones. Well, that often means you no longer are addressing necessarily the priority health needs. You are actually addressing the health needs of people who are affluent enough to have those sorts of phones. So they may have health needs, but from a public health perspective that may be problematic." (EN IA1)

Apple's iPhone is an example of this type of service development dilemma. A ministry (EN MI1) representative described that on the one hand there is a vast quantity of health related iPhone applications, the sophistication of which raises interest also with government planners when contemplating what applications to offer to citizens. On the other hand, iPhone still offers a relatively narrow market, being a high-end phone, and that makes it hard to justify application development for it within government. Targeting solutions for a mass-market audience may require the use of other platforms.

At a broader level there is a question whether the players of the two sectors, i.e. health care and telecommunications industry, can work together well enough to support the development of mobile health. An industry consultancy (EN CO2) respondent noted cooperation between organisations will be needed, in order to allow business and service models to develop. There is some uncertainty of this, as the organisations of the two sectors have such different backgrounds, i.e. "*when they are very different animals*". For example, consumer electronics companies tend to develop devices that have "*all the bells and whistles in it*", whereas for medical device technology firms the focus has been on essential functionality.

6.2.6 Attitude challenges towards technology products and services

"The more senior the doctor, the less likely they are to be using computers, and less likely to be using smart phones." (EN PA1)

There are also some attitude challenges towards products and services that use new technology, which the incumbents have observed. The above quote from one of the respondents is an apt example of these limitations. In the view of one industry association (EN IA1) respondent, some of these new technical applications may appeal only to a small group of technology enthusiasts, or "*geeks*", whether doctors or consumers. But if they do not appeal to the large share of doctors, consumers and other users, they are likely not to get the benefits that these devices may potentially bring, despite the adoption by the 'geeks'. In some cases there seems to be a clear generational factor in attitudes to communication technology. From a central government (EN MI1) perspective it has seemed that at an organisational level, at local organisations, there are "pockets" in the NHS that resist new technology, and particularly when it is imposed upon them. A technology system provider (EN SP4) has seen this manifest in practice in the insistence of using paper-based records. Speaking about intensive care units in particular, one technology provider (EN SP1) respondent suggested that modern information technology systems are only in "*less than 20% in the whole country… the majority of hospitals, believe it or not, they are doing things on paper still*." Two technology companies (EN SP4; EN SP2) have tried to overcome these attitudes by providing training at local organisations, as well as by going to industry events to evangelise about new technology. However, there is a perception that the necessary decisions by the government to invest into information technology are not being made yet:

"But with with everything else going on, this is still not as high priority… it is almost as … it is still a nice to have as opposed to need to have." (EN CO2)

The view from the government (EN MI1) side is a response that laments the difficulty in reproducing elsewhere the successful applications of technology of one location:

"The kind of pattern has generally been that there have been these pockets of things happening within local organisations that have been very successful, but mainstreaming that innovation has been very difficult, for a whole range of different reasons. I think mobile is still a very…. There is no central view how either local organisations should use it or even deliver it at the national level." (EN MI1)

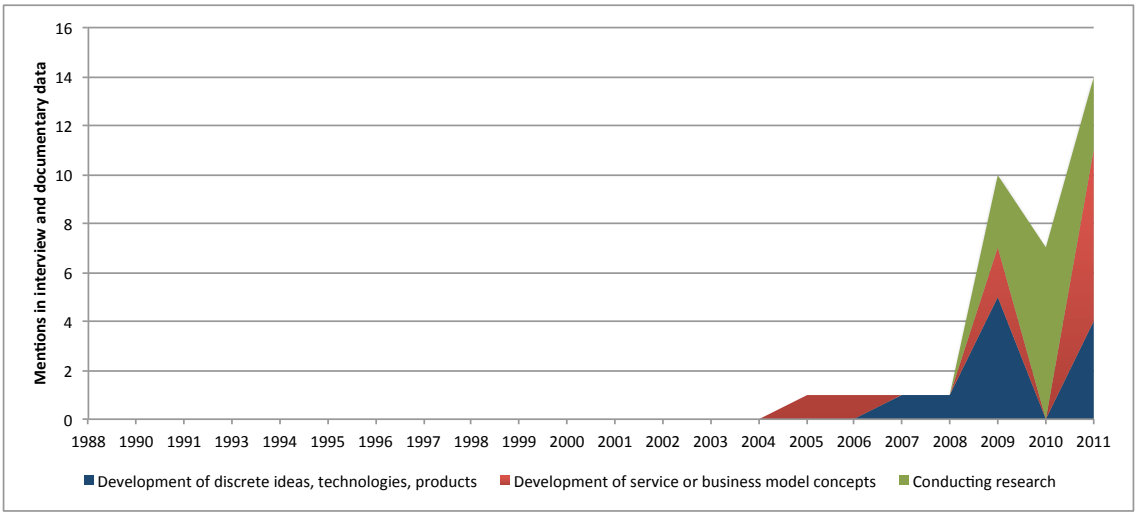
In conclusion then, early moments of mobile health in England have seen plenty of development activity that has focused on the objects of mobile health, i.e. the technical products, as well as the business and service concepts. However, these efforts have faced a range of challenges, some of which have been overcome in time, and some that have still remained. I will discuss further in chapter nine how these findings relate to the claims in the theoretical literature on technology supply.

6.2.7 Timeline of the development of mobile health objects

Graph 6.1 shows how the English organisations of this research have become active relatively late in research and technology and service development for mobile health, considering that mobile technology has been in wide use since the 1990's. Their first activities were to begin developing mobile related service concepts in

2005. From 2007 onwards there was emphasis on the development of technology, which was complemented in 2009 with research and more service concept development. As I have described in the previous chapter, no complete time-stamped data has been available, and thus the results are at best indicative. The periodic effect of the data is less pronounced than in the timelines of other chapters. Nevertheless, this graph does hint at the *episodic* progress in mobile health development – i.e. that emergence in this case has proceeded in a non-linear fashion, with different efforts at different times.

GRAPH 6.1: DEVELOPMENT OF MOBILE HEALTH OBJECTS BY THE ENGLISH RESPONDENT ORGANISATIONS



Source: Interviews and organisational documents

6.3 FINLAND

TECHNICAL EFFORTS TO BRING MOBILE TECHNOLOGY TO HEALTH CARE

Similarly to the English case, the organisations in Finland have invested much effort into technical projects. Incumbent and challenger organisations have been active in developing technical solutions, all three groups have tried to either create new or expand the old business and service concepts, and there have been incumbent and challenger organisations that have conducted research on mobile technologies in health care.

6.3.1 Technology development

One of the more prominent areas of activity among the Finnish organisations has been the development of technology. Within both the incumbent and challenger groups there have been many organisations active in this area. In the following I describe their efforts to develop novel mobile health technology solutions.

Incumbent type of organisations

One of the main activities among the Finnish incumbent type of organisations during the early moment stage of mobile health has been to develop new mobile technology solutions for health care. As in England, also in Finland incumbents from

both health care technology and non-health care technology industries have developed these technical solutions, and these organisations have commonly already had some background in this technology. For some organisations, developing new technology may represent an addition to their existing range of health care technology solutions. One example is a medical technology company (FI DM1) that has developed an application for doctors to view patient data, e.g. x-ray images, or to receive alerts when patient's vital signs are out of range, on their iPad or iPhone. This complements their already broad range of products of intensive care technology that they are known for.

Another approach at an early moment stage has been to take proven solutions and expand the list of industries where to employ them. Other mobile solutions for health care have come from an IT-system company (FI SP3). This company develops back-office IT-systems for many industries, mainly for resource planning and logistics. For example, manufacturers of equipment and appliances have adopted their solutions for maintenance duties. Since early 2000's they have included mobile devices in these solutions. After these solutions had been employed in these other areas for years, they were adapted for health care, and particularly for home visits of community matrons, as a resource planning and reporting tool.

Another early moment approach is that companies build on the existing technology on their devices, and try to expand the device functionality, e.g. with new software applications. A mobile device manufacturer (FI DM2-1) has built on its expertise of the device functionality to develop an application for wellness. A mobile phone has motion sensors upon which the application builds to provide data on

the movements of the carrier. The data then is automatically transmitted to a database, which can also hold data from other measurement devices such as weight scale or blood pressure meter.

"Our intention has been to link people with their data, and also to other service providers. That is our role. Connecting people and data" (FI DM2-1)

In some cases, developing technology at the early moment stage may be an extension of earlier unsuccessful initiatives. A health care technology company (FI DM1), whose latest applications bring patient data to doctors' iPhones, have had such applications throughout the 2000's. Even if some were sold in other markets, they however were not successful in Finland. One reason may be that the earlier applications were on other mobile phone operating system platforms, and the use of mobile phone applications has since become more popular, particularly in connection with the introduction of the iPhone. Also the aforementioned mobile device manufacturer (FI DM2-1) has been developing health and wellness related applications for a long time. Already in the middle of the 1990's it had software for diabetics. However, there were technical and market related challenges:

"It had its own challenges, it was ahead of its time, the markets were not ready… there were big challenges in the phone technology which were hard to solve, and it was not possible to update software over the network like today. … So it was a technical problem, but also it just did not scale…" (FI DM2-1)

In addition to this software for diabetics, in the 1990's the company (FI DM2-2) had also plans to design bespoke phones for diabetics and for other health condi-

tions. After some years of planning however, they were considered too early for the markets and these development programmes were terminated.

Challenger type of organisations

Technology development among these challenger type of organisations has largely been about developing software for mobile device applications, or for linking mobile devices with other devices that measure health or wellness related aspects. Whereas the efforts by incumbents were based on their earlier efforts, the challengers have generally developed technology for mobile health with little prior background in either health sector or mobile technology.

In one case a large research organisation was looking for entrepreneurs to commercialise technology for which it had patents. A small software development company (FI SP5) was founded to develop further an algorithm technology into a mobile phone application. This application enables a mobile device to retrieve data from a device that measures person's movement, transfer the data onwards, and also display the data in the mobile device for the user.

In another case, an entrepreneur, with background in telecommunications industry and with personal contacts in care services, perceived there to be a business opportunity in the health care sector for improving care processes with mobile devices. By taking advantage of the capacity of mobile phones to detect and measure movement, this software developer (FI SP1) has tried to create applications to allow patients to perform the measurement of different aspects of health, such as the movement of the patients' limbs, and to provide rehabilitation exercises. In a

similar manner, the company has been developing an application that enables diabetes patients to take their own blood sugar measurements and send them by a mobile phone to a hospital server. In both of these examples these self-care applications would obviate frequent or regular visits to a doctor or a nurse, thus offering cost and time savings in the care process.

In other cases, early moment stage has been about generating a veritable programme of software development. Two software companies (FI SP4; FI SP2) begun developing applications for mobile phone, but have since expanded into broader programmes of development that take advantage of telecommunications technology in health care. For example, the broad programme of one of these developers (FI SP2) includes extensive use of databases and video messages, but also mobile device software to enable a health campaign to conduct a survey with patients who would respond with their mobile phones. In one of their applications they employ such connection technologies as bluetooth, radio-frequency identification (RFID) and near field communication (NFC) to collect data from a measuring device into a mobile device, in order to send the data then onwards.

This technology development has not been the sole domain of these small software companies, as similar technologies have been developed elsewhere simultaneously. At this early moment stage also research organisations have been active. One research organisation (FI RO1-1) has developed applications comparable to the above examples, which connect mobile devices to measurement devices in cases of diabetes and high blood pressure patients. They also have applications for patients of reduced mobility, whose rehabilitation regime requires the monitoring of how

they perform their exercises. Their basis for developing these applications has been their long background and a state mandate to pursue high level technical research, including that of telecommunications technologies.

6.3.2 Business model and service concept development

Re-envisioning some of the health care services and developing new business models and service concepts for them has been one of the more common early moment activities among the Finnish organisations of this study. There have been initiatives from all three categories of organisations, but they have had different approaches in service development at this early moment stage. The incumbents and the health care organisations have based their new solutions on their existing technologies and service processes, respectively, whereas challenger organisations have tended to experiment with technology and processes that are new to them.

Incumbent type of organisations

Some of the Finnish incumbent type of organisations have developed new care service concepts based on their past efforts and capabilities on mobile technology. An IT-system provider (FI SP3) developed new concepts for providing home care, which draws on their resource planning system already in use in other industries. The direct access by mobile device to patient record system has enabled making changes to care pathways – the necessary changes to the patient record, new bookings for specialists and any other concerns may be recorded immediately.

A mobile device company (FI DM2-1) has developed health service concepts that are based on their existing mobile device capabilities. One service concept, for resource-poor populations with limited or no access to the Internet, is for pregnant women to receive health information by text message at certain times based on the expected delivery date. This service uses the company's sms messaging technology, and is aimed for developing countries, where consumers tend to have less sophisticated mobile phones.

Another example of service development is disease management programmes by a service solution organisation (FI SS1), a subsidiary of a pharmaceutical company. The subsidiary service provider has developed a service concept of life style coaching programmes, as part of occupational health. Whereas in earlier experiments these programmes were executed by nurses, as an effort to expand the scale of the programmes they have now been developed to provide an automated coaching service by mobile devices, usually by mobile phones. The programmes are aimed to help one to quit smoking, or to improve exercise and diet, as well as to manage work based stress, as well as a variety of chronic diseases. The development work has drawn on the experiences of other subsidiaries of the pharmaceutical company elsewhere in the world.

The new service concept has also benefited from earlier domestic work to take advantage of mobile technology. The service solution organisation (FI SS1) respondent noted that aside from building on experiences elsewhere, this development is also a result of close cooperation with a mobile device manufacturer over ten years to produce solutions for doctors and for patients that employ mobile

technology in disease management and wellness maintenance. The cooperation has consisted of various trials and initiatives, which in most cases have not proceeded to mass market implementation. However, as technology has made decisive strides forward, the most recent work has been able to take advantage of the earlier efforts.

Challenger type of organisations

Challenger type of organisations have developed business models and service concepts from a more experimental position. They have not been part of health service processes previously, and in most cases they are relative newcomers also in respect to the technology. There have been three approaches to business model and service concept development: professional use of devices, patient use of devices, and automated use of devices.

In the reorganisation of service processes and professional use of mobile devices, the work has focused on community matrons. In their traditional service model community matrons have taken notes during home visits, and made the inputs later at the office. A software provider (FI SP4), from a position of small and relatively young technology company, and two research organisations (FI RO2; FI RO1-2), from their positions of researching phenomena in other organisations, have all been developing a new service model around community care. The new service model, developed independently of each other, has the matrons using mobile devices during their visits to record patient data either directly to the server through 3G network connection, or by uploading the data after the visit. Consequently,

aside from changing the actual procedure during the visits, this process change has also prompted in one research project (FI RO2) a reassessment of the concept of management of these new services processes.

Other service development work has attempted to involve the patient more in their own treatment, by assigning the measurement of a variety of vital signs such as blood pressure, blood sugar and body temperature to patients. These service concepts have been developed by a research organisation (FI RO1-1) and two software providers (FI SP4; FI SP2), also independently of each other. Again, these organisations have not been expanding existing technology or services, nor relying on extensive experience either in technology or services, but rather have developed new concepts *de novo*. The new service concept uses mobile and other technology to enable patients to remain at home, and independently perform functions that previously were exclusively the responsibility of care professionals. An extension of this work has been the development (FI RO1-2) of slightly more personalised service concepts. These would take into account the patient's age and lifestyle, so that a 37-year old heart disease patient with a hectic lifestyle has a different treatment concept than a 87-year old patient of the same condition.

The third focus of development, adopted by two small software companies (FI SP4; FI SP2), has been to develop service concepts where automated messages or voice calls deliver laboratory results, information on self-care and treatment, appointment reminders and other alarms and notifications to patients. The traditional service concept in these cases would have required the patient to travel to see the

doctor in person. Also in these cases the development has been based on 'novel work', as technology has only in recent years enabled such automatic functions.

Health care organisations

Also some of the health care organisations have initiated projects of service development at the early moment stage. Their approach to create new service forms has been to expand from the existing services, to design the services to be provided with the aid of mobile technology. The development of these new services has been about reproducing existing services to be available on mobile devices. Typical examples of initiatives by local health care organisations (FI LH1; FI LH3) that enable existing services on the mobile platform are those where community matrons or back-up on duty doctors as well as ambulance staff have remote access to the local patient record system with a laptop computer or on a smartphone. Through this access they are able to view or add information about the patient to the system. Another example of initiatives (FI LH2) relating to existing services is to enable appointment reservations by mobile phone, to be used in place of the traditional telephone calls for making a reservation. One care organisation (FI LH4) is still in the process of completing its project on mobile phone reminders for appointments.

Other efforts by health care organisations in service development have emphasised the ability of citizens to use mobile technology to care for themselves independently of professionals. These efforts have been based on the relatively recently introduced service form of online self-care account for citizens in one local gov-

ernment (FI LH3), which has been particularly active in furthering self-care in the municipality. The local government has previously provided an online platform where each citizen has an online self-care account for recording various data on health. In addition, they have established physical self-care stations at local health care centres, which enable citizens to make various vital signs measurements independently and to record those in their own account. More recent development work has made the online self-care accounts accessible also by mobile web, thereby bringing this work within the realm of mobile health.

6.3.3 Research activities

Research is an area where there has also been a considerable amount of early mobile health activity by some of the Finnish organisations. Much of the work, while making a contribution to mobile health knowledge, has had its focus on elsewhere, in a related area. Some of this work by incumbents and challengers has focused on mobile health specifically.

Incumbent type of organisations

Much of the incumbent research has been focused on broader topics than mobile health, but have nevertheless touched on or addressed mobile health issues. One example is the work by the aforementioned research centre (FI RO3). It was established to study mainly 'telehealth' and 'telemedicine', but what in a broader sense denotes 'remote care solutions', it has also investigated the use of information, and

particularly mobile, technology in health care. Another example of a mobile health related study was a report by a government installed working group (FI EC1) that considered the ethical issues in the use of new information technology in health care. A third mobile health related study was a review and analysis of the state of the data protection and privacy issues in the Finnish health care system, by a regulatory authority (FI DO1).

There have been also studies that have directly addressed mobile health. One such study, by a technology industry association (FI IA1), focused on the structure and development of the regulatory regimes for mobile health in Europe. Another study, by a health care service company (FI SS1), conducted a feasibility study on whether mobile phone can be used, and to what extent, for providing training and coaching for health and wellness. This study provided insights from experiments in England and elsewhere in Europe.

Challenger type of organisations

Also the challengers have conducted research into mobile health at this early moment stage – both directly and indirectly. In one study that focused directly on mobile health, a research organisation (FI RO1-1) aimed to measure and assess the impact of mobile technologies on the health of the patients. While also assessing the efforts to adopt these technologies, these research projects focused, as suggested already above, on diabetes, high blood pressure, and reduced mobility.

Other research at a slightly more distant level has looked at how the applications of mobile health have an impact on the management of care processes and how

markets are built in the area of mobile health. In one research project there were two cases where mobile phones were used by community matrons to record data during their visits to elderly patients in their homes. The principal focus of the researchers (FI RO2) was to investigate what implications did introducing this technology have on the management of those care teams, but the project also addressed various other important issues for mobile health, such as the adoption of mobile technology in the organisation, and the implementation of this technology into care processes.

Another research organisation (FI RO1-2) has completed a range of studies that have indirectly attended to mobile health issues, such as the business concepts and the creation of markets around mobile technology and health care and wellness. This broad programme of research, since the 1990's until 2010, has consisted of studies of business development in a mobile phone supported self-care programme for diabetes patients; the broader dynamics of health and wellness sector; market creation for a blood pressure self-management system; market creation for electronic prescriptions; and market creation for an orthopaedic distance consultation system. Thus, while the contribution of these studies has been primarily in uncovering the dynamics of market creation and business development, they have all used the emerging area of mobile health as case study.

OBSTACLES TO THE TECHNICAL MOBILE HEALTH EFFORTS

While the above account indicates that Finnish organisations have been keen to develop the objects of mobile health, i.e. the technology products, services and research outputs, there have been many challenges these efforts have faced and still continue to face. These extensive past and on-going challenges to the technology as well as business model and service development activities suggest that the technical effort has not been and is not able to accomplish the institutionalisation of mobile health.

6.3.4 Technical challenges

Incumbent type of organisations

The incumbent type of organisations have faced technical challenges at two levels, of which the first one concerns the more micro-level of device use. At an earlier stage, there were relatively simple technical problems, as one mobile device provider (FI DM2-1) respondent has described. In the mid-1990's there were network and device limitations that did not allow handling and sending of data in large quantities, i.e. to download, update and otherwise maintain sophisticated applications. According to a medical technology provider (FI DM1), still in 2000, transmitting large amounts of data, such as ECG images in real time, exceeded the capacity of the network. However, as network speeds increased, and new applications such as Java were introduced, these problems were overcome, which enabled for instance the proper use of their device for viewing patient record data online. As these hurdles for accessing and processing data on a single device have been sur-

passed, the current, on-going and somewhat more complicated concern is the interoperability of devices. There are many devices, and they employ a variety of technologies to function. A device manufacturer (FI DM2-2) respondent argued that the interoperability of devices is one of the big challenges, and a core task that the Continua Health Alliance, an international industry association with a broad membership from medical technology, mobile and telecommunication industries as well as the health care sector, is working to solve.

This proliferation of different types of devices is another practical technical challenge, from the point of view of managing a service, as described by a representative of a health management service provider (FI SS1). Even with the relatively high level of enthusiasm for technology in Finland, and despite the relative popularity of smart phones, a large segment of population does not have smart phones yet. According to this respondent, the company does consider it somewhat problematic that their mobile application based service requires a smart phone and thus will not cover a large part of the nation. In addition, in order for the service to be comprehensive, one needs to add phone options from the major platform manufacturers, i.e. the many Android based phones, the iPhone from Apple as well as the Windows phones. For this service provider (FI SS1), managing the large range of devices in their mobile service is one of the biggest challenges.

At a more macro-level of technical challenges is the issue of legacy problems of old systems. One government agency, involved in the national patient records archive project, found that the efforts to implement the new system architecture is hindered by these old and local systems:

"As someone said when the Soviet Union collapsed and they began to make health care reforms, it was easy to make changes in processes and systems as there was no old baggage that would hold them back... Maybe we still have some old systems…" (FI RO4)

At some level, any legacy system related technical problems are exacerbated in Finland, as the local government driven health care is quite fragmented. According to one government agency (FI DO1) representative who follows closely the health care sector, there are 4000 different health care data applications in Finland, "… *and by and large they do not talk to each other"* (FI DO1). But if integration between systems and applications has been challenging, one organisation's difficulties in integrating various systems within implies that technical integration is a genuine problem with any new technology. A large health IT-system provider (FI SP3) offers many applications as part of its platform, and according to the respondent from this company, they have frequently experienced numerous difficulties in integrating their new applications into they older systems.

Aside from integration, there are also interoperability problems between the old legacy systems and new devices across the health care sector. As a research organisation (FI RO3) respondent noted, one technical challenge is to ensure the same basic functionality with mobile devices as in the traditional methods. One basic feature in the traditional systems is that the system produces a log mark to denote that a patient has been given instructions by the care professional. Due to different messaging standards, it has not been possible so far to send that kind of a message from a mobile device that in the old system creates a log mark, which is one significant limitation in mobile device use.

While these views have implied the need and urgency for change, a longer perspective from a research organisation (FI RO3) representative reveals that current technical, and other, challenges are part of a reform process, which quite simply requires time to proceed gradually. Albeit some may find these current IT-systems wanting, important progress has been achieved in the last decade:

"In the last ten years the back office systems have been introduced into Finnish health care. These have required a great effort to put in place, but they are crucial in providing the background to the national patient record archive that is being created now. Within five years from now when they are completed, we will have resources again to start thinking how to make the shift to improve the customer interface. These things proceed in stages." (FI RO3)

Consequently, it is also part of the health care sector context that mobile health, in a certain sense, is forced to wait for its turn. A government agency (FI RO4) involved in the national health IT infrastructure project stated that mobile technology has had a limited role in these reforms. There have been no mobile applications on the agenda of this project, even if the services may be used with mobile phones de facto – the ePrescription service will involve text messages, and any online service may be accessed via mobile web. Nevertheless, this agency (FI RO4) representative stated that mobile technology has simply not been part of the discussions in this project. But neither has there been any executive decisions against such extensions. Furthermore, this information infrastructure will support potential wider use of mobile technology in health care in future, by structuring all patient data in digital format and in one archive.

Challenger type of organisations

Following the theme of strong focus on objects of mobile health, the main concern among many of the Finnish challenger type of organisations has been the diversity of available devices for mobile health solutions. There is a large variety of devices that may be used for mobile health, and within any device segment, there is also a broad variety. Mobile phones are a particularly poignant example, as already highlighted above in regards the incumbent organisations. As one of the small software developers (FI SP5) pointed out, different brands of mobile phones have different operating logics, as a result of their different operating systems. Thus, the first obvious challenge, particularly for small software developing firms with limited resources, is the need to write software that can function on the many different devices.

Even if some technologies have in principle been established as standards, these standards are often not reliable. Mobile phones ought to be configured by the manufacturer, so that all the standard functionality is enabled according to the established protocols. However, according to another software provider (FI SP2), in many occasions this is not the case. For example, the many varieties of phones using the Android operating system for example can have quite different configurations. For example, Bluetooth and Java are standardised applications, but because the manufacturers do not activate some of the features, each phone needs to be tested separately for all of these supposedly standard features.

Another software developer (FI SP1) noted that aside from mere functionality, in health care the challenge of managing this device diversity may also be a particularly serious problem from the perspective of data security requirements for mes-

saging. For another software developer (FI SP2), a related difficulty is that the entire solution, including the connected devices and applications, needs to be approved under the medical devices regulations, for which the solution then may be given the 'CE' mark for approval.

Along the way, some of the challenges these organisations have experienced have been more basic technical challenges with devices and solutions. As discussed with the incumbents, also challengers faced the early problems of technical capacity with mobile phones. One software developer (FI SP4) described how in the late 1990's and early 2000's the batteries of mobile phones would not last the whole day in heavy use, the GPS positioning did not work reliably, and mobile data was not yet available at large scale. All of these made the use of these devices difficult for example for community matrons needing to log information about patients on their home visits. However, technological advancement has removed these particular problems.

There have also been other types of technical problems with mobile phones, often related to process planning that was sometimes inadequate, and sometimes merely not knowledgeable enough of the features of the technology. In one case described by an educational organisation (FI EO1), the mobile phones they used in a home care project had pay-as-you-go sim cards, which ran out of credit from the data charges of sending the measured data daily as intended. Patients were instructed not to touch the phones, and then nobody knew why the messages with the measurement data would not be transferred, until somebody from the care organisation went to inspect the problem.

In other cases there were problems caused by software design. Some services relied on mobile phones having a constant online connection, but sometimes the connection would drop for various reasons. In one case the mobile phone that was used had a feature by which the Internet connection would be disconnected automatically after a certain time. In another case, the software of the phone would cause an incoming multimedia message cut the Internet connection, in order to receive the message. And in a third case, a version upgrade of the phone software caused the connection between the mobile phone and the measuring device to drop. Also, despite the painstaking integration and planning, at first the alarms from the devices nevertheless went to wrong places (FI EO1). Also other organisations (FI RO2; FI RO1-1) confirmed that despite extensive testing and development work in mobile health projects, these connectivity problems between the measurement devices, mobile devices and servers have been common. According to one of these organisations (FI RO2), these technical problems have, in consequence, generated resistance among the care professionals against the adoption of the devices.

Health care organisations

Also the care organisations have faced technical challenges, both at the device level, and at the back-end system level. First, as I already discussed in regards the challenger organisations, integrating mobile devices to function with these back office patient record systems has been technically difficult due to inconsistencies in device protocol configurations. One care provider (FI LH1) described that smartphones do not have automatically the standard protocols by which they can

be integrated with patient record systems. In order to provide doctors smartphone access to the patient record system, some additional development work had to be carried out. This provider (FI LH1) explained further that a related challenge has been the fast technical advancement in the development of devices. In some cases it has caused a situation where the phones that were tested for adoption are on the market for only a few months, after which they are no longer available to purchase, as new models have arrived. This has complicated planning for device roll-outs. If more devices are subsequently needed for staff, then either these will be different devices that are used in the organisation, or if uniformity is to be maintained, a whole new batch of devices need to be tested and purchased for all.

Another device-related technical challenge has been to adapt devices to user needs. One care provider (FI LH1) noted that in an emergency situation the device needs to provide an immediately accessible view of an ECG image for the doctor, instead of having to jump through various windows and stages. However, such functionality has not been available in the devices used by default, and therefore this has also required bespoke development work.

In addition to the challenges described above, there have also been more systemic technical complications, relating to the functionality of the back-end IT systems that manage information delivery to the mobile devices. A care provider (FI LH1) stated that one set of system problems has been random technical failures. In one early error event, the system began sending multiple identical messages, up to 30 of them. In another problem case there were advertising text messages that disrupted the system. Somehow the system began receiving such messages, and since

it was not used to being a recipient of messages, but only a sender, it ceased functioning. Eventually these technical problems were located and solved between the IT-systems of the telecommunications operator and the IT-system of the patient record provider.

There have also been more standard system problems. One care provider (FI LH3) complained about the slowness by which the network has transferred large data files. However, they noted, such problems tend to be corrected over time as network speeds improve. In another organisation (FI LH2) the integration between two systems caused the entire structure to slow down. When the application that is operated to send text messages to patients was separate from the back-end IT-system, the server would upload the data from one system to the other only once a day. Lack of real-time data upload caused overlap in reservations and confusion among the clients as well as staff. In their subsequent development stage they built the text messaging functionality into their current IT-system, which provided a much-needed real-time updates to the reservation system.

6.3.5 Challenges to business model and service concept development

Some organisations, of the incumbent and challenger groups, have reported also of difficulties related to the development of business and service concepts. Their concerns have been about who pays for mobile health, what the services cost and whether mobile health ought to be a business or a consumer oriented service.

Incumbent type of organisations

The poor commercial results in different periods display some of the persistent hurdles that have hindered the creation of the mobile health field. First, one mobile technology provider (FI DM2-1) recounted efforts to promote an application for diabetics in the mid-1990's. Aside from some technical difficulties, in their view the business model was not well enough thought out, and the sales attempts among the diabetes patients faced an unreceptive audience to such solutions. Another respondent from the same mobile technology provider organisation (FI DM2-2) argued that there still is, in 2011, a lack of clear business models in the area of mobile applications for health and wellness. Currently many more actors are involved, such as vendors of sensor devices, of various other mobile devices, as well as those providing related services like coaching. Yet, still no clear and convincing model exists to outline such details as who pays and how much, what is the supply chain, and how is the revenue shared.

Another business model related challenge has been that for newcomers to the health care field there may need to cope with dynamics that are different from those of their industry of origin. As one mobile technology provider (FI DM2-1) noted, selling technology to the health care sector in general is a B2B proposition, which makes it somewhat complicated for those providers that traditionally have had their focus on B2C markets. While the company (FI DM2-1) of this respondent is focused on B2C commerce, they are open to their application being adopted in the B2B side. But as a B2C company they are mainly interested in, and have put their efforts in, developing the consumer markets around health and wellness, and

specifically for the latter. And so far the business model has not been successful in the consumer market for mobile wellness applications.

