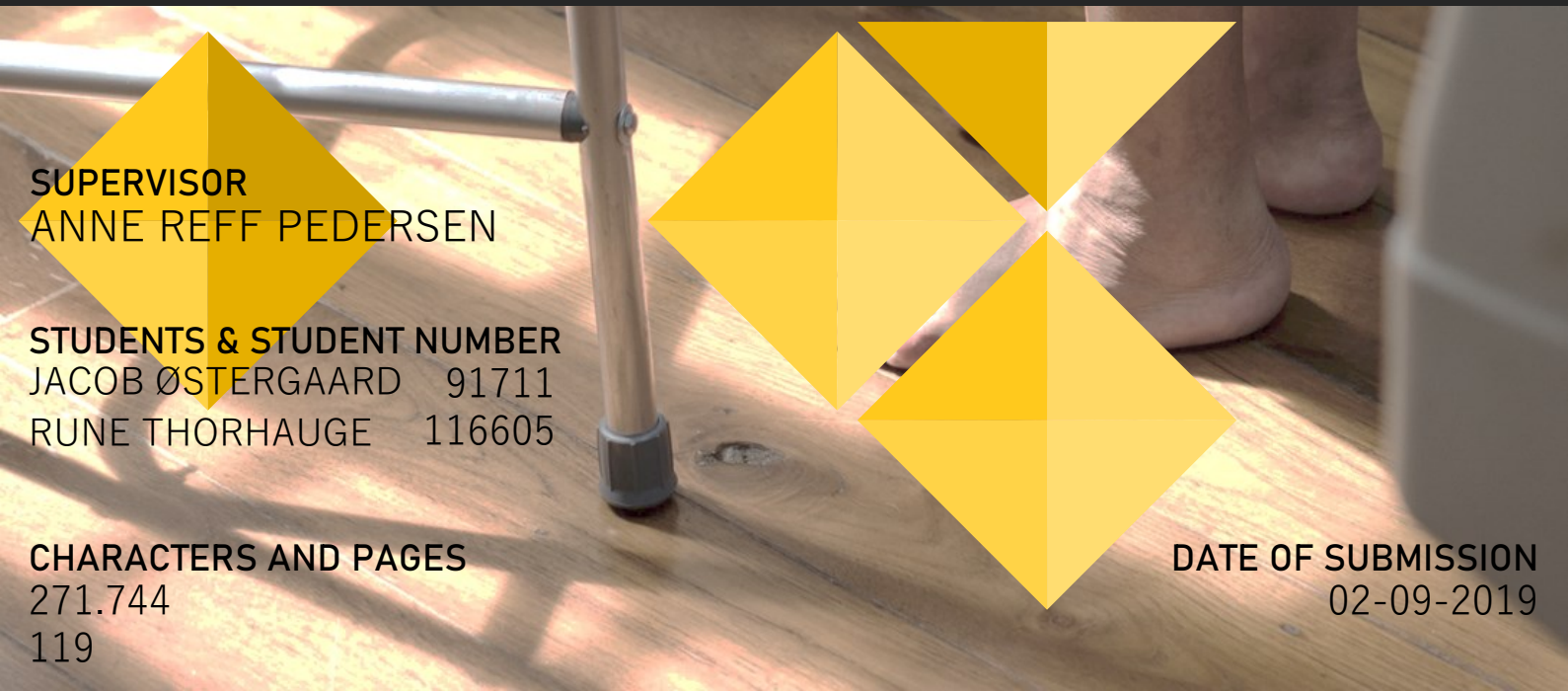
Management of Innovation and Business Development
Master's thesis

COPENHAGEN BUSINESS SCHOOL

Exploring complexity – the spread of innovations in healthcare

FROM ISOLATED FACTORS TOWARDS DYNAMIC INTERACTIONS



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DATE OF SUBMISSION
02-09-2019

Abstract

Given the mounting pressure on the Danish healthcare sector, it is increasingly important to secure the future sustainability of healthcare organizations, in which innovation spread has a pertinent role. However, spreading innovation is a remarkably complex process, especially within multifaceted settings such as healthcare organizations. This thesis explores the inherent complexities of innovation assimilation and spread through analyzing pertinent factors and their dynamic interactions. Thus, this thesis compliments the current body of literature within the field of innovation spread in healthcare by adopting a holistic appreciation, as opposed to investigating single factors in isolation. In this endeavor, a comparative case study of two innovations within the Danish healthcare sector was conducted, based on ten semi-structured interviews and supported by documentary data. Throughout the data collection, respondents from different layers of the organizations were sampled to emphasize a holistic understanding. On the basis of the data collection process, and the formation of a comprehensive literature review, a conceptual framework is presented. By applying the conceptual framework's four layers, the thesis presents findings connected to the relation between innovation and adopters, influential contextual components and interaction between these connotations.

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1. Introduction

> *"It is a survival strategy to engage in innovation and development in a healthcare system that is under pressure – if we don't do it, we might as well lie down and die."*
>
> - Head of Clinic, Hematology (LA1, 11:14)

The pressure on the Danish healthcare system, as emphasized above, has been mounting over the past decades, as of why solutions are in strong demand. An aging population results in more patients with more complex afflictions and treatment requirements (Danske Regioner, 2015). Increasing prices on medicine and rising costs of new treatments suffocates the hospital budgets. A commanding political pressure to do more for less has been influencing hospital management for almost two decades, through *produktivitetskravet* (Finansministeriet, 2017). To ensure the sustainability of the Danish healthcare system, it is evident that something must change.

Innovation has been proposed as a pertinent solution to face the challenges of the healthcare sector. Today, novel avenues of innovation present opportunities to improve value, efficiency or reduce costs through new technology, ranging from deep learning to telemedicine (Miotto et al., 2018; Weinstein et al., 2014). However, merely developing the innovations is not sufficient in unlocking its potential; to effectively realize the value of innovations, they must be spread across hospitals, departments and subunits. This connotation is supported by Sophie Løhde, the former Danish Minister of Innovation, as she comments on the benefit of spreading ideas across the public sector:

> *"When public workplaces steal each other's good ideas, it has my full support. […] It improves our collective welfare and our competitiveness – at the same time we save time and tax-money, when we don't have to develop innovative solutions from scratch every time."*
>
> - Sophie Løhde, former Minister of Innovation (DenOffentlige, 2017)

As emphasized by Løhde, a substantial opportunity for creating value is present in effectively spreading innovation. When talking about the future strategy for the Danish healthcare system, the former Minister of Finance, Kristian Jensen, further stress the significance of

spread in a healthcare context, as he states how *"the good ideas should spread from hospital to hospital"* (Ritzau, 2018). However, spreading innovation has, in practical terms, proven difficult in the hectic environment of healthcare professionals – thus, recent research is increasingly occupied with the process of innovation spread (Barnett et al., 2011; Hoholm et al., 2018). Further, Plsek (2003) argues that the complex and contextual nature of healthcare organizations makes the spread of innovations difficult to provide simple formulas for. Hence, to promote spread of innovations within healthcare, enrichening the understanding of the notion is key.

The importance of spread was first established by Rogers (1962), who investigated the diffusion of innovation in relation to adopters, which still has profound impact on this field of research (Greenhalgh et al., 2004). Later additions to the field, specifically related to healthcare organizations, have included contextual influences on the assimilation and innovation spread (Fitzgerald et al., 2002; Gustafson et al., 2003; Longo, 2007). This has contributed to mapping the individual factors which are pertinent to the comprehension of innovation spread in a healthcare setting. However, Greenhalgh et al. (2017) argue that complex processes such as assimilation and spread cannot accurately be understood by analyzing each factor in isolation, but rather, the dynamic interaction between the factors is critical to grasp. Thus, with the key importance of innovation spread in the challenging setting of Danish healthcare, the understanding of the dynamic interaction between influential factors poses strong relevance.

1.1 Research question

This master thesis aims to investigate the innovation assimilation and spread processes, within the Danish healthcare sector. To gain a deeper appreciation of the complex context, the research is conducted on the empirical basis of two nominated cases of healthcare innovation (selection further elaborated on in section 2.2), which represent markedly different innovation assimilation and spread trajectories. Accordingly, the thesis seeks to answer the following research question:

How does the dynamic interaction between innovation, adopters and context influence the innovation assimilation and spread processes of the two case innovations?

To qualify answers to the presented research question, the research will be conducted by paring a conceptual framework, developed by the authors, with empirical findings. The conceptual framework consists of four layers of analysis: (1) innovation interpretation, (2) adopter attitudes, (3) organizational context and (4) inter-linkage. Each layer is analyzed in isolation, to later explore the interactions within and between layers. The framework is illustrated in Figure 1 below.

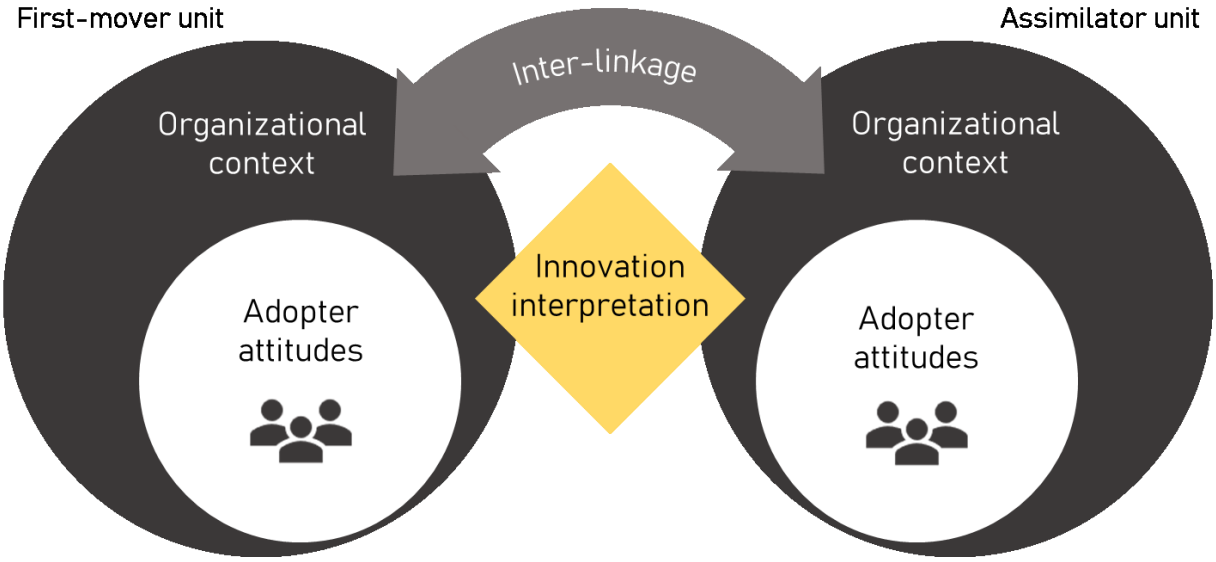

Figure 1: The four layers of innovation spread

As shown by the model, a first-mover unit can spread the innovation to an assimilator unit through the inter-linkage, where each unit holds an organizational context and adopter attitudes. Accordingly, to structure the research of this thesis, three sub-questions are presented. The three questions will, collectively, answer the overall research question:

1. **How does the relation between innovation and adopters explain the disparity between the cases in terms of assimilation and spread of innovations?**

2. **How does contextual components concerning organization and inter-linkage explain the disparity between the cases in terms of assimilation and spread of innovations?**

3. **How does the dynamic interactions between the four layers affect the assimilation and spread processes?**

Each sub-question seeks to understand certain aspects in relation to the assimilation and spread of the two case innovations: Sub-question one seeks to uncover the relation between innovation and adopter; Sub-question two is to examine the relation between contextual components of organization and inter-linkage; Sub-question three explores the dynamic interaction between the layers of the conceptual framework. Thus, pertaining to the conceptual framework, layer (1) and (2) are covered by sub-question one, layer (3) and (4) are enclosed by sub-question two, and the interactions across the layers are covered by sub-question three.

1.2 Delimitations

While the authors' interest of the topic sparked from a wider appreciation of the potential of innovation spread in the public sector, it is central to set delimitations for the research. Delimitations can, indeed, be considered safeguards against the pitfall of seeking to understand broader questions which cannot be explored within the scope of a thesis.

To define the field of interest in terms of this research, the authors have outlined exclusion criteria. The Danish healthcare system has been the initial narrowing of the scope, but further, the scope has been narrowed to Danish hospitals. In practice, this means that the collection of data has been guided by these exclusion criteria, and the case search has been conducted within this frame. The use of quantitative data has not been pursued – this type of data could, undoubtfully, allow for an interesting analysis of the proposed area of research, however, the rich and contextual understanding enabled by qualitative data has been more appealing to the authors. Consequently, the findings of this thesis will not have a strong degree of generalizability, but rather emphasize a strong internal validity – in effect the findings are strongly contextual, and the learnings can only be transferred with caution to this notion.

The theoretical aspects that have been chosen to be included, and excluded, have been an iterative selection process. A dialogic approach has been conducted by alternating between emergence of themes in the data collection and relevant theoretical aspects suggested by the literature. This approach has been underlying to the development of the presented conceptual framework. However, some items of relevance have been excluded simply due to considerations of feasiblity; for instance, the broader political landscape of the Danish

healthcare system and its implications on the innovation spread has, at large, not been examined.

1.3 Case descriptions

In the following section, the two cases will be outlined to give the reader a rudimentary understanding of the relevant cases of the thesis at hand. The information outlined is a condensation of the attained information through various sources, limited to what is assessed as the most relevant for the reader. The cases have been given pseudonyms throughout this thesis to provide anonymity for the participants of this research due to ethical considerations, which will be expanded upon in a dedicated subsection of methodology (see section 2.4). Hence, the first case presented will be referred to as 'Portable Chemotherapy' (Case A) and the second 'Food&Move' (Case B). Correspondingly, the names of interviewees and hospitals presented in the following section, and throughout the thesis, are fictitious.

1.3.1 Case A – Portable Chemotherapy

Typically, an acute leukemia patient who is treated with chemotherapy will be hospitalized while receiving the intravenous therapy. While it may vary individually, many of these patients are well enough to move around and engage in other activity during parts of this treatment period, as the side-effects of chemotherapy can occur more than a week later (Cancer Council, 2018). However, hospitalization is necessary during this period as the medical equipment is mostly stationary and the treatment runs throughout the day.

Chemotherapy pumps allow controlled infusion of drugs into the bloodstream. Typically, these pumps are attached to a drip stand, which, at best, allows for walking around within the hospital. However, some of these pumps have been developed into lighter and more mobile versions. Drawing inspiration from the UK, Laurence from Woodhill Regional Hospital proposed the idea of sending patients home while receiving chemotherapy, by utilizing the mobility offered by lighter versions of the pumps (LA1, 05:26). More specifically, patients would carry the portable chemotherapy pump in a small bag, where the medicine would be stored as well. This innovative solution would allow better quality of life for patients while eliminating the costs associated with hospitalization.

While being occupied with his responsibilities as Head of Clinic at the Department of Hematology, Laurence asked Kate, a nurse at his department, to run a project to test the idea (ibid). An opportunity presented itself as an innovation-competition was launched, Idériget, which sought to promote and develop innovative ideas within the healthcare sector. In November 2013, Laurence sent an application outlining the concept to Idériget, along with 71 other applicants (Appendix 9.1, p.1). As the competition steadily progressed, Kate, who was running the project, moved through different selection rounds of the competition. By March of 2014, resources were allocated to enable a workload reduction for the remaining ten participants of the competition to allow a stronger focus on the development of ideas (KA1, 00:47).

On the 3rd of June 2014 the first test was initiated at Department of Hematology, sending a leukemia patient home with a chemotherapy pump with initial success. The pilot project ran from June to August 2014 and displayed promising results. By October the same year, the project was selected as one of the two winners of Idériget and were thereby granted funding to advance the project further. In January 2015, the implementation process within the Department of Hematology at Woodhill Regional Hospital began and by the end of June 2015, the innovation was spread to ten treatment types within the department. During this period, the staff received training around the solution and, ultimately, the innovation succeeded in sustaining its adoption in the department. Afterwards, the innovation was attempted to be spread internally to three other departments of Woodhill Regional Hospital. Many details can pose relevance here, however, a key difference from the initial solution was that these other departments would use the portable pump for antibiotics (as opposed to chemotherapy). This was done in three sequential efforts, where Kate dedicated time to assimilate the solution in the departments, from June to December 2015. However, the innovation was never fully adopted in the departments. For two of the departments the solution remains partly adopted. In the last of the three departments, the solution was gradually unadopted until the point of abandonment.

In the meantime, another regional hospital, Sandford Regional Hospital, had begun the adoption process of the portable chemotherapy. Rather rapidly, with assistance from Kate, the department sent the first patient home with a portable chemotherapy pump by October 2015. Already two months later, by December, a department with the same specialization at another

regional hospital, Rainfall Regional Hospital, sent the first patient home by adopting the innovation. Gradually, with support from Kate and Laurence from Woodhill Hospital, this process repeated until September 2017, at which point all six departments of hematology across Denmark were treating patients with portable chemotherapy.