Challenger type of organisations

Some of the challenger type of organisations have also had concerns about the business models in mobile health. One of the concerns, as described by one small software developer (FI SP5), has been to determine the specifics of the business model, such as who is the paying customer. Much like with the incumbent organisations described above, this organisation could see mobile health being either a B2B industry, B2C industry, or a combination of these two as a business to business to consumer (B2B2C) industry. So far they have not been able to reach clarity on this, which has made it difficult for them to determine pricing. The representative of this small software provider (FI SP5) explained:

"For example, if we have a service that comes with a device to measure movement, the service can not be all that expensive, because the device tends to be compared with a regular step-counter, and thus it needs to be carefully considered who bears the cost for the service and what they are willing to pay for it. At least in Finland at the moment, because this is a small market, it seems that there is little willingness to invest in anything like this, because the return on investment is uncertain and lengthy." (FI SP5)

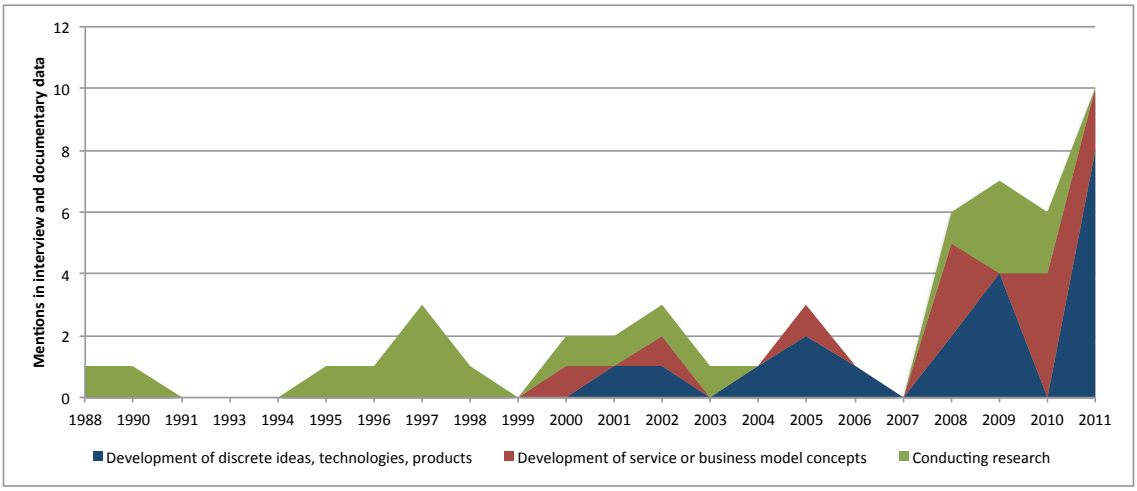
Service model development has been of concern for one Finnish challenger type of organisation, but in a manner that also highlights the general focus on technology. One research organisation (FI RO1-2) representative described how intentions to redefine and reconceptualise the service models have faced opposition among care providers and the local government officials responsible for local care provision.

As an epilogue to projects that have tested new technologies in health care processes there has been little patience to take time to reflect on the outcomes and for rethinking services. Rather, the counterparts of the researchers have attempted to gather quick insights from experiments and have swiftly moved onto new technical solutions. Thus, there have rarely been changes to service concepts that would correspond to the novel technological solutions.

6.3.6 Timeline of the technical efforts for mobile health

Graph 6.2 offers a somewhat clearer view of the *episodic* nature of mobile health development. In Finland, research on mobile technology use in health care has begun relatively early, with first studies already in the late 1980's. The graph shows clearly how research activity has taken place at four distinct periods. Likewise, organisations have developed technology also in four periods, starting in 2001. Thirdly, also service concept development displays a similar pattern in the graph, begun in 2000. While some of the other graphs show that activity has alternated, this graph implies that these activities have also often coincided. Thus, this data highlights two distinct perspectives to the episode argument: In the first perspective discrete activities, or ideas, to create mobile health have *alternated*. In the second perspective these activities and ideas may coincide, but they themselves may occur as waves, *reappearing* periodically, as in the graph 6.2.

GRAPH 6.2: DEVELOPMENT OF MOBILE HEALTH OBJECTS BY THE FINNISH RESPONDENT ORGANISATIONS



Sources: Interviews and organisational documents

6.4 CHAPTER SUMMARY AND CONCLUSION

I have described in this chapter the many technology related efforts by which organisations in England and Finland have tried to materialise ideas for mobile technology use in health care. The table 6.1 below provides a summary of the chapter's findings

Table 6.1: Summary of findings of mobile health technical efforts and obstacles

	INC England	CHA England	HCO England	INC Finland	CHA Finland	HCO Finland
Development of devices and applications	✔✔✔	✔✔	✔✔	✔✔✔	✔✔✔	✔✔
Development of business models and service concepts	✔✔	✔✔	✔✔	✔✔	✔✔✔	✔✔

Research on mobile health		✔✔		✔	✔✔✔	
Obstacles with development of devices and applications	✔✔	✔✔	✔	✔✔✔	✔✔✔	✔✔✔
Obstacles with development of business models and service concepts	✔✔	✔✔✔	✔✔	✔✔✔	✔✔✔	✔

INC – Incumbent organisations; CHA – Challenger organisations; HCO – Health care organisations, i.e. health care service providing organisations.
✔✔✔ = high frequency in data
✔✔ = medium frequency in data
✔ = low frequency in data

There are three main conclusions I draw from the findings in this chapter. First, there has been much technical type of effort at early moments. I have divided the efforts into three types, and there have been many technical efforts within these categories. In both countries, the early moments technical activities for mobile health have been about developing or adapting mobile devices for health care use, developing appropriate software applications, as well as about creating business models and service concepts that employ mobile devices. In addition, there has also been research, especially in Finland, on the efficacy of all of these technologies and business models and service concepts. In other words, institutional entrepreneurship consists at early moments of much technical endeavour, which is an extension to the currently predominantly cognitive substance of the arguments relating to this construct.

Second, in both cases, it is clear that these types of technical efforts are insufficient alone to achieve a high level of acceptance and adoption. In some cases small pilot

projects may lead to local adoption, but large-scale recognition and use have shown to be difficult. Efforts to extend the impact from any local implementations have failed. Overall, any technical efforts have been met with corresponding obstacles that the organisations and the practices and norms in the surrounding fields produce. As there is little evidence of the field of mobile health existing yet, it is the practices, organisations and technical elements of the source fields that generate this resistance.

Third, there is a fundamental uncertainty at this early moment stage about the objects of mobile health. It is unclear which technologies and technical applications present the most attractive, and thus likely to succeed, mobile health solution. Likewise, there is no broad consensus about which business models and which service concepts will be those that serve best in an area that is between two such different sectors as health care and telecommunications. The comments of respondents suggest that these uncertainties are difficult to solve only by focusing on technical or commercial considerations, but these dilemmas await resolution to come from another area of mobile health development. In the next chapter, I will describe the few efforts and the many obstacles in 'structural' types of efforts.

CHAPTER 7: THE BUILDING OF NEW AND THE IMPACT OF EXISTING INSTITUTIONAL STRUCTURES

7.1 INTRODUCTION

The two previous chapters – chapter five on mobile health ideas, and chapter six on the technical efforts around mobile health – have suggested that what makes mobile health difficult to understand is that there are too many dispersed ideas and activities about it that do not amount to a clear picture of useful functions, division of roles, most appropriate technical application and value creation. This current chapter on the 'structural' activities around mobile health swings the pendulum the other way, to expose an area where there is too little activity to construct the edifice.

Institutional scholarship has had a keen interest in studying the structural elements of social environments. Understanding the world through the structures that keep our behaviour in line is a core part of the 'identity' of this literature. Structures for institutional theory are for example the regulatory rules of an industry, as well as the social norms and the cognitive-cultural patterns in a society (Scott, 2008). Thus, in this worldview, institutionalised structures play a crucial role in enabling the society to function.

In this chapter I will describe 'structural' type of activities by which actors have attempted to put in place arrangements and systems that provide support to other mobile health related activities. In both country cases, there have been few of these activities, which thus provides another piece of evidence of the distinct and characteristic stage that is early moments. In other words, there are very few institutional

structures developed specifically for mobile health so far. At the same time, the institutional surroundings around the mobile health space, primarily consisting of health care and telecommunications sectors, is well developed. As a consequence, institutional entrepreneurs are facing a challenging institutional environment at early moments: on the one hand there is ambiguity due to lack of bespoke institutional structures; on the other they need to navigate the institutional arrangements in the surrounding or source fields. Most respondents have referred to this situation with some frustration, particularly as they have experienced the effects of the surrounding fields as obstructing their many efforts. Much of this chapter's discussion concentrates on the many structural elements of the source fields.

My conclusion here is that considering the few actions of structural support and the many obstacles to the construction of mobile health, early moments appears to be a phase when the impact of institutional structures on the efforts of institutional entrepreneurs is one of impediment rather than that of facilitation. In the area of institutional structures, at early moments there is little so far constructed that is specific to the new field, but as the actors of the field in development arrive from surrounding source fields, they bring with them adherence to their field structures, such as regulation or professional norms. These may impede the efforts of building the new field, which has been the case in mobile health. As a result, part of the task of institutional entrepreneurs at early moments, then, is to manage these impediments of the source fields. This then raises attention to the relationship between the efforts to construct the new field and the contextual conditions. Finally, this

chapter's timelines of mobile health activity show mixed support to the early moments as episodes –argument.

7.2 ENGLAND

STRUCTURAL EFFORTS TO BRING MOBILE TECHNOLOGY TO HEALTH CARE

Regarding the English organisations of this research, there is little to report for efforts to put in place structural elements of mobile health. Only a few organisational units have been founded by challenger organisations. No mobile health regulations have been created in England, albeit that the current regulatory framework in health care was noted to be permissive, with the effect that remote care solutions are not prohibited.

7.2.1 Founding of organisational units for mobile health

Challenger type of organisations

There have been few activities that have contributed institutional structures to mobile health. One of these few activities has been the founding of new organisational units for mobile health purposes. Among the English organisations in this study, only challenger type of organisations founded organisational units, while the incumbent or health care technology user organisations have not established any such organisational units. As an example of the commitment of some of the challenger organisations to the new subject, a technology industry association (EN

IA2) founded a dedicated programme of mobile health with staff, funding, and a strategic plan, with the goal of advancing mobile technology adoption in health care. One of the tasks of the programme was to investigate how mobile technology could support health care professionals to deliver services for less cost, with better efficacy and with increased access for individuals. From the perspective of industries that manufacture products of mobile technology, another particular interest was to study how to achieve scale and sustainability with mobile solutions in health care.

The problem of scale and sustainability of new solutions was also behind another new organisational entity, a collective focused on mobile health. Described by a representative of a research organisation (EN EO1), a founding member, this new collective is an association where a broad range of local and regional organisations have come together with a common interest in advancing the integration of mobile technology and telecommunications, medical technology and health care services. Included in the coalition are health care organisations such as hospitals, GP practices and the Clinical Commissioning Groups, businesses and industry associations, various departments of the University, both from research and teaching, and finally a number of intermediary organisations, such as a law firm and innovation promotion agencies. The breadth of the group, with all critical functions represented, is intended to offer better success of overcoming any obstacles to implementation of mobile health.

7.2.2 Creating a permissive regulatory framework

Incumbents type of organisations

There have been no regulations specific to mobile health in England. However, it was mentioned by two incumbent type of organisations (EN IA1; EN MI1) that the current regulatory regime for health care is permissive: the English law for health care does not prohibit care to be delivered remotely, and thus, in principle, does not preclude mobile health. As described by an industry association (EN IA1) representative, there indeed is a comparatively long tradition of remote care in England, where the legal framework has been permissive already for many years. One of the stipulations of this permissive framework is for example not to insist that the doctor and the patient need to be in the same location, but that patients can be treated at a distance. Such legislation then allows for care solutions such as mobile health, which would either involve doctor's care from a distance, or patient's self care. At the same time, there has been no state regulatory activity that would enforce or motivate the use of mobile technology in health care.

OBSTACLES TO THE STRUCTURAL MOBILE HEALTH EFFORTS

There has been a variety of challenges to the work of constructing mobile health from the existing institutionalised arrangements in source fields, whether structural forms or patterns of behaviour. Respondents commented on regulatory, data protection, procurement, political and attitude related obstacles or hindrances to their efforts. Thus from the institutional perspective the greater effect on the

emerging mobile health field has come from the existing arrangements as barriers rather than any new efforts to support the nascent field.

7.2.3 Regulatory obstacles

Incumbent type of organisations

While the legislation guiding care allows for forms of remote care, as described above, it has been other forms of regulation, and particularly the uncertainty due to the lack of regulation, that has inhibited the development of mobile health. In fact, in the view of one technology provider (EN SP2) this should be expected:

"So is the physician liable if something goes wrong, or is the mobile network operator liable… or is the user ultimately responsible? That is uncertainty, and that is something you sometimes face in emerging new markets. By definition, if something is emerging, not all the regulations and rules are yet in place." (EN SP2)

The regulatory sphere of medical devices in regards mobile technology appears somewhat unclear for the mobile telecommunications industry organisations, which is illustrated by the respondents' tendency to discuss the regulatory landscape with questions, as in the quote above. One of the basic issues for technology providers is uncertainty about the extent of their liability in situations of error.

There is also ambiguity related to professional conduct and mobile health development. One of the new trends in health care is the personal health records market, in which issues of liability and regulation are still somewhat open. According

to an industry association (EN IA1) representative, there may be aspiration for people to monitor their own health with personal records, but there is no standard method for clinicians to access them. Furthermore, there are no professional standards of conduct by which clinicians could be assured of the accuracy of the data, and how to make use of it.

Challenger type of organisations

Also the challenger type of organisations have perceived considerable regulatory uncertainty. One of these uncertainties derives from having two industries or sectors amalgamating in mobile health. An industry association (EN IA2) respondent noted that the telecommunications industry and the health care sector have vastly different regulatory regimes and aims. As a result, on both sides there is a limited understanding of both the more specific regulations as well as the broader principles of the opposite industry or sector.

''Mobile has historically mainly been targeting directly consumers, and they are very well versed in setting up consumer facing products and developing business models for that. But the health care world is a little bit more complex. When the person who pays is not the person who benefits or is the ultimate user of that service…. Again, the mobile industry is used to services where you develop it and sell it en masse to grander population, and that is just not the way health care solutions work.'' (EN IA2)

So whereas the telecommunications industry, and particularly the mobile devices industry, is focused on the consumers, health care organisations treat patients but conduct business affairs with other organisations.

''So if you go to the NHS, it is an NHS Trust to another NHS Trust, provider to the commissioner. It is not to the consumer. The consumer has got no choice in here, although the policy is developing some choice, but it is very limited choice in the context of the whole market. And it is certainly not economic choice either. You are constrained by who you go to.'' (EN LF1)

Aside from the customers, there is a fundamental difference of priorities between health care and telecommunications, according to an industry association (EN IA2) respondent. The priorities of health care are in patient safety and data privacy, whereas the telecommunications industry is focused on the financial viability of the industry and technological advancement. Yet, two respondents (EN LF1; EN TP1) noted that even if there is extensive regulation in the health care sector for the more traditional forms of care, there appears to be no specific regulation in England, nor in EU, regarding electronic health. Thus any efforts of promoting mobile health need to accommodate for the current regulatory approaches, and particularly for those of health care, even if lacking in specific guidance.

7.2.4 Data protection and privacy challenges

Incumbent type of organisations

One of the difficult issues related to mobile health, as perceived by these incumbents, is data protection and privacy issues. On the one hand a study conducted in the UK and the US by a consultancy (EN CO2) revealed that consumers would value the ability to share data with their care providers, as long as the data would be secure and kept private. A government agency (EN MI1) respondent also confirmed

that these are sensitive issues. They require careful planning in regards how data is transferred between organisations and patients, and at the moment no definitive guidelines have been put in place for mobile technology use. There are already large amounts of citizen and patient data gathered in health and various other public services, but these issues may become even more sensitive going forward with mobile use, as there is likely to be an increase in the amount of transferred data.

From a technology perspective, there are new solutions that are being explored. A consultancy (EN CO2) respondent recalled an initiative in Denmark, begun by a pharmaceutical company, to create a "*trusted third party*" to handle any patient data collected by non-public organisations. The data is then blinded to enable data mining, for research and other legitimate purposes across the health care ecosystem. This is an alternative approach to the more common data encryption at source, which requires sophisticated technical capability. England has not instituted this type of a solution – although one respondent of this research, EN SP3, has been rolling out such a solution with some success - and thus several respondents referred to the issue of 'patient consent' as somewhat problematic.

One approach has been to try to disregard the issue of data security and data protection. One professional association (EN PA1) respondent, in evident frustration of the complexity of the matter, complained that data security and data protection is an issue that tends to "*take over everything*" and block development. The interview respondent noted that in their development groups these topics are barred from being discussed:

"What we are talking about is the job in hand…. Somehow this business of data protection and consent and all the rest of it just has to be nailed. I know it is important, but not as important as they all say." (EN PA1)

7.2.5 Complexities of procurement in the health care sector

Challenger type of organisations

The institutionalised practices in health care procurement have appeared as obstacles as some of the challenger organisations have tried to introduce mobile health solutions. According to an innovation promotion agency (EN IP2) respondent, even for technology that has an evidence base there are aspects in the current procurement regime that pose a genuine barrier to implementation. One problematic area in the procurement regime for the introduction of new technology solutions is the centrality of cost. Much of the procurement is based on decisions strictly on 'cost' considerations, as opposed to more holistic considerations of 'best value', and that poses a challenge to attempts to promote and sell new technology. In this approach the new technology is assessed only by looking at the immediate cost, instead of taking into account a wide set of implications that it may have. As a consultancy (EN CO1) representative noted, since new technology often has related costs as a result of training of staff and rearranging of complementary functions, a narrow cost view tends to make the promotion of new technology particularly challenging.

Furthermore, how costs and benefits are distributed also makes it more difficult to sell new technology to NHS organisations. A consultancy (EN CO1) respondent explained that in many cases at the NHS – that has a relatively centralised structure as I have discussed in chapter four - the benefit of a new solution is gained by a different budget holder than the one that is responsible for the cost of the solution. As a result, the overall benefits are more difficult to account for and consequently this structure offers little support for the adoption of a solution on a broader scale.

Also, more closely related to mobile health type of technology and cost, the financial incentives for the provision of services do not support the adoption of self-care type of technology. This consultancy (EN CO1) representative pointed out that the provision of health care services is built around service events, and their funding arrangements reflect this. How services are paid for can make it disadvantageous for health care professionals and organisations, as well as individuals, to adopt new solutions. As described by this consultant and a long time veteran of the health services:

"There are about a million people in this country on long term anticoagulation therapy, but there are only about 18.000 of these monitors being used by individuals. …. What is the reason for that? There is a cost implication, but it is relatively small. … The doctors I have talked to estimate that about 30% of that population would be capable of self-monitoring…. More to the point, every time you go to the hospital to get a blood test, the hospital gets a payment. And there is no real incentive for the hospital to promote the use of these machines." (EN CO1)

Another feature of health care procurement at the English NHS is that there are many organisations involved and they are poorly interconnected, and this is an impediment to the efforts to introduce mobile health. Respondent from an innova-

tion promotion agency (EN IP1) described that even when one has overcome the formal obligations to qualify for procurement in the NHS, and has provided the necessary evidence regarding positive health or financial outcomes and fulfilled the data protection requirements, there may be difficulties to scale the solution to other organisations within the NHS. Spreading new solutions to other parts of the large organisation is difficult, as a consequence of the high number of organisations involved and the overall complexity of the NHS. Another aspect is, as an innovation promotion agency (EN IP2) respondent described, that due to lack of a uniform adoption regime the same steps may need to be repeated in the next client organisation again, which for technology suppliers means the need to have significant resources to direct marketing at these many organisations. On the other hand, as noted by a respondent from a law firm (EN LF1) who is familiar with the sector, the complexity is an unavoidable result of the diversity of functions:

"And health is not one industry. We say internally in our training it might be 30 industries… You mean for policy makers and government officials? I do not think they understand the complexity of health care delivery. And I am not criticising them, because to some extent cancer services are totally different to a diabetes service." (EN LF1)

The poor interconnectivity between the parts of the health care system is evident also in internal efforts to improve services across the board. An industry consultant (EN CO1) has described the NHS as well able to generate new ideas on its own, and that there are people who can create new solutions for care, but that it is not well suited for spreading these good ideas and new practices. Evidence of the seriousness of the problem of large size and poor adoption is that, until now, there

have been many organisations under the NHS tasked with the mitigation of this lack of a uniform adoption regime. Their role has been to aid with the processes of technology and other innovation adoption. However, as noted by a respondent from an innovation promotion agency (EN IP1), the harmfulness of this situation has been recognised at the top levels of the NHS and political leadership, and consequently there have been recent proposals to focus the resources to a fewer number of better resourced organisations. Fewer organisations, with better resources, could also alleviate the challenges of implementing new technologies and services that originate outside the NHS.

Lastly, for novel solutions that have been approved in the NHS for adoption, one large hurdle from existing institutional arrangements is the implementation at the level of single organisations. Novel solutions, whether technologies or services, are not implemented in isolation but they need the re-design or re-arrangement of the various complementary functions that are part of or relate to care pathways. Representative of another innovation promotion agency (EN IP2) explained that depending on the technology, at the very least clinical pathways may need to be reset, staff may need to be trained, and patients are likely to also require some education. Furthermore, proposals for new solutions tend to face another complication at the level of attitudes. According to an innovation promotion agent (EN IP2), who advises organisations wishing to supply new technological products and services to NHS organisations, new solutions are confronted by 'not-invented-here' - syndrome. It is a response that this technological solution does not suit our organisation or it does not fit our situation, because we are different. According to this

respondent, independent pilot projects, such as those of mobile health that require broader thinking of how to re-arrange services, are "*…fertile ground for such reactions*" (EN IP2).

7.2.6 Constraints from national politics

Challenger and health care organisations

Some of the organisations have perceived also various political constraints, which as existing institutional arrangements have hindered the introduction of novel solutions to health care. One national level challenge has been the lack of political leadership in regards new technology. A law firm (EN LF1) respondent suggested that the introduction of new technology and its associated changes to practices and roles in health care requires leadership. The importance and sensitivity of the health care sector nationally and politically places some of the responsibility on the political leadership to provide guidance and decision-making. However, this respondent noted that strong leadership to encourage the adoption of new technology appears to be lacking in England. This lack of change leadership has allowed an environment to develop where there is resistance to any unfamiliar solutions to health care sector's problems.

Another constraint that has become institutionalised in the political system is the public sector austerity programme. The government's aim is to improve the nation's finances through public sector reforms, which have been operationalized as

a requirement for 20 billion pound savings, or 20% of the budget, over the next few years overall in the NHS (Campbell and Meikle, 2011; Appleby et al., 2013;). In one industry consultant's (EN CO1) view the impact of this savings programme is not yet clear, but in their view there are two possible but opposite consequences this savings programme may have in relation to mobile health initiatives. It may either arrest any willingness to invest in new technology, or it may encourage investment into solutions that potentially result in lower costs for the health service. At the time of data collection, there has been no clear indication for this respondent, which will be the more likely outcome.

For one of the health care organisations (EN SH1) the outcome of these public sector cuts to funding has been quite clear. In their view, the cuts have forced many of the third sector service organisations to either reduce or cancel entirely some of their services. Consequently, in some cases these cuts have deterred the adoption of mobile health services, while in others they have resulted in the withdrawal of existing mobile health services.

Another institutional constraint for health care organisations has been their dependence on political oversight, which has prevented them from pursuing freely mobile health as a solution. Two health information providers (EN NH1-2; EN NH2) both found that they were hindered by departmental or ministerial guidance, in two ways. First, in some cases this meant that their hands were tied by what the ministers would want to seem to be doing, as opposed to the plans and the interests of the organisation's own leadership. Second, both of these organisations were constrained by the upcoming end to their service contracts. As a result, they have

not been able to initiate any new services or to develop further existing ones, including those that involve mobile technology. This has been particularly visible in regards mobile services, as the technology has been advancing at a rapid pace in recent years, but these organisations have had to forego some of this advancement.

7.2.7 Attitudes towards technology

Challenger type of organisations

One social institution that appears to be obstructing the adoption of novel technology solutions in the English NHS is the hesitant attitude towards technology. Reported by a technology promotion specialist (EN TP1) to be a persistent feature of public health care, I consider this to be an institutional obstacle in line with the other aspects described above. In their view, while there is general openness towards the use of technology to assist us in everyday tasks, there is a lack of 'pull' for technology as a solution, either from health care organisations or health care professionals. Within health care there appears to be a tendency to search for people based solutions, rather than ones that are technology based, as described by an innovation promotion respondent:

''If your average commissioner or your average senior manager in health care, in public health care organisation, will have a list of potential solutions, on the list of 1-10 I would say that 8 out of those would be people based solutions. These would be changing the way you deliver services, changing clinical pathways, changing how you manage demand…. Without technology being at the core of the solution, if that makes sense. It does not seem to be a natural choice.'' (EN IP1)

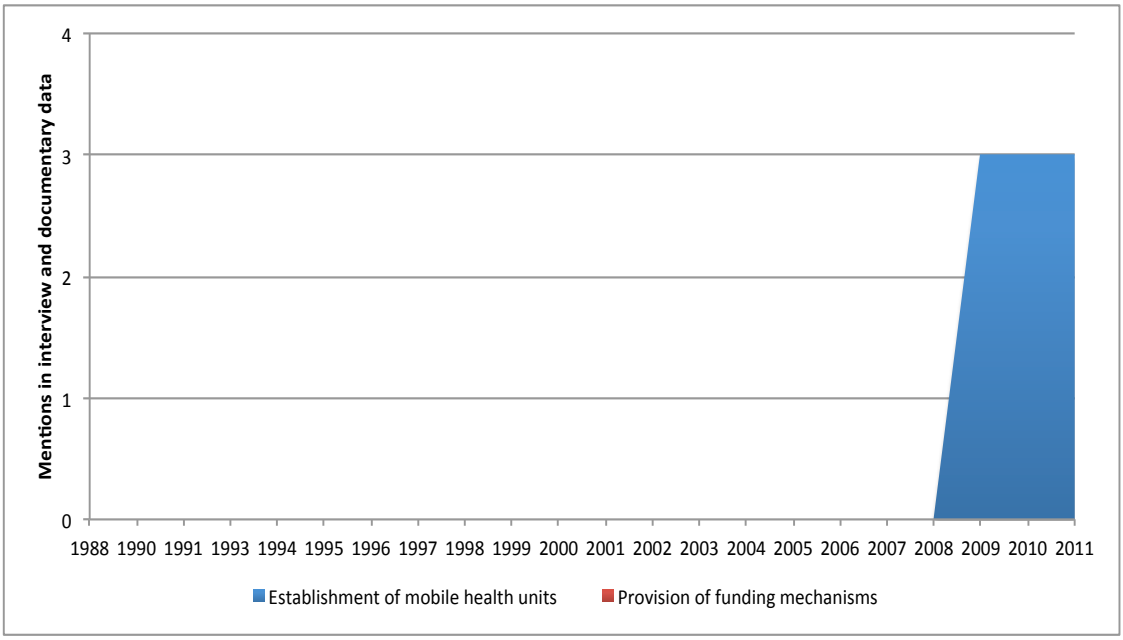
This attitude sets any technical solutions at an immediate disadvantage, and it also means that any pull for technology from the health service is missing. This "*lack of natural desire to look to technology as an integrated part of a solution*" (EN IP1) emanates from the sense of uncertainty towards any technology that is new, and from the unfamiliarity with technologies in general, in a sector where the role of human intervention has traditionally been dominant, and where patient security requires the minimisation of risks. A consultant (EN CO1) confirmed this by noting that the extent to which these devices are used in health care has been limited, largely due to this type of attitude towards technology within health care sector. This stands in contrast to a general trend of increased use of digital or mobile devices for everyday tasks by the general public, also noted by a technology promotion specialist (EN TP1).

7.2.8 Timeline of the structural efforts for mobile health

Graph 7.1 depicts the available time-stamped data on the structures that have been implemented by these organisations in England. Only three events per year for 2009-2011 are recorded in this respect, where organisations have set up mobile health related business units. Due to the scarcity of the data the graph makes a scant contribution to the temporal argument of episodes. However, the graph supports the textual account above that so far there has been little effort to put in place regulatory or other structural features. The graph also shows that any efforts

to put in place mobile health structures has been very recent, despite the availability of mobile technology already in the 1990's.

GRAPH 7.1: ACTIVITIES BY THE ENGLISH RESPONDENT ORGANISATIONS TO IMPLEMENT INSTITUTIONAL STRUCTURES FOR MOBILE HEALTH



Source: Interviews and organisational documents

7.3 FINLAND

STRUCTURAL EFFORTS TO BRING MOBILE TECHNOLOGY TO HEALTH CARE

Much like in England, in Finland there has been little activity among these organisations to create structural elements that would support the nascent mobile health field. There have been some organisational units established and some funding programmes have made project financing available for mobile health related initiatives. Compared with England, the overall level of the efforts in Finland has been somewhat higher, but nevertheless meagre. As in England, the regulatory framework in Finland has been permissive, allowing for forms of remote care, but there have been no directives to specifically support mobile health. Furthermore, the large-scale national effort to improve the information infrastructure in health care has not explicitly included mobile technology, even if the new services may be available through mobile web.

7.3.1 Establishing organisational units

Incumbent type of organisations

Also in Finland there have been relatively few activities at the early moment stage where actors have sought to construct institutional structures to support mobile

health. As in England, among these few activities in Finland has been the founding of new organisational units, by incumbent type of organisations. One example is a unit founded already in 1998 as a working group of broad membership to discuss and investigate issues of health care and data protection, organised by a regulatory agency (FI DO1). Mobile and other telecommunications technology has been frequently on the agenda, through topics such as radio frequency technologies in mobile technology, that include RFID (radio frequency identification) and NFC (near-field communication), and data protection. And as data protection is particularly sensitive in health care, mobile technology and health care has continued to be an important topic.

Entire organisations have been founded in this area as well. A large pharmaceutical company established in the early 2000's a subsidiary company (FI SS1) to provide solutions for improving chronic care management. While the original concept employed nurses and doctors who would contact patients by a landline telephone, a current and more advanced concept employs mobile technology to support patients to manage their long-term illnesses.

Challenges type of organisations

Among the challenger type of organisations new technology firms as well as research organisations have been founded for mobile health. Three software firms (FI SP1; FI SP4; FI SP5) were founded specifically with the aim of taking advantage of the rapidly developing mobile technology, while one was founded to utilise a broader range of information and communication technologies (FI SP2). Another

new organisation has been a research centre (FI RO3) that was founded by a university to investigate the use of technologies in remote care. As part of its remit, the centre has investigated also the use of telecommunications technology in care processes. The research centre has published a number of studies in recent years on the use of telecommunications technology in health care, under the labels of 'telehealth' and 'telemedicine'.

7.3.2 Providing funding

Incumbent type of organisations

Other activity of structural effect has been the provision of funding. Early mobile health has benefited from funding mechanisms that have been made available by some of the incumbent type of organisations. These mechanisms have not been directly targeted at mobile health, but their broad framing has allowed financial support to projects on mobile technology and health care. According to their representative, one funding organisation (FI IF1) has had funding programmes since the mid-1990's that have provided funds for initiatives in a broad category of information technology and health care. These programmes have funded many projects over the years that have focused on mobile technology solutions for health care. An additional form of funding by this agency has been its participation in an international 'Ambient Assisted Living' funding programme, which has made additional funding available for projects on mobile solutions that are embedded in the home environment.

Other funding for mobile health projects has been available through ministerial (FI MI1) programmes aiming to improve the basic public service information infrastructure. Digital public services have been one typical topic in the many local, regional and national projects. These projects have not directly addressed mobile phones, but have been and are providing the basic platform for electronic services, making them thus accessible also by mobile web. One example of the funded projects that indirectly is contributing to establishing mobile health as a service form is a large national project, funded by the Ministry of Health and Ministry of Finance. This project, still under way, is establishing a national archive for electronic patient records. The project does not directly aim to provide mobile health services, but through the ePrescription service and the eView service, patients will be able to use mobile phones to access services. They may receive information of prescriptions by text message, and they will be able to view their electronic health records by mobile web.

7.3.3 Regulatory activity

In Finland, much like in England, there has been no bespoke legislation for mobile health or even electronic health. Instead, related legislation regulating health care has been written to be non-restrictive, as explained by a respondent of a ministry (FI MI1). This legislation allows for care to be administered remotely, by using various suitable technologies. Thus the legislation remains somewhat agnostic about the use of any specific technology – and necessarily so, emphasized by the ministry

respondent (FI MI1), as in their view their position is not to endorse any specific technology.

As is evident, there have not been many activities that would put in place structures with institutional effects, i.e. effects that would direct behaviour towards mobile health. Instead, there have been many institutional structures that have been perceived as challenges by these organisations.

OBSTACLES TO THE STRUCTURAL MOBILE HEALTH EFFORTS

Also the Finnish organisations have perceived a variety of barriers from the existing institutionalised arrangements to the work of constructing mobile health, whether structural forms or patterns of behaviour. There have been technical, regulatory and organisational structures, as well as institutionalised patterns of social activity and relations, that have hindered mobile health development.

7.3.4 Technical structures as obstacles to mobile health development

Incumbent type of organisations

One of the institutional structures that has been blocking the arrival of mobile health is the technical infrastructure for health care in Finland. The core difficulty that the technical infrastructure poses for mobile health initiatives is the professional orientation in the whole philosophy of record keeping and IT-system use. As

the arrival of mobile health claims to disentangle place and care, with a more prominent role for patients, the current technical arrangements are not configured to support such a model of care. Health care is vitally dependent on the affordances and constraints of its IT-systems, and, according to a central government (FI MI1) representative, at the moment these systems appear to serve more the organisation than the individual. In their view, attempts to convert health care provision to involve patients will continue to face difficulties as the systems support poorly patient oriented thinking.

"Undeniably, we are still in the beginning, as really none of our systems support well [patient use of their data]*.... Health care IT-systems serve now health care operations, they serve the professionals. A little bit the idea that if we record there data about the patient, we are not really recording data about the patient, but about the care we have given. It is an instrument for documenting our own work... This thinking is quite dominant that the information is not there for the patient's best, but for our purpose. To begin with, data is categorised in these systems by organisation, and it is very difficult for me to find all the data about me. It is much easier for the hospital X to find all data about itself."* (FI MI1)

In their (FI MI1) view, this architectural characteristic impedes the patient's monitoring and use of collected data for maintaining their own health. Efficient patient use of data would require reorganising the data, towards which the new national patient record archive, described more in detail in the background chapter four, is a significant step. One of the impacts of this new data infrastructure is to collect the data in a repository and to detach it from the organisation where it was generated. But, this respondent argued, in broader health care politics the idea that the citizen owns the data is still relatively foreign, as is evident from the statements below.

Health care organisations

Also the health care organisations have noted how the current health care IT-system infrastructure is very much oriented towards serving the professionals. A doctor in a secondary care organisation (FI LH4) also commented that the patient record systems accommodate poorly any overall patient access to data. They described how some of these systems allow for some level of integration with patient self-care applications, but with only limited functionality, such as the ability of the patient to read text in the record written by a care professional. In the view of this doctor, these applications should include, but are still lacking, a decision support function which would enable the patient to use the system and the data about themselves interactively for their own care. A related technical aspect is that the patient records are currently structured in such a way that reading them tends to require a large display. It is not feasible for the data to be read on a small screen, such as that of a mobile phone or a tablet computer. Moreover, producing the data on such a display requires plenty of processing power, which the smaller devices tend not to have.

Another aspect of technical structures that has impeded the uptake of new solutions is that the back-office IT-systems have been closed to the challenger firms. This has been noted by both incumbent and challenger organisations. A government agency (FI RO4) respondent has observed that small entrepreneurs have real difficulty to integrate their mobile solutions to the existing hospital back-office systems. The providers of the back-office systems have a business interest to prevent the smaller providers of mobile applications integrating into their systems. In one case, a large IT-system provider argued that if they opened access to their sys-

tem for another software provider's mobile application, they would not be able to guarantee the validity of the data anymore. In this case the health care organisation abandoned plans to add this mobile application, which some time later was provided by the same back-office system provider nevertheless. Even if the integration in principle should have been possible by standardised protocols, it was not possible without the back-office provider's support, due to the specific, case-by-case adjustments and modifications that always need to be made.

Challenger type of organisations

Some of the challenger organisations confirmed the above statement, namely that they have not been able to integrate their solutions to the existing infrastructure systems in hospitals and other care organisations. Two small software providers (FI SP4; FI SP1) explained that proper mainstreaming of their mobile solutions would require that their applications are integrated with the back-office IT-systems. However, they have not been able to gain access to the system interface of the large IT-systems, which the large, established IT-providers control. As a result, the small producers are forced to sell "*point-to-point, one-off solutions*", in the words of one of these providers (FI SP4), that then fail to gain high level of use and broad visibility.

One of these software providers (FI SP1) noted, however, that the large providers face the same situation at an international level. In a similar manner, the large IT-providers have been unable to accomplish the technical integration, as the local providers have withheld access to the system interface. Each country seems to

have highly mature markets in health care IT, with remarkably stable positions that are not easily changed. Since sunk costs in health care IT are prohibitively high, new players find it very difficult to win contracts and replace the old providers.

7.3.5 Regulatory structures as obstacles to mobile health development

Incumbent type of organisations

As noted at the beginning of this chapter and at the beginning of the section on the Finnish case, there has been little regulatory activity. However, interviewees from several organisations have claimed that the existing regulatory framework in health care, with its ambiguities toward mobile devices, is inhibiting the development of mobile health. Some respondents (FI DM2-1; FI DM2-2) from an incumbent device manufacturer organisation have perceived mobile health to be held back by regulatory uncertainty. For them the basic question is whether mobile applications or services, and even mobile phones, are considered medical devices under regulatory definitions. In their view regulations on medical devices are not entirely clear, and there has been little consistency in judgements concerning when services and applications fall or do not fall under this regime. At the moment, the vague application of these regulations sustains a grey area in the context of mobile health, which particularly the larger technology companies consider very harmful for planning their activities.

Challenger type of organisations

The challenger type of organisations, on the other hand, have been concerned with the tightening of the regulatory and policy requirements that affect mobile technology use in health care. Recent decision by the European regulatory authorities have made all new devices introduced into health care subject to a regulatory approval, as denoted by the 'CE' label. According to one software provider (FI SP2), the approval requires an in-depth knowledge of the complex regulatory system and its specific provisions, and therefore obtaining this approval is difficult and costly. In addition to regulatory approval, another software company (FI SP1) has noted that at a more local level it has also become more difficult to include new technology related services within the reimbursement regime. The eligibility rules of different classes of patients have been tightened, in order to reduce the cost of care. At the same time, the regime has been kept tight by not including new, more technologically advanced medical devices or medication. Nor has the regime been opened to include any new providers of care, as noted by one educational organisation (FI EO1) that considered itself to have the knowledge and capacity for this role.

Health care organisations

Health care organisations provided other perspectives of how the current regulatory framework hinders the taking of full advantage of mobile enabled care services. Data protection legislation places restrictions on the communication of health data. This is particularly significant as the most important added value of

mobile technology is precisely to facilitate the transfer of data. As a doctor respondent from one health care organisation (FI LH4) noted, at the most simple level patients may be keen to send data by email or text messages to their doctor, and indeed this doctor recalled some cases where such emails were sent. However, according to the current data protection legislation, such a practice, if using unencrypted messages, is illegal.

In other cases mobile use in care practices may not be illegal, but only restricted by regulations. A care organisation (FI LH2) that regularly communicates with their patients has adopted an approach that, due to the data protection laws, any messages must be only very general in their wording. The respondent of the organisation provided an analogy in which their text messages to patients are like an open postcard, which only states the request to come for a visit, the date and the name of the care organisation - but not the name of the clinic or department that has sent the message nor the reason for the appointment. The respondent emphasized that the data protection law does not prohibit but only places conditions on health data transmission. However, according to the respondent, they have appeared as complications to potential patients or care professionals, and thus increased the resistance to mobile enabled services.

At a more systemic level, the regulatory requirements had earlier also a conflict with the broader telecommunications messaging infrastructure, thereby complicating the use of mobile devices in health care. As described by one care provider (FI LH1), data protection regulations stipulate how patient data is to be handled, and that it must at all times be secured by security protocols. As a consequence,

these regulations require that data can be located at all times, in order to ensure it remains secured. However, until recently, it was not known in advance which mobile network base tower a message will use to reach its destination, as this may depend on other traffic. In order to comply with the regulations, it was necessary to put in place certain additional mechanisms which determine the route by which the data travels in the network, thereby ensuring the security of the data at all times. Thus, while this issue has since been resolved with the implementation of more advanced network technology, earlier years of mobile technology use in health care was complicated by this clash of regulatory requirements and technical capacity.

7.3.6 Organisational structures as obstacles to mobile health development

Incentive structures in health care organisations is another example of how current forms of organising do not support care by mobile technology. According to a government official (FI MI1), one complication in current health care from the perspective of new care solutions is the strategic purpose of care organisations themselves, which does not reward patient independence. Whether reflected in the salary incentives of a single doctor or in the functions of a single health care organisation, health care is organised at the moment with the aim to receive and process large numbers of sick people - as opposed to trying to prevent them from coming to be processed. These misguided system incentives then also hinder moves to as-

sign more responsibility to patients, i.e. to keep them away from care organisations and to encourage more self-care with the help of new technologies.

At the level of national organising, decentralisation of health care under local government jurisdiction has been a feature that has complicated efforts to implement care reforms that include novel technical solutions. In chapter four I have already described how first initiatives to unite regional patient record systems into a national system failed due to differences between the various local systems. Another aspect is the resources available at local units for the needed development work. A government agency (FI RO4) respondent noted that health care being the responsibility of local governments means that any development towards new forms of service is highly dependent on the resources available in those units. Many local governments are small, and consequently the resources for developing new care services are bound to be very limited.

"A small town health care centre, with one part time IT-person, is not going to be able to develop mobile services for their customers." (FI RO4)

This was confirmed by a provider of technology systems for hospitals (FI DM1), who explained that some health care units in more remote areas may employ only one or two intensive care doctors, who are always on call. They are perhaps coping with the demand for now, but their scant resources limit any significant amount of work that a transformation of the current models of care would involve.

The fragmentation of patient data and organisational silos are another aspect of how care is currently organised, which could benefit from mobile technology, but

so far has only retarded development towards its use. In health care services, which often require cooperation across organisational boundaries, the "silos" or boundaries between organisations tend to hinder exchange of information. Representatives from a regulatory agency (FI DO1) and a technology provider (FI DM1) both observed that there is a fragmentation of patient data, particularly between primary and secondary care, where their aims are aligned but boundaries exist. While the national patient record archive project ought to be an improvement in this, the project has exposed the difficulty of finding agreement between organisations. Deciding the content of the different service messages, for example, has been slow due to the complexity of the processes, varying organisational interests and the inflexibility of the current service system.

Some other challengers have noted that there is a culture of local and independent solutions in the Finnish health care sector, largely due to the local government dominance over health care provision.

''There is a culture here that we make it ourselves, from start to finish, and that creates these silo-type of solutions.'' (FI IF2)

One technology provider explained that as these local and regional entities decide independently on their IT-systems, it has the effect of creating rather fragmented procurement markets for technology providers (FI SP1).

Another organising type of obstacle to mobile health efforts has been the procurement process in health care organisations. Selling new systems to the health care sector is considered to be difficult and to take a long time. According to one tech-

nology provider (FI DM1) the minimum time for such a sale to process through is three years. At first, one needs to put effort into creating the market demand, i.e. to create some level of "hype" around the new solution. Then the client organisations need to realise that this is useful for them, and make budget plans for it for the following year. After budget approval there will be negotiations with the provider, the actual sale, and planning of the implementation in the third year. The more invasive the solution is, the more likely it will have a significant impact on the care pathways and in other processes throughout the organisation. Consequently, it will take more time for a procurement decision to be processed.

7.3.7 Structures of social institutions – attitudes towards technology

Lastly, some of the organisations have described social institutions, i.e. institutionalised patterns of behaviour and attitudes, that have hindered efforts to implement mobile health. One of these social institutions that health care organisations have reported has been the resistance to change that exists in the health care sector. As explained by one local government (FI LH3) director in charge of the health care services, one manifestation of this is to hold on to the old practices. In their view, the sector is very conservative, and introducing anything new always requires battling against resistance:

''Even though we have thought that this will make our processes and use of time more efficient, and that access to services will be improved, in fact the services in some respects have become slower and worse, because people do things twice. They do them the new way and the old way, just in case. So this un-learning, the problem of

un-learning, is what we will struggle with for some years still. These are surprisingly slow processes." (FI LH3)

One manifestation of either resistance or conservatism is the little inclination that exists towards technology use among core staff in these care organisations. A software provider (FI SP4) and a research organisation (FI RO1-1) describe their experience being that few care professionals, particularly of older generation, have aptitude or familiarity to using technology. They can and are willing to use it only at the minimum level, and are reluctant towards any training. Even once the technology is implemented, the commitment of all members of the care organisation for following the new procedures is not automatic, as has become evident in the projects of one educational organisation (FI EO1). One software provider (FI SP2) argued that in health care organisations there is a public sector mentality, which appears to favour sometimes values other than efficiency. As a result, any efforts to try to optimise care processes with technology have seemed to produce more confusion than sense of advantage.

One view to why the behavioural patterns and attitudes have so far not facilitated mobile technology adoption is that there is a tension that exists between technical and organisational development. According to a central government (FI MI1) official, one way to look at the evolution of the health care system is to consider technical development and organisational development to be two wheels that are usually more or less synchronised. When one goes forward, it enables another to advance, which thereby gives further scope again for the first to develop.

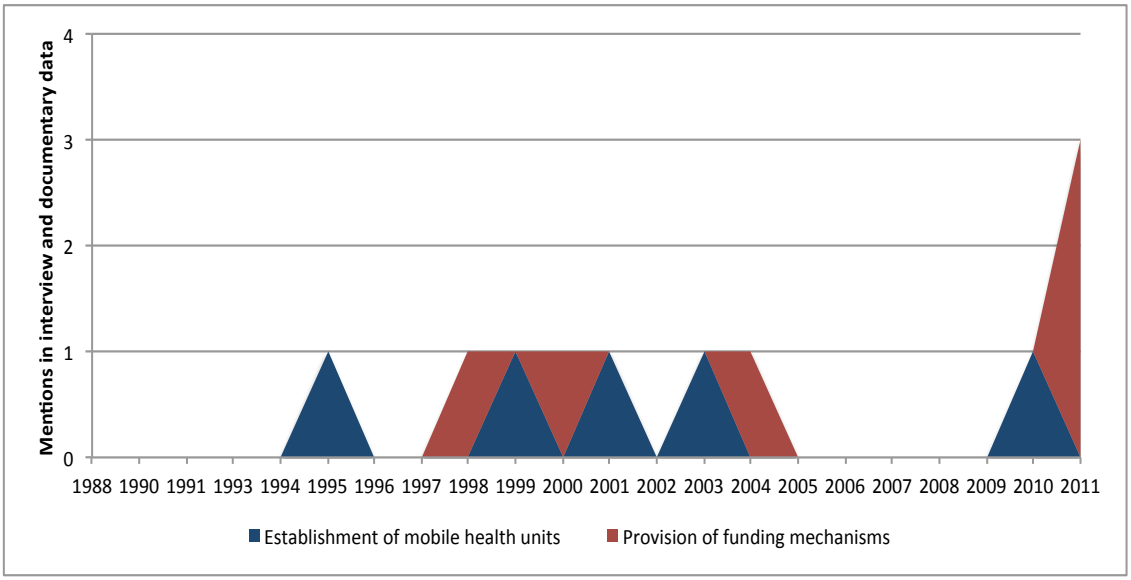
"At the moment it seems that in health care the organisational wheel has been somewhat stuck for some time. A tension has developed between professions, that health care professionals feel that the engineers are telling them how they ought to work. So there is in some ways a clash between technology and health care professionals." (FI MI1)

This government official is suggesting here that social and technical organising have not proceeded in synchronisation, as the professionals have not taken steps in social organising to complement the technical advances. In other words, as technology has developed rapidly, the organisational development of processes and professional practices have been slower to develop, and thus the two elements have become asynchronous.

7.3.8 Timeline of the structural efforts for mobile health

Graph 7.2 indicates well the wave or *episode* –like development of early moments of mobile health, in this case in terms of the provision of funding mechanisms and the establishment of organisational units. I have introduced above, in the text explaining the graph 6.2, the two types of *episodic* development of mobile health, namely the *alternating* as well as the *reappearing* trends. Here both perspectives are represented, as the activity of establishing mobile health units has reappeared on four occasions, while alternating with the four occasions of funding instruments being offered.

GRAPH 7.2: ACTIVITIES BY THE FINNISH RESPONDENT ORGANISATIONS TO IMPLEMENT INSTITUTIONAL STRUCTURES FOR MOBILE HEALTH



Source: Interviews and organisational documents

7.4 CHAPTER SUMMARY AND CONCLUSION

In contrast with the previous chapter on technical activities, as well as with the next chapter on what I call 'social and cognitive efforts', there has been relatively little attempt to put in place structural elements that would support mobile health initiatives. Table 7.1 below provides a summary of the chapter's findings.

Table 7.1: Summary of findings of mobile health structural efforts and obstacles

	INC England	CHA England	HCO England	INC Finland	CHA Finland	HCO Finland
Establishing organisational units		✔✔		✔	✔✔	
Providing funding mechanisms				✔		
Establishing bespoke regulatory rules						
Regulatory obstacles	✔✔	✔✔		✔	✔	✔✔
Data protection and privacy challenges	✔✔	✔		✔✔✔	✔✔✔	✔
Procurement obstacles		✔✔✔				
Technical infrastructure challenges				✔	✔	✔
Constraints of national politics		✔	✔		✔	
Organisational structures as obstacles				✔✔		
Attitude obstacles towards technology	✔✔	✔✔		✔	✔✔	✔

INC – Incumbent organisations; CHA – Challenger organisations; HCO – Health care organisations, i.e. health care service providing organisations.
✔✔✔ = high frequency in data
✔✔ = medium frequency in data
✔ = low frequency in data

There have been few efforts to establish new organisational units in both country cases, as well as some efforts to provide funding in Finland. However, the organisational units have not aimed to structure the whole field, but have expanded the capabilities of single organisations. The funding that has been available for mobile

health has had a broad scope, i.e. it has been available to mobile health projects also and not exclusively, and therefore its effect has been somewhat diluted into single case solutions.

More significant finding to report in this chapter is that in neither country has there been legislation to directly support and regulate mobile technology use in health care. Instead, regulatory guidance has been indirect, through the source fields. The actors involved have mostly felt that their efforts to materialise their mobile health visions have been hampered extensively by the institutional structures of surrounding source fields, especially those of health care and telecommunications. Among the existing arrangements that have appeared as obstacles to mobile health have been the data protection and privacy protections, the procurement procedures, the manner in which data is currently structured in health care back office systems, and the recent placing of all devices subject to regulatory approval.

One of my conclusions in this chapter is that bespoke structural elements for a new field, such as regulations, do not appear at early moments. Fields begin with other, non-structural, activities, and in the case of mobile health, they have been technical and social. As a consequence, the absence of bespoke structures may have an effect that appears contradictory, exemplified by the regulatory situation here: on the one hand, there is regulatory ambiguity, as there are no bespoke regulations that would offer guidance and thus certainty for the actors in this specific field. On the other hand, in the midst of uncertainty, regulatory guidance may be drawn on from the surrounding *source* fields, such as health care and telecommunications in this

case. The regulations of these fields may provide effects that serve poorly the new solution, or they may pull in different directions, causing confusion in the new field. Either way, this case suggests that at early moments there is an absence of bespoke structural elements, which acts as a hindrance to the development of the new field.

The aforesaid leads to another conclusion, which is that institutions, namely those of the source fields, may have a more notable effect in hindering, rather than supporting, the new initiatives. In both country cases of mobile health, a range of institutionalised rules and norms from source fields, whether procurement practices or incentive structures for health care professionals, have made it difficult for these actors to pursue their mobile technology initiatives in health care. This hurdle appears as another distinct effect of early moments period.

The timelines in this chapter show mixed support to my argument episodic character of the early moments period. While the English time-stamped data is scant at best, the Finnish timeline implies a pattern of episodes, both of alternating and reappearing periods.

CHAPTER 8: SOCIAL AND COGNITIVE ASSOCIATING OF MOBILE HEALTH

8.1 INTRODUCTION

I have portrayed the efforts to bring mobile technology to health care so far by describing the broad variety of ideas about it, the many technical activities to build it, the shortage of structural activity to support it, and in particular by the numerous obstacles that actors have faced in their mobile health related efforts. Thus far mobile health development has centred on the broad range of ideas about it, and the many technical manifestations of these ideas. Another dominant impression from this evidence is the difficult conditions surrounding these efforts, in the form of intense resistance in many ways from existing institutional arrangements and organisations in surrounding fields.

The current chapter adds another layer to the story, that of the associational activities to materialise mobile health ideas. Socio-political efforts to shape institutional landscapes have been of interest to institutional theorists for a long time. These interests have related to such topics as power (Maguire, Hardy and Lawrence, 2004), legitimacy (Aldrich and Fiol, 1994), framing (Seo and Creed, 2002), and the ways and skills by which institutional entrepreneurs are able to form new coalitions (Fligstein, 1997).

This chapter discusses two types of associational activities to bring mobile technology to health care. On the one hand, there have been the efforts of social association by which actors have sought to form partnerships around mobile health pro-

jects. These have consisted of partnering in projects to develop products, or participating in various working groups for planning mobile health related services.

I portray the social world around mobile health also with evidence on how participating actors envision the developing organisational field. I asked in the interviews the respondents to imagine what a mobile health field looks like, i.e. what organisations populate this developing field – and the respondents in face-to-face interviews drew a rich variety of sketches. On the one hand the variety in the sketches again confirms the earlier claim that mobile health is far from being a settled concept. But on the other hand, most of these images are thoroughly filled with organisations already or potentially involved in the use or administration of mobile technology use in health care. These pictures depict an early moment space that is complex for an institutional entrepreneur to operate in. I provide examples of these sketches.

Another set of associational activities has been to try to create cognitive associations between mobile technology and health care or wellness. The practical efforts for making these cognitive associations have consisted of producing publicity for mobile health, i.e. of providing interpretations of how mobile technology may either improve the delivery of health care services, or assist in managing one's own health condition. Another attempt of making cognitive associations between mobile technology and health care has been to try to provide evidence with pilot projects of how this technology may advance health care provision, through improved health or cost outcomes.

I also show in this chapter, as in the previous empirical chapters, how these different efforts in social and cognitive association have faced also significant obstacles. The timelines in this chapter show support to my argument that emergence, especially at early moments, proceeds in *episodes* – even if the support is clearer in the case of Finland, and more subtle in the case of England.

8.2 ENGLAND

SOCIAL AND COGNITIVE ACTIVITIES TO ADVANCE MOBILE HEALTH

Aside from technical activities, there has also been a relatively strong effort by English organisations to create social and cognitive associations between mobile technology and health care and wellness. These efforts have included the seeking of collaborative relations between the organisations of these and other related sectors, as well as efforts to make mobile health understandable. Organisations from all three groups have been active in developing social associations. In making the cognitive associations, the incumbent and health care service type of organisations have conceived mobile health as an extension of existing care processes, whereas the challenger type of organisations have sought to define mobile health as a novel activity, with an imperative to reorganise health care.

8.2.1 Organisational associating in mobile health

Aside from the flurry of technical activities, another common feature of the early moment stage in mobile health has been the efforts to create organisational partnerships. In England, there has been plenty of effort to create collaborations for mobile health across all the three types of organisations. However, the pattern that is visible in the evidence is that the incumbent and health care service type of or-

ganisations have primarily focused on exploiting existing partnerships, whereas the challenger organisations have explored and established new partnerships.

Incumbent type of organisations

Incumbent type of organisations have been active in pursuing partnerships and collaborations around mobile health. Some of them have viewed it even more important than developing technology in bringing a new market into life, as this telecommunications company respondents noted:

"*It requires exploiting what we got in a smarter way, in a better way, it does not require to develop a new laser. It's exploiting more, it's more about exploiting technologies that we got and our partners got, rather than completely developing something new, something that might win a Nobel Prize.*" (EN SP2)

In their pursuit of collaborations, the incumbent organisations have tended to be, by definition, in the favourable position of already having established connections in their respective industries and sectors. They have primarily made use of these existing relationships in their activities to locate and partner with key organisations. As an example, one large software and hardware company (EN SP4) began to develop a new device for health care and recognised that there were many clinical needs that it needed to meet. It set out to develop a device that would be optimally fit for mobile working. For this project, its strategy was to involve various patient organisations and clinical organisations such as the NHS and its equivalents around the world in the project. As a provider of other technology and information services for these care organisations, the company had an existing relationship with these organisations. This project strategy produced detailed data on actual

care processes, which then enabled the creation of a reference design for mobile working. The company then leveraged its other existing relationships to device manufacturers, who produced this device for clinical work.

Another form of collaboration for incumbent organisations at early moment stage has been to collaborate through the participation in industry associations. One of the main international industry associations in the area of mobile health is the Continua Health Alliance consortium. This consortium is made up of organisations from various technology industries as well as the health care sector. Several English (EN SP2; EN SP4; EN CO2) as well as Finnish (FI DM2-2; FI IA1) organisations that were interviewed for this research have taken part in the work of Continua. Taking part in an international, cross-industrial consortium that seeks to create technical standards for health care technology is distinctly an incumbent form of collaboration, as no challenger or health care organisations have been involved in such supra-industrial partnerships.

Another form of how incumbent organisations create new social associations is by linking organisations not previously connected. In one example a consultancy organisation (EN CO2) respondent described the connecting work that they undertake, both to external as well as internal experts. Externally, they facilitate their clients' discussions with the regulators of different countries, e.g. the Food and Drug Administration (FDA) in the USA and European Medicines Agency (EMA) in the EU. Internally, in addition to making their regulatory experts available, they provide their clients a connection also with their internal colleagues of different

areas of industry expertise, which in the case of mobile health have been electronics, health care and telecommunications.

Challenger type of organisations

Challenger type of organisations are, by definition, very likely to look for collaborative relationships. These organisations may be only recently founded, and thus not in a position of power nor well connected, and therefore they tend to be more in need of finding partners with access. Even if they are not recently founded, they are likely to be either small and thus lacking in resources, or otherwise in an inferior position relative to their aims, and thus in search of partners to aid them to reach their goals.

The English challenger organisations have actively been searching for and creating collaborative relationships. One of the outcomes of these efforts is the creation of an interdisciplinary association[11], of which three of these challenger organisations (EN LF1; EN IP3; EN EO1), and one incumbent organisation (EN SP4) in England are members. This interdisciplinary association connects a wide range of relevant actors, and it was founded as a response to the perceived weakness and low sustained impact that earlier small and fragmented pilots in the field have suffered from:

"Because that gives you five hospitals, essentially cancer hospital, mental health hospital, and then three essentially tertiary hospitals…. And with the PCT we have 38 GP practices, all agreeing to come in…. And we have the clinicians through the different

[11] This collaborative initiative is advanced by a cross-national association (INT IA1) that was one of the organisations where data was collected for this research.

GCC groups, so we have their commissioning hat as well. The academic science centre gives you the university, which gives you the health informatics, and it gives you the business school, as well as the schools that teach doctors, dentists, nurses, pharmacists, the health care professionals. And the businesses who are members… have to come forward and suggest that we would like to deploy this and this and that." (EN LF1)

The aim of creating this vehicle of cooperation has been to improve the possibility for the implementation of new solutions:

"So all of our partners have signed up to deliver on our priorities, which will move, with a detailed strategy of our section leads, and once agreed on board level, with an executive management team which is essentially the medical directors who have overall responsibility of clinical service, that once agreed on board level, that these things are implemented through the individual organisations, and building on common needs, common interests, and not reinventing the wheel …" (EN IP3)

The challenger organisations have also pursued less far-reaching forms of collaboration, which have consisted of creating partnerships at industry level, either between the telecommunications industry and health care sector actors, or at the organisational level, i.e. between two or more enterprises. In an industry case, an industry association (EN IA2) representative for one of the mobile health related technologies described how they recruited their industry members into a working group, together with consultants, to try to create the standards architecture for mobile health. At the same time, in its other, more exploratory engagement activity, this industry association established new collaborative relations with health care associations in order to have their input for the development of the industry perspective.

A distinct feature of the challenger group of organisations is that through their efforts mobile health has been expanding to incorporate some organisations that have not previously been involved in health care. One entrepreneurial case, of a visionary software firm (EN SP3), shows how these solutions can result in networks of broad range of organisations. In fact, through its platform it has not been only expanding its own connections, but it has also been making connections between others, and thereby putting in place an extensive network of heterogeneous actors.

"We started off with NHS hospital, but we are beginning to get non-NHS, non-UK hospitals ,…. We are also connecting GPs. We are also connecting A&E and ED departments. That is your traditional provider view. But we are also signing up pharma companies, because they want to run clinical research trials. We are also signing up health insurance companies, because they can reduce health care usage by becoming more efficient. … We are getting commissioners, because they … are the ones who pay the price for the lack of joined-up care. … We are also looking at organisations like... wellness people like Virgin Gym, because they have exercise bikes that have a USB cable… they upload the data on your usage…" (EN SP3)

As the quote above shows, wellness organisations are becoming connected, through intermediaries, to the traditional health care actors. In another example, a small software provider (EN SP6), whose mobile application measures patient movement, has established close partnerships with data hosting and cloud computing companies, thus bringing new actors to the domain of health care. In their view, these types of organisations are becoming particularly relevant for health care as well, as there is an expected increase in privately held health data e.g. in personal health records, and also as some public organisations are beginning to release data to be analysed by outside parties (Rogers, 2011).

In other social association efforts some challenger organisations have sought to join projects and consortia of other industries. One example is an industry association (EN IA2) from the mobile technology industry side signing up to participate in several health care related working groups and international associations of the health care sector and medical technology industry. According to their representative, their interest is in establishing new connections through these groups, to disseminate information about their own industry, and to strengthen their own knowledge of the health care sector. Furthermore, this industry association is also taking part in several research programmes of the European Union on topics such as telemonitoring and telehealth. The association works actively in these groups to contribute on the development of knowledge and activities, particularly in regards standards for technology and interoperability.