1.3.2 Case B – Food&Move

The Danish healthcare sector face challenges for elderly patients, particularly patients who are at nutritional risk – a study showed that 71% of patients, older than 65 years, were at a nutritional risk when discharged from the hospital (Lawson-Smith, et al., 2015). While hospitalization periods commonly cause minor weight losses to all patients, Lawson-Smith et al. (2015) stress that elderly patients are more susceptive to the associated complications, such as increased morbidity and mortality. The Danish National Board of Health has, for some time, actively been trying to create awareness and guidelines for health professionals, since there is strong evidence proving that nutritional care improves the overall health both during and after the hospitalization (Sundhedstyrelsen, 2008).

To combat this problem, Theresa, a senior researcher at Rockmore & Oakville Hospital, has, in collaboration with a private company, Smartware Ltd., developed a software application that seeks to improve the nutritional health of hospitalized elderly patients through (1) involvement, (2) information and (3) visual stimuli called Food&Move. The application is facilitated through a tablet, which the patient is meant to use to order food from the hospital cantina, where images are displayed, and nutritional information is provided and tracked. Further, the application can be used by health professionals to improve the monitoring of the health developments of individual patients.

The idea flourished after the CEO of Smartware and Theresa met at a conference. Not long after, during the period from 2010-2013, the project was initiated in the development phase of conceptualizing and programming the application itself; by the end of 2013 a prototype was ready. The development process was characterized, as Theresa puts it, by a strong degree of co-creation with the relevant patient group, the elderly (THRI1, 11:14). Beyond Smartware and the patients, other stakeholders were relevant – thus, the regional IT-infrastructure (CIMT) and the kitchen staff and the kitchen's IT supplier were involved in the development phase as well. While no top-management support was attained in terms of funds, internal

funds from Theresa's own department and external funds supported the development of the innovation (THRI1, 34:28).

With further research and feasibility studies conducted in-between 2013 and 2016 (Appendix 9.2, p. 8), the first introduction of Food&Move was attempted in September 2016 at a department at Rockmore Hospital and soon after at Oakville Hospital (Rockmore & Oakville Regional Hospital is led under one management after a fusion of two hospitals but remain at two distinct physical hospitals, separated by several kilometers) (ibid., p. 19). The attempts to assimilate the innovation was unsuccessful – some apparent issues being that the nurses encountered many technical and practical issues. The software itself was somewhat premature and, in terms of practical issues, there was a lack of power sockets and it was challenging to locate an appropriate storage solution for the tablet (THRI1, 08:15; LU1, 29:05).

Soon after, the app was relaunched. At Oakville, the new attempt took place at the same department, Department of Internal Medicine, whereas at Rockmore, it was eventually completely abandoned, and was relaunched again in December 2018 at a new department, Department of Geriatric Medicine. Eventually, a dedicated nurse was hired for each department to support the assimilation process – Lucy at Oakville and Shirley at Rockmore. Furthermore, Rita, a Ph.D. student became involved in the project and supported the assimilation process.

As per today, Food&Move is being assimilated at two departments, one at Rockmore and one at Oakville. While the solution has gradually become part of the everyday of the nurses, the assimilation is still ongoing. Food&Move is often utilized inappropriately due to time pressure. More specifically, the tablet is used by some nurses to simply order food without further involvement of the patient and images are missing for parts of the menu. In this sense, the benefits of the app are, mostly, unrealized. Thus, while it has been assimilated to some degree at the two departments of Rockmore & Oakville Hospital, the potential of the innovation is, arguably, not realized.

2. Methodology

The following section will outline the methodology applied in this paper. Thus, the section will reflect upon the impact of these methodological choices, as well as argue how these choices provide the best foundation for answering the research question at hand, but also allow for better transparency of the study. In other words, the section will demonstrate how the choice of research philosophy, research design and methodological approaches have been aligned to provide a strong internal validity and transparency. As this research builds on an interpretivist philosophy of research and qualitative data, a high degree of replicability will not be possible to achieve – however, transparency will be established throughout this section of methodology, as it is central to allow the reader to understand and critically review the findings of this thesis.

The structure of the section will reflect Saunders et al.'s (2009) methodological approach, where research philosophy, approach, strategy, choices, time horizon & techniques and procedures are debated and reflected upon. Figure 2, an adaption of their model *the research onion*, illustrates this structure.

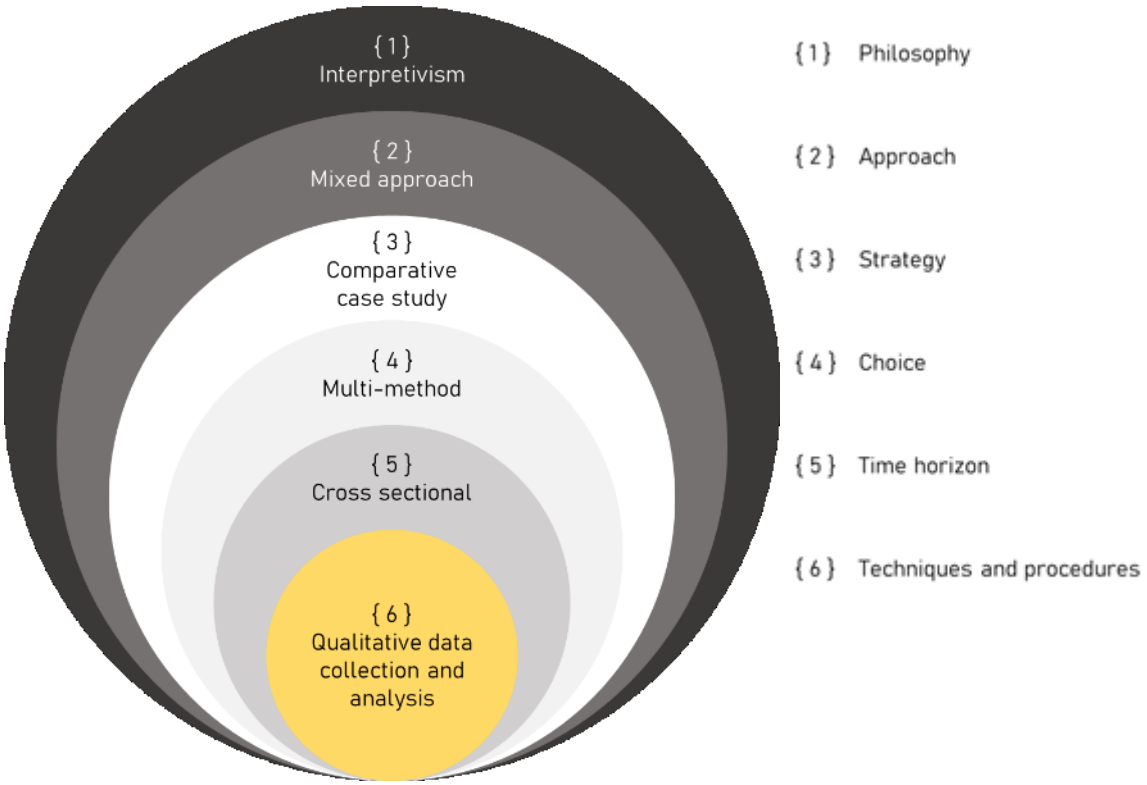

Figure 2: Methodology of research

Source: Own illustration, adapted from Saunders et al. (2009)

The model clarifies the methodology of this paper, where the six previously mentioned categories of methodological choices are elaborated on, in connection. Firstly, an *interpretivist (1)* research philosophy is adopted to gain a greater depth in the research, while also gaining a better contextual understanding. Moreover, the research is advanced through a *mixed approach (2)*, where a recurring movement from induction to deduction characterizes the process of the research with a main emphasis on an inductive approach. The research is conducted through a *comparative case study (3)* as research strategy, where the research is supported by a *multi-method* (4) choice. The time scope of the research process has led to a *cross sectional (5)* time horizon. Finally, the process of *data collection and analysis (6)* is planned synergistically with the outer layers, expanded in further detail, later in this section. As implied by the model's order of numbers, the layers will be examined sequentially from outer to the most inner layer, gradually unfolding how the layers are aligned to support the research.

2.1 Research philosophy and approach

Accordingly, the first and most outer layer of the model, the research philosophy employed in this research will be outlined. In a sense, the research philosophy function as a lens for the researcher, as it is tied to the paradigm in which she operates (Saunders et al., 2009). When developing new knowledge, as any research attempts to, it is important to outline these underlying assumptions which any research philosophy offers – as these have great influence on how the research is conducted. To outline these assumptions on which the paper's understanding of knowledge is based, the terms ontology and epistemology are discussed.

The term ontology relates to how reality can be understood. This reflection upon reality unfolds on the continuum between objectivism and subjectivism. From an objectivist stance it is argued that "*social phenomena and their meanings have an existence that is independent of social actors*" (Bryman, 2012, p. 33). By contrast, subjectivism do not separate social actors and reality in this strict manner – from this perspective, reality is socially constructed and is therefore formed through the perceptions and actions of social actors (Ibid.). The term epistemology is closely related to this discussion of ontology, as the epistemological view establishes what is acceptable knowledge in relation to the research. Thus, when employing a

subjectivist view, the meanings of social actors constitutes as knowledge, as these are part of shaping reality, whereas through objectivism this would be disregarded as acceptable knowledge.

When seeking to understand the phenomenon of innovation spread within healthcare, as this paper attempts, it is important not to neglect the nuances and deep complexities that exist. As Paul E. Plsek (2003, p. 2) states when talking about healthcare organizations and innovation spread:

> "*A complex adaptive system is a collection of individual agents who have the freedom to act in ways that are not always totally predictable, and whose actions are interconnected such that one agent's actions change the context for other agents.*"
>
> - Paul E. Plsek

This clearly contrasts the rigid world view which an objectivist suggests – the outlook of Plsek resonates well with how the authors of this paper appreciates the research field at hand. Accordingly, this paper will adopt a research philosophy of interpretivism, as this arguably better aligns with the research's goal of understanding a complex and socially embedded phenomenon and, similarly, best aligns with the authors' view. This translates, in terms of ontology, a stance of subjectivism and therefore an epistemology where meanings, actions and motivations of social actors constitutes as not only acceptable, but imperative knowledge (Bryman, 2012). Alternatively, if a positivist research philosophy had been adopted for this research project, the findings would likely point to more general rules – for instance, the research could indicate that a clear observability of an innovation is a requisite to foster a high degree of spread. However, when researching complex issues, as this paper seeks to, it is important to avoid "*reducing an inherently complex set of issues down into a formula*" (Plsek, 2003, p. 13). Subsequently, as the structure of the section suggests, the research approach of the thesis is outlined.

In general, research can be approached either inductively, deductively or as a combination of the two approaches – the choice of research approach relies on different considerations (Saunders et al., 2009). As a deductive approach seeks to attain a strong degree of

generalizability, quantitative data is often preferred, as this allows for processing larger quantities of data within reasonable time constraints, whereas an inductive approach often prioritizes qualitative data to gain a deeper understanding at the cost of a weaker generalizability. Moreover, an inductive approach offers more flexibility as the research progresses compared to a deductive approach, which demands a more structured approach.

The authors of this paper have chosen to apply a mixed approach in the conduction of this research, with a primary emphasis on the inductive approach, as this approach allowed for a deeper understanding of the human interaction in relation to certain events (Saunders et al., 2009). In other words, specifically in relation to this paper, a focus on the inductive approach allowed for a deeper insight into the interaction between adopters and innovation. It is difficult to fully decipher how the research process unfolded – however, the research process was initiated in an inductive manner, where the empirical discoveries guided the direction of the research, but, later in the process, the data collection gradually became guided by a combination of empirical discoveries and theory, tilting the approach more against a deductive approach. This back and forth mechanism between induction and deduction, was balanced to allow for depth of research and contextual understanding while establishing theoretical relevance.

The emphasis on the inductive approach gave a better understanding of the research context – something which is valuable in general, but perhaps even more to researchers who are presented to a novel field of research – in this case healthcare innovation. In alignment with this approach, which have sought depth and contextual insight, only two cases were analyzed (certainly a rather tiny proportion of the overall population of Danish healthcare innovations), which, however, leads to a weaker generalizability of the findings. In this way, the researchers of this paper have prioritized to attain stronger internal validity over a robust external validity.

As a consequence of the research approach, with the main emphasis on induction, the collected data has primarily guided the formation of the conceptual framework (see section 4), as an inductive approach prescribes the progression from data to theory – in other words, the movement from specific to general (Adams et al., 2014).

2.2 Research design

This section will focus on the next three layers: Research strategies, choices and time horizons. Together, these are components of the research design – in the process of composing a research design, the concrete research project is formed on the basis the research question (Robson, 2002). Central to the research design is the commitment to a research purpose; thus, to either pursue exploratory, descriptive or explanatory research – or a combination of these (Saunders et al., 2009).

The research presented in this paper is of exploratory nature, as this type of research best captures the essence what the paper attempts to unveil. In line with the properties of the inductive approach, exploratory research allows for great flexibility, as the direction of research can change as data is collected, if the data presents new interesting paths of discovery (ibid., p. 140). This flexibility has been important, as the collected data has been able to guide the direction of the research, while the authors of this paper have granted a better understanding of the field gradually. This does, however, not imply that this research is broad and vague but rather that the research focus has gradually been narrowed down throughout the research process.

In extension, to underpin the exploratory research of this study, a case study strategy has been chosen as research strategy – which Saunders et al. (2009) point to as a useful strategy for this type of research purpose. A case study is defined by Robson (2002, p. 150) as: *"a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence"*. As opposed to an experiment, where the studied phenomenon is within a highly controllable context, a case study cannot attain this clear distinction between phenomenon and context, as this boundary is not clearly observable (Yin, 2003). A case study does, however, allow for a deep understanding of the research context, which is important when the context cannot be separated from the phenomenon. Underlying in this concept is that the context must be examined to fully understand a phenomenon as complex as processes of assimilation and spread (see section 2.4 for further clarification of terminology).

This research strategy is further outlined as a comparative case study, which *"involve the analysis and synthesis of the similarities, differences and patterns across two or more cases*

that share a common focus or goal" (Goodrick, 2014, p. 1). The common focus, in the context of this thesis, is the innovation and spread or hereof in a Danish hospital setting. It is noted, that a comparative case study may be employed when it is not feasible to conduct an experiment research (ibid.) – a condition which is argued to be present when attempting to undertake research around the spread and assimilations of innovations within healthcare, as this process arguably would be impossible to replicate in an experimental setting. Moreover, this type of research strategy is useful when attempting to understand the influence of context (ibid.), which, as previously stated to be central in this study.

As the authors of the paper were curious about the innovation spread, or lack hereof, within and across hospitals in Denmark, examining cases with varying degree of successful spread came to mind. To find cases which displayed similarity on certain properties while dissimilarity on others, a purposive sampling took place. The similarities were sought to establish a common ground for comparison, while the contrasts in innovation spread between cases would establish a foundation for analyzing the reason for this difference – this sampling method is referred to as heterogenous sampling (a subcategory of purposive sampling) (Saunders et al., 2009, p. 239). The selection-criteria for the cases during the search phase of this research is outlined in Figure 3 below.

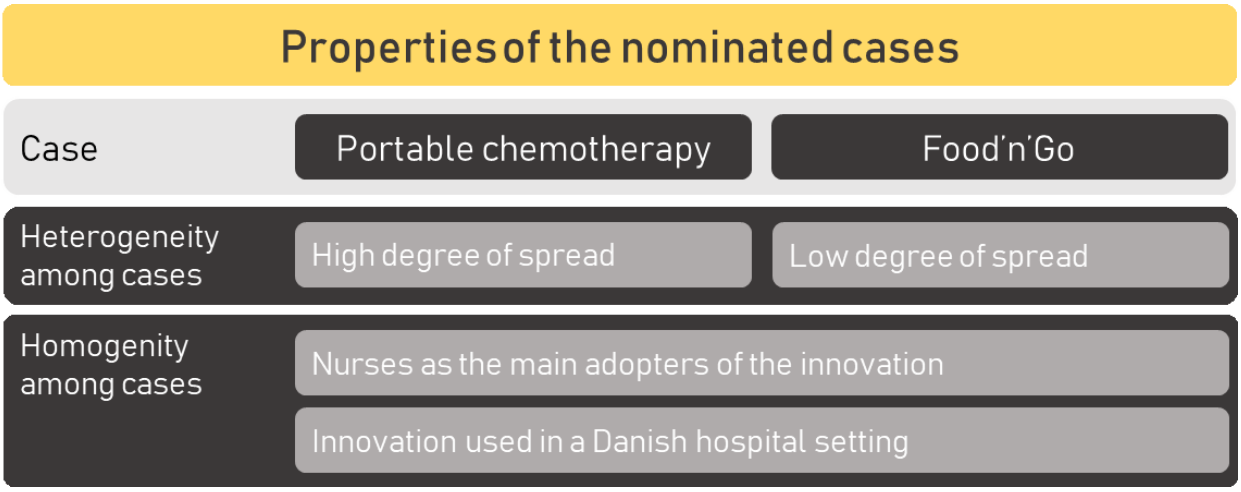

Figure 3: Properties of Case A and Case B

As illustrated above, it is highlighted that a varying degree of spread was a selection-criteria when nominating cases to study, thus finding a case with a relatively high degree of spread

and another with a lower degree of spread, while it was similarly important that the selected innovations were used in a Danish hospital setting with nurses as the primary group of adopters. In this manner, by comparing the two cases similarities, contrasts and patterns can be assessed and analyzed to provide relevant insights.