Health care organisations

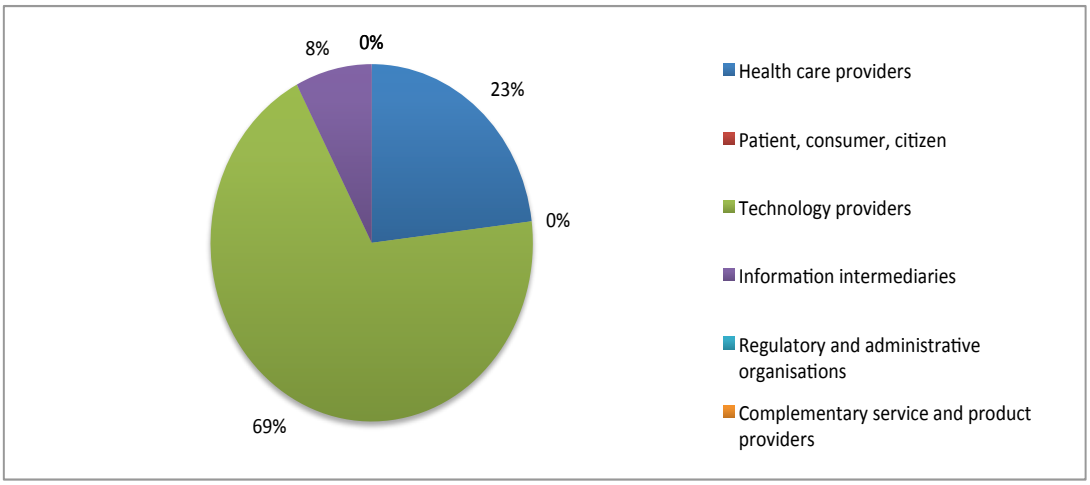
Health care providers have also collaborated with other organisations in their mobile health development initiatives, but these have mostly been ones that they already had a working relationship with. Some care organisations (EN NH1-1; EN NH2; EN SH1) reported having developed their mobile services with the help of a software company they were already familiar with, whereas another unit (EN LH1) cooperated on mobile applications with a different department within the same university. In order to fund their mobile health projects some of the care providers (EN NH1-1; EN NH2; EN SH1) were able to obtain financial support from familiar sources of funds, such as the central government, while two other organisations (EN SH1; EN LH1) sought and acquired funding from charitable funding bodies.

One of these care organisations (EN SH1) noted that they have strong, frequent ties with some of their peers of similar services. By accessing their details of similar projects helps the former to further their own mobile related initiatives. In short, the care organisations here have relied more on their already established relationships, and unlike the challenger organisations, have not sought to find cooperation with new types of organisations.

8.2.2 Mobile health field in sketches: Perceptions of the emerging social structure

Among the English organisations of this study, there has been a variety of views of how the organisational field in mobile health looks like, i.e. which organisations are and will be participating in the field, and which are in more important roles. Graph 8.1 below is a summary of what the English incumbent type of organisations view as the most prominent types of organisations in mobile health field development.

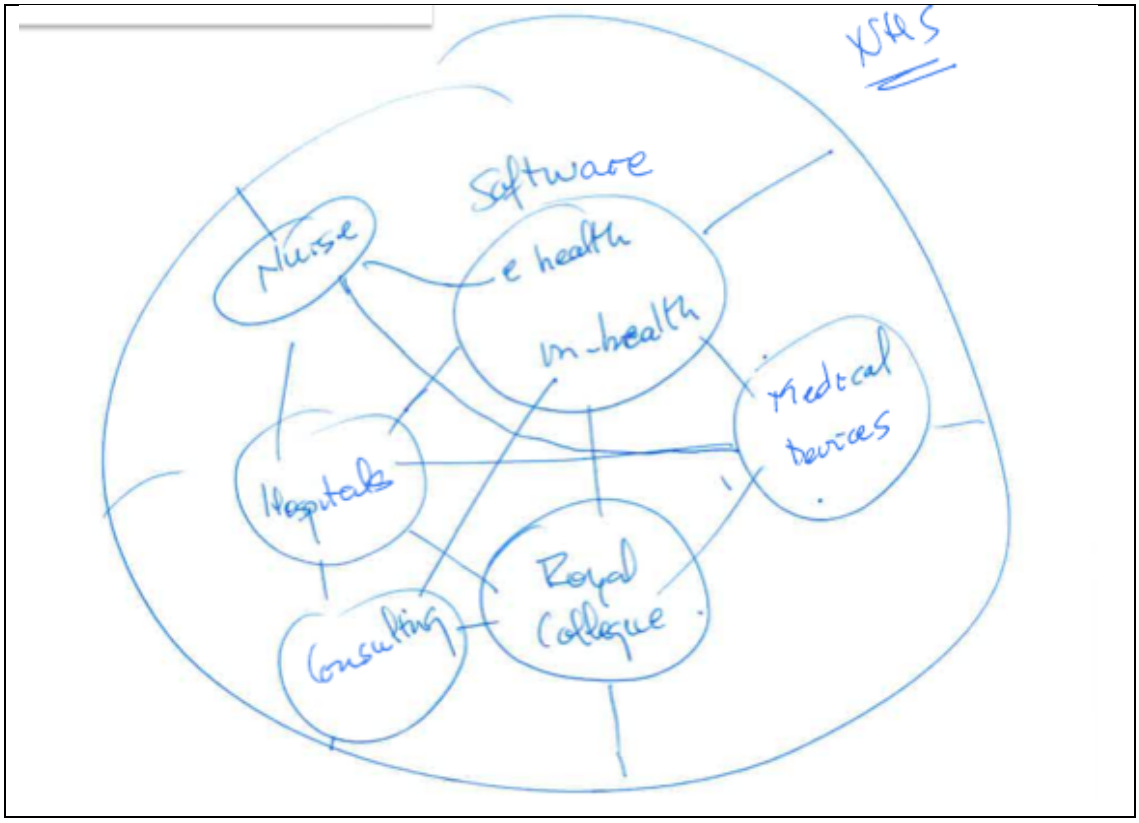
GRAPH 8.1: IDEAS OF SOCIAL STRUCTURE – VIEWS OF ENGLISH INCUMBENT ORGANISATIONS ON THE KEY PLAYERS IN MOBILE HEALTH



Source: Mobile health field sketches drawn during interviews

The incumbent organisations drew field sketches that had a relatively narrow view of the mobile health social structure. These sketches generally had relatively few organisations, with either technology developing organisations or health care organisations in the key position. Smaller roles, if any, were accorded for information intermediary organisations. The intermediary organisations in these sketches are e.g. universities and research institutes, insurance companies and industry associations. An example of this narrow view of the emerging field is below (figure 8.1), drawn by a representative of a large software company (EN SP1). In their view, mobile health is emerging into a field that consists of health care organisations ('Hospitals' and 'Consulting'), professional groups ('Nurses', 'Royal Colleges') and technology companies ('Medical devices', and 'Software' firms, which provide eHealth and mHealth software). In this vision almost all are connected with each other, and they all work under the umbrella of the NHS, which suggests that there is little opportunity for newcomers to enter the field.

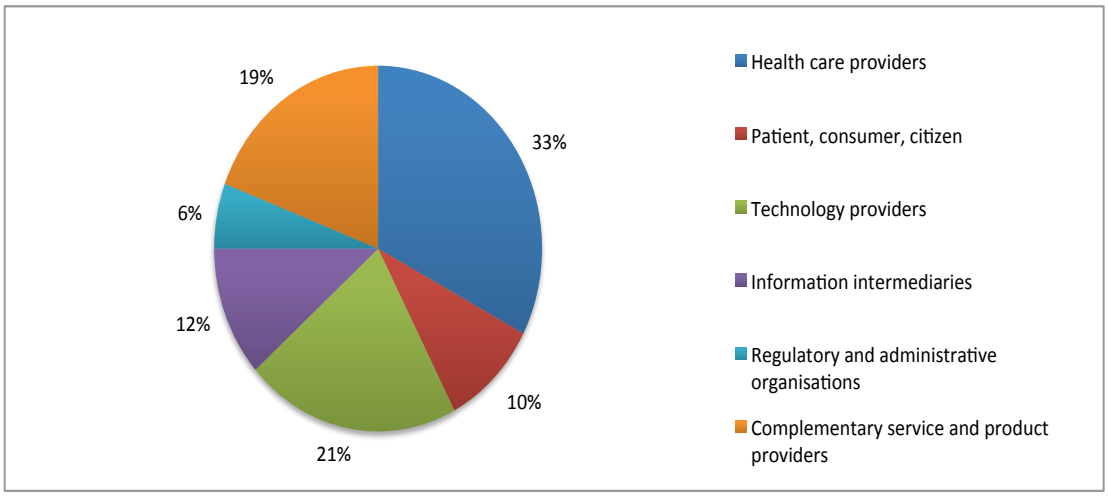
FIGURE 8.1: EXAMPLE OF INCUMBENT TYPE OF ORGANISATION MOBILE HEALTH FIELD SKETCH: LARGE SOFTWARE PROVIDER (EN SP1)



Source: Interview data

Graph 8.2 below is a summary of how the English challenger type of organisations considered the prominence of different types of organisations in mobile health.

GRAPH 8.2: IDEAS OF SOCIAL STRUCTURE – VIEWS OF ENGLISH CHALLENGER ORGANISATIONS ON THE KEY PLAYERS IN MOBILE HEALTH



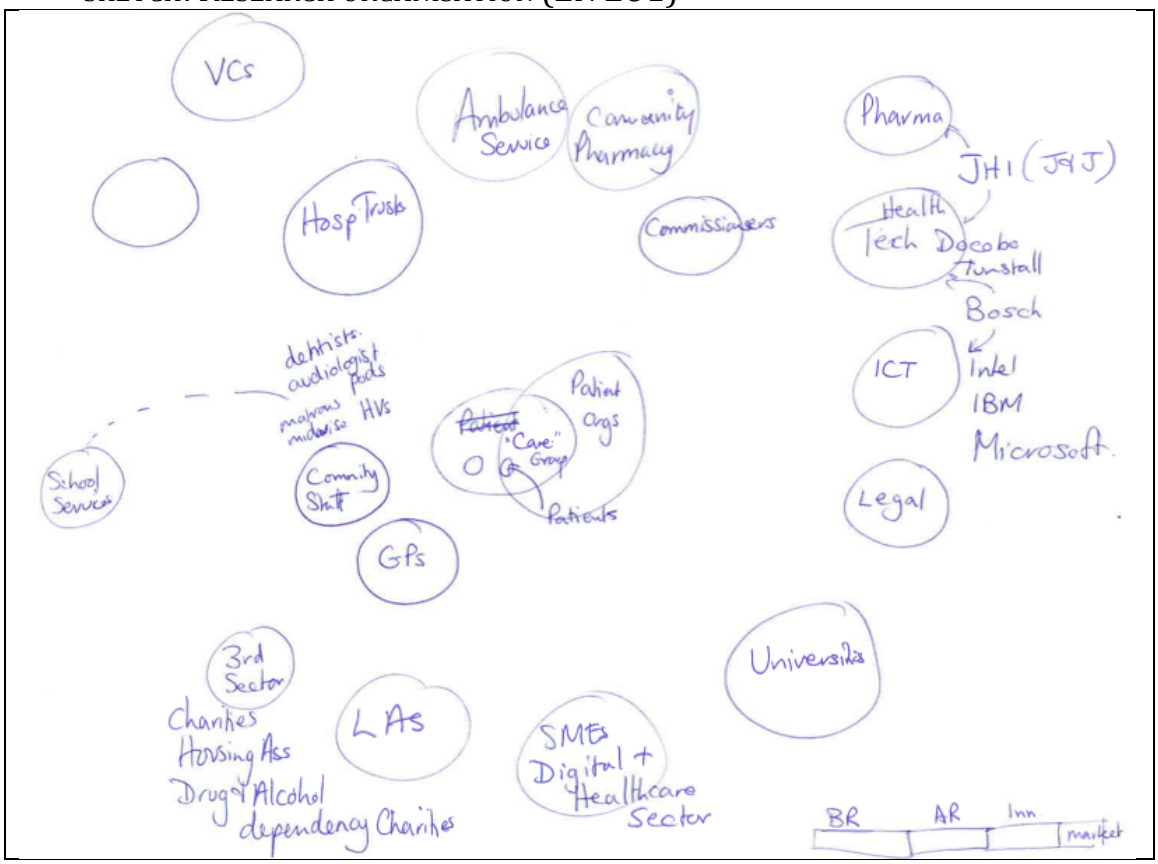
Source: Mobile health field sketches drawn during interviews

The challenger organisations and the health care organisations drew sketches that were quite alike, and far richer in content than those of the incumbent type of organisations. For both of these sets of organisations the health care organisations were the most significant players in mobile health, after which came the technology providers as the second most significant type of organisation. As these two types of organisations were the same as for the incumbent organisations' sketches but in reverse, they are clearly considered as the most important actors in mobile health. In third place, the challengers emphasised the complementary service and product providers, which are e.g. the 3rd sector care service providers, pharmaceutical companies and pharmacies. It is also notable that the challengers highlighted the role of the patients far more than the two other respondent groups.

An example of the challenger organisation view of the mobile health field is below in figure 8.2. This field sketch was drawn by a manager of a research organisation (EN EO1). It is generally representative of the perception by the challenger organi-

sations about the field of mobile health. It is noteworthy that 'Patients' and their representatives have been drawn in the middle, which captures one of the core messages that challenger organisations have argued, namely that in mobile health patients will be a more central player than in the current health care system. Technology firms are placed on the right side, with many different types of providers, as well as at the bottom ('SMEs and Digital Healthcare Sector'). Health care providers are situated on the left hand side, and a variety of '3rd sector' organisations at the bottom left hand side. At the top left corner the respondent has placed 'VCs', i.e. venture capitalists, who would have a role in funding some of the companies providing the solutions.

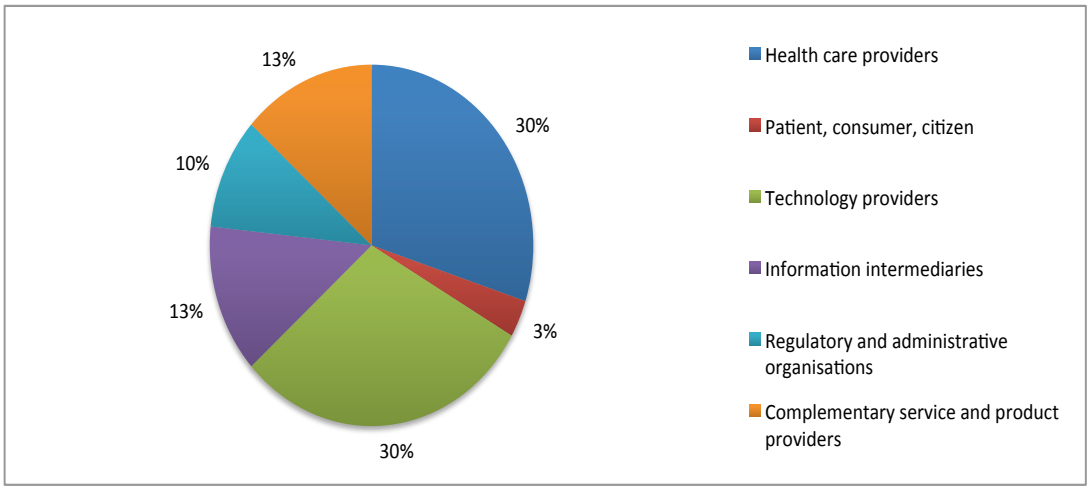
FIGURE 8.2: EXAMPLE OF CHALLENGER TYPE OF ORGANISATION MOBILE HEALTH FIELD SKETCH: RESEARCH ORGANISATION (EN EO1)



Source: Interview data

Graph 8.3 below is a summary of how the English health care organisations considered the prominence of different types of organisations in mobile health.

GRAPH 8.3: IDEAS OF SOCIAL STRUCTURE – VIEWS OF ENGLISH HEALTH CARE ORGANISATIONS ON THE KEY PLAYERS IN MOBILE HEALTH



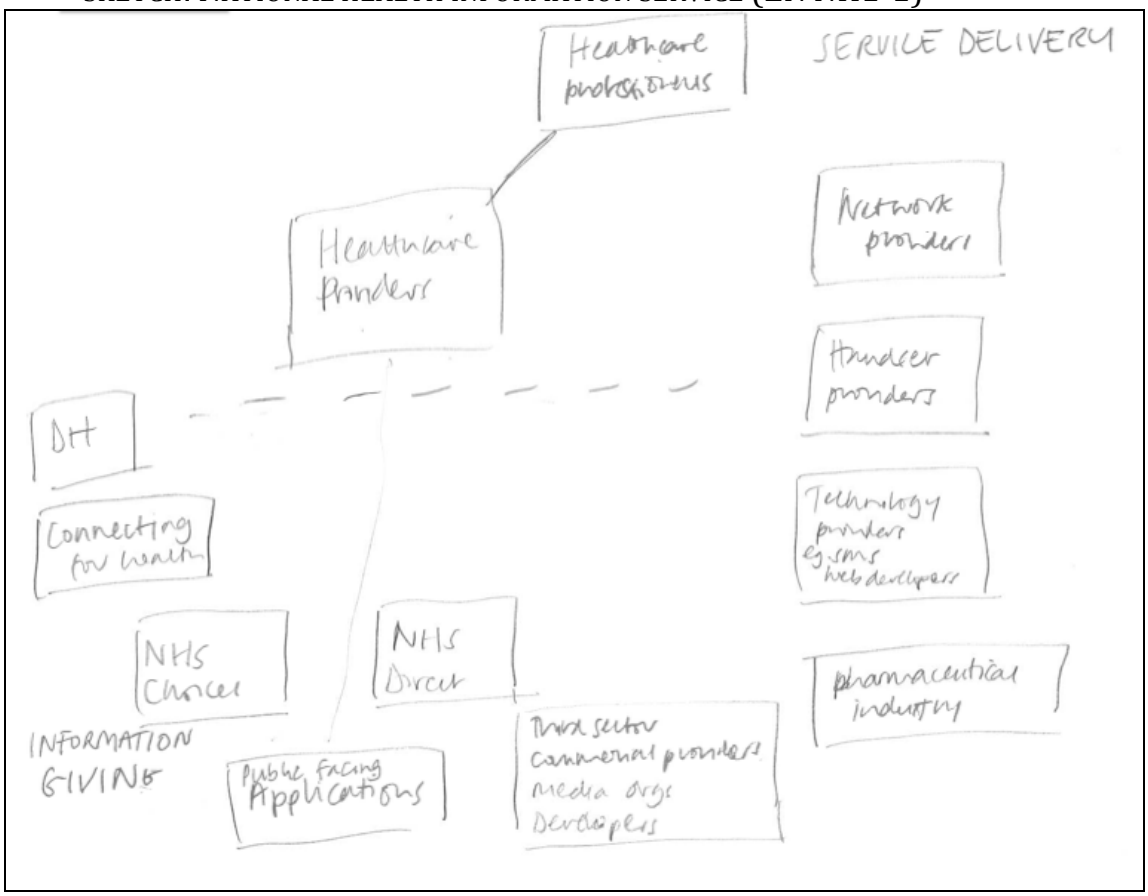
Source: Mobile health field sketches drawn during interviews

As mentioned above, similarly to the challenger organisations the health care organisations emphasised the health care organisations and the technology providers above others in their field sketches. Following these two, they stressed the role of the information intermediaries and the complementary service and product providers. Distinctively, the health care organisations also underlined the role of the regulatory and administrative organisations, while patients were given a very minor role in these sketches.

The figure 8.3 is an example of a drawing by a health care organisation respondent, from a national health information service (EN NH1-1). They have placed 'Service delivery' and 'Information giving' at opposite corners, while 'Healthcare providers' are in the middle. A box of additional service providers ('Third sector', 'Commercial providers', together with 'Media organisations' and 'Developers') is in the bot-

tom centre. On the right hand side the author has located the technology companies ('Network providers', 'Handset providers', 'Technology providers, e.g. sms & web developers'), as well as the 'Pharmaceutical industry' as an additional player.

FIGURE 8.3: EXAMPLE OF HEALTH CARE ORGANISATION MOBILE HEALTH FIELD SKETCH: NATIONAL HEALTH INFORMATION SERVICE (EN NH1-1)



Source: Interview data

These images of the emerging mobile health landscape confirm my argument above of how these different types of organisations perceive mobile health in different ways. All three respondent types have considered health care and technology organisations as the two most important actor categories in mobile health development, but beyond that there is diversity in responses. Incumbent organisations appear to view mobile health rather narrowly, as mostly a technical affair and as one where they would build on existing relationships. Challenger organisa-

tions in contrast seem to perceive mobile health as a more diverse matter, which requires the participation of various kinds of organisations, and for which new relationships need to be constructed. Also health care organisations have described mobile health as a development that requires a broad approach, with contribution by many types of organisations. However, as I have described above, the health care organisations interviewed here have so far worked mostly only with their existing partners to develop mobile services.

These sketches also indicate that the challenger type respondents have viewed the emerging mobile health field bringing some new types of organisations to a more prominent role in health care, e.g. the "ICT" companies Intel, IBM and Microsoft (figure 8.2). These sketches visualise how the challenger type of organisations are distinct from the incumbent type and health care organisations in that they view mobile health involving new organisations in health care.

8.2.3 Cognitive associating in mobile health

Efforts to create or shape the meanings of novel solutions has a prominent place in institutional theory in general, as well as in the institutional entrepreneurship literature specifically – I have discussed this in chapter two. In mobile health, organisations have also engaged in these efforts of 'cognitive association', i.e. connecting mobile technology to health care in ways that attempt to make mobile health understandable. In more unambiguous terms, actors have been creating publicity for mobile health, by publishing white papers and by making presentations in public

events to explain the use of mobile technology in health care. Moreover, their pilot projects have also been attempts in cognitive association, through the production of evidence of the efficacy of mobile health. Active in these efforts have been the incumbent and the challenger types of organisations.

Incumbent type of organisations

Incumbent type of organisations have used 'white papers' and conferences as the means by which to examine mobile technologies in health care. Care professional and care organisation oriented framing of mobile health is prominent element in their presentations. In three white papers, two on information technology and health care by a technology consultancy (EN CO2) and a software provider (EN SP3), and another on mobile health industry association (EN IA1), the underlying and unquestioned argument is that mobile technology offers health care related benefits in both health and cost outcomes. These advantages are set against the current pressures of the health care sector, to indicate that these technologies, tried and tested in other industries, offer genuine solutions to these problems. From this broader, industry level of analysis they pinpoint with case studies how individual organisations have been able to make efficiency savings when they have introduced applications of these technologies.

The focus in these papers, aside from the efficiency issues, is on two more prominent concerns for the telecommunications industry: how telecommunications technology is regulated in health care use, and what are the potential revenue sources in such use. They seek to make visible one of the important links, namely

the connection between health care regulations and mobile health as a business opportunity. Noteworthy here is that their focus is on the existing regulatory framework, which is consistent with other evidence here that the perspective of the incumbent type of organisations is firmly anchored in the existing health care paradigm of relationships and processes. In contrast with the challenger organisations' view of the patient role in mobile health, here the references to patients are as recipients of care, which position seeks to maintain the current paradigm of patient – care professional relationship.

In addition to publishing white papers, some incumbent organisations (EN CO2; EN SP2; EN IA1) have made conference presentations on mobile technology and health care. The framing that these incumbent organisations have used has also tended to be anchored in the existing models of care. As one example, a representative of a telecommunications operator (EN SP2) illustrated their services at a recent presentation at the Healthcare and Life Sciences Summit. In these cases a mobile phone, whether a smart phone or a simpler phone model, was used to facilitate the delivery of services by care professionals. In one case the mobile phone enables the validation of medication, to combat the selling of counterfeit medication, by an sms-message to a pharmaceutical company's automated short code service. This presentation framed mobile health as a solution to be used by existing organisations of the sector, such as care and pharmaceutical organisations, to improve their service delivery. Interestingly, this framing, despite references to 'game-changing' and 'revolutionary innovations', offers little change in the existing

framework of care provision, in terms of who provides care, and what is the patient – care professional relationship.

Challenger type of organisations

Challenger type of organisations have also engaged in various types of activities where they have made cognitive associations between mobile technology and health care. In contrast to the previous section, they have presented their views of mobile health in terms that would challenge the existing framework of care, mainly through the emphasis on patients. Some of the arguments have concerned patients caring for their own health, whereas in other cases the focus has been the current care system, and how a new emphasis on patients may help reduce the burden on the care system. Others have discussed how new technology may improve care processes in ways that may bring reform to the public health care system - without referring to patients. This division between reform of health care system through patient focus and reform of care organisations directly corresponds to the division among the respondents between small software providers of the patient-oriented position and public care-related organisations of the non-patient position, who promote and assist in the adoption of innovations and technology. These positions have been made clear through presentations at conferences and workshops, and these organisations have disseminated their insights also on their own websites.

The principal idea uniting the software provider organisations in their discourse has been that mobile health ought to be put in the hands of the patients, whose active participation in their own care may alleviate the burdens on the care sys-

tem. Some of these organisations (EN SP7; EN SP6; EN SP5) make this argument by advocating the empowerment of patients through the use of these technologies. They claim that mobile solutions allow patients to perform the simple tasks relating to their health – e.g. taking a daily measurement of various vital signs, responding to health surveys, or recording their exercise and nutrition patterns. As a consequence, they will feel more involved in their own care, which at the same time helps to reduce the pressure on care professionals.

Other challenger organisations (EN CO1; EN IA2) argue that the care system is in, or heading towards, such finance and resource -crisis that it requires a major rearrangement of care processes. Therefore, in the view of these organisations, some of the responsibility for care ought to be re-distributed to patients, which is possible with new technology. This latter is a distinctly technology oriented message. As an example, a representative of a telecommunications industry association (EN IA2), at a recent European level conference on health care and mobile health, argued that by enabling "prevention", "diagnosis", "treatment" and "monitoring" of patient condition mobile health may significantly bring down the cost of health care. A consultancy (EN CO1) has argued in its white paper that significant savings in improvements in care as well as in financial terms may be achieved from the adoption of these systems.

One other example highlights the way in which challenger type of organisations have sought to associate mobile technology with health care in a way that involves changes to the care system. The claim in this example case is that more patient centric approach is needed, in order to improve care and the performance of the

whole health care system. Part of the argument in this example is a connection to concerns about 'integrated care', i.e. the ability of health organisations to coordinate patient care. This small software company (EN SP3) provides a platform for care organisations to exchange electronic health records, thereby enabling the organisations to view a patient's health record from another unit. Mobility is one of the core aspects in this model, i.e. regardless of their location, a patient may request any care professional to access their health record, and the patients themselves have access to this record through mobile devices such as mobile phones.

This software provider (EN SP3) organisation has made frequent appearances in conferences, including a recent presentation at the Royal Society of Medicine, in radio and even in television in the United Kingdom to present their case. Their framing is to describe the challenge that health care in general is facing as a problem when patient data does not flow seamlessly between care organisations. In their view the core obstacle is that patients do not have control over their patient records, and they use actual patient cases to highlight how health care organisations have real difficulties in communicating with other health care organisations. Their somewhat radical argument then is that giving patients the control of the records, as their system does, has the result that the patients will de facto connect these different organisations. Thus, this example, along with the other arguments about the use of mobile devices for patient focus as described above, show how these challenger type of organisations have sought to associate mobile technologies with a reform of the health care system, and with a particular reform that involves putting the patient at the centre of care.

Lastly, another group of challenger type of organisations, mostly affiliated with a health care organisation, have framed the uses of mobile health as direct advantage in improving the efficiency of care processes. In their framing the health care system is in desperate need of reform, and these new communication technologies are able to make its processes more efficient. Some of these organisations (EN IP2; EN TP1; EN IP1) have a role in assisting local NHS organisations to adopt new technologies. One of them (EN IP1) has argued that these NHS organisations have a bias toward searching for people-based solutions, and since many of these technology solutions are yet to be tried, these could provide a significant boost to their processes. Two of them (EN IP3; EN EO1) are involved in a consortium that is an attempt to facilitate technology adoption at a local and regional level. The birth of this consortium is based on the vision that there are many technologies that provide significant advantages to care organisations, but which have not been employed so far. Thus, as an alternative view among the challenger type of organisations, this set of organisations has associated mobile technologies with the improvement of the processes of the current health care system.

In addition to cognitive associating through presentations and white papers, one challenger type of organisation used a cultural project to highlight the efficacy of mobile technology in health management. An industry association (EN IA2) in the telecommunications field sought to demonstrate the advantages of using mobile health application with a cycling project. In this project a group of diabetes activist cyclists travelled from Brussels to Barcelona through five countries and 2000 km, equipped with monitoring equipment that were connected to their mobile phones

and through that to the servers of a care organisation. This application solution allowed the riders themselves, as well as care professionals, to monitor the impact of changes in blood glucose while cycling. Embedding the mobile health application into the sports campaign was an opportunity to showcase how such solutions may function flawlessly across borders, over long periods of time (it took the cyclists two weeks to reach destination) and in peripheral landscape (the cycling route crossed the alps). Through embedding this new solution in a cultural project, i.e. a campaign to raise awareness about diabetes, the organisation (EN IA2) sought augment the impact of their message about the benefits of mobile technology use in management of health conditions.

OBSTACLES TO MOBILE HEALTH EFFORTS FOR SOCIAL AND COGNITIVE ASSOCIATION

The efforts by these organisations to associate mobile technology with health care have faced some difficult obstacles. This section focuses mostly on the challenger type of organisations: Their difficulty in advancing their solutions has a direct relationship to how they have sought to associate mobile technology with health care, whether in terms of organisational relationships or cognitive claims. Their call for a considerable reform in health care, as part of introducing mobile technologies, has proven problematic. I discuss below how making the cognitive association has required producing evidence, which they have found difficult to assemble. They have also had difficulties to gain partnerships. On the other hand, the incumbent and health care organisations have reported of only few difficulties. Due to their

established position and relationships they have mostly been able to pursue implementations successfully. The insistence for evidence in England stands in stark contrast with the experience in Finland, where public funding has provided means for testing solutions, but where instead the main obstacle for the challenger type of organisations has been to acquire access to the critical back-office IT-systems for sustained implementation.

8.2.4 Obstacles for social and cognitive associations around mobile health – the trouble with evidence

Incumbent type of organisations

As described above, the incumbent type of organisations of this study have faced relatively few obstacles in their efforts to create the social and cognitive associations for mobile technology and health care. Their core idea has been to insert their applications of mobile technology into existing models of care. They have existing relationships within this model, and thus they have advantage from upholding the current system. Yet, one of the problems these organisations have reported is with attitudes, particularly at the level of care workers. According to one software and system provider (EN SP3) respondent, some care professionals are reluctant towards new technology solutions:

"There are a lot of people that still want to use paper, and believe in paper based records. And it is very difficult sometimes to get them to look at technology, to try and use their minds really... And the biggest issue that we find is that they try to carry on

doing their existing workflow, they try to run it in parallel, and they don't really try to run down the existing workflow, and let the new workflow with technology surpass ..." (EN SP3)

A respondent from a professional association (EN PA1) in medicine noted that in their view it is largely a generational issue, where

"the more senior the doctor, the less likely they are to be using computers, and less likely to be using smartphones." (EN PA1)

This respondent added that as the younger doctors and other care professionals seem to have far less if any hesitation towards the use of these technologies, this problem is likely to eventually disappear.

Thus, attitudes have been the core challenge for incumbent type of organisations, but the respondents have suggested that these have not been insurmountable. Large organisations have resources by which to overcome these issues, and improvements may be made e.g. by providing training to client staff. Furthermore, one technology provider (EN SP1) respondent observed that over time attitudes are changing, particularly as more evidence of the advantages of these technologies comes to the public domain.

Challenger type of organisations

Some of the difficulties that the challenger type of organisations have been facing in winning contracts or funding for their mobile solutions emanate from the way they have associated mobile technology with health care. As described above, they have placed mobile technologies and their benefits in the context of a larger reform

that the health care system is in need of. While it may be widely accepted that the health care system is in need of reform, there is less agreement on whether these technologies are able to produce such efficiency improvements, and how to take advantage of them for maximum system benefit. These types of uncertainties around mobile technology in health care have lead to demands for evidence of such improvements, which the challenger organisations, and particularly the small software providers, have consequently attempted but struggled to produce.

Challenger organisations have created pilot projects to provide evidence of the efficacy of their applications, but these attempts to 'validate' mobile health have been rejected by the organisations that currently operate the health care system. These pilot projects are another form of cognitive associating where the evidence is meant to show the advantages of this technology for the use of health needs. The argument against this evidence has been that the pilots have been too small to demonstrate whether a roll-out in a large population would produce significant health and cost benefits. Universal adoption across the NHS requires the demonstration of the evidence base for a solution in rigorous, large-scale trials. While a local adoption would allow for a smaller pilot project to test novel approaches, in the view of one national health information service (EN NH1-2) representative the broader implementation of mobile technology gets "caught up" between these two interests, resulting in small-scale local initiatives that are not adopted widely. As remarked by one respondent involved in promoting these solutions in the health care field:

"There are a lot of trials, small scale studies that have shown things, that mobile health is generally favourable, it can have financial benefits, it can have other benefits. The problem, as far as I know, across the world is adoption and scale. And yet, we have not done that on scale. … So we have not done it yet, so I can not say that we tried to do it and it did not work, or we tried to do it and these were the barriers and this is how we overcame them." (EN IP3)

Another point of resistance has been that many studies on mobile health have provided evidence about the functioning of the technology, as opposed to health or cost impact that are more vital to health care organisations. One industry association (EN IA2) conducted a review of literature on mobile health studies and found that vast majority of the studies examine the technical functions and features of these systems. There were only a few impact studies, and they all had a small sample. Moreover, an innovation promotion agency (EN IP2) respondent noted that even if results in some studies have been positive, the credibility of results has been in doubt as these small studies often have not had external, independent validation. Thus, the standard response, confirmed by both those representing the existing health care establishment and those speaking on behalf of the software companies, has been that small-scale studies have provided little evidence value that would justify larger deployments of mobile technology solutions. In the absence of large-scale projects the arguments for an extensive, patients and mobile technology centric reform have become difficult to sustain. In other words, these small-scale projects, then, have not supported those cognitive associations that the challenger type of organisations have primarily made.

Moreover, small pilot projects may have the opposite cognitive effect. They may strengthen the perception of the stability of the current system, where temporary

or marginal arrangements, i.e. temporary projects, are regularly employed for temporary aims, but without forcing change in the established practices. Described by a technology promotion agency (EN TP1) respondent, this effect of small scale projects is illustrated by projects typically developed by health care professionals, particularly doctors, who are technology 'geeks', i.e. highly interested and capable in communication technology. They develop applications for certain functions that often have a specific use in their own work. However, these projects are often limited in their approach, lacking usually systems integration, and therefore they may not scale up. Furthermore, they also tend not to have core elements of comprehensive systems such as control of data flow and information audit. Their light version approach may in fact have an opposite effect to the change they were meant to introduce, as this technology promotion agency expert describes:

"There is a quote used in the telehealth community, which is that 'telehealth has more pilots than British Airways' and I think that is true, … While we have more pilots than BA, all they are flying are single engine propeller driven aeroplanes. All they got is a land or grass airstrip, they do not need traffic control, they do not need radar, they do not need radios. They need no infrastructure, and they do not need to change how you operate and do your day to day jobs. What we need to do is to get these people out of these single engine Cessnas, and get them to fly airbuses and jumbos, where you need a lot of infrastructure, you have to change the way you operate, you need new care pathways." (EN TP1)

In other words, small-scale trials have been rather paradoxical in their effect, as on the one hand providing an opportunity to test the efficacy of an application, but also yielding insufficient evidence and potentially reinforcing the primacy of the existing arrangements and infrastructure. Small pilots may have the effect where

mobile technology is associated with a marginal and temporary role in the health care system.

Health care organisations

The one relatively large-scale project in England that has employed telecommunications technology for providing care services has also left a rather uncertain impression for its observers. The outcome of this project shows that even larger scale pilot projects may have difficulty in providing the type of positive cognitive associations that are considered needed in order for the popularity of these devices to rise. The Department of Health launched the Whole System Demonstrator (henceforth WSD) project, by which it sought to study the financial and health outcome impact of certain telehealth -type of remote care solutions. The programme *"involved 6191 patients and 238 GP practices across three sites,…*" (Department of Health, 2011, p.3). One of its objectives was to provide answers to long-standing questions of whether significant positive impact can be achieved with large-scale implementation. The early headline results, later confirmed also by a study published in the British Medical Journal, stated that telehealth and telecare technologies have had a mild positive impact (8% reduction) on health care tariff costs, reductions between 14% and 20% in hospital admissions and bed days, and a 45% reduction in mortality rates (Department of Health, 2011; Steventon et al., 2012).

However, this project seems to have produced a mixed effect for the telehealth and remote care community more broadly. Department of Health never published more detailed results of the study itself, which has prompted commentators to

question whether a closer scrutiny of the outcomes evidence does not support the argument for expansion of telehealth solutions (Whitfield, 2012). Some of the external assessments have found positive results (Steventon et al., 2012), while others have found little or no impact (Henderson et al., 2013; Cartwright et al., 2013; Steventon et al, 2013) of telehealth and telecare technologies. Thus, the results seem to have been mixed at best. Regardless of evidence, the Department launched a campaign (3million lives[12]) in 2011 to support the adoption of telehealth and telecare technology and services, for which it sought closer cooperation with the related technology industries. However, in the middle of 2012 several media organisations[13] reported a Yougov survey that 91% of the UK population has not heard of nor knows the meaning of telehealth, suggesting that the campaign has not been very successful so far. In other words, the cognitive associations of improved health and better care, that this project was aimed to produce for these technologies, have not been achieved.

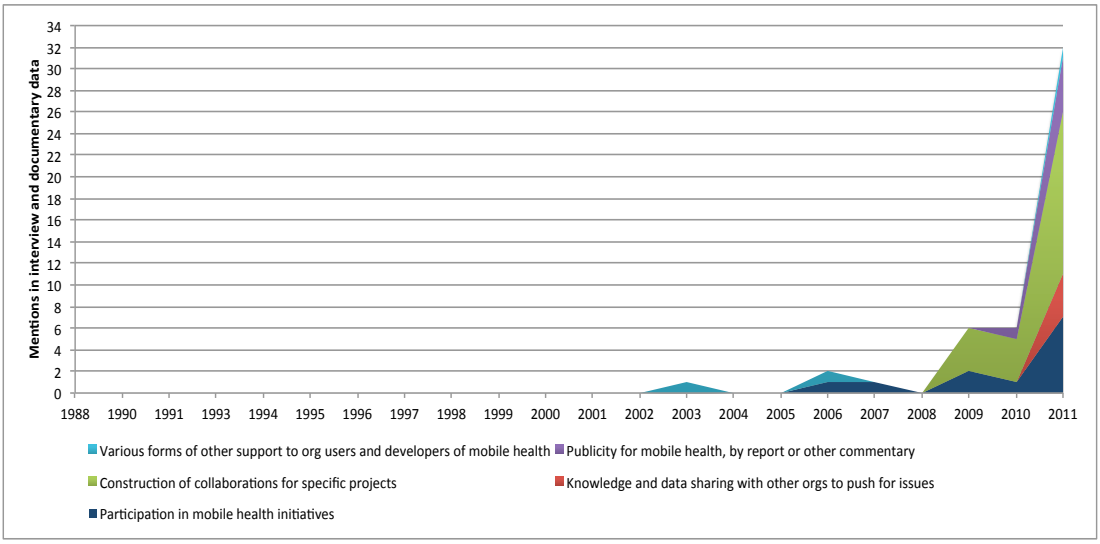
8.2.4 Timeline of the collaboration and framing activities in mobile health

The data in the graph 8.2 gives mild support to my *episodes* –argument. There has been social associating between organisations in the form of various forms of support (such as training), as participation in broader initiatives (e.g. working groups) and as partnering for specific projects that have dominated this perspective. Aside from this social associating also some cognitive associating has taken place, in the

[12] http://3millionlives.co.uk/about-3ml, accessed 29.11.2013
[13] http://3millionlives.co.uk/about-3ml, accessed 29.11.2013

form of publicity making as well as knowledge and data sharing. Consistent with the other timeline graphs it is visible also here that the efforts to bring mobile technologies to health care have only begun in the first half of 2000's. The first activities were scant in number, but in last years there has been a high level of activity, particularly in the partnering for specific mobile health initiatives. There is still an overall impression of a wave-like pattern by which the collaborative and framing activities have proceeded in England: in first years the associational efforts were about participating in broader initiatives and taking part in various support activities, whereas in the most recent years partnering for specific projects, publicity making and knowledge sharing have become more prominent, together with the broad initiatives.

GRAPH 8.4: SOCIAL AND COGNITIVE ASSOCIATING ACTIVITIES BY THE ENGLISH RESPONDENT ORGANISATIONS



Source: Interviews and organisational documents

8.3 FINLAND

SOCIAL AND COGNITIVE EFFORTS TO ADVANCE MOBILE HEALTH

Finnish organisations have also sought to make the social and cognitive associations between mobile technology and health care. However, unlike their English counterparts, all three types of organisations have partnered with both previously known as well as previously unknown organisations. Organisations from all three groups have been active also in making the cognitive associations. Much alike those in England, the incumbent type of organisations and the health care organisations have argued for the uses of mobile technology within the existing paradigm of health care, whereas the challenger type of organisations have argued for reform of the care system and with a patient focus.

8.3.1 Organisational associating in mobile health

All three of the types of Finnish organisations have sought partnerships in order to materialise their visions of using mobile technology in health care. Looking for partners has been common at this early stage, whether among the more resource-poor challenger type of organisations, or among the better-endowed incumbent type and health care organisations. They have all engaged with organisations that were either previously known or unknown to them – in other words, they have created also new partnerships through mobile health.

Incumbent type of organisations

In contrast with the English incumbent type of organisations, two examples show how the Finnish incumbent type of organisations have pursued collaborations with both previously known and new partners. First example describes creating collaborations around new product development, whereas the second highlights another typical early form of collaboration, around a research project to study the functionality and efficacy of mobile technology in health data transmission.

One typical occasion for creating partnerships at early moments has been at the moment when new products are introduced. These new products tend to require complementary products and services, and thus encourage the search for new collaborations. Two respondents from a mobile device manufacturer (FI DM2-1; FI DM2-2) described their efforts to find partners to complement their wellness software application. What can be considered as their approach to collaboration, the company uses the term 'ecosystem', by which they denote the creation of a network of different types of organisations of complementary functions. For creating a network around their wellness software, their need has been to find two types of organisations: First, they have been keen to connect with other technology companies. These may complement their application product with various sensor devices, which may measure movement or the vital signs of an individual. Secondly, they have been searching for coaching partners. These are expected to provide individuals with more specific and personalised advice, and even help them to change their lifestyle habits. In both of these aims this company has been successful, as many other firms are eager to work with a large player in the market. Thus, a pow-

erful, or 'incumbent' type of, organisation may gather partners around itself relatively easily, even at early moments.

Attempts to create social associations through large research projects may be facilitated by the available public funding. A researcher (FI RO3) described a research project in the late 1990's to study the feasibility of mobile technology to transmit crucial patient data and radiology images between a mobile device, i.e. an early smartphone, and hospital servers. The following quote highlights how one early moment research initiative was dependent on a broad range of functional contributors. Acquiring the commitments from all participants was aided by the fact that there was ample funding to make it all possible.

"If we had not been able to acquire funding from the EU, it could not have been made at that scale, because it required its own research group within the main hospital, and it required other resources so that their IT-unit would write the integration software to the back-office solution. Then we needed the mobile device company that provided the bespoke software for the end user device... Then we needed the telecoms operator. Then someone needed to develop the data security solution. Then there was work to integrate sub-systems that connect to the back-office system…. And then we needed commitment from all of these so that the work could be done during office hours, and that this would not be only research but be adopted for clinical use. So we needed a lot of resources and commitment…" (FI RO3)

This research organisation is a central actor in its geographical context, making it relatively easy to find and convince the important service providers to participate in the project. In short, the efforts of incumbent type of actors are made easier by their access to funding, and existing connections to important complementary technology and service providers.

Challenger type of organisations

The challenger type of organisations have engaged in various mobile technology initiatives, but as their resources are limited, they have actively sought partnering opportunities, with both public and private sector organisations. In one example, a software provider (FI SP4) has taken active part in a working group organised by local government, established to generate ideas and planning for developing digitalised health services for the region. In another example a publicly-funded technology research agency partnered with a small software developer (FI SP5) for the latter to commercialise some of the former's technology patents. Moreover, some software providers have partnered with public sector content providers, such as in the case of one software provider (FI SP2) partnering with a regional authority on environmental services. The latter produces information about the current state of the environment, such as air-quality, which the software provider's application links with health data, to make this analysis available to its clients. This example also shows that some of the collaborations of the challengers have been with organisations not previously involved in the health care sector.

Other examples describe partnerships between these challenger type and other private sector organisations. Another content provider is the national association of doctors, the Finnish Medical Society, which provides information for doctors and medical students. They produce databases of medical information, and one software provider (FI SP2) has partnered with this association to make this information available for care professionals through its application. Another software provider (FI SP1) has partnered with a medium size back office system provider in

England in a project to develop the mobile application software for the latter's broader system of health services. To sum up, for the Finnish challenger type of organisations mobile health efforts have involved active partnering, both with public as well as private sector organisations, and they have found some partners outside of the traditional health care and telecommunications sectors.

Health care organisations

Also health care organisations have created or joined new collaborations around mobile technology, in some cases with their peers and in others with organisations outside of the sector. In one example of collaboration with peers, these organisations were brought together by central government funding programme, aimed at supporting the digitalising of public services. Related to their project for implementing a mobile application for appointment reservation, a local care organisation (FI LH2) described how they were obligated to cooperate with other local care organisations of similar early initiatives, as a condition of project funding. The projects had meetings to exchange various types of information, such as advice on challenges and successful practices, and they shared documents with each other, such as their patient instructions for the service. The collaborations through these projects brought together organisations that despite providing same services in different parts of the country had not been previously in contact. These connections were sustained beyond the project-funding period as the different project groups continued to exchange the knowledge that accrued from implementation.

In other cases, local health care organisations have started working groups to develop aspects of mobile and digital technologies in the regional care services. In one case, local government (FI LH3) (responsible for development activities on behalf of the local health care organisations) established a development group to which it invited local technology companies to join. This development group was tasked to plan how to develop further the local services. They had already developed online self-care services, and now were keen to add new services that involve mobile technology. While the partners were familiar to the local government already from earlier projects, this working group represented a new form of partnership to develop public services.

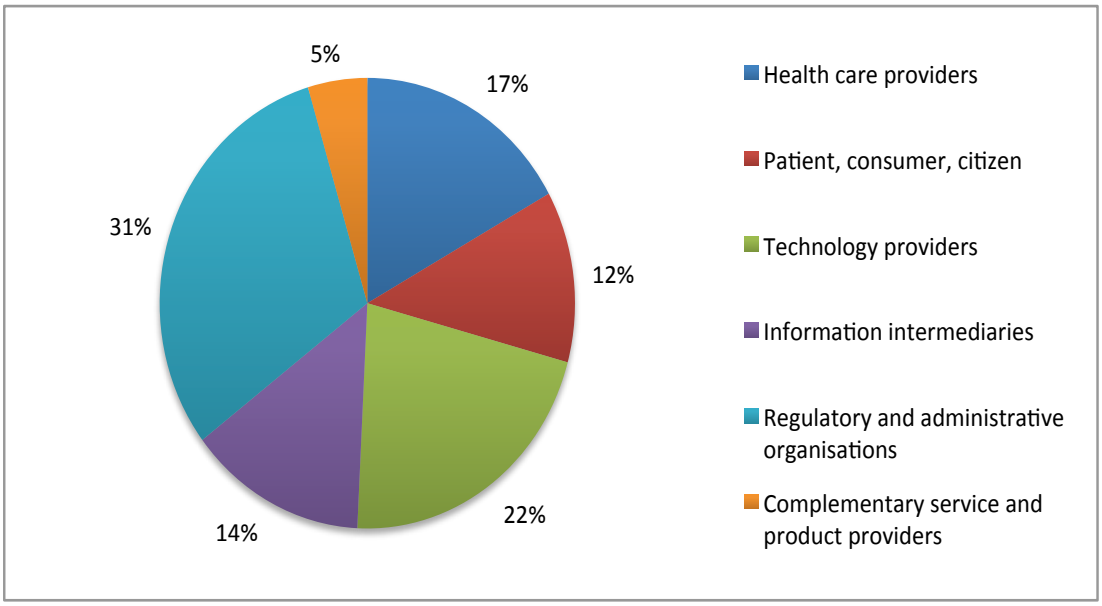
In yet another example, health care organisations have become involved in partnerships as a result of other national organisations gathering partners to mobile health projects. In one case, organisations previously unknown to each other were brought together by a national funding agency (FI IF2). As described by a doctor in one of the care organisations (FI LH4), also active in one of the professional associations in health care, a national innovation fund has involved also the professional association in a project where a variety of technology and service organisations collaborate to develop a certain mobile health service of national scope. For this professional association to work together with other organisations on this mobile device project is uncommon, because the technology concerns of the association focus on different issues crucial for the work of doctors, such as those of IT-system functionality and capacity, as opposed to the usability of mobile applications for patients. In conclusion, in Finland the early moments stage of mobile health has

seen all types of organisations coming together, to advance their interests in this area.

8.3.2 Mobile health field in sketches: Perceptions of the emerging social structure

The Finnish organisations of this study have provided a slightly different perspective from the English ones on the emerging organisational landscape of mobile health. In the case of England, incumbent organisations had a narrow view of mobile health field, in contrast to the broader views of the challenger and health care organisations. In the Finnish case, incumbent and challenger organisations have had a broader view, and the health care organisations have had a more narrow vision of what kinds of organisations are to take part in mobile health. Graph 8.5 below is a summary of how the Finnish incumbent type of organisations have viewed the importance of various organisation types for mobile health development.

GRAPH 8.5: IDEAS OF SOCIAL STRUCTURE – VIEWS BY FINNISH INCUMBENT TYPE OF ORGANISATIONS ON THE KEY PLAYERS IN MOBILE HEALTH



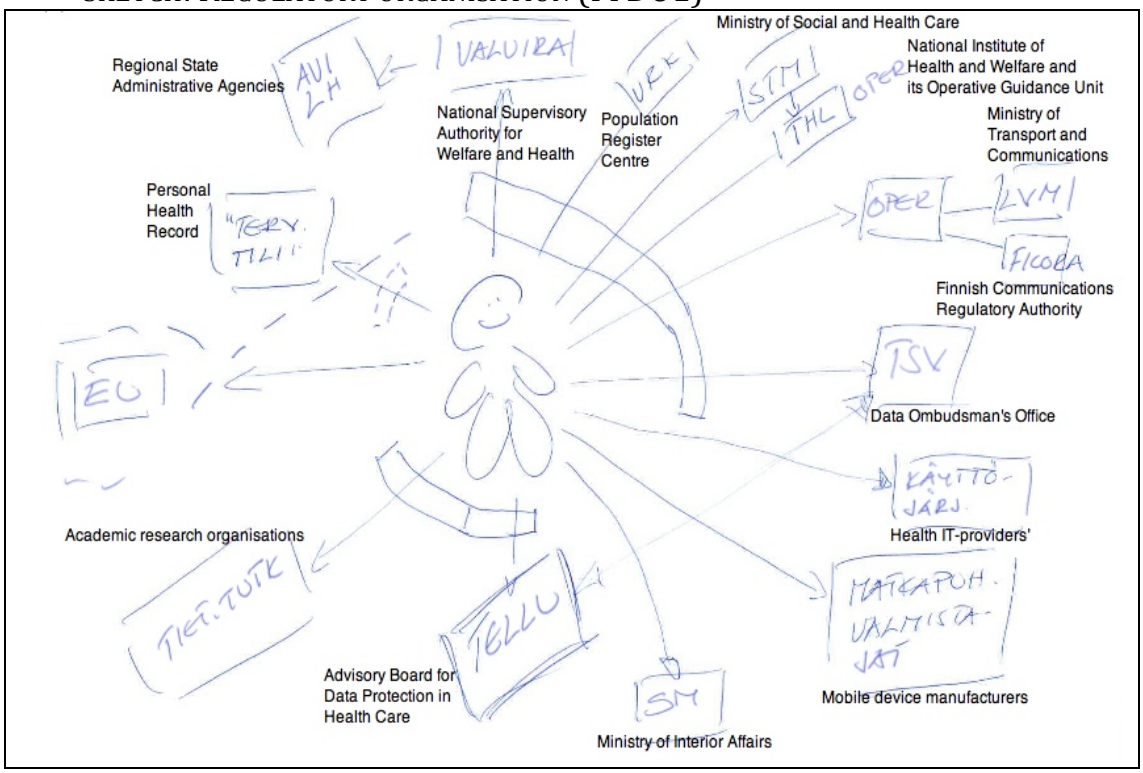
Source: Mobile health field sketches drawn in interviews

In Finland, the mobile health field sketches drawn by the incumbent type of organisations have shown a bias towards the type of actors that can be considered as the current incumbent types. Most commonly they have referred to regulatory and administrative agencies, implying that the regulatory aspects have a core importance in the development of mobile health. Secondly they have referred to technology providers and thirdly to health care organisations. Patients and information intermediaries, in the next bracket, also have a reasonable visibility in these sketches, indicating that the incumbent organisations have some view outside of the three more obvious types of organisations at the top of this list. Lastly, complementary service and product providers have received little attention.

A representative example of how these incumbent type of organisations perceived the coming mobile health organisational field is below (figure 8.4), drawn by a regulatory agency (FI DO1). The drawing consists of multiple organisations, but is

relatively ‘public agency-heavy’. The respondent has included also technology companies (‘Mobile device manufacturers’ and ‘Health IT-providers’) as well as information intermediaries (‘Academic research’), and the character in the middle represents the patient. But all the other actors that are included are public agencies that regulate or provide an administrative function (Ministries of Social and Health Care, of the Interior, of Transport and Communications; Data Ombudsman; Finnish Communications Regulatory Authority; National Institute of Health and Welfare and its Operative Guidance Unit; National Supervisory Authority for Welfare and Health; Regional State Administrative Agencies; Population Register Centre; Advisory Board for Data Protection in Health Care; and the EU) in the health care system. Thus, the view of this incumbent respondent seems to be that while mobile device manufacturers were included and patients were placed in the centre, institutionalising mobile health will be largely dependent on the regulatory and other actors of state authority. The author has left out the actual health care providers, whose role is therefore not clear.

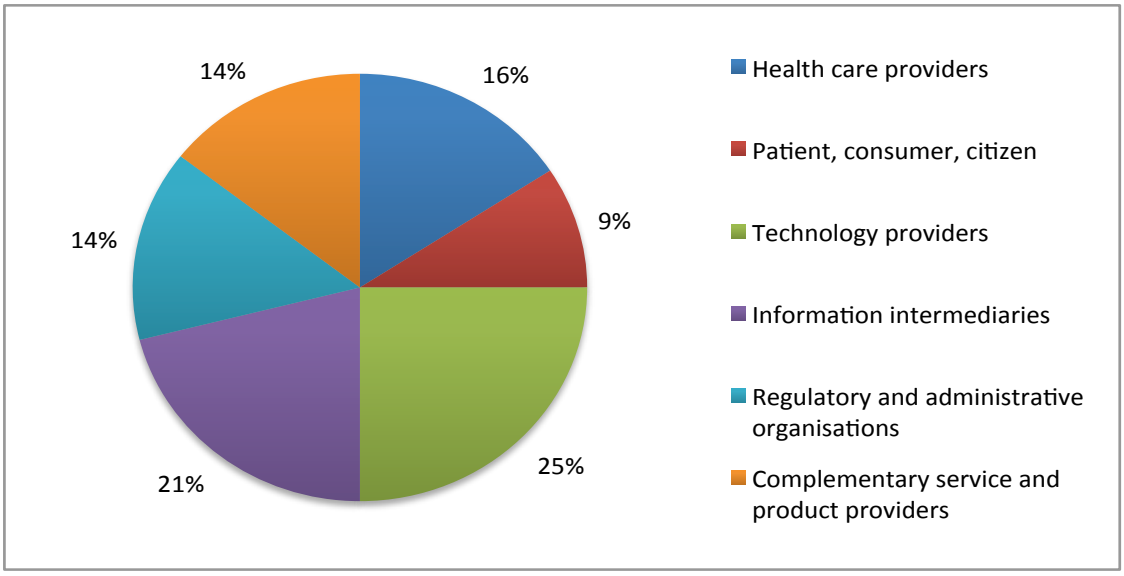
FIGURE 8.4: EXAMPLE OF INCUMBENT TYPE OF ORGANISATION MOBILE HEALTH FIELD SKETCH: REGULATORY ORGANISATION (FI DO1)



Source: Interview data

Graph 8.6 below is a summary of how the Finnish challenger type of organisations considered the prominence of different types of organisations in mobile health.

GRAPH 8.6: IDEAS OF SOCIAL STRUCTURE – VIEWS BY FINNISH CHALLENGER TYPE OF ORGANISATIONS ON THE KEY PLAYERS IN MOBILE HEALTH



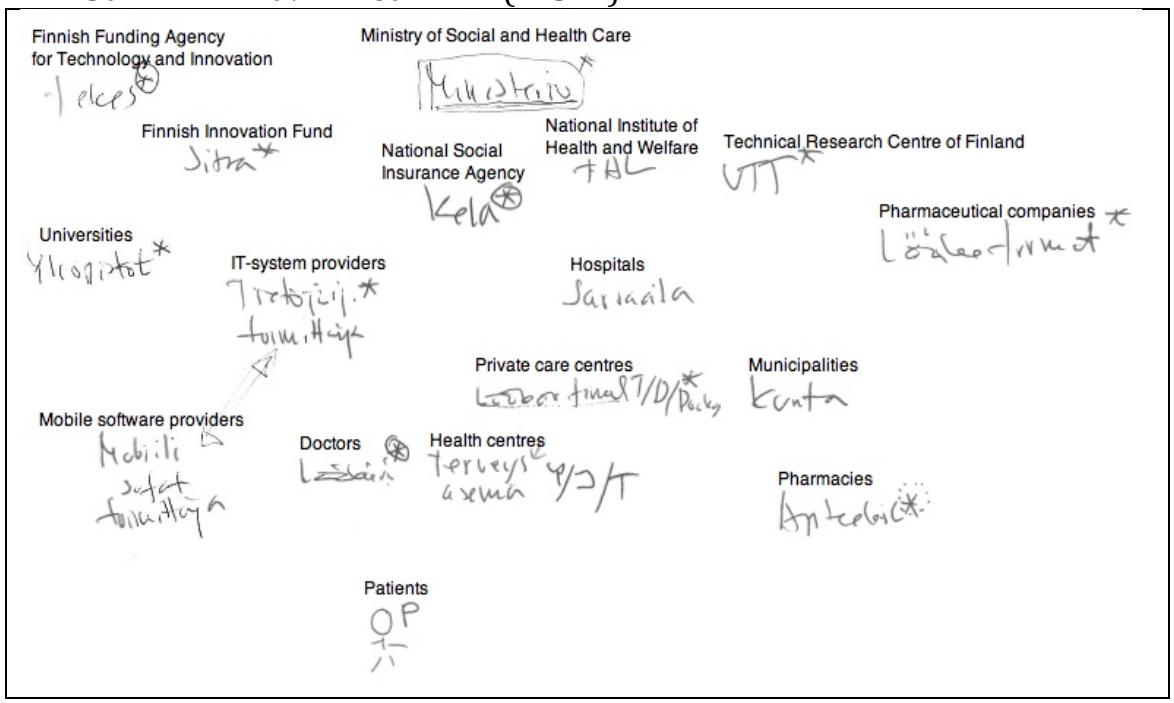
Source: Mobile health field sketches drawn in interviews

The challenger type of organisations have viewed the developing mobile health field in a rather balanced way, placed almost equal weight between the various types of organisations. Technology providers have been considered the most important category, but closely behind come the information intermediaries, i.e. the universities and other research institutes, insurance companies and industry associations. Health care organisations, regulatory organisations and the complementary service and product providers the next groups of types in significance, with almost equal weighting. Even if last in this count, the patients too have had such visibility in these sketches that indicate that they also are considered quite essential.

An example of challenger type of organisations' sketches (figure 8.5 below) shows a mobile health field that reflects the balanced view about the participating organisations that the above summary describes. This software company (FI SP1) respondent included six different types of organisations in their mobile health field sketch: Regulatory and administrative authorities (Ministry of Social and Health Care, National Institute of Health and Welfare, National Social Insurance Agency) in the top centre; funding agencies (Finnish Funding Agency for Technology and Innovation, Finnish Innovation Fund) in the top left corner; research organisations (Universities, Technical Research Centre of Finland) in left and centre; technology companies (IT-system providers, Mobile software providers) in bottom left side; care provider organisations (Health centres, Hospitals, Private care centres and Municipalities that are responsible for local care) in centre bottom; complementary service and product providers (Pharmaceutical companies, Pharmacies) on

right side; and finally Patients at bottom. The author of the drawing has emphasised the Ministry (Ministry of Social and Health Care) in the top centre in a separate text box, considered to have a slightly more important role in comparison with the other organisations. As an example of its importance, in his other comments this respondent lamented the fact that this Ministry had decided not to include mobile services in the new national patient record archive that is currently being developed. The star symbol marked next to some of the organisations indicate those actors that this software provider has sought to cooperate with.

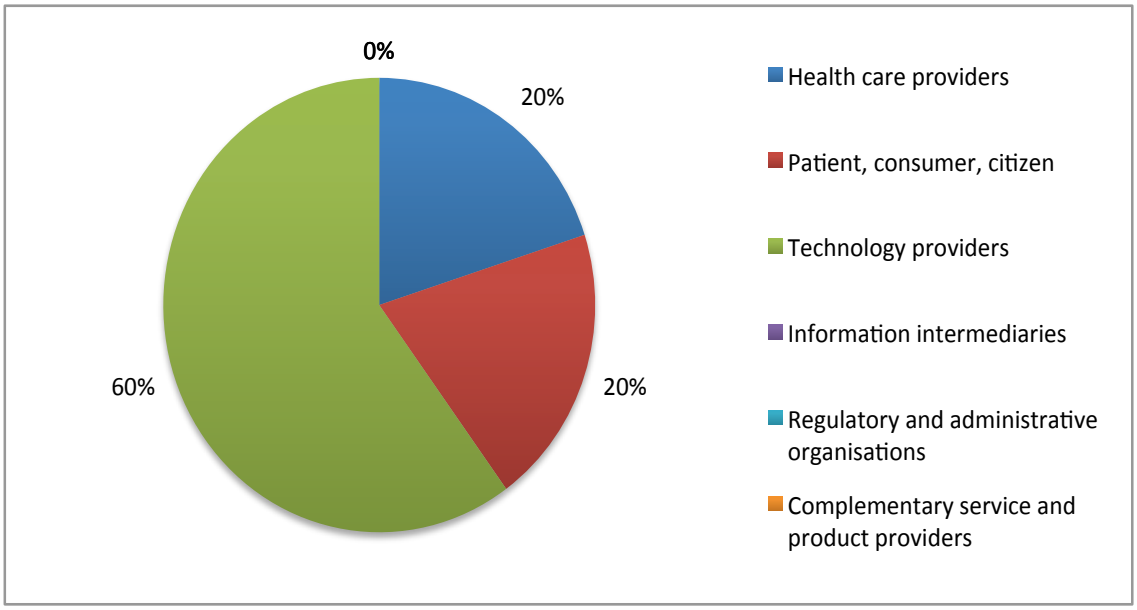
FIGURE 8.5: EXAMPLE OF CHALLENGER ORGANISATION MOBILE HEALTH FIELD SKETCH: SOFTWARE PROVIDER COMPANY (FI SP1)



Source: Interview data

Graph 8.7 below is a summary of how the Finnish health care organisations regarded the importance of different types of organisations in mobile health.