This approach has enabled the researchers to select the cases that are evaluated as giving the best foundation for answering the research question, thus disregarding considerations in favor of random sampling, e.g. representativeness of population or bias (Saunders et al., 2009). In this manner, a higher degree of internal validity has been prioritized over external validity, as purposive sampling allows the research to examine cases that are particularly informative, allowing for a higher internal validity, but does not consider the representativeness of the cases, which could lead to a better external validity. As the reader may notice, this prioritization is consistent with other methodological choices such as an exploratory research design or a primarily inductive approach, which similarly favors internal validity over the generalizability of the findings.

The next layer of the model, method choices, it is concerned with which type of quantitative and qualitative procedures and techniques that are combined in the research. More specifically, research can be conducted by applying either a mono method, multi-method or mixed methods (Saunders et al., p. 151). Mixed methods apply a combination of quantitative and qualitative procedures and techniques, where multi-method similarly use several procedures and techniques but only within one of the two categories (e.g. only qualitative or quantitative). A mono method does, by contrast, only employ one technique for data collection and one procedure for analysis (Ibid.). This research has chosen a multi-method research design, as the data will consist of multiple sources, more specifically interviews and documents, but only qualitative data will be collected and analyzed. Employing interviews have strengthened the research by presenting the cases from various perspectives, where the documents (such as past presentations of the innovation cases or time line documents) have offered, perhaps, more precise information (e.g. specific dates), details which might not have been outlined during an interview and, similarly, opinions or feelings which might not have been expressed during an interview. These data sources and their methods of collection will be elaborated upon in depth later in this section, however, the combination of data employed

through a multi-method is argued to strengthen the research findings, as the different types of data can be synergized to provide a more holistic research fundament.

Finally, as the last part of the research design, the time horizon of the research will be discussed. The authors have been faced with choosing between conducting a longitudinal or cross-sectional study, where a cross-sectional approach has been chosen. This implies, that the data collection for this research been taking place over a relatively short span of time, and there has been no attempt to purposefully re-collect data to observe development or change over time (Saunders et al., 2009). A longitudinal study which, optimally, had followed the cases since the beginnings would have been able to gain a deeper understanding than a cross-sectional study. This effort is, however, far beyond the scope of this study; it should, nonetheless, be acknowledged that when trying to understand a change process, as this paper attempts, a longitudinal approach can be advantageous.

2.3 Qualitative data collection

In agreement with the research philosophy – interpretivism – a deep understanding of the studied phenomenon and the context was pursued, thus, collecting data through qualitative methods were considered appropriate. This section represents the final layer of the research model and will guide the reader through how the data collection process and analysis has been approached, and what implications this might have had for the research findings. Thus, the techniques employed in the data collection process and procedures used when analyzing the data are presented.

2.3.1 Qualitative technique considerations

When considering qualitative data collection, there are several considerations to be made, relating to the previous methodology choices, but also what is feasible within the context of the two cases. While subcategories within each of these categories exist, the three primary qualitative techniques available are questionnaire, interview and observation (Saunders et al., 2009, p. 2).

Questionnaires were not employed, although this type of technique could possibly have added value to the overall scope of the data, as this type of data collection technique emphasizes a broader perspective on the cases. However, this thesis aimed to achieve a deep understanding

within the complex setting of the two cases, which is why a broad perspective was not appropriate compared to the alternatives. Furthermore, questionnaires are usually not particularly good when employing open ended questions or when it is important to establish a personal relationship with the respondents (Saunders et al., 2009). As this thesis' research is concerned with dynamics of spread, such as, how adopters interact with an innovation, conducting observations would allow the authors to gain insights into how adopters interpret the innovations and interact with it. Furthermore, observations are useful when adopting an explorative approach since they can uncover insights that the respondents themselves were not aware of (Saunders et al., 2009). However, while this technique could have provided useful data, it was assessed as unfeasible. Gradually, as persons of interest related to each case were contacted, it became clear that most healthcare professionals have a rather busy workday. Even finding a timeslot to fit an interview of one hour proved difficult at times – to ask to observe them in their job simply appeared inappropriate, considering their struggle to fit an interview into their schedule.

Accordingly, a deeper understanding of the complex nature of the topic was pursued through interviews, as this technique is essential within the interpretivist research philosophy. This thesis has, consequently, relied primarily on interviews as a mean for collecting data. The considerations about the interview techniques are described in the section below.

2.3.2 Interview technique

Research interview techniques can be condensed into three general subcategories; Structured interviews, semi-structured interviews and unstructured interviews (Saunders et al., 2009, pp. 320-321). While only one of these was employed in the data collection process, each of the techniques have their own strengths and weaknesses and should be matched with previous methodological choices.

Structured interviews have not been employed, since, this technique did not align with our exploratory research purpose (Saunders et al., 2009). When using structured interviews, the interviewers risk letting their own perception dominate the data collection process. This was deemed inappropriate, as novel areas of interest should be able to develop organically, based on the insights from the respondents. Alternatively, unstructured interviews are useful when exploring general areas in-depth or as preliminary interviews (Saunders et al., 2009).

However, this technique is challenging to use when employing a mixed research approach, since some structure is valuable when introducing theoretical models and investigating complex multifaceted areas, such as the spread of innovation in healthcare.

A semi-structured interview technique was employed, as this aligned with the overall mixed research approach. This technique provides enough structure to explore relevant areas of the innovation spread process while allowing new areas of interest to emerge during the data collection process. Thus, conducting semi-structured interviews aligns with exploratory research, as it helps uncover complexity while also gaining insights of the respondent's perception of the research area (Saunders et al., 2009). The questions developed for the semi-structured interviews were based on loosed themes concerning the spread of innovation (role of management, reception of the innovations, etc.). The questions did not follow a fixed order and the emphasis varied naturally for each interview, depending on the responses from each interviewee. Based on the themes, probing questions were used, as these can be helpful in uncovering certain areas of interest and avoid areas in which the respondents lack knowledge (Ibid.). Furthermore, after each interview, new insights were incorporated into the question themes to facilitate a dynamic data collection process, in alignment with the exploratory research purpose. For instance, in one case, certain decisions in the development process had significant implications for the spread of innovation. This was gradually expanded upon in the interviews, as the authors became aware. This dynamic approach has a negative effect on the reliability of the findings in this thesis, as this approach is difficult to standardize – however, in accordance with our research philosophy, the reliability has not been the focus. Instead, this thesis aims to investigate a highly complex and dynamic process, to uncover findings that are relevant in this specific context. With this goal, semi-structured interviews are, indeed, appropriate to obtain a high degree of internal validity (Saunders et al., 2009).

2.3.3 Interview conduct and process

The section will, in detail, describe the procedures employed when conducting interviews, which have been selected to produce the most internally valid data possible in relation to the research question. The section includes our procedures regarding the selection of respondents, along with the scope and conduct of the interviews.

When selecting respondents for the semi-structured interview, purposive sampling approach was applied to ensure the most relevant respondents in relation to the scope of the research (Saunders et al., 2009). The respondents of both cases where chosen based on their proximity and knowledge relating to the spread processes of the two case innovations. The authors initially aimed to include respondents from all levels of the organization, to gain broader insights into spread process – this idea, however, was abandoned as it did not align level depth central to the research. Thus, the operational healthcare professionals were excluded, unless they had been central to the innovation spread process, as was the case with one respondent. Selecting respondents based on their relevance to the research area is best described as a subcategory of purposive sampling, called critical sampling (Saunders et al., 2009, p. 240).

In total, nine healthcare professionals were selected to interview, divided between the two cases, as seen in Figure 4:

Case A - Portable Chemotherapy			
Name	Position	Department	Hospital
Kate	Project Nurse	Department of Hematology	Woodhill Hospital
Laurence	Head of Clinic	Department of Hematology	Woodhill Hospital
Ann	Charge Nurse	Department of Hematology	Sandford Hospital
Audrey	Clinical Nurse Specialist	Department of Hematology	Windston Hospital
Karen	Nurse / Project Nurse	Department of Hematology	Windston Hospital
Case B - Food&Move			
Name	Position	Department	Hospital
Theresa	Research Manager	Department of Internal Medicine	Rockmore Hospital
Rita	Ph.D. Student	Department of Internal Medicine	Rockmore Hospital
Shirley	Project Nurse	Department of Geriatric Medicine	Oakville Hospital
Lucy	Project Nurse	Department of Internal Medicine	Rockmore Hospital

Figure 4: Overview of respondents

To increase the comparability between the two cases, the same critical sampling criteria was employed. For each case the following persons of interest were sought to be interviewed; an initiator of the spread process, a high-level manger and at least two change agents who were actively managing the spread efforts within each organizational unit. In practice, this was only partly possible, as a high level-manager was only interviewed for Case A. Thus, Case A is slightly over-represented in the data collected, with special emphasis on some respondents who were central to the spread process. Although, this is not ideal for the internal validity of the thesis, it was simply not possible to gain access to all persons of interest.

In total, the nine healthcare professionals were divided into nine semi-structured research interviews between the two cases. Thus, some interviewees were interviewed twice, while other interviewees were interviewed jointly, as illustrated below:

Conducted Interviews

Ref.	Participants	Date	Duration (hh:mm)	Location
KA1	Kate	22 / 02 / 2019	00 : 24	Phone interview
LA1	Laurence	26 / 02 / 2019	01 : 01	Woodhill Hospital
KA2	Kate	07 / 03 /2019	01 : 00	Phone interview
LA2	Laurence	21 / 03 / 2019	01 : 45	Woodhill Hospital
AN1	Ann	09 / 04 / 2019	01 : 11	Sandford Hospital
AUKA1	Audrey, Karen	24 / 04 / 2019	00 : 57	Windston Hospital

Ref.	Participants	Date	Duration (hh:mm)	Location
TH1	Theresa	28 / 02 / 2019	00 : 23	Phone interview
THRI1	Theresa, Rita	08 / 03 / 2019	01 : 03	Oakville Hospital
SH1	Shirley	10 / 04 / 2019	01 : 04	Rockmore Hospital
LU1	Lucy	11 / 04 / 2019	01 : 23	Oakville Hospital

Figure 5: Overview of interviews

Throughout the data collection process, establishing trust has been an important objective. Establishing trust is key to create a positive experience for the respondents and, further, a lack of trust can have a significantly negative impact on the internal validity (Saunders et al., 2009). To ensure the trust and comfortability of each respondent, efforts were made to form an informal relationship between the interviewers and the respondents. Where possible, this meant to conduct the interviews on-site and dedicating time to informal conversation, since both are beneficial when establishing a relationship with the respondents (Saunders et al., 2009). Each respondent was also briefed on the objective and scope of the research, including the overall themes on which they would be questioned. Although, this procedure could create some level of response bias, and thereby weaken the validity, it was weighted against establishing trust and creating transparency for the respondent.

When conducting each interview one of the authors would take the role of 'lead interviewer' while the other author would act as a 'support interviewer'. This allowed the lead interviewer to focus on the overall themes and structure of the interview, while the support interviewer could ask in-depth questions relating to the insights from previous interviews. Specifically,

one of the techniques applied by the support interviewer was critical incident, in which interviewees were encouraged to mention real-life examples when answering questions, to insure internal validity (Saunders et al., 2009, p. 332). The roles of lead interviewer and support interviewer varied between each interview, to avoid the build-up of certain questioning biases between the authors. This dynamic was prevalent regardless of the interview type.

Although conducting the semi-structured interviews in person was emphasized to allow a more in-depth understanding of the innovation spread process, this was not always possible – in practice, three interviews of nine were conducted telephonically. While this was not ideal in terms of validity, a balance between what was feasible and ideal had to be found. On two occasions, the interviews were conducted between the two interviewers and two respondents – this was, surprisingly, helpful since it allowed the respondents to complement each other's insights and supported an informal atmosphere, which improved internal validity.

2.3.4 Documentary data

In alignment with the multi-method choice, several documentary data sources have been used, both primary and secondary, to allow for a triangulation of the data and create a stronger internal validity (Saunders et al., 2009, p. 328).

Although, the documentary data in this thesis plays a comparatively smaller role, it has been important to gain insight into each of the two cases. The documentation includes PowerPoint presentations and timelines for each case innovation, along with old treatment schedules, which were used prior to the introduction of the two case innovations. The documentary data can help uncover how the perception of the two case innovations have changed and how they differ among different stakeholders. Furthermore, the triangulation of data insures are stronger internal validity, especially when research case studies (Saunders et al., 2009).

2.4 Ethical considerations

This section will touch upon what ethical considerations the authors of thesis have reflected upon, and what efforts have been made to negate potential ethical issues. A principle, which have been underlying to this research, is to prevent harm to participants; in particular, to avoid negative consequences or stress associated with citations (Bryman, 2012).

In practice, to avoid such implications of the research, names of participants, hospitals and the case innovations have been anonymized, merely by substituting these names with fictitious ones. This has been important, especially as the thesis will be publicly available. While this procedure has created a broad anonymization of the participants, further action has taken to ensure prevention of harm. In particular, each respondent has received an email, which lists the citations of themselves, that are outlined in the thesis. Thus, this has presented the respondents with the opportunity to reject parts or all the citations. However, none of the respondents wished to withdraw any of their statements – this means that no citations have been retracted from the thesis.

2.5 Data processing and analysis

The forthcoming section will outline how the collected data has been processed and analyzed to qualify answers to the research question of the thesis. As presented, this thesis data foundation consists solely of qualitative data – a primary strength of qualitative data is its richness and depth that can unveil complexity. However, this depth is easy to be overwhelmed by; interviews, in particular, offer a large body of unstructured material which can be hard to navigate through. In other words, while the depth of qualitative data allows for deep insights, it is important to approach the processing and analysis of data in an organized manner, to avoid the pitfall of "getting lost" in the data (Bryman, 2012). To outline the authors' approach to navigate in the arena of qualitative data analysis, the applied data processing techniques will be presented.

Each interview has been transcribed, as this way of processing data allows for a better overview of the data itself. More specifically, transcription allows for the data to be accessible in written format as opposed to audio recordings, which can be easier to navigate through. Hence, each conducted interview has been transcribed to provide a comprehensive overview of interviews, where the transcription outcome has varied between full transcriptions to partially condensed transcriptions. Through the transcription process part of the analytical process unfolds, as the data is processed and reflected upon by the authors (Bailey, 2008). Additionally, as a reflection by the authors, the process of transcribing has been valuable to understand details and aspects that might have been overlooked otherwise, as transcription forces the transcripter to understand the interview in its detail. However, the transcription has in its primary function

been crucial to establish the foundation to conduct the analysis by providing a better overview of the vast body of interview data. The initial version of the conceptual framework was formed after the transcription process, as the transcription process allowed the authors to understand the theory and assess its importance in relation to the collected data.