GRAPH 8.7: IDEAS OF SOCIAL STRUCTURE – VIEWS BY FINNISH HEALTH CARE ORGANISATIONS ON THE KEY PLAYERS IN MOBILE HEALTH

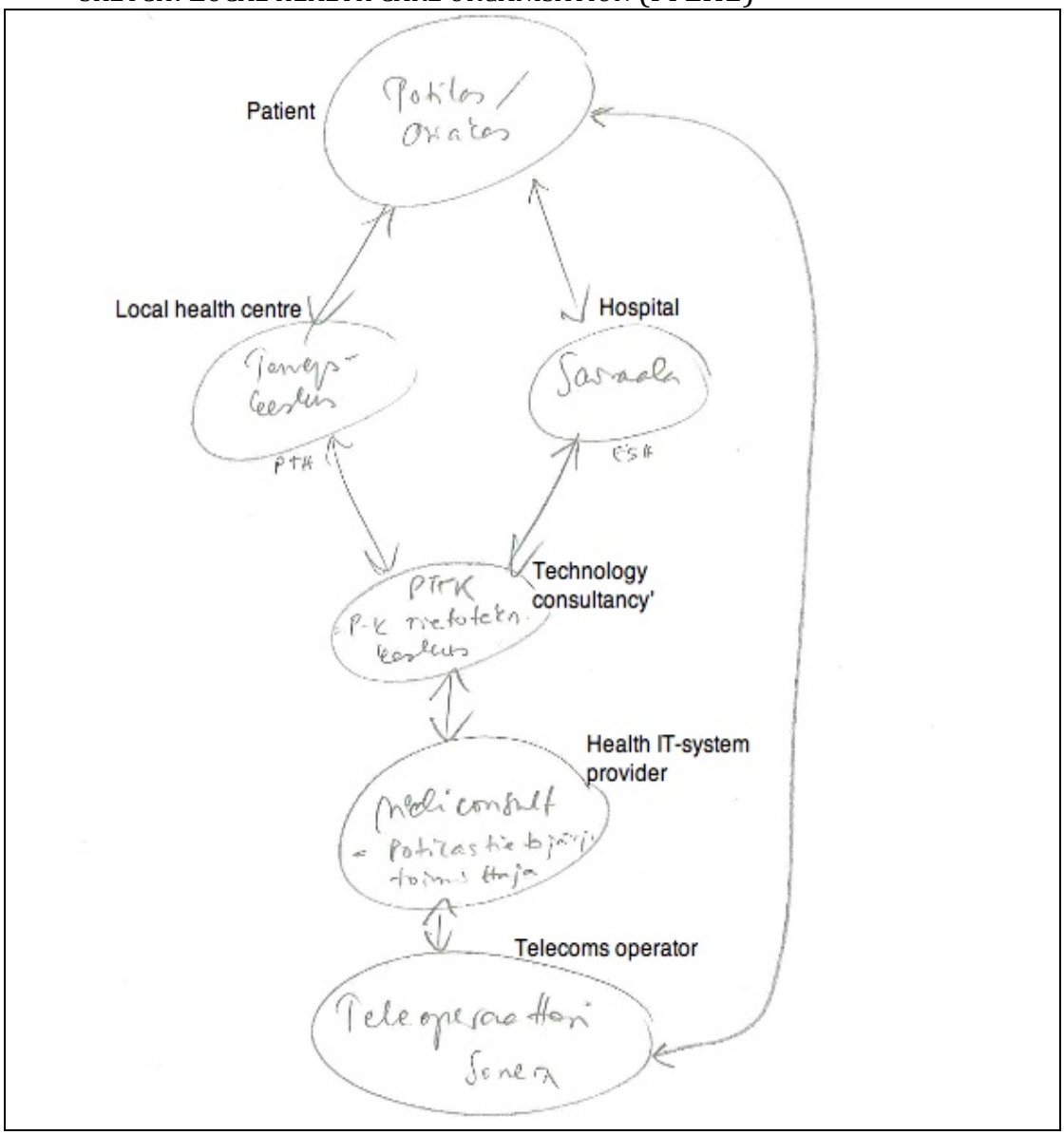


Source: Mobile health field sketches drawn in interviews

These health care organisations viewed technology providers as having supreme importance in mobile health. After the technology companies, they placed equal weight to health care organisations and the patients.

An example reflecting the more 'narrow' view that the health care organisations had is the image below (figure 8.6), provided by a local care organisation (FI LH2). Their sketch was focused on the traditional participants, with the 'Patient' at the top, the care providers ('Local health centre' and 'Hospital') at one level below, and the technology software and service providers ('Technology consultancy', 'Health IT-system provider', and the 'Telecoms operator') as a vertically stacked group below the care providers. In this drawing the respondent focused on the strict technical functionality in mobile health, and thus neglected many of the organisations of indirect influence that the field sketches of other Finnish organisation types did include. This also stands in stark contrast with the field sketches of the English health care organisations with their broad range of actors.

FIGURE 8.6: EXAMPLE OF HEALTH CARE ORGANISATION MOBILE HEALTH FIELD SKETCH: LOCAL HEALTH CARE ORGANISATION (FI LH2)



Source: Interview data

Overall, these sketches on mobile health field development indicate that the Finnish organisations, just as the English organisation, have divergent views of mobile health field membership. Even though in both case countries the health care and technology organisations have been indicated clearly as the most important categories of organisations, beyond those there is variation between the views of these groups. In both cases the challenger groups have emphasised two categories, which are not important in the sketches of the two other groups. These categories

are the information intermediaries, e.g. universities and research institutes, insurance companies and industry associations, and the complementary service and product providers, e.g. the 3rd sector care service providers, pharmaceutical companies and pharmacies.

The distinct view by the challenger type of organisations about the formation of mobile health field suggests that this group sees the developing field as diverse and thus complex to navigate. This finding implies that they see many types of organisations to potentially have influence over the field's development. This finding also corresponds with the social associating patterns in the English case, where the challenger type of organisations were more keen to develop partnerships with organisations outside of traditional health care and telecommunications sectors. In the Finnish case there is less clear correlation, in that also incumbent and health care organisations had become involved with organisations traditionally outside of these sectors.

8.3.3 Cognitive associating in mobile health

The Finnish organisations also engaged in activities of cognitive association by which they have tried to shape the understandings of mobile technology in health care. I described above how the English organisations have used white papers, conference presentations and their own websites to put forward their views of how mobile technology may serve health care. In addition, I described one cultural project, a diabetes cycling campaign, that one English challenger organisation has

used to showcase and gain visibility for the advantages that mobile technology offers for health management. The Finnish organisations have also attempted to shape the public understanding of mobile health, but they have been somewhat more careful in choosing their audiences, restricting their displays to smaller and selected groups of stakeholders. Finnish organisations have made these attempts mostly by speaking at various events, while being less active in publishing non-research type of analysis, such as white papers.

Incumbent type of organisations

Incumbent type of organisations have not been particularly vocal about mobile health. In my data only few incumbent organisations have indicated that they speak occasionally in events about the benefits of mobile technology in health and wellness. Representatives of one organisation, a mobile device manufacturer (FI DM2-1; FI DM2-2), have been speaking about their bespoke software solution for wellness management in conference and workshop events, two of which I witnessed myself. In their presentations they focused on the vast business opportunity that they perceive in mobile health and on the technical capabilities of the latest mobile technology. However, while they argued that patients ought to be more independent in the management of their own health and wellness, the software application they offer is not integrated to the formal care system. Due to uncertain regulations on mobile devices in health care, they have opted to remain outside of this care system, in order to avoid any regulatory complications. Thus, while heavily emphasising the technology's ability to empower individuals, the cognitive asso-

ciation they have sought to make has kept mobile technology distinct from the formal care system.

It is notable that among the incumbent type of organisations mobile health has not been high on the agenda, at least when measured in terms of presentation topics. It seems that this company has been the only one among the Finnish incumbent type of organisations of this study that has been active in making presentations particularly on mobile health. While undoubtedly most of the these organisations present their work frequently in seminars, conferences or workshops, mobile health does not appear to have been their focus on these occasions, suggesting that mobile health has a limited importance to these organisations in their repertoire of activities.

Challenger type of organisations

The Finnish challenger type of organisations have been slightly more active than the incumbent type of organisations in offering interpretations of mobile health. While the above-described large technology company had a strong patient focus, the small software providers (FI SP1; FI SP2; FI SP4) and a research organisation (FI RO1-1), i.e. the challenger type of organisations, have directed their software products mostly to care professionals. Their attempts to associate mobile technology with health care consists of three common themes that run through their respective presentations held at various events. One of the themes is the increasingly challenging circumstances in the health care sector, with cost and resource pressures from larger share of old age cohorts in the population. Another theme in

their framing has been that technology is able to provide a number of solutions to alleviate these pressures.

A third common element among these challenger organisation presentations relates to the role of the patient, but in their framing this role is defined somewhat differently from the example of the large technology company above where the patient was placed at the centre of mobile health. According to these challengers there is a need to re-define the roles between care professionals and patients, with the latter assuming a larger share of responsibility for their care and health maintenance than until now. In this situation care professionals will be needed to provide support to the self-monitoring. In their presentations the respondents from these organisations have all referred to diabetes as an exemplary case. Their reasoning has been that while patients are able to monitor and manage their condition at most times, the care professionals are still needed to oversee the trends in the patients' condition and be available for support at a moment of sudden deterioration. Thus, these organisations have ventured to propose a new paradigm of patient and care professional relationship, i.e. one where patients are more central in their own care and the care professionals provide them support when needed.

Health care organisations

Health care organisations have also made presentations to introduce and explain mobile health, thereby making specific cognitive associations between mobile technology and health care. One respondent from a local care provider organisation (FI LH1) noted that there has been very significant interest among municipalities and health care organisations in Finland towards how their organisation has

employed mobile technology in care processes, and this has resulted in many speaking engagements to present their experiences. They have employed mobile technology in care processes, in which doctors and nurses have been given mobile phones, with remote access to all patient records, making them reachable at all times. Thus, the cardiologists may be reached immediately for a second opinion, and community matrons may directly log in patient data on home visits. Consequently, these conference presentations have made the cognitive association between mobile technology and health care in rather practical terms, mostly focused on the advantages and disadvantages of use as well as on aspects of practical implementation. But also other issues have been touched, as at the 2011 annual conference of Municipal Health-IT, where the presentation focused in addition to the technical functionality in care processes also on the related privacy and data security issues.

Another example confirms that health care organisations have positioned mobile technology cognitively as tools to make the work of care professionals more efficient. One local care organisation (FI LH2) has made presentations at events where other local care organisations in Finland have initiated their projects to implement mobile technology solutions. Their presentations have focused also on the practical use and implementation issues. They employ text messaging as part of an appointment reservation system, and while patients are the recipients of the messages, this solution mostly improves the work processes of the care organisation staff. This local care organisation has also produced a manual to carefully describe the new appointment reservation process, further emphasising the utility of mobile technology in the practical operations of the organisation.

Thus, the cognitive associating by care organisations in these presentations has been to place mobile technology as a tool in the improvement of care professionals' work. Their framing of mobile health is clearly more focused around operational details in care processes, in contrast to the patient focus that the incumbent and challenger types of organisations have presented. The latter two differentiate by the role of care professionals in their framework, with the challengers still involving them as support for patient self-care. The one incumbent type of organisation that has actively provided framings of cognitive association separated the patients from the formal care system, setting them free to manage their wellness with the help of wellness software application.

OBSTACLES TO MOBILE HEALTH EFFORTS FOR SOCIAL AND COGNITIVE ASSOCIATION

The most prominent obstacle that the English challenger type of organisations have faced has been the difficulty to produce the evidence that supports their cognitive associations for mobile technology in health care. In Finland, as in England, it has been the challenger type of organisations in particular that have found it difficult to advance mobile health projects, whereas the two other organisation groups have experienced little or no difficulties. However, in the Finnish case the major obstacle has been for the challenger type of organisations to accomplish those social associations that would enable wide implementation of their solutions. This section will focus, consequently, mostly on these hurdles of the challenger type of organisations. The health care organisations have experienced problems in atti-

tudes related to technology, as part of their cognitive associations of improving organisational performance with mobile technology.

8.3.4 Obstacles for social and cognitive associations around mobile health

Challenger type of organisations

As I have described above, the challenger type of organisations, and in particular the software providers within that group, have framed mobile health as a set of technologies that will alleviate the health care sector crisis by allowing more patient responsibility in care and thus help leverage better the resources in the formal health care system. The core relationship in making this kind of cognitive association is the connections between the applications that these software providers develop and the health IT back-office systems. The latter are at the heart of care provision as they control critical information in care processes, e.g. patient records and booking systems. At the organisational level, this social association refers to a relationship between small technology providers and large IT-system providers. Their connection in material terms is between new mobile applications (e.g. for recording patient-monitored vital signs) and the health IT back-office systems.

The challenger organisations have made numerous but largely unsuccessful attempts to establish these social relationships. Many small software providers (FI SP1; FI SP2; FI SP4), along with some of the regulatory agencies (FI RO4; FI DO1)

have reported of the difficulty that the small software providers have had to create partnerships with the large, established IT-providers. According to one software provider (FI SP4) the typical scenario is that small software developers' access to the large, proprietary health IT-systems is effectively blocked. In the absence so far of public integration platforms, the only option for these small developers has been to build point-to-point solutions that collect data and store it on a server. As these solutions are not integrated into the patient record systems, any data collected in such a solution is stored on a separate database, outside of the main health care system. The consequence of this has been, as noted even by some of the incumbents organisations such as an innovation fund (FI IF1) respondent, that there are many providers of technology solutions, but none are offering a solution that is able to fulfil all needs. Neither has there so far been a way to integrate the many solutions into one package.

That the incumbent organisations controlling the back-office IT-systems have effectively blocked out the challengers can be seen also in the development activity on the field. In order to trial their new systems, the software developers have sought to run pilot projects for their applications. As a result of this control by the large system providers, the field has been full of pilots by small developers, which nevertheless have not lead to solutions that have been sustained. The concern in this Finnish case, in contrast with the English case, has been less about evidence, and more about the ability to ensure long term viability of the mobile solutions, that integration with the formal care system would provide. One software application provider explained:

"Pilots begins, pilot ends, but they do not scale. One is forced to sell isolated systems, and consequently most of the firms [that begun early on] *in this business are gone, probably 90% or more, both in Finland and elsewhere."* (FI SP2)

In some cases the connection of the new application in a pilot project has not been blocked outright, but it has been otherwise unattainable. One software provider (FI SP1) recounts how a municipality client insisted that integration of the mobile health application to their back-end system would be so costly and difficult that a small, independent pilot project was far more feasible. One of the reasons for this was the expenses incurred by the involvement of the back-end system provider, as they tend to charge "*outrageous*" fees for any additional development work. Another reason for this insistence was largely due to a complicated political process for tendering that any more formal procurement than merely a trial would require.

Beyond the inability to gain social and hence technical integration, the challenger firms also see a need for other cooperation with larger organisations once the market for these solutions will burgeon. As the respondent from one small technology firm explained (FI SP2), organisational resources and capacity have generally been a challenge for them in the early growth stage due to limited revenue. But they expect these resources to be wholly inadequate at the point when the market actually begins to grow vigorously and to near maturity. The small enterprises would need to be able to scale up fast, for which they have little capacity. One solution would be to partner with larger organisations, but so far these potential partners have been reluctant to enter into any formal alliances.

"Big players will take this field of course, small ones will not be able to compete, they will need to form alliances with the large ones quickly. [When the industry takes off]

no small firm, at least no small Finnish firm, will be able to grow big enough in short time [to be able to compete]*. They would need to grow 100 times bigger in a year, or something. You need a strategic partner that brings that volume right away, and then you may survive."* (FI SP2)

As a further challenge in making the critical social associations, the venture capital and other investors have been reluctant to engage with small mobile health software companies. One software provider (FI SP2) described how the uncertainty about the business and revenue model has made investors reluctant to accept a long time frame for a return on their investment. In this data there appeared no cases where the technology and health care sector investors would have invested into mobile health.

As the pieces from a mobile application, the back-office IT-system and the care organisation's processes are assembled together, many other practical matters also require agreement across organisations. One state technology research organisation (FI RO1-1) representative, with experience of several mobile health pilot projects where the technical integration has been unproblematic, suggested that on many occasions some more practical pieces have still been missing. The many organisations that are involved would need to take a holistic approach, to view this assembly as something akin to a system construction, involving organisational cooperation on nitty-gritty details.

"To implement these systems is still far from routine for us, despite the projects where we have done them already. While the technology for many functions exists, somebody needs to think about how the patient will receive the devices, e.g. an implanted device to measure ECG, who will pay for them, and what business or operational model this type of care process and technical system fits into. These things have not been thought of as a whole. Some people are interested in the implant, some in the

phone or other technology, doctors are interested in the care - as they should be. But thinking for the whole still needs to be done, and that we should be able to make progress on in the next five years." (FI RO1-1)

One additional present-day hurdle of social association for challenger type of organisation relates to the national patient records archive and their inability to convince the political decision makers of the usefulness of mobile technology in this system. This patient records archive and information infrastructure has been developed in an on-going project throughout much of the 2000's. I have already described the aims and the progress of this project in chapter four. The project will establish an archive for the collection of all patient data from public and private care organisations. In principle, being a publicly funded, nation-wide project, it carries a promise of equal access for service providers, which would allow any software providers to integrate their solutions to the national grid.

This project could be a salvaging initiative for mobile application developers, but it will, however, not bring any immediate relief to these small firms. The project will not contain, at first anyway, any functionality intended particularly for mobile technology, which has obviously disappointed some of the software providers. One software developer (FI SP1) respondent observed that despite agreeing to the likely benefits of using mobile devices to access electronic patient records, the project group developing the infrastructure project and in particular the public organisation responsible for project leadership has declined proposals to integrate mobile solutions into the system. According to this respondent, the project leadership pleads the absence of a political decision for mobile integration at the ministry level.

Health care organisations

The Finnish health care organisations have faced obstacles in cognitive association instead. I have reported above that the health care organisations have framed the adoption of mobile technology as an efficiency measure, in order to improve care processes. One of these challenges has surfaced in the form of attitudes about technology. Embedding new technology has required changes in care pathways and in other organisational processes, and some of these changes have faced resistance among some of the staff. Some staff has resisted the adoption of new technology on the basis that the past work processes are easier and more convenient to follow. As reported specifically by two local care providers (FI LH3; FI LH2), in some cases staff have either refused initially to change their familiar work practices to the new processes, while in other cases they have continued to follow the old practices alongside the new, thus completing the task twice. One example (FI LH3) is the registering of data on home visit to the patient record, where community matrons input data on the mobile device while at the patient's home, as well as at the end of the day at the office for the second time. However, in time there has been "*unlearning"* of the old processes and the resistance has subdued as a result of the positive experiences with the new technology by some of the staff (FI LH2).

Another, more complicated challenge of cognitive association has been the need to create performance metrics to verify the supposed improvement in organisational processes. The arguments of mobile health as a tool of process improvement call for evidence of such improvement over time, for which measurement instruments are needed. The challenge has been to develop tools that are able to measure, pref-

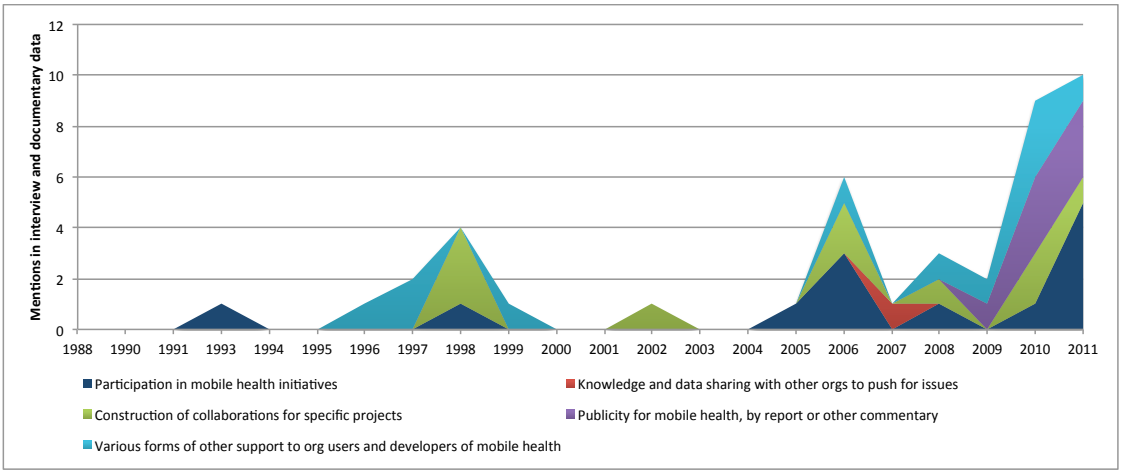
erably in quantitative terms, all the benefits accrued. While the information on some of the costs on device and system investment and expenses for staff training tend to be easily available, some of the benefits are often more difficult to gauge. Some of the savings related to the costs of providing care may also be relatively easily discernable, but health improvement, better quality of care or better quality of patient life may be difficult to measure. One local care organisation (FI LH1) has developed Return On Investment (ROI) calculations of all newly adopted technology. Their experience has been that developing these measurements is extremely difficult. Ready models of how to calculate such qualitative factors have not been available, and thus this organisation has been forced to make the development effort by itself. Thus, it has been difficult to develop the tools by which evidence is made available about the effect of mobile health. This evidence is nevertheless needed to support the cognitive association of mobile technology and improved health care processes.

8.3.6 Timeline of the social and cognitive association activities in mobile health

Graph 8.8 is another piece of evidence of how mobile health efforts have occurred in an *episodic* pattern. Social and cognitive association activities have *alternated* and *reappeared* in sequence during the two decades, beginning already in 1993. The activities of social association – seeking partners for projects, participating in others' initiatives and the support activities such as training – have occurred throughout the two decade period, while the activities of cognitive association –

making publicity for mobile health and knowledge sharing for common aims – have appeared only later, from 2007 and 2009 onwards, respectively.

GRAPH 8.8: SOCIAL AND COGNITIVE ASSOCIATING ACTIVITIES BY THE FINNISH RESPONDENT ORGANISATIONS



Source: Interviews and organisational documents

8.4 CHAPTER SUMMARY AND CONCLUSION

I have discussed in this chapter the efforts by organisations to associate mobile technology with health care, both in terms of organisational relations and in terms of how to understand the advantages of mobile health. Table 8.1 below provides a summary of the chapter's findings.

Table 8.1: Summary of findings of mobile health social and cognitive efforts and obstacles

	INC England	CHA England	HCO England	INC Finland	CHA Finland	HCO Finland
Social associating efforts	✔✔	✔✔✔	✔✔	✔	✔✔	✔✔
Cognitive associating efforts	✔✔	✔✔		✔	✔✔	✔✔
Obstacles to social and cognitive associating	✔	✔✔	✔		✔✔✔	✔✔✔

INC – Incumbent organisations; CHA – Challenger organisations; HCO – Health care organisations, i.e. health care service providing organisations.
✔✔✔ = high frequency in data
✔✔ = medium frequency in data
✔ = low frequency in data

In both England and Finland there have been many examples of these activities of social and cognitive association. Overall, the challenger type of organisations have generally taken a distinct approach to mobile technology and health care. Their approach is underscored by the notion that the current health care system is in need of reform, and mobile technology has the potential to further that reform. The incumbent and health care organisations, in contrast, have seen mobile technology rather as an additional functionality within an existing care system.

In terms of the social associations, the distinct approach by the challenger types of organisations has meant seeking partnerships with a variety of types of organisations, also with ones that are new in either health or telecommunications sector. Through their sketches of the developing mobile health field they have given a relatively prominent place for new types of organisations that are information intermediaries and complementary service and product providers, more than the other groups of organisations. In Finland in particular the software development compa-

nies have, however, been unable to make the crucial social connections that would enable them to integrate their applications with the back office health IT infrastructure. As a result, they have only been able to conduct small-scale pilot projects that have had little continuity, and in consequence difficulties in gaining stability for their business ventures.

In terms of cognitive associations, organisations have been making publicity for mobile health through presentations in conferences, workshops and websites. One of the arguments have been that mobile technology, already proven in other industries, may bring efficiency advantages also to health care and to the management of personal wellness. This more general claim has been made by the incumbent organisations, whereas health care organisations have made more specific organisational efficiency arguments. The challenger type of organisations have, instead, associated mobile technology with broader reform in the system of health care provision. In an improved system the patient would be placed at the centre, and mobile devices, usually well known to patients, would therefore be a key part of this reform. Yet, associating mobile technology as part of a broader reform effort in health care has placed the onus on these actors to provide evidence that mobile technology can deliver improvements in cost efficiency and health outcomes, at large scale. Particularly the challenger organisations in England have found it difficult to muster evidence to back up their stance that the care system needs reform. They have been unable to organise large-scale pilot projects that would provide such evidence. As a result, they have made little progress in having mobile solutions procured by the health care organisations in large scale.

These efforts at social and cognitive associating have shown early moments, thus, as a period when institutional entrepreneurs engage in many efforts, but there are obstacles to advance novel arrangements. These obstacles have derived largely, as in the evidence of previous chapters, from the well-established organisations in control of the health care IT infrastructure and from those controlling the procurement operations for health care. The forms that institutional entrepreneurship have taken at early moments has also included these efforts at associating, which corresponds to some extent with the institutional theory literature that emphasises social interaction in structuration processes. However, one of the crucial findings of this chapter has been to note how these institutional entrepreneurs have faced resistance in their associating efforts, an aspect that has received less attention in the literature. Lastly, the timeline data in this chapter has provided further support for the *episodes* –argument: the Finnish data has again made a more clear indication, while the English data provides more subtle support for this argument.

CHAPTER 9: DISCUSSION – MORE TECHNICAL AND CONTEXTUALISED INSTITUTIONAL ENTREPRENEURSHIP

9.1 INTRODUCTION

In designing this investigation I have been driven by curiosity to understand the difficulties that seem to exist in regards taking proven technology and applying it in new areas of society. In order to investigate these difficulties, I have studied how organisations take existing mobile technology solutions, develop them further, and attempt to apply them to the perceived needs in the health care sector. Mobile health, in England and Finland, has provided an excellent opportunity for examining what are the complications in this type of 'technology transfer'.

In this discussion chapter I will draw together the pieces of my inquiry. I first provide a brief summary of my empirical findings, in terms of actors, macro-level contextual aspects, and the specific efforts and context that my study has mostly focused on. Next, with the help of my research questions, I discuss my analytical conclusions as they relate to the literature. Finally, I respond also to the intellectual dilemma that has motivated this study.

9.2 BRIEF SUMMARY OF EMPIRICAL FINDINGS

9.2.1 The active organisations and macro-level tendencies in early moment mobile health

There have been significant differences in the level of initiative among these organisations. Overall, evidence from the two countries suggests that the early efforts for advancing mobile health as practical installations have come from those involved in pilot projects to test technology applications. The technology companies and health care organisations have been involved most prominently in early initiatives, while in Finland also research organisations have also played a contributing role. It is particularly noteworthy that regulatory organisations have not been active as of yet. In both countries the domestic legislation for care has been labelled 'permissive', allowing for the delivery of remote care, but there has been no further encouragement for mobile health in the form of statutes or other legal directives. This suggests that such institutional structures as regulations tend not to be implemented at the early moment stage, but only in subsequent phases of field development. Initiatives to introduce mobile technology into health care have come from all three categories of organisations of my study, i.e. the incumbent type of organisations, the challenger type of organisations and health care organisations.

In England organisations have become active in mobile health only since the second half of the 2000's. In Finland organisations have become active much earlier, already since the early 1990's. An additional distinction has been that, to a greater extent than in England, in Finland there has been particular interest and initiative among research organisations, as state funding programmes have enabled early research on potential application of mobile technology in different areas of society. Moreover, there have been various innovation promotion organisations that have also sought to act as a catalyst and driver of this new field.

Based on my analysis of the macro-level economic and health care sector factors in these two countries, England and Finland have many features by which they are alike, and few features that distinguish them as cases. Both have a relatively high level of mobile phone and Internet use, measured as subscriptions and compared with their reference countries. Both have an average level of ICT and medical technology patent applications. Both also have average utilisation of care facilities, level of health care and social employment, and expenditure on health care sector. They also both have a low level of product market regulation.

These two cases are different on few points, which cluster around the issue of 'centralisation'. While Finland has a decentralised health care system, its industrial development is significantly guided by extensive central government funding. England on the other hand has a centralised health care system, but its industrial development lacks Finland's financial guidance from the centre, forcing entrepreneurs to rely on private capital markets. I will elaborate below on the significance of the similarities and the differences in these macro features, and how they contribute to the broader insights on institutional entrepreneurship at early moments.

9.2.2 The efforts and contextual elements in the institutionalisation of mobile health

Analysis at the case-specific level brings out the multifariousness of mobile health at early moments. One characteristic of mobile health development has been that there is much diversity in regards ideas about this concept: Four different views of

what devices mobile health means, seven different views of what functions mobile health serves, and three types of users of mobile health devices. The diversity in ideas entails diverse arguments, and in neither of these two cases there has been consolidation yet of what mobile technology use in health care means.

The early moment diversity is manifested also in the efforts to materialise these ideas of mobile health. Firstly, 'technical' efforts have been predominant in both cases. Under this heading I have included three types of efforts: First, the development of devices and software applications; secondly, the development of business models and service concepts that employ these technical objects; and thirdly, the efforts to conduct research that has examined the functionality of both the technology and the business and service concepts. There have been many efforts of the first two kinds in both country cases while only in Finland has there been relatively extensive academic research on mobile health.

However, there have also been considerable obstacles in both cases to these technical efforts. In Finland, where these efforts began earlier already in the 1990's, there have been many inefficiency problems with the device and network technology. The English efforts began in the second half of the 2000's and they exhibit a later generation of challenges, many of which are shared by the Finnish case. The differences between location-fixed, broadband computing and mobile devices have forced developers to create new approaches to handling data transfer and display. Also the large variety of devices have required different lines of software and integration development, necessitating extensive investment in time and financial resources.

An exception to the diversity theme is the 'structural' efforts, of which there have been only few in these two cases of mobile health development. There have been a small number of new mobile health organisations or intra-organisational units founded in both countries. There has also been some public funding mechanisms in Finland made available for mobile health projects. However, there have been no bespoke mobile health regulations in either country.

There have been diverse institutional arrangements from source fields that have had adverse effects to these mobile health building efforts. For example, the medical device regulations of the EU have had a negative effect, as they do not provide clarity on the key questions on the compliance requirements of mobile devices and applications in health care services. In both countries, the existing institutional arrangements of the source fields, like procurement rules in England, and the way data is arranged in health IT systems, like the organisation oriented ordering of data in care IT systems in Finland, have appeared as constraints and obstacles to the actors' efforts to build mobile health.

Third area of efforts concerns social and cognitive associating. In both countries there have been many efforts to collaborate and create partnerships on mobile health. This has involved many organisations that already operate either in health care or mobile telecommunications, but also other types, such as gyms or data hosting services, which have been newcomers to health or telecommunications field. A typical example of actors' efforts in cognitive associating has been the making of publicity, in conferences and workshops, about mobile health.

Also here there have been obstacles presented by the surrounding source fields. Particularly prominent example is the difficulty of Finnish organisations to develop partnerships with the larger IT providers whereby their mobile applications could be integrated with the existing back office systems that the large firms control. In England the challenger type of organisations have attempted to associate mobile health with cost and health outcomes improvements but their small pilot projects have failed to provide convincing evidence to support these claims.

Temporally mobile health has evolved at different pace in the two countries, but with a similar pattern nevertheless. Finnish efforts began in the early 1990's whereas the first efforts in England took place in the second half of the 2000's. The discernible pattern in both cases has been one of episodes, where the types of efforts have alternated and recurred over time. Despite the limitations of available timestamp data, the timeline graphs show this pattern of waves. This suggests that the early moment period of institutional entrepreneurship has an episodic character, with fluctuations in efforts.

9.3 THEORETICAL SIGNIFICANCE OF EMPIRICAL FINDINGS

I discuss the theoretical significance of my findings and analysis for the concept of institutional entrepreneurship. Observing and analysing the efforts by institutional entrepreneurs at early moments have produced two main findings that have implications for the conceptualisation of institutional entrepreneurship. As I have described in chapter two on literature, the extant view on institutional entrepreneur-

ship has emphasised the cognitive and socio-political efforts to promote the institutionalisation of novel solutions. I respond to my overall research question and the intellectual dilemma I set out in the beginning by first addressing my supporting research questions.

9.3.1 Efforts by institutional entrepreneurs

My first supporting research question has been:

How do the efforts of institutional entrepreneurs differ at early moments from those described by the extant literature?

As I have indicated in my review of the institutional literature, the prior scholarly arguments have emphasised the cognitive and socio-political types of efforts to institutionalise novel solutions. Cognitive systems have been at the core of sociological neoinstitutionalist arguments (Scott, 2008), making the central task for institutional entrepreneurs to shape, in various ways, the meanings and knowledge of other actors in regards the new solution. This emphasis emanates from the underlying premises in institutional theory, set to uncover the motivations of actors in meaning systems. This cognitive turn (March and Simon, 1958) has produced several strands of work. One of the interests has been towards how the normative authority of social action influences actors (Parsons, 1951, in Scott, 2008). Another focus has been on symbolic systems (Mead, 1934, in Scott, 2008). Other work within the cognitive stream has moved towards the socio-political approach, with focus on common meanings as generated through interaction (Schutz, 1967, in Scott,

2008). Berger and Luckmann's work amplified attention to how meaning and reality was produced in social interaction, through repetition and shared knowledge (Scott, 2008), thus bringing these two perspectives ever closer. Yet, despite this convergence, the cognitive and the socio-political may be seen as two different streams of arguments that have been employed in recent work to explain institutional processes.

Cognitive efforts

The cognitive stream of arguments has stressed the importance of influencing the understandings of actors in regards a novel solution, in order to achieve its acceptance. In typical cognitive type of arguments scholars have investigated products of discourse, such as formal legal documents (Maguire, 2003) or advertising campaigns (Munir and Phillips, 2005) that seek to reshape the impressions of an artefact. In other cases the focus may be on an issue, such as environmentalism (Hoffman, 1999).

Also the mobile health case consists of evidence of cognitive associating, which confirms the argument that institutional entrepreneurs engage in cognitive claims, even at early moments. In the mobile health case they have sought to argue and demonstrate how mobile telecommunications is a proven technology in other fields, and that its application in the health care field may bring cost efficiencies and improved health outcomes. The means for this publicity making have been relatively conventional, e.g. producing white papers, making presentations at conferences and workshops, and even radio and television interview programmes.

While these messages have been produced, they have been directed mostly towards specific constituents, i.e. professionals in the health care sector, telecommunications industry or government agency officials who either at the local or national level are involved in developing health care services. Thus, these discourses have not sought to command national debates about advancing health care services with mobile technology. In chapter five I have reported that there has been a recent surge in news media interest in regards mobile health, yet it is unclear how widely mobile health is known as a concept among the population. Thus, cognitive associating of mobile technology with health care may have remained within the organisations and individuals or the relevant sectors.

The significance of these cognitive efforts may be assessed through their relative success, which requires a further comment. The methodological approach of this study has removed the default presumption of success in efforts, which I have argued mars many of the presentist works in this genre. The data in this study has also shown how cognitive efforts may face resistance. The diversity in messages between types of organisations has seen the health care and the incumbent type of organisations promoting mobile solutions within the framework of existing care paradigm, whereas the challenger type of organisations have advocated a new patient-centred paradigm that would involve mobile technologies. The former, more conservative, approach has received less resistance, whereas the latter has struggled to provide the needed evidence for the arguments that the new paradigm, enhanced with mobile applications, would represent a leap forward in health service provision. These struggles have related directly to the inability to organise large-scale pilot projects to test applications. Thus, as the failings of the cognitive associ-

ating have had rather concrete, practical roots, these cognitive efforts have been subservient to the technical efforts of experimenting.

Socio-political efforts

In another prominent stream of arguments authors have made claims around the idea of the construction of social structure (Lounsbury and Ventresca, 2002; Fligstein and McAdam, 2010). Organisations seek to institutionalise novel solutions by developing or reconfiguring their relationships with other organisations. In this position the network relationships trump any technical efficiency aspects of the artefacts, as organisations seek "*social solutions to competition*" (Fligstein, 1996, p.656). Potential partners for these organisations may be either in subject positions critical for domination or access (Maguire, Hardy and Lawrence, 2004), or they may have significant resources which to leverage (Lawrence, Hardy and Phillips, 2002; Hargrave and Van de Ven, 2006; Garud, Jain and Kumaraswamy, 2002). Advancing the institutionalisation of novel solutions through collaborations has frequently been likened to social movement type of coalition efforts (Schneiberg and Lounsbury, 2008; Rao, Monin and Durand, 2003).

Also efforts at social associating have been a relatively common feature at early moments of mobile health. Organisations have sought partnerships in their mobile health initiatives, whether with those already familiar to them from before, or with organisations unknown to them. There have been three main approaches in their efforts to create collaborations. They have searched for suitable partners for their own mobile health projects; they have joined broad based coalitions or industry

association working groups; and, some organisations have served to facilitate the forming of collaborations between others.

As with cognitive associating above, also the potency of social associating is called into question by the resistance to these efforts. While the data shows that there have also been partnerships created without struggles, there has been a recurrent pattern in how the efforts for integration by many small organisations have been de facto blocked by large, incumbent type of organisations. One prominent, frequently cited situation has been the closing of the health information network for the small mobile health application developers. Large IT companies have provided and control the back office IT-systems in care organisations, which are the backbone to the broader information network for health care. Refusal to open API access to these systems have kept the small developers at the fringes of health care, precluding a large-scale use of mobile devices in health care. These small companies have made concerted efforts to connect with these large IT firms and to integrate their applications with the main systems in care services, but they have faced determined and concrete resistance. At the time of data collection, after years of efforts, several of the small application developers, as well as others who had immediate knowledge of the dealings between these companies, commented on this pattern. Thus, while social associating has occurred in some areas, these efforts have fallen short in others. Again, as with cognitive associating, technical efforts have played a significant part in these problems.

Overall however, this evidence suggests that social and cognitive efforts are part of institutional entrepreneurship even at early moments. At the same time, the exten-

sive material efforts and the considerable obstacles to these efforts testify to their importance, suggesting that the social and cognitive efforts have not been the sole, nor even the most important element of institutional entrepreneurship at the early moment stage.

Technical efforts

As a result of its emphases on cognitive and socio-political efforts, institutional theory literature has paid little attention to technical or material efforts in processes of institutionalisation. Garud, Jain and Kumaraswamy's closing statement is well indicative of how authors of this genre have closely remained within the domain of the cognitive and socio-political argumentation:

"Essentially, even the development of technological standards is a battle fought in political and cognitive realms." (Garud, Jain and Kumaraswamy, 2002, p.210)

Nevertheless, the prominence of the technical activities, in both country cases, underscores the need to consider how institutional entrepreneurs engage in material efforts at the early moment stage. This case shows plenty of evidence that institutional entrepreneurs are intensely involved in the production of material artefacts. They put together technical solutions from pieces of software and devices. Once these technical solutions are developed enough, institutional entrepreneurs test them. They measure the performance of the devices, and analyse the advantages and limitations. They write software for devices, in some cases bespoke software for each device, and run endless tests to ensure the software produces the desired outcomes in the user interfacing applications.

In an attempt to connect these solutions to the existing network of information systems, they acquire the API, the 'application programming interface', when available and write software that allows the application to connect to the large information system. In short, they bring to material existence the ideas of what information technology may accomplish in health care.

Moreover, the importance of materiality extends beyond the building of artefacts. It is even more evident in the experiences of obstacles that the study's respondents have reported. Whether in the malfunctioning of technical devices, in the limitations of devices to transfer, receive, handle and display information, or in the difficulty to integrate new devices and applications to existing back office systems, the many technical complications indicate the pivotal part of material considerations.

I have suggested above that technical efforts have a significant role as the basis for any cognitive and socio-political efforts. I extend this idea here to argue that from the perspective of the notion of 'commitment' technical efforts may be more crucial at early moments for the institutionalisation of a new solution than the cognitive or socio-political efforts. Without the technical efforts, in cases where material artefacts are involved, statements attempting to create symbolic meanings for mobile health may have a more fleeting nature, as little or no cost is involved with failure to honour these pledges. Likewise, in cases where technology is involved, partnership relations might be established to anticipate field development, but also in these cases retracting on agreements may impose little expense or penalty. However, technology development involves cost, at least in human resources but possibly also in parts, licences, and through devices on which to test on. Due to cost

implications, technical efforts signal a different, a more concrete type of commitment than the cognitive and socio-political efforts, which are potentially more tenuous and easily unravelled.

Further attention on the technical efforts comes from some authors' contention that material efforts may in fact have a decisive institutional impact. The mobile health case confirms Friedland and Alford's (1991) and DiMaggio's (1988) contention that

"*institutional transformations are simultaneously material and symbolic transformations of the world. ... The deployment of material resources not only involves real material relations; it also communicates meanings."* (Friedland and Alford, 1991, p.246)

Friedland and Alford go on to suggest, with reference to exchange of cultural values between the West and the non-West, that without a material transformation the ideas and values do not transport sustainably. Even if their argument in fact makes the opposite case of the importance of symbolic systems, in these statements they uphold the existence of material efforts in these processes. As I have suggested here, subsequent work has neglected the material effects and focused on the cognitive and socio-political efforts.

A sequence model to incorporate technical, cognitive, socio-political and structural efforts

One solution to reconcile the centrality of the technical efforts and the primacy of cognitive and socio-political efforts in the extant literature is to consider placing these in a step-wise model of institutionalisation. The process of institutionalisa-

tion would be considered as tiered in stages where each stage, while not entirely devoid of a specific type of activity, would be denoted by one activity as more prominent than others. The stages would complement each other to build up technical, social and cognitive stability for the new solution.

The mobile health case suggests that the first stage in this model involves particularly the technical efforts, i.e. the building of artefacts and the creating of technical connections. At the same time, even if at a lower level of intensity, there may also exist the socio-political and cognitive efforts, and possibly even little of the structural efforts in the form of founding organisational units. At the subsequent stage these roles are reversed, as the concern turns more towards conceptualising products and conveying meanings to audiences, as well as establishing supply partnerships and marketing alliances, and away from immediate technical efficacy. The mobile health case evidence suggests that efforts to build structural elements occur at a further stage yet. While some have argued that structural elements, such as regulatory norms or establishment of professional associations (Scott, 2008; Greenwood, Suddaby and Hinings, 2002), are pivotal in the processes of institutionalisation, the near absence of structural efforts in the mobile health case suggests that this type of activity has a very small role at the early moment stage. That regulatory arrangements may lag behind other efforts is consistent with some of the earlier work (Scott et al., 2000). The logic of this order would thus be the following: Technology experimentation and integration provides the building blocks upon which the other elements are constructed; the existence of technical devices and applications allow making both cognitive assessments of products and services as well as gauging the social structure of collaborations; and finally, these

prior activities have prepared a more solid ground for the task of formulating regulatory directives, which is aided by the existence of examples of technology and operating models.

Examples of this type of modelling exist in current literature on institutional entrepreneurship, but their shortcoming is that they have been less explicit about the importance of the technical efforts. For example, Greenwood, Suddaby and Hinings (2002) argued that institutionalisation occurs in six stages. In one of the early stages they suggest that organisations "*innovate independently, seeking technically viable solutions to locally perceived problems"* (p.60). However, they do not elaborate beyond this statement about what this innovation consists of, and how crucial it is for the subsequent stages. Their focus is on theorisation, i.e. the cognitive efforts, which they see as the pivotal activity.

Likewise, there have been other authors who have been proposed similar models, but have been equally vague about the importance of material effects (Morrill, 2006; Purdy and Gray, 2009; Lounsbury and Crumley, 2007; Dorado, 2005). While not structured with the terms I have proposed, in these models one may recognise faintly similar stages. The emphasis in these models is on the social and cognitive efforts, generally placed at the centre of the model. For example, Lounsbury and Crumley (2007) have labelled this "*theorisation/mobilisation"* (p.1004). They include cursory references to the development and promotion of new practices and organisational forms, labelled "*innovation stage"* (Morrill, 2006, p.11; Purdy and Gray, 2009, p.373), which represents the stage of technical efforts I have advocated. The arrows in these models suggest that the third stage consists of legislative

efforts, phrased "*legitimacy/boundary redrawing"* by Lounsbury and Crumley (2007, p.1004). Nevertheless, my criticism of these models is for their diminution of the technical efforts, mentioned in passing but far underweighted in the entire scheme. As I have insisted, this study has shown that at early moments institutional entrepreneurship is particularly about the efforts to develop the technical side of novel solutions.

9.3.2 Contextual impact on institutional entrepreneurs' efforts

My second supporting research question examined the influence of the contextual conditions at the early moment stage:

How do the perceptions of context at early moments differ from how context is perceived in the extant literature?

The second focus of this research concerns the role of context in which institutional entrepreneurs operate. The mobile health case sheds new light on the question of context for institutional entrepreneurship. The argument here is that, as this early moment case shows, institutional entrepreneurship may face fiercely resistant contextual conditions from source fields surrounding the newly developing field. Yet, literature has placed rather little emphasis on context, as if taking it for granted. I specify the distinction between institutional change and emerging field studies in terms of context, I emphasise the importance of detail in descriptions of context, and I introduce the idea of '*source field*' as a way to specify the origin of contextual effects. With claims related to these areas, I stress the importance of

accounting for the influence of contextual conditions in institutional entrepreneurship framing.

Institutional change vs. emerging fields in terms of context

As I have noted in chapter two, there are two typical framings in this area of literature, namely 'institutional change' and 'emerging fields'. Most of the work in this literature concerns cases where change occurs in an existing organisational field, with existing set of institutional arrangements. The aspect of context has been recognised as important (Mutch, Delbridge and Ventresca, 2006; Emirbayer, 1997; Barley and Tolbert, 1997; Lounsbury and Crumley, 2007). This literature has discussed context for the most part in terms of the existing set of institutional arrangements, as revealed by statements "*existing institutions*" (Purdy and Gray, 2009, p.355) or "*the socially constructed field-level consensus*" (Greenwood, Suddaby and Hinings, 2002, p.60) that these authors use when describing the circumstances of their cases. In these typical framings contextual conditions constrain the efforts to institute novel solutions, which, by definition, deviate from the institutionalised processes, behaviour and technologies. Paradoxically, some of these pieces nevertheless are positioned to discuss the 'emergence of new fields', which logically are not furnished yet with an institutional framework. The wording 'change within existing fields' would more accurately reflect these cases than field emergence. This incoherence leaves students of new solutions and emerging fields uncertain as to how to treat context in their studies, but resolution exists in the distinction between 'institutional change' and 'emerging field' types of cases.

Context and detail

The 'institutional change' types of studies tend to treat context in a general manner, whereas the 'emerging field' cases have a more complex relationship with context. As Hoffman (1999) has suggested, one needs to analyse the specific institutions that concern the issue, as well as those that concern the actors that inhabit the developing field, in order to gauge the proper impact of context. An example of the former type of work is Seo and Creed's (2002) discussion of how institutional contradictions and collective, conscious action can produce institutional change. Their references to context, such as the "*larger, societal context, a context consisting of multiple, interpenetrating levels and sectors"* (p.228), allude to institutional conditions and pressures, but give little indication of how efforts to make changes are constrained by institutional arrangements, even if that is the underlying premise and starting point. At points where the become more explicit about the relationship between change efforts and the institutional context, they see the context as supporting change, by

"*not only triggering the shift in actors' consciousness, but also providing alternative logics of action and psychological and physical resources to be mobilised, appropriated, and transposed in the process of institutional change." (p.231)*

Yet, their account is silent about how the context, i.e. the incumbent actors, the regulatory framework, the established professional practices, may react against the proposals for change, which disregards the earlier insights about context, what Hannan and Freeman called "*external pressures toward inertia"* (1977, p. 932). The

studies in the 'institutional change' genre tend to sweep over the institutional context as relatively static, wherefore I call their treatment of context as 'general'.

In contrast, a completely opposite image of the relationship between the efforts and the institutional context highlights the difference between studies of 'institutional change' and 'emerging field'. What the mobile health case has shown is that, when looked at in detail, the introduction of novel solutions faces the obstructive side of context. In the 'emerging field' type of work, as in the mobile health case, in principle the contextual circumstances are less clear than in established fields and therefore these cases merit a closer examination of what are the different elements of context.

In an example of 'emerging field' work and detailed treatment of context, Morrill's (2006) study of the emerging alternative system of dispute resolution displays a relatively comprehensive treatment of contextual factors. He discusses context as "*nested domains*" (p.5) that includes two levels: A higher level as Friedland and Alford's (1991) five central institutional logics of the West, namely the market, bureaucratic state, family, democracy and Christianity; and a lower field level comprised of organisations, services, products, regulatory agencies and the social ties between all of these. Throughout the case description Morrill makes references to various organisations and events that either facilitated or constrained the development of alternative dispute resolution mechanisms.

Particularly interesting is that Morrill's case study has a setting that is structurally similar to the mobile health case. He frames his case as "*interstitial emergence*" (p.2) in which the novel organisational form of alternative dispute resolution was

developed in the space between the formal socio-legal field, therapeutic and community organisation fields. In the mobile health case this space is between the health care sector and the telecommunications industry (I discuss this further below). Morrill has included in the analysis a wide range of actors whose positions shaped the context for the efforts to promote alternative forms of dispute resolution. Aside from the more obvious actors in the legal field such as courts and state government, there were other actors such as private funding agencies, legal scholars, community advocacy groups, lay public, academic and practitioner journals, and even the presidential administrations. They all are accounted for as influences, whether for or against, in the development of the reform that is alternative dispute resolution. This suggests that especially in cases of 'interstitial emergence' an analysis of the contextual conditions and impacts is needed.

Yet, some studies, despite assigning themselves the label 'emerging field' type of study, have been more cursory in their analysis of contextual influences, indicating that this aspect of institutional analysis has been often neglected. Lawrence and Phillips (2004) suggested that new fields emerge in the context of *"broad macro-cultural institutions as well as more local, specific or technical institutions"* (p.691). In practise, their focus is on the macro-cultural discourses, by which Lawrence and Phillips refer to society-wide discourses on the given topic, in their case the popular perceptions regarding whales. They describe local action to materialise entrepreneurs' ideas to create local whale-watching industry. These ideas were partly born out of the macro discourses, but the authors include little of the local context that should have had an impact on these efforts.

Another example shows how the neglect of the specifics of context tend to occur in favour of detailed description of action. Maguire, Hardy and Lawrence (2007) were keen to develop a "*contextualised understanding"* (p.658) of institutional entrepreneurship in an emerging field, which they defined as a "*relatively unconstrained space"* (p.674) which lacks "*clearly defined leading actors, a coherent discourse, structures of cooperation and domination, sets of accepted norms, or stable inter-organizational relationships." (p.675).*

In other words, their intention was to give a contextualised account, but the case exhibited an absence of much of institutional structures. Their discussion focuses on the specific activities by two main institutional entrepreneurs, promoting HIV/AIDS treatment advocacy, but it forgoes an analysis of the impact of the societal circumstances and responses. Considering their relatively contentious topic, at least in the 1980's and 1990's, there most likely existed various institutional pressures and resistance by other institutionalised actors, but the authors choose not to include these into the case description.

Source fields

These formulations go some way towards providing a framework to understand contextual aspects, highlighting the broader conditions in which efforts are made, and to account for the influences of the institutional context. However, they, even Morrill's work, fall short of offering means to determine boundaries for context, which would follow Hoffman's (1999) argument about the need to specify conditions in order to gauge their impact. In the mobile health case I have employed the

idea of *source fields*, which refers to established fields surrounding the developing field.

I use the idea of source fields in the mobile health case analysis in order to display the specific impact of context and to provide a template for treating the contextual factors. In this case the source fields are the health care sector and the mobile telecommunications industry. These sectors provide specific resources and interests to mobile health. One of these is the organisations that seek to take advantage of the perceived opportunities of bringing mobile technology to health care. From the mobile telecommunications industry there are e.g. the software developers, the IT-system providers, the device manufacturers, and the telecommunications network service providers. From the health care sector there are e.g. local and national health care clinics, hospitals, health information services and the providers of specialised services for health conditions.

Another contribution of the source fields to the field of mobile health is the regulatory regimes that they bring with them. The most prominent observation in this regard is that these regimes have conflicting interests. Mobile telecommunications field is governed by a regulatory ethos and mechanisms to enable efficiency and profitability of the member organisations, while health care is governed by principles of patient safety and quality of care. As a consequence, the institutional entrepreneurs in mobile health have reported how these sectors pull in different directions and thus create complicated contextual conditions for the developing mobile health field.

My data collection strategy has produced detailed evidence of how the two source fields have constrained mobile health efforts, and how their different regimes have complicated attempts to bring technology solutions from mobile telecommunications to be employed in the health care sector. I have reported of these constraints extensively in my empirical chapters. Here I point out few of these constraints in order to highlight how the contextual impact may be traced to specific source fields. These examples emphasise the impact of the health care sector in particular. To begin with, in both countries there have been, and continue to exist, many legacy back-end systems in health care that tend not to be 'mobile-friendly', making the integration of the new solutions difficult. Part of the context is also the overall physical environment, such as old hospital buildings, that do not support the use of wireless communication. Equally, the efforts to develop the business and service concepts have been deterred by the 'culture of expensive fixed systems' that care organisations exhibit in their procurement, despite the promise of lower cost service delivery from the more modular mobile solutions. Moreover, part of the procurement processes is a narrow view in cost evaluation, how costs and benefits are allocated to different parts within care organisations, and the financial incentives in care delivery have all worked against the implementation of mobile health solutions.

In addition to these specific source fields, it is necessary to recognise, or at least stay attentive to, also the impact of broader national and international factors that are part of the contextual circumstances for these kinds of efforts. In the mobile health case there has been national politics, in terms of lack of political leadership to support new solutions for care as well as spending cuts in health related ser-

vices. These have been perceived as being unhelpful or even counter-productive to mobile health efforts. National projects to transform the infrastructure of health care IT-systems have in both countries suffered from severe delays, which in turn have held back interest towards implementing new solutions until the national systems provide the broader technical framework. There has also been an impact of the international context. This context has had an impact in the uncertainties regarding the reach of the European wide medical device regulations to mobile devices and applications.

Finally, the telecommunications sector has also had a contextual impact. This industry, ingrained in the psyche of its professionals as well as in its regulatory regime, is hard-wired to the logics of financial viability, exerting commanding influence on the strategic planning of its firms. This profit-oriented logic has confronted the health outcome and patient security dominated logic of health care sector, leading to difficulties to reconcile between these interests. In more detail, the mobile technology firms that have entered the mobile health space have tried to find a balance between these interests, yet so far this seems to have eluded these companies.

Overall, these contextual aspects have had a considerable and mostly inhibiting impact on the efforts to introduce mobile health. The early moment examination of institutional entrepreneurship indicates that context is a formidable counter-force to efforts to introduce new solutions. In this case the effect has largely been of resistance, but in other empirical studies the surrounding institutional frameworks may be more accommodating – even if in most cases they have been considered as

a constraining or an isomorphic element. The mobile health case shows that the institutional context – which at early moments is likely to come from *source fields* – has many impacts on the efforts of institutional entrepreneurs, and therefore deserves a careful and detailed examination.

9.3.3 The impact of early moments view on the concept of institutional entrepreneurship

I have thus arrived at the main question in this research, which has been to examine whether employing the early moment period as a different lens provides additional insight about how institutional entrepreneurs promote new solutions. I phrased my main research question as:

How does the early moment perspective impact the conceptualisation of institutional entrepreneurship?

As my supporting research questions indicate, I have focused on two pivotal aspects in this study that I contrast with the corresponding tenets in the literature: how efforts may be different at early moments; and how the context may seem different at early moments. The initial response to the main research question above is relatively direct: Early moment perspective highlights a significant new side of institutional entrepreneurship, with emphasis on technical efforts, and on contextual conditions that have a significant impact on the efforts to create novel arrangements.

Examining these efforts at early moments has revealed aspects that have been mostly disregarded in earlier theorising on institutional entrepreneurship. These findings suggest that scholarship on institutional entrepreneurship should expand from its cognitive and socio-political moorings and consider other types of efforts that may nevertheless have institutional effects. As I have argued in this report, the literature on institutional entrepreneurship has not considered technical efforts as having such effects, but that the mobile health case indicates that indeed technical efforts are an inextricable part of overall efforts to introduce and institutionalise novel solutions.

From the sphere of information sciences, an argument by Lessig (1999) serves as a useful analogy to highlight the potential institutional significance of technical efforts. Writing on the computer software, copyright and privacy in cyberspace, he has suggested that software architecture may have equally authoritative and isomorphic effect as regulatory or legislative norms. The way software code has been written will determine the functioning of information systems, to which humans operating them respond. In this way technology forces a certain discipline on its users. I have argued that in the efforts to bring mobile technology to health care the technical efforts are equally central, as the technical choices will define much of the other choices, whether cognitive, socio-political or structural.

My emphasis on the technical efforts is countered by the weight I place on the contextual effects. The detailed view at the early moment stage has brought into full view the friction between these two aspects in the mobile health case. I have described how this friction is extensive, with practically all efforts meeting resistance

from institutional elements of the source fields. The early moments perspective has enabled to discover these specific points of resistance, and to trace them to these source fields, in contrast to the more sweeping references to institutional framework that the generalist treatments of past literature have produced.

Aside from distinguishing from the broad statements of past work, this study has indicated a different relationship between efforts and context. Much work interested in the relationship between agency and context or structure has paid attention particularly to the influence of the latter to constrain, *but not prevent* novel efforts. In the accounts (e.g. Whittington, 1992; Barley and Tolbert, 1997) that have explained Giddens' (1984) conceptualisation of structuration, efforts are modified, yet allowed, by broader social processes and elements. The direct conflict between efforts and contextual elements that I have described in many instances has outright blocked the use of mobile technology, which provides a view of context distinct from earlier literature. It is with this type of detailed account and conceptualisation of contextual conditions that I have hoped to contribute to clarifying what Fligstein and McAdam (2010) call "*forms of action endemic to … overall structure of contemporary society*" (p.2). It has been my research design approach of early moments, with avoidance of presentist bias from known outcomes and by the gathering of data from broad range of organisations, that has made possible to unearth these aspects as they relate to institutional entrepreneurship.

9.3.4 Response to the intellectual dilemma

My findings provide a response to the intellectual dilemma I presented in chapter one as motivation to embark on this research project. I asked *what accounts for the apparent difficulty of implementing novel solutions, even if they are proven technologies?* As I have argued in the beginning, the concept of institutional entrepreneurship has been a useful approach to study this question. This concept is set to examine the activities of institutional entrepreneurs, while considering also the institutional environment. In this research, it has allowed me to discover detailed efforts that actors engage in, but also to obtain data on the specific circumstances that influence these efforts.

I draw two insights from my results to answer this intellectual dilemma. My research suggests that the difficulty of implementing novel technology solutions, in an area of society previously untouched by this technology, is linked particularly to the institutional environment of these efforts. In this mobile health study this environment consists of two main institutional contexts, the health care sector and the telecommunications, that overlap in the newly developing organisational field of mobile health. Coupled with the absence of its own, bespoke institutional elements, such as a regulatory framework, it has been difficult for the actors to negotiate the differing interests and demands that these conditions present. Therefore, one of the answers to the intellectual dilemma are the constraints of the existing institutions, resisting proposals for change that the new technology implies.

Another answer to this intellectual dilemma concerns the efforts. In this case, where there is no outcome at the time of data collection, it has not been possible to determine which course of action produces institutionalisation, and conversely which does not. However, I draw the following conclusion from the efforts and the obstacles I have described. As there have been obstacles to efforts in all three areas of activity, i.e. the technical, the structural and the socio-cognitive, it is necessary to make efforts in all areas. I have referred in this chapter to *integration* as a key idea. Based on the mobile health study, a novel solution, whether in terms of the technology, of organisational processes and set of policy implications, or of social relations between organisations and individuals, needs to be integrated with the corresponding existing, institutionalised elements. In other words, an institutional entrepreneur needs to make battle at all three fronts in order to overcome the resistance of existing practices. This also suggests a response to the first question in the abstract about how to achieve impact and endurance through implementation – which stage, as I have noted, this case has not reached, and thus a response may only be suggestive.

9.4 CHAPTER CONCLUSION

I have drawn together in this chapter my core findings and the claims in the literature on institutional entrepreneurship. I have argued that a look at institutional entrepreneurship at early moments reveals some core shortcomings in this concept, so central in institutional theory and in its view of action and change. The

extant literature has emphasised the cognitive and socio-political efforts of institutional entrepreneurs, but my study shows that at early moments these actors engage particularly in technical efforts. The technical efforts are the basis for the efforts in social and cognitive associating that takes place after the devices and applications have been built. At early moments there are very few structural efforts, i.e. only a few mobile health organisational entities are founded, and no bespoke regulations or other governance mechanisms are created. These, I conclude, are put in place at a later moment in the process of field structuration. I suggest that a step-wise model where these efforts each have their distinct home in three stages might provide a useful framework to view institutional entrepreneurship at early moments.

I have also argued that contextual conditions receive less attention than is due in accounts of institutional entrepreneurship. At early moments the impact of context is formidable. I have reported how practically all of the efforts have faced some contextual constraint or resistance. I have explained these to originate in the source fields, in particular health care and telecommunications. These findings highlight context for a literature that largely has treated context in a rather general manner, or examined it as supporting change, while disregarding the constraints on efforts of change. Greater, and more refined, attention to context allows us provide more comprehensive explanations about how institutional entrepreneurs attempt to institute novel solutions, and why those efforts may often fail.