Organizing and interpreting the data for analysis was an extended and time-consuming process, where the authors aimed to provide an overview that revealed patterns within each case, but also make comparisons among the cases feasible. Each interview was examined through the prepared transcriptions, where numerous physical notes were created to capture details and components of the interview. In more practical terms, for instance, if an interviewee expressed: *"Our patients did not express any concerns regarding the new innovation – they trusted the nurses and doctors to do the right thing",* it would be noted as *"No concerns among patients, they trust staff"* on a post-it note, along with a time-stamp and interview reference. In this manner, over 600 post-its were used to map the data, where the notes were organized in themes. If two notes had a resemblance in theme, they would be clustered in the same area, whereas if notes expressed the exact same idea in their contents, they would be piled on top of each other. Accordingly, an overview was established across the interviews where the themes of the data were made more visibly comprehendible – but also, this approach allowed for a clustering that was, in a sense, dictated by the data. This was the initial part of the analysis process, which is illustrated below in Figure 6:

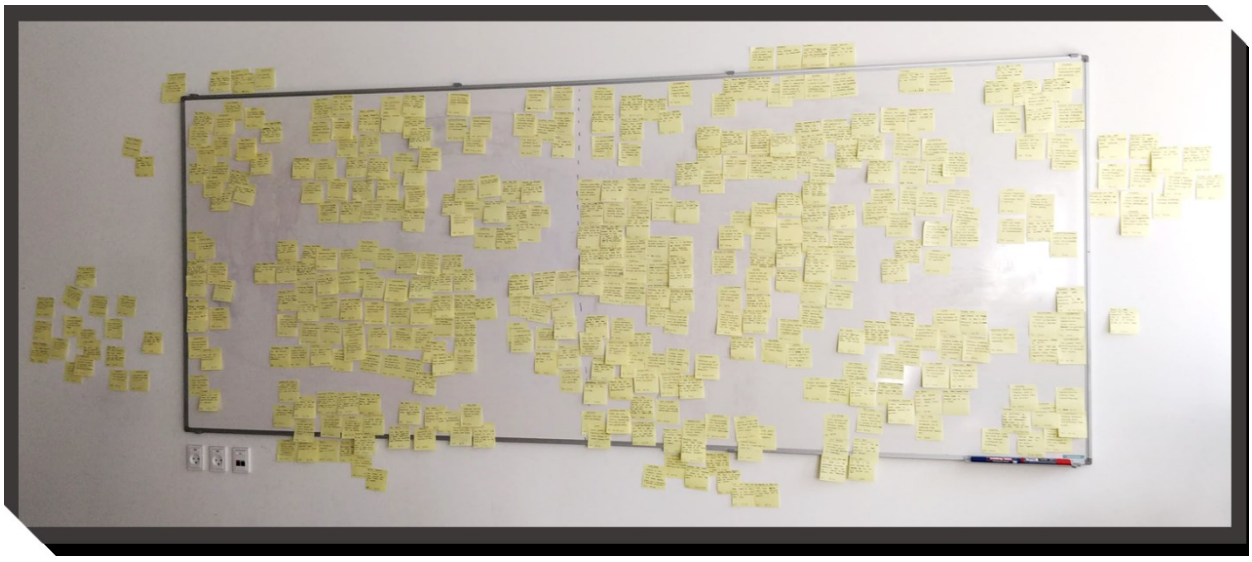

Figure 6: Analyzing the collected data

After this phase was completed, a longer discussion unfolded among the authors around the data which later involved the assessment of data in relation to the conceptual framework. Afterwards, the data was rearranged to pair with the conceptual framework. This was, in practice, done by arranging notes under specific theoretical concepts of the conceptual framework. A challenge during this exercise was arranging the notes where they seemed to be most appropriately analyzed, as some notes could be analyzed in different parts of the analysis – this was an ongoing and iterative process. The data revealed several fascinating aspects, yet some parts of the data could not be included – it was simply not feasible to integrate all aspects of the data into the analysis in a meaningful way. Consequently, some aspects revealed through the data were omitted from the analysis. During this process, the conceptual framework was reviewed in detail and understood in relation to the overview of data – in this manner, some theoretical items were removed from the framework, some were added, and some were adapted; this made the conceptual framework more relevant to the collected data and improved the quality of the analysis. This illustrates, how the method of forming the analysis displayed the thesis' mixed approach.

3. Literature review

The aim of this literature review is to provide a structured overview of the theoretical developments within the fields relating to the assimilation and spread of innovation, both in a broader general context and more narrowly within a healthcare context. The theoretical developments are reviewed through established frameworks to highlight the varying perspectives of spread researchers and is useful when developing the conceptual framework of this thesis (see section 4). Furthermore, it is relevant to include a discussion concerning the innovation and spread terminologies used in the literature, since various terms are often overlapping or not clearly defined. The literature review serves as the theoretical foundation, along with empirical data, from which the conceptual framework will be developed.

3.1 Innovation - from invention to adoption

Varying definitions of innovation are often used interchangeably within the literature to the degree that some researchers seem to regard innovation as a static predefined concept. However, for the purposes of this thesis, when analyzing the innovation spread, and subsequent assimilation and adoption, it is central to define the core concept of innovation.

Schumpeter (1942) was among the first economists to separate innovation from invention, arguing that invention, by itself, offers no value within the market or industry. Instead, Schumpeter states that innovation, when introduced into the market or industry, causes the destruction of the old structures, by creating the new ones – a term he labels *creative destruction*. Although, Schumpeter's (1942) perspective on innovation is heavily founded within the field of industrial economics, and thus inappropriate for this thesis, it is interesting to investigate the underlying assumption of creative destruction. Schumpeter assumes that whenever an innovation is introduced into the market, it will inevitably destroy the old structures and be widely implemented by all actors within the market.

This assumption is implicitly contested by the theories originally proposed by Rogers in 1962 who defines innovation as "*an idea, practice, or object that is perceived as new by an individual or other unit of adoption*". Rogers introduces the concepts of adoption and diffusion to explain how innovations are spread throughout nations, organizations or groups and refutes the idea that innovation will be widely implemented, simply based on the fact of being new.

Furthermore, one individual could perceive an innovation as groundbreaking, while another would consider it standard practice (Rogers, 2003). This disparity of perceived newness underlines the fact that innovation is not evenly implemented as proposed by Schumpeter (1942), indeed, innovation must actively be adopted by individuals or organizations. The process of adoption is socially based, in which adopters and organizations will not always act rationally – although the innovation posses' substantial benefits to them, it is not necessarily adopted.

However, according to Rogers (2003), the only criteria for innovation is newness, which makes the distinction between change, invention and innovation difficult. Alternatively, West (1990) states that innovation should be defined as *"the intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society"*. This definition accounts for a wide range of adopters and innovation types, while emphasizing that innovations must be designed to create value. This implies that innovations that are initially introduced to create value, can change throughout the spread process depending on, for instance, adopters' values and organizational settings.

This thesis adopts the definition provided by West (1990) which is widely accepted within the literature, as outline in Anderson et al.'s (2004) comprehensive literature review. The definition provides a focal point in analyzing the spread of innovation, relating to the nuances described above.

3.2 Innovation spread literature

The spread literature is highly diverse and incorporates a wide range of theoretical fields which often connects innovation spread with diffusion of innovation – however, this thesis argues that diffusion does not capture the nuances and complexities of the spread process (see section 3.4). However, for the purposes of accurately presenting the following frameworks, the original terminology of each author will be used, primarily diffusion of innovation. This section presents an overview of the development within the diffusion literature based upon the most established theories and frameworks by Rogers (2003), Van de Ven (1999), Wejnert (2002) and Greenhalgh et al. (2004). Greenhalgh et al. (2004) is especially relevant in the context of healthcare and will be described in detail in the next section.

Everett Rogers first published *Diffusion of Innovation* in 1962, developing the concept of diffusion and subsequently creating the foundation for diffusion literature as an independent field. Rogers developed his diffusion framework within rural sociology including cases about American farmers adopting hybrid corn and teaching Peruvian villages to clean drinking water by boiling it. The definition presented by Rogers (2003, p. 5) is *"Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system".* As such, the framework is largely focused on the individual adoption decision and the role of communication through the social network. The sociological approach of Rogers meant that his framework proved relevant within a multitude of different theoretical fields such as medical sociology, communication and marketing, who all adopted diffusion theory (Greenhalgh et al., 2004, p. 586-589).

The early studies of diffusion relied on Rogers' (2003, pp. 165, 245) theories about the innovation characteristics, adopters and the communication, which affects the rate of diffusion, and is closely linked to Rogers' famous concepts of *early adopters and laggards* and *the innovation decision process*. The early adopters and laggards represent stages of the diffusion process over time in which groups of individuals gradually adopt the innovation. Early adopters are the first to adopt innovations. They are individuals with a high degree of innovativeness with high use of relevant communication channels, while laggards are the last to adopt innovations (Rogers, 2003). The innovation decision process represents five stages (knowledge, persuasion, decision, implementation and confirmation) that each individual adopter passes to make the final decision to adopt the innovation (Rogers, 2003).

Since Rogers (2003) first presented his studies, the diffusion literature has spread into other theoretical fields such as development studies, knowledge distribution and organizational studies. However, later studies often criticize Rogers' theory since it does not account for the context in which the innovation is introduced, such as the history of previous innovations that have been introduced within the same setting or how adoption process varies within different organizational settings (Greenhalgh et al., 2004). In Rogers' republished edition from 2003, he adapts his decision stage model to account for organizational process of adopting innovation. The adaptions were made to accommodate the growing literature field of diffusion, specifically related to organizations.

Van de Ven et al. (1999) develop their own framework for analyzing the entire innovation process, but argue that diffusion and adoption cannot be separated from the innovation process and as such their framework poses relevance when analyzing innovation spread. Van de Ven et al. (1999) state the literature on innovation in organizations can be split into two sperate perspectives. The first perspective is reflected in the stage-model as presented by Rogers (2003), which assumes that each stage follows the other in a predicable sequential matter. Thus, stage-models are conceptually appealing since the diffusion process can be evaluated depending on which stage the innovation or individual is in. This perspective is contested by Van de Ven et al. (1999), who argue that the diffusion process is too complex to be described through a stage-model and found no evidence in their own research to support a stage-model approach when analyzing innovation in organizations. The second perspective states that the diffusion process within organizations is an inherently random process that is affected by a multitude of unobservable external and endogenous factors. Van de Ven et al. (1999) argue that such an approach offers little insight in how to manage innovation and diffusion, since the innovation process is determined by uncontrollable events in which organizations can only evaluate the diffusion retrospectively. Instead, Van de Ven et al. (1999) develop a framework that states the innovation process, and by extension the diffusion, to be a complex and dynamic system that is highly dependent on different contexts but can be managed. The *Innovation Journey model* describes 12 process that innovation can pass through, however, these processes are widely different depending on the specific context and can happen parallelly, independently or be entirely skipped. Although the innovation journey model encompasses the entirety of the innovation process, Van de Ven et al. (1999) state that the diffusion and adoption of innovations happen throughout the processes. Thus, *the Innovation Journey* recognized some of Rogers (2003) ideas relating to the diffusion process, although it is presented much more dynamically as an ever-changing process.

Wejnert (2002, p. 297) builds upon the original framework of Rogers (2003) and defines diffusion as *"the spread of abstract ideas and concepts, technical information, and actual practices within a social system, where the spread denotes flow or movement from a source to an adopter, typically via communication and influence".* However, Wejnert states that the actor can be any social entity such as groups, organizations or countries. As such Wejnert (2002) further argues that the framework is relevant within several theoretical fields when

analyzing the diffusion of innovation. Unlike Rogers (2003) and Van de Ven et al. (1999) this framework does not aim to analyze the diffusion process, instead it focuses on understanding the various characteristics that affect diffusion. These characteristics are divided into three components; innovation characteristics, innovator characteristics and characteristics of the environmental context. While these characteristics are thematically similar to Rogers' (2003) characteristics, they have been modified to fit the wider context with special emphasis on innovation advantages and the external environment. Interestingly, Wejnert (2002) states that the interaction between the components of the framework are not widely understood but could have implications for the diffusion of innovation among actors.

The different authors and frameworks presented above represent the broader spread literature and the different approaches used. The unit of analysis have gradually shifted, from Rogers (2003) original framework with focus on the adoption of individuals to spread in complex organizations, relating to the spread process and characteristics that affect spread of innovation. As mentioned above, spread literature have been applied narrowly into other theoretical fields, therefore, it is relevant to present the spread of innovation regarding healthcare in a dedicated section.

3.3 Innovation spread in healthcare

As mentioned in the previous section, spread of innovation has been adopted into several theoretical fields, including the diffusion of innovation in healthcare and hospitals. However, this field of literature suffers from the same narrow definitions and fragmentation mentioned above, which makes a structured overview difficult. Greenhalgh et al. (2004) present a conceptual model for considering the determinants of spread of innovations in healthcare service delivery organizations, based on a comprehensive systematic literature review. Greenhalgh et al.'s framework represents the theoretical developments within the literature thoroughly and will be reviewed below, along with contemporary, less established, frameworks.

Greenhalgh et al.'s (2004) framework is heavily inspired by Rogers (2003) original theories of innovation spread, although they argue for a need to refined original framework. As outlined by Greenhalgh et al., the process of spread in healthcare service delivery organizations is multifaceted and highly complex. However, most of the literature on spread of innovations

relies on more simplistic product-based innovations, where the diffusion process unfolds on a mostly individual adopter level, much unlike the process that takes place inside a healthcare organization. This is important to recognize, as findings from this type of literature can be used to oversimply the complex process which takes place in a healthcare setting, where adoption happens inside teams, departments and organizations with numerous adopters involved (Greenhalgh et al., 2004). In their own model Greenhalgh et al. (2004, p. 595) describe 9 theoretical components that can affect the spread of innovation within a healthcare organization. As such they do not contribute to understanding the process of spread or offer a prescriptive model for practical use but adopt a similar approach to Wejnert (2002) when describing complex processes. Indeed, the empirical findings explicated in the systematic review do not support such a process model, since the spread process vary greatly depending on the context. However, Greenhalgh et al. (2004) argue that researchers within the field have primarily focused on one or two components of the model, but not the interactions between each component and how they might affect each other. Yet, they recognized the difficulties of such studies and how the inherent contextual complexities limit the generalizability of such studies.

In the contemporary literature, several attempts have been made to create a theoretical framework that captures the complexities of the spread processes within healthcare. Wainwright & Waring (2007, p. 47) review 4 previous frameworks to construct their own comprehensive framework, which is applied to analyze an empirical case, to test the robustness of their findings. The framework divides the spread process into 3 stages; *primary adoption* (top-level), *secondary adoption* (middle managers and staff) and *organizational consequences*. Although Wainwright & Waring (2007) succeed in developing a theoretical framework for analyzing the innovation spread process, it is highly focused on the political decision-making and the role of power, within and outside of the organization, when adopting innovation. Thus, their framework neglects the informal process of innovation spread and implicitly states that spread processes must be initiated and managed from the top-level of the organization. These findings could be influenced by their empirical case on the spread of new information systems, in which, political decision-making and power could be the most relevant factors for the spread of innovation. This further highlights the difficulties of developing frameworks that moves beyond the specific context of an organization.

One paper, by Atun et al. (2010, p. 106), proposes a general framework for innovation spread in healthcare that can be modified depending on the specific context. This is indeed similar to the framework proposed by Greenhalgh et al, (2004), grouping 5 components, however, instead of 9. Interestingly, the problem that a given innovation aims to solve, is included as an independent component, since it will affect the rate and speed of the spread. However, despite Atun et al., (2010) interesting addition, Greenhalgh et al., (2004) should be considered more comprehensive and detailed when structuring contextual frameworks.

More recently, Greenhalgh et al. (2017, p. 12) developed a new framework, based on their previous studies, to analyze the spread and non-spread of technology innovations in a healthcare context. The framework is comprised of 6 domains: the condition, the technology, the value proposition, the adopter system, the healthcare organization and the wider context. A seventh, separate, domain is included which contains the interactions and adaptions over time. Greenhalgh et al. (2017) acknowledges the inherit complexity of the innovation spread process and argues that the degree of complexity negatively affects the spread process. As such, their framework analyzes each domain's level of complexity from simple, to complicated, to complex. If the technology introduced within the organization is untested and requires reconfiguration of existing systems, the domain is complex and reduces the overall probability of innovation spread. Interestingly, the seventh domain represent the interactions of the domains over time, stating that the domains can move from simple to complicated, or reversely, during the innovation spread process (Greenhalgh et al., 2017). However, this form of analysis is impossible to apply prescriptively since the context of each innovation spread and the interactions differs. Although the framework cannot be used as normative model, there is evidence that it could have some value as preliminary analysis during the early development stage of the spread process (Greenhalgh et al., 2017).

The review above highlights the difficulties when analyzing the spread of innovation within a healthcare context, because of the internet complexity of the field and varying definitions among the frameworks.

3.4 Terminology

In the body of literature reviewed in this section, and in the literature on which the authors based the conceptual framework (as outlined in the section 4), various topics are described

with the use of varying terminology with subtle and more apparent differences, in terms of definitions. However, individual terms are also understood and used inconsistently in-between researchers and research fields (Greenhalgh et al., 2004). To avoid confusion and ambiguity around the terminology presented in this thesis, a brief discussion will argue how central terms of this thesis have been selected and how these terms are understood by the authors of this thesis.

3.4.1 Assimilation

The term "adoption", as it is often presented in the literature, has mostly been used to emphasize a level of analysis on an individual adopter level. However, in more complex settings, such as inside a healthcare organization, an individual level of analysis will be over-simplistic and fail to recognize the many other influential elements that are present – in other words, simply analyzing the adopter and the innovation in isolation will not suffice to explain this process (Greenhalgh et al., 2004). To better absorb this complexity, the term assimilation has been introduced, as it is used to describe adoption in a more complex setting, but also emphasizes the messier model of adoption (Van de Ven et al., 1999), as opposed to a sequential stage model of innovation adoption. Thus, while terms such as adopter and adoption still will appear in this thesis, the process that takes place within an organization or unit will be referred to as the assimilation process, as this term offers a better explanation for the process which takes place in a healthcare context.

3.4.2 Spread of innovation

The process of innovation spread can best be understood by outlining the continuum between diffusion and dissemination (Greenhalgh et al., 2004). Diffusion, on the one end of the continuum, is where innovation spread is unplanned and occurs in a mostly horizontal and decentralized manner, whereas dissemination is, oppositely, planned and unfolds in a more centralized manner, enabled by vertical hierarchy. Adapted from Greenhalgh et al.'s (2004, p. 593) model of *"Different Conceptual and Theoretical Bases for the Spread of Innovation in Service Organizations",* this continuum of innovation spread is illustrated in the authors' model:

Figure 7: Authors’ illustration of innovation spread (adapted from Greenhalgh et al., 2004)

To the far left of the continuum is the most passive form of spread, “Let it happen”, in the middle, “Help it happen”, and to the far right, “Make it happen”. This refers to the type of dynamic of spread, where one end is more passive and emergent (left) and where the other is more active and deliberate (on the far right). The model further displays how innovation spread through diffusion is represented on the left side of the spectrum, and dissemination is on the right, thereby indicating each term’s different use in the literature. It should, however, be noted, that these terms should not be viewed as opposing but rather as supplementary; together, the terms outline the spectrum of how innovation spread can unfold in various settings.

While the majority of the literature reviewed and applied in this thesis can be referred to as part of the diffusion literature, e.g. Greenhalgh et al. (2004) and Rogers (2003), the thesis will refer to the broader term “innovation spread”, which encompasses the full range displayed by the model. This term has been chosen, as the thesis covers cases where the innovation is arguably spread through a combination of these dynamics, thus not solely unfolding through emergent and unplanned spread nor simply through planned and centralized efforts.

4. Conceptual framework

This section will present a conceptual framework for analyzing the dynamics of innovation assimilation and spread in healthcare, based on the context of the two empirical cases; as such the contextual framework is heavily guided by the data collected. Further, the framework structure is largely inspired by Rogers' (2003) *Diffusion of innovations* and Greenhalgh et al.'s (2004) meta-study on diffusion within a healthcare context, both which are still heavily referenced in modern diffusion literature. The goal of the conceptual framework is to guide a structured analysis that is both relevant in the given context and emphasize a holistic perspective on the assimilation and spread of innovation.

The framework is divided into four layers of analysis. The first two layers, (1) innovation interpretation and (2) adopter attitudes, pertain to the interaction between innovation and adopters, whereas the third and fourth layer, (3) organizational context and inter-linkage, pertain the contextual components. The framework does not present the role of the external environment explicitly, such as political pressure or demographical pressure, not because it is not relevant for the assimilation and spread, but because it is indirectly presented in the within four layers, especially within adopter attitudes and organizational context. Furthermore, the framework does not account for the adoption process of each individual adopter, but rather as a group of adopters, since the empirical data simply do not support an analysis of individual adopters. Finally, this framework analyzes the dynamics between the four layers, based on the empirical data. The structure of the conceptual framework is visually presented in Figure 8.

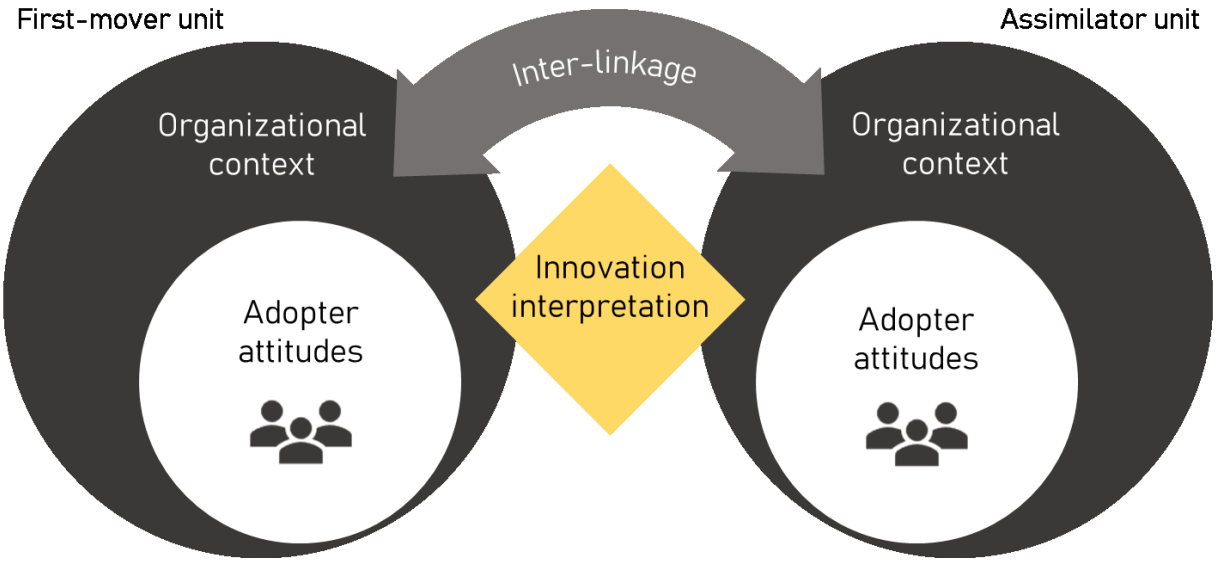

Figure 8: The four layers of spread

The first layer, innovation interpretation, relates to the specific innovation introduced in each case and how they are interpreted by adopter groups. The interpretation consists of the relative advantage and observability available to adopter groups. The second layer, adopter attitudes, relate to the groups of individuals that will apply the innovation within a unit. As a group, the adopters have certain attitudes toward each innovation, which is formed by adopter concerns and the compatibility between innovation and adopters. The third layer, organizational context, represent the first-mover unit that first assimilated the innovation and the units who later assimilated it. Each unit has an organizational context that affects the spread and assimilation of the innovation, in particular concepts of champions and dedicated time and resources. The fourth layer, inter-linkage, consists of linkages between units that enables the innovation assimilation and spread process, in particular pertaining boundary spanners. Throughout each layer, theoretical arguments are presented to support that there is an interaction within and in-between the layers. Although direct evidence is sparse in the literature, multiple researchers have highlighted the importance of these interactions.

The conceptual framework does not represent an exhaustive compiling of all literature related to innovation assimilation and spread. Instead, the framework is guided by the empirical data, to match the specific context of the two cases. To ensure that the four layers described in this framework hold relevance, both theoretical and empirical findings from literature relating to assimilation and spread of innovation within healthcare are included, to support the layers of

analysis. As such, the broader usefulness of the framework might decrease consequently. However, it is important to note that complex problems, such as assimilation and spread of innovation in healthcare, should not merely be reduced to a simple formula, as simple solutions rarely solve complex issues (Plsek, 2003). Thus, the conceptual framework offers a structured and highly relevant method for analyzing the innovation assimilation and spread in this specific context.

4.1 Innovation interpretation

Innovations are not identical and as such their spread processes varies based on the innovation interpretations. The interpretations represent the first layer of the conceptual framework. Inspired by the innovation characteristics of Rogers' (2003) and Wejnert's (2002) frameworks, the conceptual framework of this paper introduces the concept of innovation interpretation. Innovation interpretation largely overlaps with innovation characteristics, but more accurately captures the nuanced degree to which a given innovation is successfully interpreted by the relevant adopter groups. Successful interpretations are those that align with the initial valued offered by the innovation. Attributes such as observability and relative advantage, and their dynamic interaction can influence the interpretation. This section aims to describe the theoretical innovation interpretations relevant for the conceptual framework to analyze the spread of healthcare innovations.

4.1.1 Relative advantage

An important concept, when discussing the role of innovation interpretations in relation to spread, is the *relative advantage* of the innovation. Relative advantage is defined by Rogers (2003, p. 15) as *"the degree to which an innovation is perceived as better than the idea it supersedes".* Importantly, innovations with a high degree of relative advantage is more easily assimilated within the organization. Although, the relative advantages are often expressed in economic profitability, the term encompasses a variety of benefits relating to social status, convenience, efficiency, reliability and satisfaction (Rogers, 2003). Even in organizations, the non-economic advantages take precedence when adopter groups evaluate innovations – according to the findings of Dearing et al. (1994), non-economic advantages were perceived as increasingly important for primary adopter groups of the innovation.

Rogers' (2003) theories have been central in understanding adopter perception of relative advantages and applied within a variety of fields. More recent studies, within healthcare, have noted that relative advantage is not static construct, but constantly changing, negotiated or diverging from the initial value of the innovation (Ferlie et al., 2001). Thus, in this conceptual framework the idea of *perception* is rejected, as it does not accurately display the malleable nature of the relative advantages, instead we adopt *interpretation* in coherence with the theme of first layer.

In healthcare organizations, interpreting relative advantages of an innovation is a continuous process, in which adopter groups interact with multiple stakeholders, hospital managers, patients and other adopter groups (Ferlie et al., 2001). Each interaction can cause the interpretation of relative advantages by the adopter groups to change, which can have both positive and negative effects on the assimilation and spread of innovation. The determinants for successful interpretation of advantages through interaction is not widely understood (Dopson et al., 2002). Other researchers argue, that the complexity of healthcare organizations and varying stakeholder objectives can create challenges in realizing the relative advantages of an innovation (Fitzgerald et al., 2002). It is argued that organizational politics and economy does not always align with the proposed value of introduced innovations and can change the interpretation of the relative advantages.

Denis et al., (2002) argue that healthcare innovation can be outlined by a hard core and a soft periphery – the hard core, the fixed and well-defined part of the innovation and the soft periphery, the inherent ambiguity, which enables different modes of assimilation. Innovations which hold great ambiguity in ways of assimilation (and therefore a larger soft periphery) can lead to a mixture of non-standardized practices (Denis et al., 2002). New practices that diverged from the intended use, can reinforce or inhibit the interpretation of relative advantages by adopter groups. The soft periphery is similar to Rogers' (2003) concept of re-invention, however, the soft periphery also accounts for negative consequences of ambiguity when adopter groups apply the innovation unintendedly, which can have negative impact on interpretation and the subsequent assimilation and spread.

To understand the interpretation of relative advantages and how they can change is relevant in both cases. It is interesting to analyze how different interpretation trajectories develop

among the adopter groups of each case and the implications in explaining difference in assimilation and spread of each case. However, relative advantage is not the only relevant component in determining the innovation interpretation.

4.1.2 Observability

Another important concept introduced by Rogers (2003, p. 16) is the *observability* of the innovation. Rogers defines observability as *"the degree to which the results of an innovation are visible to others".* The more observable the results of an innovation, the more likely it is to be assimilated into the organization. It is important to note that if the results are disadvantageous, the degree of observability will have a negative effect on the assimilation. Highly observable innovation benefits can stimulate communication between potential adopters and therefore inspire conversations and discussions which can propel the spread process (Rogers, 2003). Naturally, innovations have a varying degree of observability, in which physical innovations are more easily adopted compared to process innovations, because the benefits have a higher degree of observability (Damanpour & Gopalakrishan, 2001). This is due the tangibility of physical innovation and often physical innovation represent an outcome of innovation efforts.

The first-hand observability of benefits described above have been adequately researched by Rogers (2003), however, within healthcare organizations, observability often take the form of scientific evidence which is, theoretically, more easily transferable between adopter groups (Dopson et al. 2002). According to Dirksen et al. (1996) strong scientific evidence is critical when healthcare organizations adopt new practices, as it can reduce uncertainty. The robustness and credibility of scientific evidence is underlined by a hierarchy, in which clinical trials are considered the "golden standard" (Evans, 2003). Such findings have been disputed, notably by Grilli & Lomas (1994), who found that there was no difference in spread of innovation between new compliance guidelines with a high degree of observability and those without. The results were categorized as surprising, since clinical relevancy (observability) is often cited as a major explanation to the lack of compliance with new guidelines. Øvreteveit et al. (2002) states that both scientific evidence and first-hand demonstrations are significant when aiming to improve the rate of innovation spread within healthcare organizations, especially when motivating and sustaining spread effort in adopter groups. Interestingly, in healthcare organizations, preventive treatments are often considered as a valuable alternative

to immediate care or hospitalization. However, preventive innovations often lack observability, since apparent benefits of adopting the innovation are not immediately observable to the adopter (Rogers, 2003).

The relevance of observability, in relation to healthcare innovations, is supported by the literature presented in this section, indeed, it is indicated that observability can have a significant influence on the assimilation and spread of innovation. In each of the cases, the observability differs significantly, and one case innovation could be classified as a preventive innovation.

Previous frameworks, such as Rogers (2003) and Wejnert (2002), include both relative advantage and observability, but do not touch upon possible interactions. However, from the literature above, it can be gathered that relative advantages and observability is highly connected, for instance, through scientific evidence. Scientific evidence is often the vessel, in which, the relative advantages are first presented to healthcare professional but, as mentioned, the relative advantages can be disputed and reinterpreted (see section 4.1.1). According to Rogers (2003), the scientific evidence could be considered the "objective" relative advantage, as originally proposed and under ideal circumstances, before the interpretation of adopter groups. Conversely, Denis et al. (2002) argue that a strong degree of observability, such as scientific evidence or first-hand experiences, can ensure the proper application of innovation with large ambiguity. The interaction between the innovation interpretations is central when analyzing spread and assimilation – however, the other layers and their interaction are equally significant to understand the diffusion of innovation.

4.2 Adopter attitudes

An interesting but challenging endeavor is comprehending the labyrinthine behavior of adopters and how they interact with innovations – this implication is examined through adopter attitudes, the second layer of the conceptual framework. The interaction between adopters and innovations is not simple, but unfolds in many ways – adopters evaluate, challenge, experiment with and modify innovations, but also develop feelings, concerns and meaning around them, which together significantly influence the degree of assimilation for a given innovation. Consequently, with the apparent key role of adopters, this section will seek

to understand the role of adopters and the interaction between adopter and innovation through a theoretical lens.

4.2.1 Compatibility

In his effort to construct universal characteristics of innovations which predict an innovation's rate of adoption (Rogers, 2003, p. 223) outlines the concept of *compatibility*. The compatibility of an innovation should be understood in its relation to the adopter's values and beliefs, formerly introduced ideas and adopter needs. Rogers (2003) argues, that if an innovation is incompatible, the assimilation will be hindered. For instance, if the adoption of an innovation pushes a doctor to go against some of her firmly held beliefs, it is less likely that she will adopt the innovation. Likewise, if an innovation is based on a technology which is dissimilar to previously introduced technologies, the rate of adoption could diminish. Rogers' claim is built on three studies, where values and beliefs, formerly introduced ideas and needs of adopters had a significant impact on the rate of adoption (Clinton, 1973; Hahn, 1974; Kilvin, 1960).

Other researchers have later expanded this understanding by examining compatibility in the context of healthcare. Denis et al. (2002) found that adopters' values function as the foundation to legitimize or disapprove the adoption of an innovation, thus serving as a significantly influencing factor in the assimilation process. For instance, this means that the values of adaptors can promote evidence-based legitimization. However, the study also concluded, that more 'subjective' values such as conformity to standards, or firmly held beliefs about how to treat patients, can have a significant impact on the success rate of assimilation (Denis et al., 2002). Similarly, Foy et al. (2002) found that recommendations for clinical practitioners to change practice was more likely to be adopted if the change was compatible with clinical norms and values and did not require a change of routines. Interestingly, the study also concluded that recommendations with a lower degree of compatibility resulted in greater improvements. As presented later in this paper, it will be analyzed and discussed how compatibility issues across the two cases differ in nature.

While the adopters' beliefs, values and work routines have great relevance in the assimilation process, it is similarly important to understand the how the concerns of adopters can have strong relevance in the spread and assimilation processes.

4.2.2 Adopter concerns

While the model was initially developed by Hall & Hord (1987) for innovation in the context of schools, Greenhalgh et al. (2004) have referred to the *Concern-Based Adoption Model* to be suitable to understand the assimilation process in a healthcare context, as it "*better explained the findings of empirical studies of complex service innovations in an organizational context*" (Greenhalgh et al., 2004, p. 600). As recomposed by Greenhalgh et al. (2004), the model consists for three parts: *Concerns in the preadoption stage, concerns during early use* and *concerns in established users*. As Hall & Hord (1987, p. 53) intriguingly explained when introducing their model: "*in the end, how [adopters] feel about and perceive change will in large part determine whether or not change actually occurs*". This clearly emphasize the potential implications of adopter concerns.

The model emphasizes how the nature of concerns among adopters differ over time, and therefore, how successful assimilation requires a shifting focus as concerns arise. In the first part of the model, prior to adoption, it is important that the potential adopters are simply aware of the given innovation – in extension, they need underlying information such as what it is used for, and how. Beyond this, it is important that they can assess the innovations potential impact personally; for instance, what costs may incur or how the innovation may affect the adopters' work. Later, in the second part of the model, other concerns arise – here, it is important that the adopters have continuous support in terms training, planning, addressing task issues and overall assistance in integrating the innovation into the adopters' daily work (Greenhalgh et al., 2004).

Lastly, concerns in established users is related to the impact of adoption and refinement of the innovation. It is argued, if the adopters easily can assess the impact of adoption in their work, this will affect the assimilation process – e.g. if a nurse easily can observe that patients are recovering faster after the introduction of an innovation, the assimilation process is more likely to succeed. This is closely related to the previously introduced concept of observability, which similarly is concerned with the significance of observable impact of the adoption of an innovation. Finally, sufficient autonomy among and support of adopters are required to allow adopters to improve, refine and adapt the innovation, which, naturally, leads to a better assimilation process (ibid). Concerns among adopters are present and attempted to be

resolved during the assimilation process of each case, however, the concerns eventually pose varying impact on the two assimilation processes.