Next, in addition to reflecting on this research, I will discuss the implications of these analytical and methodological perspectives on the study of institutional entrepreneurship and for organisational sciences more generally.

CHAPTER 10: CONCLUSION – EXTENDING INSTITUTIONAL ENTREPRENEURSHIP

10.1 INTRODUCTION

I have presented here an extensive account of a case study on the efforts of introducing novel technologies to new areas of society. In this concluding chapter I explain how this research may contribute to the study of institutional processes and organisation theory more generally. Next I will reflect on the limitations of this project and on the potential for conducting further research based on this work. I conclude this chapter, and this report, with ideas on potential broader implications of the findings.

10.2 THEORETICAL CONTRIBUTIONS OF THE STUDY

I have argued that institutional theory literature has been missing some critically important elements in its way to explain how new technologies are introduced and promoted. One of these elements relates to how this body of work has exhaustively sought to show the impact of cognitive and socio-political efforts. The emphasis on these types of efforts is coherent with how institutional theory has evolved over time, and with the influence that certain movements of thought and authors have had (Scott, 2008). However, this work has rarely referred to the more rudimentary activities of material development that actors engage in, such as designing, making prototypes, testing and manufacturing of devices and software applications. One may infer that in this literature these material aspects have been part of a Hobbesian kind of state of nature, already provided for, leaving the construction of the

civil society (Hobbes, 1651) of meaning systems and stable social relationships as the only matter of interest. This neglect of materiality may be a product of research design, which I have argued has mostly been 'presentist', i.e. tracing backwards the steps to institutionalise the presently known outcome (Butterfield, 1931).

However, a more comprehensive view of how actors introduce and promote new technologies is needed, if we are to produce detailed yet widely applicable theoretical insights to support practical efforts to bring new technologies to our societies. In order to evade retrospective bias I designed my study to allow an impartial and wide-open view of these activities. The choice of early moments as the stage to study in the institutionalisation process enabled me to capture a wide range of efforts, including the failures, before the focus in the respondents' and the researcher's mind had turned to only the 'relevant' or successful ones. Collecting data at a wide range of organisations has allowed observing the influence and interconnectedness of a variety of actors on mobile health.

As a result of this research, I have extended the concept of institutional entrepreneurship to recognise the value of material development in the process of institutionalisation. Based on my findings, I have suggested that technical efforts may be a foundation for the other efforts in institutional processes. The model that I have proposed in my discussion chapter places technical efforts as the dominant activity at the first stage, with cognitive and socio-political efforts more prominent in the second stage, and the structural efforts at the last stage. I have made an argument also that these technical efforts may have institutional effects beyond their role as a foundation for later activities. For this argument I have referred to Lessig's

(1999) claim that computer software may act as an architectural element that has a determining effect on related organisational processes and other individual behaviour.

Another aspect I have found wanting in this literature has been the cursory attention to contextual conditions for these efforts. Most studies in this genre have studied institutional change in established fields, which in principle facilitates the assessment of contextual effects. This work has incorporated context by analysing how outcomes were produced under the influence of institutional effects. While consistent with the achieved outcomes of their studies, these theorisations have neglected those effects of context that forestall entrepreneurial efforts.

In my study I have tied the impact of institutional entrepreneurship more closely to its context. Examining the contextual effects at macro-level and in connection to actors' specific efforts has revealed the substantial role that various institutional arrangements play in institutional entrepreneurship. I have suggested that while the early moment stage consists of ambiguities and uncertainties, an analysis may trace the contextual effects to source fields that provide the actors and other resources to the newly developing field. My work thus encourages a greater attention to context in studies of institutional entrepreneurship, and the idea of source fields may help to generate specific descriptions of what kinds of contextual factors have which kind of effects.

My study makes also a methodological contribution. With my study I respond to a common call (Barley and Tolbert, 1997; Munir and Phillips, 2005; Purdy and Gray, 2009; Garud, Jain and Kumaraswamy, 2002; Clemens, 2007; Padgett and Powell,

2012) to develop ways to overcome the difficulty of investigating how new ideas, practices, organisational forms as well as technologies are first brought to our attention. My early moments approach has produced a study that has distinct advantages from other work of institutional entrepreneurship. With the non-presentist collection of data, i.e. prior to known outcomes, I have avoided the retrospective bias of both the respondents and researcher. Gathering data from wide range of organisations, in the spirit of the organisational field –concept (DiMaggio and Powell, 1991), has provided a broad, even if also detailed, view of the efforts, perceptions and experiences of actors at early moments.

10.3 LIMITATIONS OF THE STUDY

As any study, also this one has its limitations. Overall, the early moment stage, with all its ambiguities and uncertainties, complicates the planning of research. Many of the open questions are basic, which in other, less ambiguous research contexts would not hamper planning, and indeed would provide guidance for design. Here some of these questions were: Which types of data to collect that would best provide a view of events in an emerging field? How to manage the potential shortage of data? Where to find organisations that are active? Such uncertainties may result in research design choices that turn out to have shortcomings. I count three significant limitations in my study.

One of the limitations of this research relates to the organisational documents. Organisational documents were intended to support the data provided by the inter-

view respondents about the activities of these organisations. Organisational documents had potentially an important role in this study, but they provided only modest value for analysis. The interviews were rich in data terms, but in order to gain a more comprehensive view of the organisation's activities, the documents were expected to provide a strong supplement. I considered at planning stage the role of documents to be significant as the sample size for a qualitative study was expected to be relatively large and obtaining access and conducting multiple interviews in each organisation was deemed unrealistic.

However, the yield of my documentary data collection efforts turned out to be rather weak. Many organisations were reluctant to make internal, project related documents available. Most had no brochures made up of mobile health services or technologies. Some of the organisations had added mobile health to their range of services, but these represented a small part of the whole, and thus mentioned little if anything on their website of these services. Several of the documents that were available were sales related brochures, which were of rather low value for this study, as they contained no information about the projects to implement mobile health, who these services had been developed with, and what were the experiences to develop these technologies or services. Thus, this limitation of the document data had to be managed by relying more on the interview material.

Another limitation of the study comes with the timeline data. As I have explained in connection with some of the timeline graphs, the data is incomplete as no timestamp has been available for all ideas, activities or perceptions of challenges. The interviewees were asked to specify the time point of events, but in the interest

of a good flow of interview discussion the interviewees were not interrupted at each turn to make a time reference. This is clearly a methodological issue that requires resolution, as such timeline data can be advantageous in studies where time matters. In this research I managed this limitation by making the tone of the related arguments cautious, and emphasized the limited strength of the argument due to the incompleteness of data. Also, part of managing this limitation is that in making the episode –claim I have drawn on the context data (chapter four) and also the interview data to show that the episode –dynamic appears in different types of data. The appearance of this dynamic in these different data gives more credence to the episode -claim.

Third limitation in this study is the somewhat unbalanced set of organisations. A good balance of types and numbers of organisations would provide additional coherence and credibility to the study. To begin with, one improvement would have been an overall balance in the number of organisations between these two cases - in this study there were more organisations from Finland than from England. More importantly, there were difficulties in achieving a balance in some categories of organisations. For example, despite laborious efforts, I was unsuccessful in obtaining access to more than one NHS local health care organisation, whereas in Finland there were four such organisations I gained access to. Likewise, I gained access to several large device manufacturers and software providers in Finland, but in England the software providers were almost all small. Better balance between the cases in types of organisations would have provided yet another level of analysis and set of questions, such as: Is there evidence across cases that large technology organisations behave differently at early moments from small technology organisa-

tions? Do local health organisations have similar conceptions of mobile health across cases? In the analysis this limitation has been managed by leaving out this level of examination, as the sets of organisations have not been compatible enough, and by focusing on other aspects.

10.4 POTENTIAL FOR FUTURE RESEARCH

I have suggested that my contributions urge a partial rethinking in regards the study of technologies and their new applications. I have emphasised in this study the importance of material commitments, and their relationship with the existing institutional arrangements, whether a good fit or requiring significant alteration of these orderings. I have argued that they need to be the initial focus of efforts by institutional entrepreneurs, at least at early moments.

What would this mean in a study of other technologies currently at an early moment stage? Examples of technologies or concepts that have recently entered into public consciousness are self-driving cars, drones for peaceful use (such as logistics or search and rescue missions), digital currencies (such as Bitcoin), and wearable computers (such as Google Glass or smart watches). Examples of other technologies that have been in public discussion for a longer time but that are still far from wide-spread use are electric cars, semantic web, genetic engineering and 3D printing. These topics all involve novel technical solutions, societal interests or needs, and enthusiasm by organisations that are moving first to develop and promote applications. While first discussions of these may have emerged prior to ac-

tual physical devices, none of these areas have progressed much until there have been at least trial versions of the products. At the same time, entrepreneurs have begun shaping the cognitive landscape for these products, associating their advantages with a variety of needs or interests. It seems also quite clear from these cases that structural elements, such as bespoke regulatory guidelines, follow after the development of devices. The existing legislation on currencies, for example, is having difficulties in controlling Bitcoin, and several countries are actively monitoring its development while they prepare to regulate this new technology (Foley, 2014).

In this study I have used the temporal construct of early moments as a lens to study efforts to develop and implement new technology, and this design could be explored more for its appropriateness to the study of technology. As I suggested above, these technologies are at their early moment stage now. Thus, they provide appropriate venues for studying further the efforts and context of institutional entrepreneurship. These studies could then confirm whether technical efforts are dominant first at early moments, as in the mobile health case. They could also give some indication about the relative weight of cognitive, socio-political as well as structural efforts. Furthermore, these studies could develop further the defining of context in this type of "*interstitial emergence"* research (Morrill, 2006). The relevance of this type of research may be on the increase, as the transfer or extension of technology from one industry to another sector becomes more common. Information and communication technology is a good example of this, where in addition to mobile health these technologies are being applied to payment at supermarket cashiers, to payment for parking, to control household energy use, and most re-

cently to acquire a taxi service (i.e. a Uber-service). Studying these cases with the early moment approach could explore further how to bound its elements, such as the actors, but especially the contextual effects that originate in a variety of fields. I have suggested at the beginning that technologies continue to proliferate, and consequently this will increase the demand for techniques to study such complex cases.

Another interesting avenue would be to study and theorise further the contextual obstacles to novel efforts. In this study these obstacles have played a distinctly visible role. A researcher could apply a 'reverse engineering' type of approach by focusing particularly on the obstacles, and through data on obstacles build a portrait or an image of the early moment landscape of a given technology. The assumption behind this proposal is that questions of obstacles would prompt respondents to relate their experiences of various challenges to their efforts, and thus this approach would provide not only data on the obstacles but also on efforts, as well as the organisations active and the extant structures. Theoretically this work could contribute to the perennial debates about structure and agency (Weik, 2011) and more specifically to those on institutional entrepreneurship and the structural constraints.

Moreover, another feature of this study that deserves further scrutiny is my research design. I have argued that the concept of organisational field has frequently appeared in studies that have consisted of either a small number of organisations, or only a few different types of organisations. I have also emphasised that my interpretation of this concept is one of many organisations from different industries

and sectors that are bound together by an interest. A large study on the concept of organisational field itself would investigate several of these novel technologies and seek patterns of field development or emergence at early moment stage. Aside from producing insights on these fields themselves, and such a study would also help to develop further the concept of organisational field. An additional feature to this type of study is the drawing exercise I have used, in which respondents are asked to sketch their perception of the developing field. This device could be refined in terms of the precision of its objective and task assignment, as well as the analysis of the sketches.

Another project to follow up on my research would be to continue investigating the development of mobile health. There are many useful questions to ask from new data: The timeline graphs that I have presented show a spike of increasing activity in the last years. Further research could track whether this trend continues, or will subside and change or even fade out. This latter finding would then put my research into new light, which could be defined e.g. as 'early moments without success'. New research could also continue to monitor whether there are changes over time to the efforts of organisations towards more cognitive, socio-political and structural types, as I have suggested. For example, as the level of activity in mobile health appears to be increasing according to the timeline graphs, are the large actors becoming more active, and perhaps even beginning to acquire some of the smaller companies with proprietary technology or ready service concepts? Few respondents in this research suggested that although until now the large technology companies have made little commitment in mobile health, they will at some point become more active and take over the emerging field. If further moni-

toring of the field would reveal this to be correct, might an inflection point be determined when the emergence process becomes dominated by larger organisations?

Also, additional research into mobile health might be able to study the subsequent impact of these early moment efforts. My research has deliberately left out the analysis of impact, as the absence of successful cases of institutionalisation would make the assessment of impact potentially unreliable. Continuous research on mobile health, until clear signs of institutionalisation, would enable analysis of impact of these earlier activities.

10.5 CONCLUSIVE COMMENTS FOR BROADER SIGNIFICANCE OF FINDINGS

I have tried to make arguments in this report that provide focused theoretical contributions. But I also propose that there are two broader implications for society and the study of technical change that my findings and conclusions have.

First, this study may be considered useful also in the context of our relation to technology and its role in the society. As I have suggested in the introduction chapter, one of the aspects of contemporary society is how ubiquitous the use of technology is. Organisations equally in public and private sector employ technologies in order to improve the efficiency of their operations as well as the quality of their services. As a consequence, great investments are made into the development of

technologies. Aside from highlighting the significance of technical efforts, this study has urged a greater attention to contextual resistance, by which actors may prepare more strategic implementations.

I have also suggested that none of the types of efforts alone may suffice in attempts to institute new technology. While this study has no evidence of completed processes of institutionalisation, and thus may not yield definite answers to the question of how to institutionalise a new technical or other solution, the extensive obstacles on all fronts suggests that efforts need to be made on all fronts. From this observation I have inferred the insight that institutionalising new technology solutions requires efforts at integration in all three areas of technology, cognitive and socio-political, and structural elements. This insight has implications for strategic planning and execution in both private and public sector. In particular, one of the questions that arises in consequence is that if this is the dynamic of economic reform more broadly, or 'innovation' at a local scale, what may be the public policy mechanisms that best support positive regeneration of the economy.

Secondly, the above considerations are related to another broad theme that may be informed by this study, namely how to think about change and social action. My extension of the concept of institutional entrepreneurship is built on a world-view where broader reform is possible only when new solutions may be integrated with existing arrangements and relationships. In other words, complete 'greenfields', i.e. new and unconnected to existing fields, are rare, but novelties are always dependent on, and working within the framework of, a large range of existing institutions. These integrations are not built overnight, and thus the characteristic efforts in

this notion are of sustained and multitudinous action. There may be mistakes, failures and defeats, but new endeavours are needed to find solutions around obstacles. This is a world-view that sees reform happening through relatively slow processes. This view stands in contrast to common public talk, and some academic theorising, on innovation, which celebrates heroic entrepreneurs, breakthrough events, radical innovation and disruptive technology. These popular maxims neglect the need for the integrative efforts at broad front that I have suggested. Based on this research, it is my view that instituting new technical solutions in complex societal contexts such as health care requires strategies of sustained efforts that equally encompass technical, social, cognitive and structural aspects.

APPENDIX 1. DESCRIPTIONS OF PARTICIPATING ORGANISATIONS

The tables below indicate the organisations that have participated in this research through granting interviews and making organisational documents available. They are divided here by category (incumbent, challenger and health care organisations) and by country (England and Finland). They indicate the type of the organisation, the short code by which the organisation is referred to in the empirical chapters, and the justification for placing this organisation in the category (or description of services, for the health care organisations). The first two letters of the short code refer to the country affiliation, and the following two letters to the type of organisation. The identity of the participating organisations and their representative interviewees has been concealed due to confidentiality guidelines of the NHS Research Ethics Approval process.

Incumbent type of organisations in England and Finland

Table A-1 and A-2 indicate the incumbent organisations. These organisations are in a position of power, mostly as a result of their strong market position (private sector organisations), but also because of their core role in either self-regulating industry or providing guidance (industry association or professional association), for their mandate from ministry (for administrative or oversight duties, or for a

role in providing funding), or for the actual state legislative and executive role (Ministry).

Table A-1: English incumbent type of organisations

Type of organisation	Short codes	Justification of incumbent status
Industry association	EN IA1	Industry standards body, with international reach
Consultancy	EN CO2	English unit of a large multinational business and technology consultancy
Professional association	EN PA1	Professional association in the health care field
Software and system provider	EN SP1	Large multinational software provider
System and service provider	EN SP2	Large multinational telecommunications company
Software and system provider	EN SP4	Large multinational software and system provider
National ministry	EN MI1	Government executive agency with regulatory power

Table A-2: Finnish incumbent type of organisations

Type of organisation	Short codes	Justification of incumbent status
Innovation fund	FI IF1	National funding agency
Public research and development organisation	FI RO4	Ministerial mandate
Industry association	FI IA1	National industry association
Industry association	FI IA2	National industry association
Device manufacturer	FI DM1	Multinational device manufacturer for the health care field

Table A-2: Finnish incumbent type of organisations

Type of organisation	Short codes	Justification of incumbent status
Device manufacturer	FI DM2-1	Mobile telecommunications device manufacturer
Device manufacturer	FI DM2-2	Mobile telecommunications device manufacturer
Software and system provider	FI SP3	Multinational IT-system provider for the health care field
Service solution provider	FI SS1	Multinational service solution provider
Ethics advisory council	FI EC1	Expert body with authority to make recommendations
Ministry	FI MI1	Executive agency of the state
Regulatory ombudsman	FI DO1	Expert body with authority to make binding recommendations and to issue regulatory orders

Challenger type of organisations in England and Finland

Table A-3 and A-4 lists the challenger organisations. These organisations are the 'underdogs' in the mobile health field. The private sector companies sell their services or technology products, but being small firms they have little market power. For many others the key word is 'promotion' - they promote mobile health, but without power to enforce implementation of this new technology in their target population. Similarly, research organisations have produced studies on mobile health, but are not in a position to implement solutions.

Table A-3: English challenger type of organisations

Type of organisation	Short codes	Justification of incumbent status
Industry association	EN IA2	Promotes the industry but has little power beyond members' interests
Consultancy	EN CO1	Independent consultant, promotes the adoption of technology in health care
Educational organisation	EN EO1	Conducts research on mobile technology and health, and collaborates in promoting mobile health
Law firm	EN LF1	Is involved in promoting mobile health
Specialist health service	EN SH2	Promotes and provides a mobile health service to individuals
Technology promotion agency	EN TP1	Provides service within health care system for adoption of technology and standards - no power to enforce
Innovation promotion agency	EN IP1	Promotes and assists in the adoption of innovations in health care - no power to enforce
Innovation promotion agency	EN IP2	Promotes and assists in the adoption of innovations in health care - no power to enforce
Innovation promotion agency	EN IP3	Regional consortia of actors that promotes technology adoption in local health care
Software and system provider	EN SP3	Small company that sells a mobile technology enabled service to care providers
Software and system provider	EN SP5	Small company that sells mobile health services to care providers
Software and system provider	EN SP6	Small company that sells mobile health applications to care providers
Software and system provider	EN SP7	Primary care trust funded technology venture that sells a mobile health service by proprietary system

Table A-4: Finnish challenger type of organisations

Type of organisation	Short codes	Justification of incumbent status
Innovation promotion agency	FI IP1	Promotes and assists in the adoption of innovations in health care - no power to enforce
Innovation promotion agency	FI IP2	Promotes and assists in the adoption of innovations in a regional economy - no power to enforce
Educational organisation	FI EO1	Provides teaching and conducts research on health services and new technology
Research organisation	FI RO1-1	Conducts research on health services and new technology
Research organisation	FI RO1-2	Conducts research on health services and new technology
Research organisation	FI RO2	Conducts research on health services and new technology
Innovation fund	FI IF2	Provides funding and promotes the adoption of innovations in the national economy - no power to enforce
Consultancy	FI CO1	Promotes the adoption of new technologies, and also of mobile health
Software and system provider	FI SP1	Small company that develops mobile applications for care providers
Software and system provider	FI SP2	Small company that develops technology solutions for care providers
Software and system provider	FI SP4	Company that develops technology solutions and services for care providers
Software and system provider	FI SP5	Small company that sells a mobile technology solutions to care providers

Health care organisations in England and Finland

Table A-5 and A-6 display the health care organisations. There are national (national health information service), regional (regional hospital) and local (local health care centre) health care providers. In England, also two specialist care organisations have participated in this research, the other providing helpline service throughout the nation and the other providing a virtual GP service in England. The remit of care services these organisations provide is obviously not uniform, but they were all providing care services that involve mobile technology at the time of the research (save for one of the Finnish regional care organisations that was about to introduce such a service at the time of the interview in 2011). They are mostly large organisations, save for one small organisation that relies on a network of professionals on a case by case basis.

Table A-5: English health care organisations

Type of organisation	Short codes	Description of services
National health service	EN NH1-1	Provides a national service of health information
National health service	EN NH1-2	Provides a national service of health information
National health service	EN NH2	Provides a national service of health information
Local health care organisation	EN LH1	Provides a local, specialist care service
Specialist health service	EN SH1	Provides a national, independent, specialist service of health information
Specialist health service	EN SH2	Provides an independent health service, directed at patients

Table A-6: Finnish health care organisations

Type of organisation	Short codes	Description of services
Regional health care organisation	FI LH1	Provides regional, general care services
Local health care organisation	FI LH2	Provides local, general care services
Regional health care organisation	FI LH3	Provides regional, general care services
Regional health care organisation	FI LH4	Provides regional, general care services

APPENDIX 2. CODING STRUCTURES FOR ANALYSIS

This is an appendix to my description of research design in chapter three. In that chapter I present the first table in this series, table 3.5 on the analysis of the various efforts by organisations participating in this study.

Table A2.1: Coding structure for data on the conceptions of mobile health

1st level: general scheme	2nd level: conceptual items from data	3rd level: classification of items	4th level: the weight of these alternatives
Perceptions of meaning: Mobile health as a concept	Mobile phone	Mobile health as devices	
	Mobile phones, tablets, laptops		
	Any device with wireless connection		
	Large data systems		
	Patient use	Mobile health as users	
	Professional use		
	Automated use		
	Vital signs measurement, capture of data	Mobile health as functions	
	Organisational logistics and resource planning		
	Health information, appointment reminders		
	Emergency care		
	Independent management of health conditions		
	Decision management, data access to electronic health records		
	Enable onsite treatment services		

For the fourth level results of analysis, please refer to tables 5.2, 5.3 and 5.4 in chapter five.

Table A2.2: Coding structure for data on the obstacles to mobile health efforts

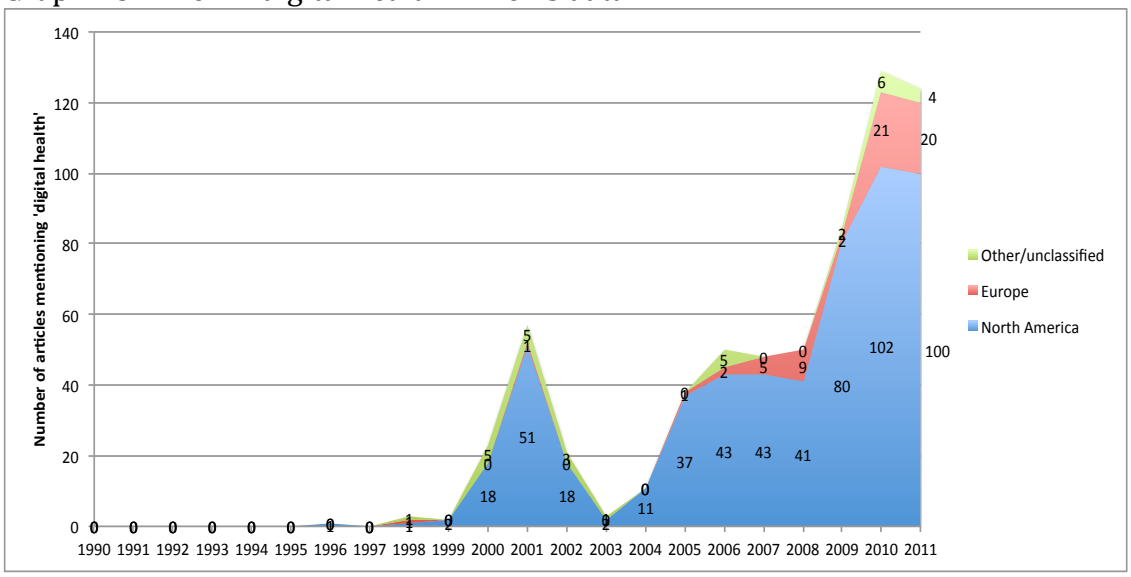
1st level: general scheme	2nd level: items of obstacles from data	3rd level: classification of items	4th level: Extent of obstruction to efforts to institutionalise mobile technology use
Perceptions of obstacles	Technical problems	Technical / product related	
	Financial, business and market challenges		
	Regulatory obstacles	Structural association	
	Data protection and privacy challenges		
	Procurement obstacles		
	Obstacles of national politics		
	Obstacles to collaboration	Social and cognitive association	
	Organisational challenges		
	Societal and organisational attitude challenges to technology		

For the fourth level results of analysis, please refer to tables 6.1, 7.1 and 8.1 in their respective chapters.

APPENDIX 3. INFORMATION TECHNOLOGY IN NEWS MEDIA

This is an appendix to chapter five. In that chapter I have presented analysis of how terms related to communication technology in health care have appeared in news media. I displayed a graph in section 5.2 on the term 'mobile health' or 'mHealth'. Below are two other core terms, 'digital health' and 'electronic health' or 'eHealth'. Digital health has begun appearing earlier than mobile health in news media, but as the scale on the left side indicate, the level of the usage of this term has remained relatively low.

Graph A3.1: Term 'digital health' in news data

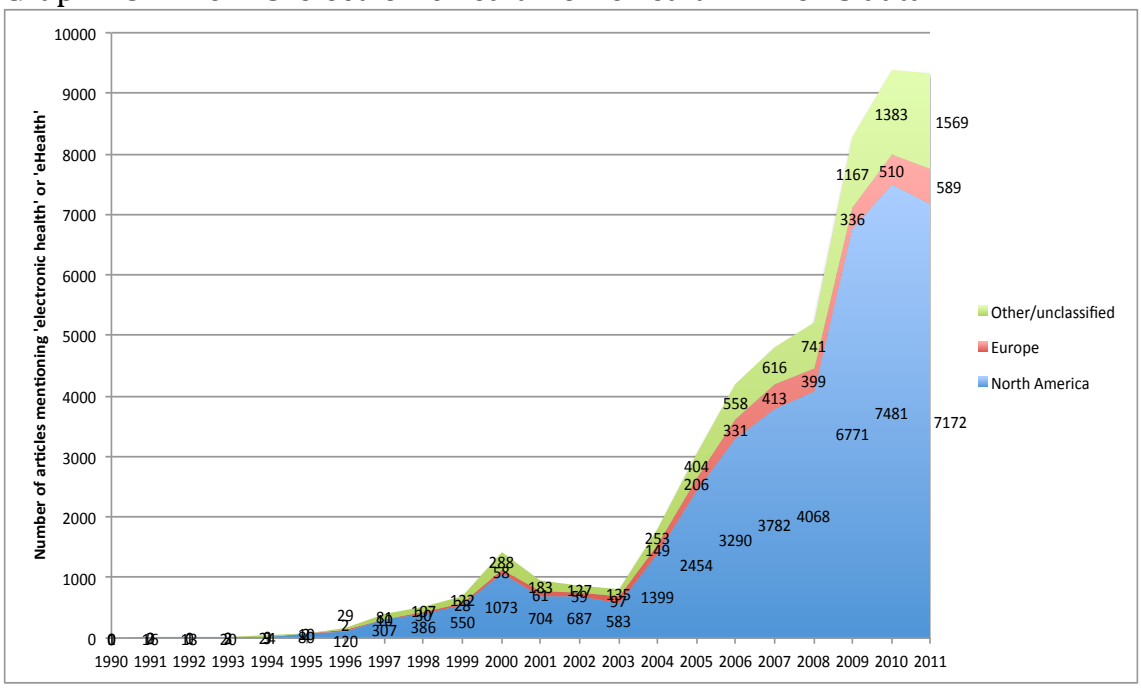


Source: Nexis UK news database, 1990-2011

'Electronic health' or 'eHealth' has been the most common term out of these three, and its usage has begun the earliest, already in the middle of the 1990's. The scale on the left indicates that the use of this term has since 2004 been in the thousands. As in the other graphs, the predominance of North America as a geographical de-

nomination for these articles has been clear. Nevertheless, considering the access to wide range of news media around the world through the Internet, the visibility of these articles may be broader than their traditional 'home market' would suggest.

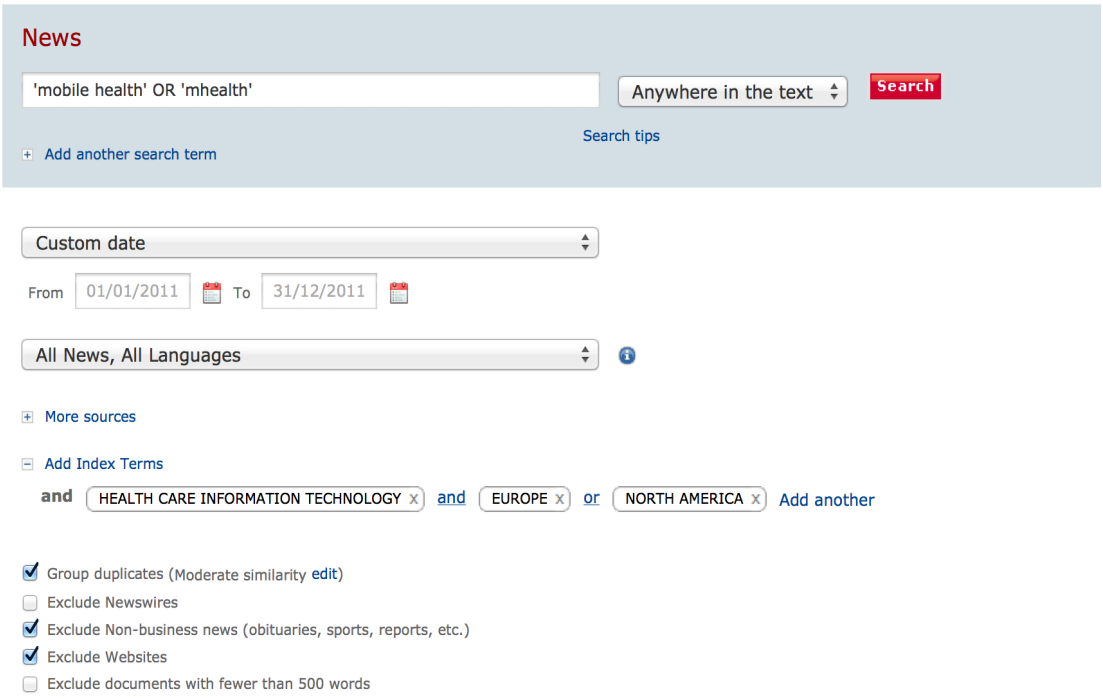
Graph A3.2: Terms 'electronic health' or 'eHealth' in news data



Source: Nexis UK news database, 1990-2011

Figure A3.1 shows an example image capture of the search criteria for these graphs. This example shows a search for the term 'mobile health' or 'mHealth' in the year 2011. A geographical ('Europe' and 'North America') and subject ('Health care information technology') index terms have been applied to facilitate the analysis of search results and to exclude possible other meanings for mobile health, such as movable health care delivery units. This search was repeated for all years between 1990 and 2011, and for all three sets of terms. Duplicates have been selected out with 'moderate similarity' option.

Figure A3.1: Nexis UK search criteria for communication technology in health care -terms



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