While each part of this section will, individually, highlight influential aspects to the assimilation process, it is important to recognize how these in parts are interconnected. Thus, for instance, incompatibility between innovation and adopters can lead to stronger concerns among adopters and thus a greater need to address these concerns throughout the assimilation process. The interplay will be analyzed and discussed in relation to the two cases in later parts of this analysis and discussion.

4.3 Organizational context

While traditional studies of innovations have been mostly occupied with the innovation itself and the individual adopter as the subject of analysis (Greenhalgh, 2004), the context in which it is introduced has proven to have great significance in terms of implementation and spread. This is highlighted within the third layer of the conceptual framework that emphasize organizational context of the first-mover unit and assimilator units. Organizations, departments or units serve as a substantial component of this context and hold elements which can advance or hinder any adoption process. Consequently, this section will attempt to map some of the important theoretical aspects of the organizational context in relation to innovation assimilation.

4.3.1 Champions

The setting, in which adopters and innovations interact, hold several significant factors of influence – one of these, which is widely pertinent to the assimilation process, is the champion. Champions have, as a concept, been outlined in the literature as a significant influence on the assimilation of innovations in the context of healthcare (Cifuentes et al., 2005; Feifer & Nemeth, 2007; Cohen et al., 2005). Consequently, the absence of this role is associated with a poorer rate of assimilation (Graham et al., 2002). In particular, champions are referred to as individuals, who drive the assimilation process through devoted efforts (Soo et al., 2009).

Shaw et al. (2012) have built further upon the theory of champions in a healthcare context, by separating the concept into project champions and organizational change champions. The two roles hold some similarities in their traits and activities – however, a key difference is that the

project champion's role is focused on a single innovation project, whereas the organizational change champion role is occupied with facilitating change on a broader scale, and is therefore typically not engaged in similar depth with each single project (Shaw, et al., 2012). Interestingly, the two roles are emphasized as complementary – in other words, if the efforts of the project champion and the organizational change champion align, the assimilation process is promoted. Conversely, the efforts of a project champion can be hindered if there is a lack of support from an organizational change champion, or if the efforts of the two roles are misaligned (Ibid.).

Champions engage in efforts which seek to advance the assimilation process – active promotion of the innovation, leadership and facilitation of education and training are some of these efforts. Shaw et al. (2012) emphasize that the leadership of champions is most effective when leaning towards what is referred to as facilitative leadership. This type of leadership seeks to form psychologically safe environments for change, but also relies on empowerment or involvement of staff. Moreover, Soo et al. (2009) highlights that training and education is a key activity of the champion, which is in more practical terms involves providing information of the innovation, demonstrating appropriate use and its purpose. In the same vein, the study emphasizes that *"basic education efforts alone were not enough"* (Soo et al., 2009, p. 125) – thus, it is essential that the education is meaningful to the receiver. In this manner, the training and education should be customized and planned to resonate well with the receiver, which is typically more successful if the champion is within the same professional field as the receiver (e.g. intraprofessional training). In this manner, champions can push towards a successful assimilation process through several efforts.

However, there are other factors present within the organizational, which similarly has relevance in relation to spread and assimilation of innovations, namely the dedication of time and resources.

4.3.2 Dedicated time and resources

To achieve successful assimilation and spread of an innovation, it should not be undermined how dedicated time, resources and staff can have great influence (Gustafson, et al., 2003). A study concluded, that financial considerations are indeed a key factor for innovation spread which can ultimately determine success or failure (Fitzgerald et al., 2002)

As complex innovations in healthcare organizations are rarely introduced as an off-the-shelf solution, budgets should be outlined to not only allow for acquiring the most tangible components of an innovation (e.g. the technology itself), but also to support the assimilation of the innovation. Similarly, allocating time and personnel is crucial to allow for training, change of procedures, planning, general project management and other activities related to effective assimilation. In practice, to allocate resources beyond the most obvious tangible costs can simply be overlooked by managers. However, such allocation of resources can also be undermined due to the general lack of resources in healthcare departments and organizations. In this context, Fitzgerald et al. argue, if the innovation is related to an area of non-priority, lacks financial incentives or generates additional work, chances for successful assimilation might dwindle, as all these factors will reduce the likelihood of robust financial support (Fitzgerald et al., 2002). In both of the two presented cases, financial support and dedicated staff has been pointed to as crucial during the assimilation process – however, this type of support has varied across the cases and the process, conceivably with consequences for the process of assimilation and spread.

While the context factors perceived individually, as outlined above, has great impact, they should also be understood in their interrelation. It is argued, that without financial support or dedicated time, it can be challenging for champions to function effectively – and reversely, if champions are not present, perhaps time and resources are not as effectively employed to promote the assimilation and spread processes. In this manner, it is suggested that these efforts have greatest effect in synergy.

4.4 Inter-linkage

The process of spreading innovation is highly complex and content dependent, with no innovation exhibiting the same spread trajectory. Yet, underlining all spread of innovation are important inter-linkages that facilitate the sharing of information, knowledge and resources. According to Rogers (2003), these inter-linkages are dependent on the social networks of adopters, or outside sources such as *change agents* and *mass media*. Between organizations the same linkages are needed, although they can be argued to be even more complex to navigate (Greenhalgh et al. 2004). The fourth layer of this thesis aims to combine the empirical

data with theoretical concepts, to accurately describe the relevant inter-linkages found in each case.

4.1.1 Boundary spanners

Although Rogers' (2003, p. 312) terminology varies slightly, he supports the notion of important individuals "*who influences adopters' innovation decisions in a direction deemed desirable"*. Rogers refers to these individuals as change agents, yet it can be argued that the terminology of boundary spanners (in an organizational context) is more accurate considering their role beyond organizational confines. Indeed, Greenhalgh et al. (2004) argues that the definition of change agents, boundary spanners and champions are used interchangeably within the literature which can make it difficult to distinguish. For the purposes of this conceptual framework boundary spanners are defined as individuals who act outside of organizations or organizational units to further the spread and assimilation of innovations. This contrasts with champions who promote assimilation within organizational boundaries.

According to Rogers (2003), the primary objective of boundary spanners is to enable adopter groups or organizational units to assimilate a given innovation, by facilitating the *flow of innovation* which encompasses information, knowledge and resources. Yet, significant social and technical chasms exist between adopter groups and boundary spanners. Rogers (2003) describe these chasms through the concept of boundary spanner *heterophily*; by definition, boundary spanners differ from the adopter groups as they represent and 'outsider' to the assimilator units and can often have a different profession, social status, knowledge, etc. Thus, the heterophily of boundary spanners represent a significant boundary that must be overcome to successful facilitate the flow of innovation.

Within healthcare organizations, the study by Ferlie et al. (2005) represent the most comprehensive investigation of boundaries to the flow of innovation, although it has incited multiple studies with similar themes of boundaries between organizations, departments and professionals (Currie et al., 2007; Powell & Davies, 2012; Liberati et al., 2016). It is argued, that these boundaries are especially relevant to boundary spanners, as their heterophily is even greater compared to those inside the assimilator units.

The first boundary described by Ferlie et al. (2005) is the social boundaries. These boundaries can be formed through professions, traditional work practices or interactions with other actors in the organization. Through these, a common language and jurisdiction evolves, which, can be difficult to overcome for outsiders. For instance, in the cases presented by Ferlie et al. (2005, p. 129), significant social barriers existed between nurse, doctors and physicians due to differing convictions about appropriate patient treatments, which had a negative effect on the spread of innovation. According to Rogers (2003), these social boundaries will also have a negative effect on the credibility of boundary spanners which decreases their successfulness. The second boundary relates to knowledge and how epistemological views differ between adopter groups (Ferlie et al. 2005). Different departments often have different knowledge bases and assumptions that dictates their approach to new practices. Within healthcare, scientific evidence is often disputed by various healthcare professionals as a consequence of their knowledge boundaries. According to Rogers (2003), knowledge barriers could also mean lack of capabilities in applying the innovation, in which training is required. Individuals that understand both social and knowledge boundaries are often effective as boundary spanners, which is supported by Hilz (2000), that highlights the effectiveness of clinical nurse specialists when spreading innovation. The last boundary is inspired by Rogers' (2003) notion that boundary spanners can transfer resources to promote assimilation, if adopter groups lack them. The resources boundary relevant to hospital since they often experience shrinking budgets. Within the literature, this area is not widely investigated, however, Birken et al. (2013) argue that middle managers are effective boundary spanners as they can allocate resources beyond their own organizational unit. Thus, this thesis perceives boundary spanners to not only overcome organizational boundaries, but also social, knowledge and resource boundaries.

The success of the boundary spanners' efforts is shown to be dependent on the existences of strong boundaries, and the ability of the boundary spanners to overcome them. In both cases, the boundary spanners were found to occupy an important role in the spread process, that transcended the confinement of the original organizational unit. The relation between boundary spanners and boundaries are interesting to investigate, as it can significantly influence the spread of innovation, in accordance with the theory presented above.

Ferlie et al. (2005) argues that interactions between each of the boundaries can also have important influences on spread. When boundary spanners face multiple strong social, knowledge and resources boundaries, the boundaries can become mutually reinforcing, challenging the effectiveness of the boundary spanner even further. This point is supported by the heterophily of boundary spanners – when multiple chasm between boundary spanners and adopters exist, the likelihood of spread decreases (Rogers, 2003).

4.5 Interactions between the four layers

Through the description of the conceptual framework, interactions within each layer have been presented – however, interactions in-between the four layers are equally important elements of this framework. The interaction between interpretations, attitudes, context and inter-linkage can prove to have strong significance, and in turn display substantial influence on the spread and assimilation processes. For instance, Øvreteveit et al. (2002) state that observability is critical in boundary spanner efforts, as the adopters can observe the effect of an innovation during demonstration, and therefore shape their interpretation of the innovation. According to Rogers (2003) this will increase the chances for assimilation and enable adopters to share their experience within the group. Through the sharing of experience, adopter attitudes, such as concerns, can be migrated, changed or solidified, creating new attitudes to foster or inhibit the assimilation process. If the innovation interpretations are changed, namely relative advantages, the organizational context could adapt and allocate dedicated resources and time, as the innovation assimilation is prioritized (Fitzgerald et al. 2002). This example illustrates how changing innovation interpretations can have a ripple-like effect throughout the spread and assimilation process.

Although the theoretical examples above only include a limited representation of each layer's interactions, it is apparent that the literature supports an analysis of the interaction across the four layers. In the context of the two cases, it is intriguing to expose these interactions to observe their effect on the spread process and how these interactions might differ between each case.

5. Analysis

In following section, the innovation assimilation and spread will be analyzed for each case separately and, subsequently, in comparison, to answer the research question of this thesis. In this endeavor each sub-question will be answered by applying the conceptual framework. The four layers of the conceptual framework is illustrated below:

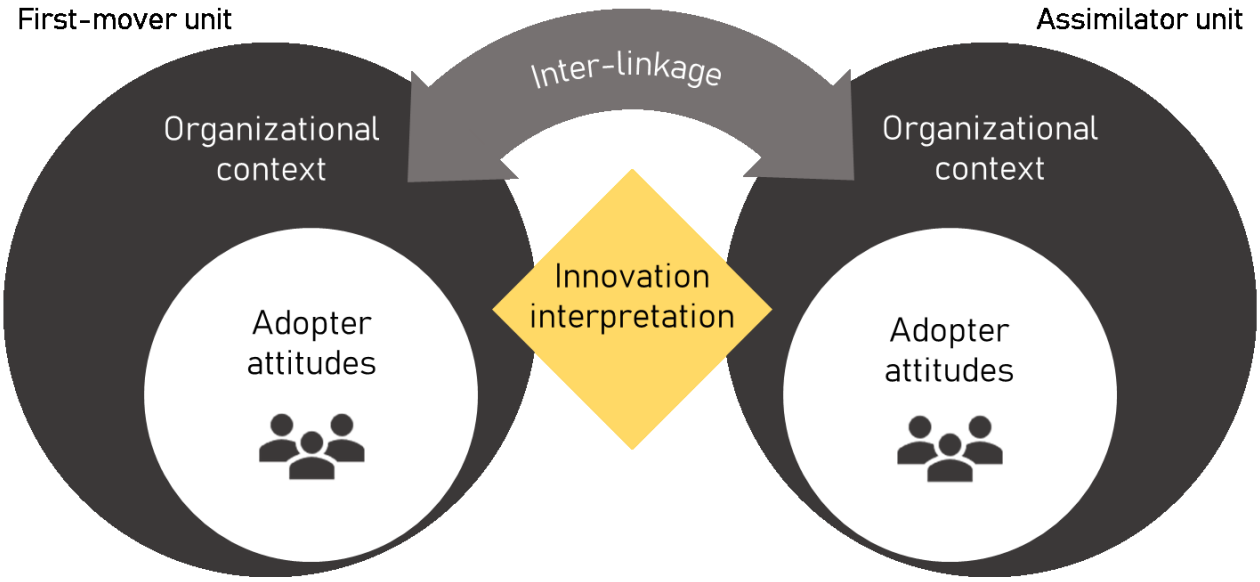

Figure 9: The four layers of innovation spread

The first and second layers, (1) innovation interpretation and (2) adopter attitudes, analyze the relation between the innovation and the adopters, pertaining to the first sub-question. Succeeding, the third and fourth layers, (3) organizational context and (4) inter-linkage, analyze the context of the two cases pertaining to the second sub-question. Finally, the interaction between the four layers is analyzed in respect to the empirical findings to answer the final sub-question.

In accordance with the outlined conceptual framework, each layer will hold components that will be analyzed in relation to the two nominated cases. In particular, each case will be analyzed separately within each layer, to then be analyze collectively. In this manner, patterns of similarities and dissimilarities will be uncovered between the cases, while the connection between the concepts within the layers will be analyzed with an apparent focus on the assimilation and spread processes. Finally, the four layers will be analyzed across to unveil

interconnections between the concepts of the conceptual framework to gain a deeper understanding of the assimilation and spread dynamics present in the two cases.

Each layer holds theoretical components – to provide an overview of these, and outline the general structure of this analysis, a visual representation is presented to the reader:

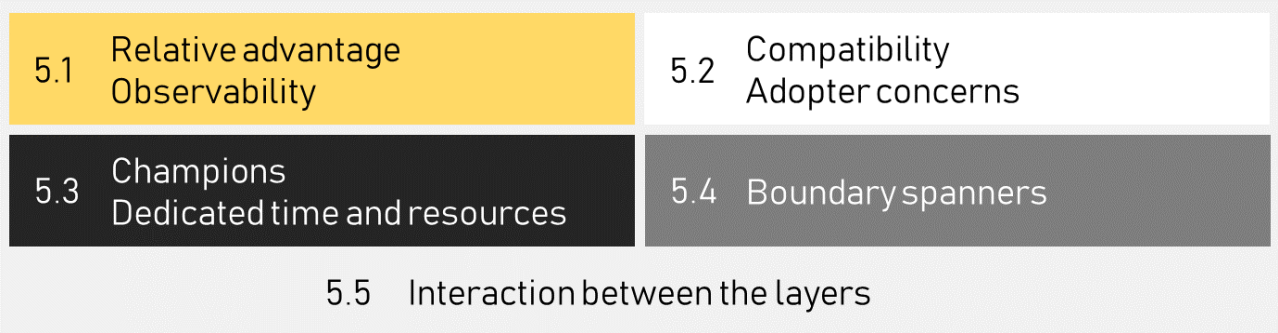

Figure 10: Outline of analysis components within each layer

As established above, section 5.1 will concern the first layer of innovation interpretation which hold the components of relative advantage and observability. Accordingly, section 5.2 will outline the second layer of adopter attitudes through the concepts of compatibility and adopter concerns. Moreover, section 5.3 will analyze the fourth layer of organizational context through the concepts of champions and dedicated time and resources. Subsequently, section 5.4 will regard the fourth layer of inter-linkage through analyzing the concept of boundary spanners. Finally, in section 5.5, the interaction across layers will be analyzed.

5.1 Innovation interpretation

The first layer of the conceptual framework, innovation interpretation, aims to analyze how different adopter groups interpret the innovation, which will have a profound impact on the spread of innovation. The degree to which an innovation is successfully interpreted depends on two components; (1) the interpretation of the relative advantage and the (2) the observability of the innovation. In this section each case are analyzed, respectively, to then investigate the differences and similarities in innovation interpretation relating to spread.

5.1.1 Relative advantages

Whether an innovation will spread or not is strongly influenced by how the adopter groups interpret the relative advantage of the innovation. If no advantages, relative to the current practice, are interpreted, the spread of innovation is unlikely to continue (Rogers, 2003). This section aims analyze how the interpretation of relative advantages have changed among adopters, from what was initial proposed, and the subsequent effect on the spread of innovation.

Case A – The "wow-effect" of portable chemotherapy

The portable chemotherapy was initially proposed to provide a better treatment quality for acute leukemia patients and cut costs by reducing the number of hospitalizations (KA1, 08:39). Although, the economic advantage was important to hospital management in the early part of the spread process, the interpretation of the relative advantage by adopter groups, were mostly concerned with increased quality in patient treatment (KA2, 46:34; LA2, 34:00). This is demonstrated below:

> *"[...] the value for the patients was clear to see, that was what the nurses bought into. You could say that there was some economy behind it, but their focus was 'oh wow, the patients are able to stay home'. That was of paramount importance."*
>
> - Ann (AN1, 1:08:16)

According to Dearing et al. (1994), adopter groups that are closely involved with the innovation are more likely to interpret non-economic advantages as more significant. Through continuous interactions with other adopter groups, such as doctors, the interpreted advantages of the nurses were eventually shared by the entire hospital department (AN1, 45:00). According to Ferlie et al. (2001) this represents how the interpretation of one adopter group can influence other groups.

Although strong interpreted advantages existed among the adopter groups, it did not guarantee the spread of innovation. Fitzgerald et al. (2002) argues that organizational economy and politics can inhibit the spread of innovation. This thesis argues, that factors such as organizational economy and politics can "cloud" the interpretation of relative advantages among adopter groups. Since the economic advantages was not interpreted as central in this

regard, mainly the organizational politics had a significant effect on the spread of innovation. This is demonstrated below:

> *"[the shelf-life of chemo medicine] has played a big role. It's varies a lot – Rainfall has one [guideline] and we have a different one, which you don't really understand as a nurse, but we must follow our own pharmacy's guideline."*
>
> - Karen (KAAU1, 37:08)

Each regional hospital has an associated pharmacy that must formally approve the length of time that chemo medicine is usable, called shelf-life – in this manner, fully identical medicine can have different shelf-life from hospital to hospital, as each pharmacy makes these decisions in isolation. If the shelf-life is not approved for longer durations in a given hospital, the patients are not able receive the treatment at home (KA1, 12:03; LA2, 25:07). The interpreted advantage of nurses is dependent on patients being able to stay at home – as such, the differing shelf-life for each hospital can cloud the interpretation of relative advantages. Through continuous political negations between regional hospital, managers and the pharmacies, most pharmacies have agreed to approve a sufficiently long shelf-life, which otherwise would have negative effect on spread of innovation (LA2, 1:28:18).

Interpreted advantages can also diverge from the initial proposed values through the interaction between the innovation and the adopter groups. This is best described through Denis et al.'s (2002) concept of *soft periphery*. The periphery represents all possible modes of application, even those in which the innovation does not align with the value initially proposed. If an innovation has a large soft periphery, the innovation interpretation of adopter groups is likely diverge from the initial innovation proposed. The periphery of the portable chemotherapy can be inferred through the following quote:

> *"When we started, we thought that this project should only help patients able to be treated at home [...] We quickly realized that it doesn't matter if it is an inpatient or outpatient, they still have the same benefit of the pump. They become more mobile and flexible"*
>
> - Kate (KA2, 06:43)

Whether the portable chemotherapy is applied to inpatients or outpatients the interpreted advantages of the nurses are the same: Better treatment quality for the patients. The use of portable chemotherapy on both inpatients and outpatients has been adopted by all regional hospitals (AN1, 29:23; KAAU1, 26:28). It can be argued that the portable chemotherapy has a relatively small soft periphery. Furthermore, the interpretations that did diverge still supported the initially proposed value of the portable chemotherapy. Through interaction with the innovation, the interpretation of the advantages becomes stronger for the adopters, which has a positive effect in spread (Denis et al., 2002). In the same vein, the following quote demonstrates an alternative interpreted advantage through the soft periphery:

> *"It is also workload reducing [...] Because we've started mixing antibiotic for 24 hours, instead of giving it as a single dose four times a day. And it really doesn't take long to mix four doses [...] everything goes in a bag, put it on a pump and you don't have to worry about it for the next 24 hours."*
>
> - Ann (AN1, 29:29)

The interpreted advantage is developed by the nurses who also use the technology behind the portable chemotherapy, when administering antibiotics (AN1, 29:29; KAAU1, 26:12). This also has a positive effect on the spread of innovation, as the nurses have interpreted further advantages of the innovation. The previous two quotes demonstrate the positive effect of a soft periphery; however, the effect can also have negative effects. A smaller soft periphery simply ensures that interpreted advantages are less likely to diverged from the initial proposal.

The analysis above displays how the adopters' interpretation of relative advantages can be reinterpret and diverged from what was initially proposed. This can happen through interaction between adopter groups and the innovation, or the inhibiting factors, such as organizational politics.

Case B – From patient empowerment to efficiency

Food&Move was initially proposed to provide empowerment and a better nutritional care to older patients during longer hospitalized periods (THRI1, 00:42). Nutritional care has, previously, received low prioritization from nurses, as they experience increasing time pressure from other tasks (TH1, 14:30). When a project nurse at Oakville Hospital was asked

to compare the previous practice to after introducing Food&Move, she provided the following quote:

> *"[...] it was more time consuming. When you use the app, everything relevant pops up – before you had to stand and look for all the items. It's just faster, and you can quickly see what has been served and the [nutritional] calculations happen automatically."*
>
> - Lucy (LU1, 13:28)

The interpreted advantages of the nurses are clearly related to efficiency (Dearing et al., 1994). The registration and automatic calculation of nutritional intake is part of the nutritional care, but ideally this task should be done by the patient themselves, which is how the system was designed (THRI1, 10:52). To understand the diverged interpreted advantage among, the following quote is helpful:

> *"There are not a lot of patients that use the app themselves [...] It's probably because the times you try, the patient have problems with touch [technology], their nails are too long, press to hard or accidently lock the tablet – we simply have to use too much time."*
>
> - Shirley (SH1, 14:08)

Through the interaction with patients, the nurses changed their interpretation of the advantages, since they did not align with their busy workday. Instead they interpret the advantages that creates more efficient work task. This is another example of how interactions between the adopter groups can change the interpreted advantage (Ferlie et al., 2001). While the nutritional care is improved, by tracking intake, the empowerment of older patients is not practiced by the nurses. This has a negative effect on the innovation assimilation and spread processes.

Again, it is relevant to introduce Denis et al.'s (2002) concept of the soft periphery. The periphery represents all possible modes of application, even those in which the innovation does not align with the value initially proposed. Food&Move has a larger soft periphery in which the interpreted advantages among the adopter groups are more likely to diverge from

what was initially proposed. By interaction with the innovation, the adopter groups find new ways to interpret the advantages, which can be seen from the following quote:

> *"[...] we still involve them in the nutritional part, but we help them a bit with the technical part. We typically hold the tablet and help them press the screen if it's necessary [...] It gives us an opportunity to talk with patients about nutrition."*
>
> - Lucy (LU1, 22:57)

The larger soft periphery has a somewhat positive effect, since the patient lack the technical capabilities to use the app themselves, but the nurses are still able to involve them in their own nutritional care. This practice has been adopted by some of the nurses (LU1, 23:10; SH1, 16:05). This has a positive effect on innovation spread, since the interpreted advantages still align with what was initially proposed. However, nurses can still deprioritize this task, during increasing pressure from other work tasks which does not align with the initial advantages, reducing the strength of the interpreted relative advantage (LU1, 1:22:57).

Other factors could also diverge the relative advantages interpreted by nurses. As previously argued organizational economy or politics can cloud the interpreted advantages by adopter groups, which has a negative effect on the spread of innovation (Fitzgerald et al., 2002). For Food&Move to effectively function as proposed, multiple stakeholder must integrate the app into their systems (THRI1, 12:10). The lack of integration can be demonstrated by the quote below:

> *"In the feasibility study, we had direct contact with the kitchen – now we don't. Therefore, it is understandable if it doesn't seem valuable to the staff, because it only functions as an ordering system, where the orders do not go to the kitchen, but is printed out on a paper instead."*
>
> - Theresa (THRI1, 05:08)

It is unclear whether the kitchen inhibits Food&Move politically or economically, however, Fitzgerald et al. (2002) states that other organizational factors could play a role in clouding the interpretive advantages. The lack of integration clouds the interpreted advantages of nurses, since additional work tasks are allocated to them, in contrast to if the integration was

better. The kitchen is simply one example of the lack of system integration; others include the regional IT-mainframe and the catering supplier for the kitchen (THRI1, 05:34; 22:07). This has a negative effect on the spread of innovation.

This analysis demonstrates how the interpretation of Food&Move diverged among the nurses, since they emphasized efficiency, but received additional work task when using the app as intended. While the technical capabilities of patients and the lack of integration had a negative effect on the innovation spread, the automatic nutritional registration strengthened the spread of the innovation.

5.1.2 Observability

Innovations with strong interpreted relative advantage, can still be difficult to spread if the advantages or benefits are not observable to the adopter groups or assimilator units (Rogers, 2003). In the two cases, observability could be found in two forms; (1) concrete evidence, such trials or patient data or (2) the first-hand experience of adopter groups, when applying the innovation. Both will be analyzed for each case in the section below, to then be compared to reveal emerging patterns between cases and theoretical components within the layer.

Case A – Happier patients and growing ambulatories

The portable chemotherapy represents an entirely new technology and treatment procedure, as such, it is important that the adopter groups can observe the benefits of applying the innovation. Dirksen et al. (1996) argues that concrete evidence, such as randomized controlled trials (RCTs), are important at the early stages of the spread process. The following quote demonstrates the concrete evidence available to the adopter groups:

> *"[...] There will always be skeptics – normally one would conduct a randomized controlled trial, but we quickly saw a greater quality for patients [...] we were able to show that from our pilot project and the data from our own department, so we could say that it worked. That was enough for the other departments."*
>
> - Kate (KA1, 10:46)

According to Evans (2003), RCTs represent a stronger type of concrete evidence than pilot studies and departmental data – however, as seen above, the adopter groups accepted the

concrete evidence because they *"quickly saw a greater quality for patients"*, despite that RCTs were not conducted. Alternatively, Grilli & Lomas (1994) argue the concrete evidence is not a significant determinant for successful spread. This thesis argues that when the observability of first-hand experiences is high, the importance of concrete evidence is lessened. The quote below demonstrates the benefits observed by nurses, first-hand:

> *"We have happier patients and less sick patients. It is hard to find any disadvantages [...] I haven't faced the 'big bad moment', where you think to yourself: 'Holy Moses, this is bad.'"*
>
> - Ann (AN1, 1:08:39)

Although the nurses have comparatively less contact with the outpatients, they are able to notice benefit of the better treatment quality (AN1, 09:38). The observability of the positive benefits is important for the spread of innovation (Rogers, 2003). Furthermore, the possible negative benefits of applying the innovation has not been observable. Rogers (2003) states that the degree of observability can vary between adopter groups. In relation to the portable chemotherapy, the doctors represent another influential adopter group; however, their interaction with the patients is different from nurses. This notion can be demonstrated from the quote below:

> *"One area, where we are different, is our daily interaction with the patients – we see them every day, so we really know how they feel about being here [the hospital]. The doctors are more scientifically oriented".*
>
> - Ann (AN1, 10:51)

Arguably, as the nurses have more interactions with the patients, the benefits of the increased treatment quality are more observable to them. This can promote the assimilation process for one adopter group, but decrease it for another (Roger, 2003). Because the doctors do not observe the benefit of the innovation, they can develop several adopter concerns (see section 5.2.2). Øvreteveit et al. (2002) argues, that a high degree of first-hand observability has a positive effect on the spread of innovation, since this can foster discussions within the adopter groups or between them. In practice, this could allow nurses to discuss the increased patient treatment quality with doctors.

However, both adopter groups were able to observe the changes within the organization. By applying the portable chemotherapy and shifting inpatients to become outpatients, the physical changes to the ward and the ambulatory were observable to the adopters:

> *"We have established ambulatories that can handle the changes [associated with introducing the portable chemotherapy] – that was in the interest of the patients […] We transferred a lot of inpatients that received chemotherapy – I think that approximately 60 - 70% of inpatients have been moved to the ambulatory."*
>
> - Laurence (LA2: 15:54)

The organizational shift from ward to ambulatory has been observable to nurses and doctors, as beds have been closed and staff have been relocated to the ambulatory (LA1, 26:57; KAAU1, 53:37). From the collected data it is unclear whether the observability of the growing ambulatory is connected to the economic benefits or increased patient treatment quality. Since no staff was discharged, this should be considered to have a positive effect on spread.

The analysis above shows the importance of observability. Although documentable evidence could have been stronger, it was complimented by the observability relating the first-hand experiences of the portable chemotherapy. Nurses, particularly, were able to observe the benefits of the portable chemotherapy to a high degree.

Case B – New features creates observable nutritional targets

Food&Move aims to improve nutritional care and empower patients, thus, changing the previous routines of the nurses when interacting with patients (THRI1, 00:42). It is important that the adopter groups can observe the benefits of the innovation, to ensure that the previous routines are changed. In this process, concrete evidence is useful to establish observability during the early spread process (Dirksen et al., 1996). Theresa, a research manager from Oakville, offered her own reflections on the concrete evidence provided:

> *"We had made two feasibility studies. Instead of going from that to a large randomized controlled study, which is usually the next step, we said: 'This*

[concept] has already proved itself – it works' [...] doing randomized trials with older patients is also harder."

- Theresa (THRI1, 39:15)

Feasibility studies can be valuable for champions, as it highlights the conditions needed to successfully assimilate the innovation. However, according to Evans (2003) it does not provide the same concrete evidence as RCTs. Indeed, the feasibility studies were not successful in establishing clear causality between the application of Food&Move and increased nutritional care (Theresa, 2016). As the degree of observability from concrete evidence was low, it is important that the benefits of applying the innovation is observable through first-hand experience. This is demonstrated below, when a project nurse from Rockmore Hospital was asked about the visible effects of improve nutritional care:

"I actually don't know [if the patients eat more] and we don't have any data from before [to compare with] – so it's very hard to assess the improvements."

- Shirley (SH1, 57:40)

Hence, the benefits from applying the innovation is not observable to adopter groups, which has a negative effect on the spread and assimilation of the innovation (Roger, 2003). When the nurses engage with Food&Move, it is difficult to see if patients have an increased nutritional care. Effective nutritional care prevents the likeliness of re-hospitalization among patients, but if the patients are healthy at home, the nurses are not able to observe the benefits. Rogers (2003, p. 218) specifically states that preventive innovations often lack observability, which is a significant factor to why such innovations are harder to spread. It is argued that preventive innovations, such as Food&Move, benefit more from concrete evidence, since first-hand observability is not available. The quote below shows, the efforts of Lucy to resolve this challenge:

"It's hard to say if they eat more. We are currently doing before-and-after measurements [...] where we saw how much food the patients ate and did a lot of other stuff [...] so when the project ends, we will be able to see the differences."

- Lucy (LU1, 24:30)

To clarify the difference between the two seemingly opposing statements of Lucy and Shirley, measurements had been conducted at Oakville, but not at Rockmore where Shirley is stationed. Nonetheless, these efforts to create more observability, relating to concrete evidence could have an improved effect on the innovation spread of Food&Move. Furthermore, before-and-after studies represent a strong form of concrete evidence (Evans, 2003). Increasing the first-hand observability is also possible by integrating new features into the app. This is demonstrated by the quote below:

> *"During the implementation period, more and more features have been added to the app [...] The newest feature shows [the nurses] a nutritional target curve for each patient per meal to see if they eat enough."*
>
> - Lucy (LU1, 1:18:12)

The information provided to the nurses in the new feature allows them to continuously observe if the patients meet their nutritional targets, providing observable benefits through first-hand experiences. This increase in observability have made nurses more positive towards Food&Move (LU1, 1:18:34). The improved observability allows nurses to share and discuss the nutritional target which each other, which, according to Øvreteveit et al. (2002), can improve the spread of the innovation.

This analysis shows that the degree of observability relating to the concrete evidence was weak and not supported by first-hand experiences. This was partly due to the preventive characteristics of Food&Move, which lessened the observability for the nurses. Although efforts to increase observability was initiated, the low degree of observability still affect the spread of the innovation and made continuous use of Food&Move increasingly difficult.

5.1.3 Emerging patterns – The value of first-hand observability

In both cases the interpretations of the innovations diverged significantly from the initially proposed innovation. In Case A, the portable chemotherapy was interpreted by adopter groups as having strong advantages related to increasing patient treatment quality. In Case B, the interpretation of Food&Move was related to advantages in efficiency, to assist nurses in registering nutritional intake of patients. Both cases had

relatively weak concrete evidence, compared to the RCTs that represent the "golden standard" of evidence in healthcare organizations (Evans, 2003).

However, critical differences exist when considering how the interpretation diverged and the subsequent effect on the spread of innovation. When the adopter groups of Case A interacted with the innovation or other adopter groups, their interpretation was strengthened or developed positive reinterpretations. This was supported by the first-hand observability available, such as improvement in patient care. The soft periphery, as presented by Denis et al. (2002) reduced the likeliness of unfavorable interpretations. The adopter groups of Case B did not develop positive reinterpretations of the innovation, since they experienced increasing time pressure by the new tasks introduced, along with lacking technical capabilities of patients. The nurses experienced a low degree of observability, because of the preventive characteristics of Food&Move, which did not encourage continued use of the innovation. The soft periphery was comparatively large, which caused the interpretations by the nurses to diverge towards efficiency instead patient empowerment (Denis et al., 2002).

This thesis argues that the first-hand observability, is significant in guiding adopter groups' innovation interpretations, especially for innovations with larger soft peripheries. If the adopter groups are unable to observe the benefits, they will reinterpret the relative advantages until they are able to observe some form of benefit. In Case B, the nurses themselves started using the app for nutritional registration, since they could save time, which was observable; oppositely, the effects of empowering patients were not. The gradually introduced app features continue to strengthen the current innovation interpretation of nurses, by increasing the observability. The observability of concrete evidence could have some impact in guiding adopter groups' innovation interpretation, but primarily during the early spread process. Further, concrete evidence was most effective when supported by the adopter groups' first-hand experiences, as observed in Case A.

Lastly, organizational politics and economics have emerged as factors that can affect the adopter groups' interpretation of the innovation. In Case A, the pharmacies' approval of shelf-life of chemo medicine was central to the interpreted advantages of portable

chemotherapy – however, this was approval was given for most regional hospitals. Conversely, Case B, was not able to integrate Food&Move with hospital it-systems and stakeholders, which significantly reduced the interpreted relative advantages of the innovation.

5.2 Adopter attitudes

The following section will analyze the second layer of the conceptual framework, adopter attitudes, specifically in relation to the two selected cases. Thus, the concepts of compatibility and adopter concerns will be analyzed, specifically to emphasize the relation to assimilation and spread processes. The separate analysis of each case will be employed as a foundation for a comparative analysis, where patterns among cases and theoretical concepts are explored.

5.2.1 Compatibility

This section of analysis will discuss how the compatibility of each case innovation and the adopters has affected the spread and assimilation processes. More specifically, this will be done by highlighting the compatibility of the innovation in relation to previously introduced ideas, values and beliefs and adopter needs, as part of the conceptual framework (Rogers, 2003). In this manner, the analysis will be able to point to the compatibility as an amplifier or hinderance of the innovation spread process.

Case A – There's no place like home

While the idea itself of sending patients home while receiving chemotherapy was somewhat profound, it was not the first step in this direction – increasing the number of treatments through the ambulatory and generally having more outpatients was a trend that had occurred over several years prior, as Ann notes:

> *"I have been part of launching the whole project, where we gradually began to say: 'Could these acute leukemia patients be more at home? What do we need to do to make this happen?' And that was long before the chemotherapy pumps came – it was simply about getting them out of the hospital."*
>
> - Ann (AN1, 3:17)

All the other respondents of Case A echoed this development, where progressively more patients were treated as outpatients, even before portable chemotherapy was introduced (KA1, 05:51; LA1, 5:36; KAAU1, 16:35). As Roger outlines when talking about compatibility with previously introduced ideas: *"Old ideas are the main tools with which new ideas are assessed"* (Rogers, 2003, p. 224). In this concrete context, there had already been introduced ideas around shifting to more outpatient care – this displayed a compatibility with the portable chemotherapy, which similarly added to more ambulant treatment. Hence, in accordance with Roger's theory of compatibility, this improved the likelihood of successful assimilation and spread of the portable chemotherapy across the departments of hematology.

The ideas and values of adopters similarly have great influence on the compatibility of an innovation – if the adoption of an innovation opposes the value and beliefs, the probability of assimilation dwindles. Conceivably, had the portable chemotherapy project been introduced a few decades beforehand, adopters' beliefs could have hindered the assimilation process:

> *"There has been a complete paradigm shift [...] We really thought that we took care of the leukemia patients by keeping them [at the hospital] and telling that being at home was much more dangerous. Until we realized that all the danger is here – because it is us [at the hospital] that have a bacterial flora and a setting that is completely different from what you have at home."*
>
> - Ann (AN1, 13:51)

It is indicated here by Ann, that there has been a change in beliefs among the health professionals, as sending patients home during their treatment, stated to be broadly believed to be better for their recovery today (Ellenbecker et al., 2008) – perhaps this shift in belief could be part of the reason for the rise in outpatient care as discussed above. Thus, a clash with values and beliefs is not only circumvented but there is a strong compatibility between the innovation, which enables patients to be treated at home, and the belief among adopters that patients will recuperate better at home.

Finally, the portable chemotherapy innovation fitted well into the needs of adopters. In relation to the mounting demographical pressure on most departments at Danish hospitals,

the department of hematology at Woodhill Hospital being no exception, reducing costs is paramount – as Laurence outlines:

> *"We are a medical branch which experience a strong demographical pressure – we get more and more patients. We are able to do more and more; unfortunately, we don't always cure the patients, when we get better treatments, but we prolong their life. This means we only get extra work [...] This costs money and induces more tasks."*
>
> - Laurence (LA1, 09:09)

As Laurence explains, there is a strong demographical pressure on the hematological departments, which leads to an increase in treatment costs. This economical pressure translates into a need to gradually reduce the costs of patient care, or to simply do more with less:

> *"Everyone feels the same demographical pressure on the healthcare system; a huge challenge [...] It was clearly a help, that there was this pressure, so that we were forced to look at new solutions to make room for more patients."*
>
> - Kate (KA1, 18:01)

Kate similarly highlights the demographical pressure that the healthcare system is under – which, naturally, translates into mounting costs and budget pressures. With the great need for reducing costs among adopters there was a compatibility between this need and the cost reduction which the portable chemotherapy innovation offered, which lead to an improved spread and assimilation process. However, as previously discussed (Section 5.1.1), the incentive created by cost reductions have conceivably been more important to the management than the nurses (AN1, 1:08:16) – thus, the opportunity for cost reduction has had greater impact during the initiation of the process, namely as management decided on adopting the innovation.

As a whole, there was a great compatibility between the portable chemotherapy innovation and its adopters in the hematological branch of medicine. Thus, the innovation of Case A has displayed great compatibility with the adopters in all three areas: Compatibility with previous

introduced ideas, which shifted focus towards more outpatient care, compatibility with values and beliefs, where treating patients outside of the hospital is believed to be better in terms of recovery and, finally, compatibility with the needs of adopters, where adopters collectively have a need to lower costs.

Case B – "We ought to, but we don't"

A core element of Food&Move is to involve the patients better, specifically in relation to nutrition (THRI1, 8:56). As the innovation was introduced to the departments at Rockmore and Oakville Hospital, it appeared distinctly different to most prior projects – in particular in relation to patient involvement. As Shirley was asked about the department's experience with patient involvement, she could only recall one project, by asking the clinical nurse specialist, which relied on patient involvement:

> *"I asked our clinical nurse specialist, she is only familiar with one project [with patient involvement], where the [nurses] were not involved in any way. There has been no follow-up [on the project]."*
>
> - Shirley (Appendix 9.3, p. 17)

This project was, however, not related to patient involvement during hospitalization but as the patients were sent home – and, more importantly, the project did not involve the nurses but rather nutritionists. Thus, it is clear that the nurses at Rockmore had limited prior experience with involvement of patients. As the innovation of Case B relies on patient involvement and the adopter group had limited experience with this, it can be reasoned that this constitutes to a low compatibility between Food&Move and previously introduced ideas. In accordance with Rogers (2003), previously introduced ideas function as a lens for assessing innovations – consequently, the low compatibility in this area has restrained the assimilation process.

In addition, Food&Move's use of patient involvement similarly appears incompatible with the believes and values of adopters. The nurses at Rockmore and Oakville Hospital do not believe that most of their patients are able to use the application or that it simply takes too much time to teach the patients how to use it (SH1, 14:06; TH1, 15:33) – this is, however, a myth according to Rita:

"[Introducing Food&Move] does not take long time and it is a myth – I can do it in less than five minutes. To use the system is so simple, it has been developed for this patient group [...] But you have to say, 'you should do this and that' and stand beside them."

- Rita (THRI1, 10:08)

This discrepancy between Rita's statement and the nurses understanding of their patients' capabilities could indicate that the nurses hold certain beliefs about their patients, where involvement seems either inconceivable, too difficult or exceedingly time consuming. Hence, it seems that Food&Move's intention to involve patients clashes with the nurses' beliefs about their patients' capabilities. A lower compatibility in this context of values and beliefs among adopters decreases the odds of a successful assimilation (Rogers, 2003).

The way adopters rank areas in terms of importance relates to their needs – if an adopter group do not prioritize certain things in their work, they might not recognize a need for innovations which offer value in this context. In particular in relation to Case B, nutrition appears to be a low priority for the nurses – and thus, in the busy environment of the nurses, recording nutrition intake is often not practiced (LU1, 1:20:28; SL, 05:21). As Theresa puts it:

"I can tell that we [the staff] don't manage to make the patients eat enough food – it is not prioritized. We don't register nutrition either – we ought to, but we don't."

- Theresa (TH1, 14:30)

It is clearly indicated that nutrition is, among the many tasks and responsibilities of nurses, not prioritized. The lower priority of nutrition of patients could imply a lesser need among adopters, in this case the nurses (patients being users). Nurses want to provide a better care for patients (Aiken et al., 2002) – however, the value for the patients related to a lower priority area, as Food&Move offers, is not fully recognized, which in turn makes the need of adopters lesser. This relates to the compatibility of adopter needs, where a weaker compatibility with adopter needs leads to a worsened prospect for the innovation to assimilate or spread well (Rogers, 2003).

Thus, there is a low compatibility with Food&Move and the nurses in several regards. Firstly, there has, at large, not previously been introduced ideas that attempt to involve patients, as Food&Move attempts to. Further, there is an indication of that nurses' beliefs and values are incompatible with the innovation, as nurses sees patient involvement as too laborious or difficult, given the patient type of the departments at Rockmore and Oakville Hospital. Finally, as nutrition appears to be deprioritized in the nurses' busy work environment, a low compatibility in relation to adopter needs is demonstrated.

5.2.2. Adopter concerns

Subsequently, the concerns among the adopters will be analyzed to appreciate how these have affected the assimilation and spread of each case innovation. This will be done by uncovering concerns displayed by adopters in different parts of the assimilation process, namely concerns in the preadoption stage, concerns during early use and concerns in established users (Hall & Hord, 1987).

Case A – "It's too dangerous!"

While a substantial part of the focus on Case A is directed towards the primary adopter group, the nurses, the doctors have also been influential in the assimilation and spread process of portable chemotherapy. In particular, prior to adoption, some doctors displayed concerns about sending patients home while receiving chemotherapy, believing that this approach could be too hazardous and unsafe (KAAU1, 37:38; KA2, 54:14; AD1, 45:05). Laurence highlights this issue, when talking about concerns among doctors:

> *"It is often that thing with: 'What if?' It is generally with innovation, that many things are shot down because of something that could happen but would happen extremely rarely – and then we lose the entire gain for those, where nothing goes wrong."*
>
> - Laurence (LA1, 41:34)

It is well illustrated in this statement, how concerns among doctors, and perhaps adopters in general, can hinder assimilation. This resonates well with Hall and Hord's (1987, p. 53) appreciation of this issue, that "*in the end, how [adopters] feel about and perceive change will in large part determine whether or not change actually occurs*". Thus, it is clear how addressing

these concerns are crucial for the assimilation and spread processes. As Kate explains, the concerns among the doctors were dealt with by sharing experiences and displaying concrete results:

> *"There were some doctors, who said: 'That's not going to happen here!' and 'It's too dangerous!' […] We had a meeting, where we went through everything, challenges that we had and the results we had created. After that, [the doctor] was convinced."*
>
> - Kate (KA2, 54:14)

In this way, while some doctors had an initial skepticism towards the innovation, the concerns were dealt with in an effective manner. Addressing these concerns is crucial, as these types of concerns, in this case around patient safety, can entirely suspend the assimilation process. Notably, if the doctors believe the approach linked to the innovation is unsafe, they will not allow it to be practiced. Nevertheless, the concerns which appeared during the preadoption stage were attended effectively, thereby propelling the assimilation and spread process forward.

Later, during early use, other concerns were preempted; not only the doctors displayed concerns. This new way of giving patients chemotherapy was ironically not a concern for the patients themselves, it was mostly a concern among nurses – as Kate explains:

> *"The barrier is clearly present among the staff, more than among the patients. Because the staff has been used to give [the treatment] in another way. So, we have had to adjust. It can be anxiety-provoking to send patients home with complex chemotherapy, but it is not anymore."*
>
> - Kate (KA2, 16:37)

As illustrated by Kate's statement, it was important that the nurses felt comfortable with the new solution for chemotherapy treatment, as it could create some distress for the nurses. To meet this potential concern, that nurses would feel unsafe or uncomfortable with the innovative treatment approach, there was someone that could be called at any hour, if problems arose (KA2, 30:32; KAAU1, 36:16) – in the case of Woodhill, this 'someone' was Kate, for Windston and it was Karen. Ann clarifies the approach they had at Sandford:

> *"We were some [staff] on the phones, available 24/7 as support for the nurses. If they had a problem here during a nightshift... because that is what you fear! Suddenly there is something [a device] making noises and no one knows how to stop it or make it work again – then there is always someone you can call."*
>
> - Ann (AN1, 39:56)

Hence, targeted efforts were made at each hospital to meet the concerns that could arise during early use. Providing continuous support for the adopter group has, in accordance with Hall & Hord (1987), been vital to advance the assimilation and spread process of the portable chemotherapy, as this has addressed the concerns for nurses during early use.

In relation to concerns among established users, there has been no clear indication of the presence of such concerns in Case A. However, it should be noted, that if adopters can easily observe the impact of the innovation, it is more likely to persist among established users (Hall & Hord, 1987). In other words, if the impact of an innovation is not visible, concerns could arise among adopters along the lines of "does it really have any impact?", potentially leading to an abandonment of the innovation. This closely relates to previously introduced concept of observability (see section 5.1.2) In the context of Case A, Ann points to that *"[the portable chemotherapy] fosters happier patients and less sick patients"* (AN1, 1:08:40), indicating that there is a visibly better patient care. This is something which could be significant for the innovation's visibility and impact, and thus push towards a sustained assimilation of the innovation.

Consequently, there has been dedicated efforts to meet the concerns of doctors in the preadoption stage, each hospital has established around-the-clock support to address concerns during early use and, lastly, the visibility of better patient care has possibly prevented potential concerns among established users. Hence, the concerns have gradually been neutralized, resulting in an improved spread and assimilation process.

Case B – It takes time to move on

During the first attempts to assimilate Food&Move at two departments of Rockmore and Oakville Hospital, various technical issues hindered the assimilation process, as the

technology was implemented at a premature stage (THRI1, 07:00, 38:47, 40:39; LU1, 28:42). Rita expresses some concern about the bad experiences that can arise with the technical issues:

> *"When [the nurses] go to a patient room, then it has to work. If it doesn't work the first time and then they go on with their work… That experience stays with them and is dangerous. Even if it is resolved after a few weeks, then the memory is still with them. And it takes such a long time to move on."*
>
> - Rita (THRI1, 42:13)

It is here displayed how concerns in early use can be problematic, as they can stay with the adopters, perhaps even longer than expected. At Rockmore Hospital, previous attempts to assimilate Food&Move at another department at the fifth floor had not succeeded (SH1, 28:40). Eventually, the project was abandoned at the fifth floor of Rockmore – so when Shirley was hired to be responsible for Food&Move on the sixth floor, the nurses had no prior memories of the innovation; they got a "fresh start" (SH1, 26:04). However, at Oakville, when Lucy was hired to take responsibility of Food&Move at Department of Internal Medicine in March 2018, the project had already been launched over several attempts (SH1, 26:32, LU1, 28:52). This meant that the nurses had prior concerns which had not been addressed at that time. As Lucy explains:

> *"At this department, it started during the spring of 2017. That was the first implementation here at Oakville. It stopped rather quickly – there were several things which made it so, that it did not work the first time. It probably had to do with that there were a lot of technical problems with the application itself – and then there was… The staff had not felt entirely involved or heard in all of this."*
>
> - Lucy (LU1, 29:05)

As outlined in the statement, both technical issues and lack of involvement had halted the assimilation process. This could arguably have created major concerns among the nurses in early use during the first attempt - but further, this could have led to preadoption and early use concerns among the nurses at the later attempts to assimilate Food&Move. As the theory by Hall & Hord (1987) suggests, having these types of unmet concerns during preadoption and early use can have significant impact on the assimilation process. To address the potential

concerns connected with prior negative experiences, Lucy used some of the time during one-to-one training sessions to cleanse the air among the nurses:

> *"As I was hired, I reached out to everyone and organized a new [training], one [nurse] at a time. […] I think it was best this way, that they could sit and press through the system and hold it in their hands – and get to know me. Then I could also learn about their assessment of [Food&Move] from before and try to 'rinse' [their previous experiences] a bit."*
>
> - Lucy (LU1, 39:58)

It can be inferred from Lucy's statement that she has attempted to address some of the nurses' concerns and preconceptions which had originated from their previous experiences with Food&Move – she had possibly recognized that these concerns could halt the assimilation process. As Hall & Hord (1987, p. 58) underpins when talking about concerns, and the importance of addressing them: *"Through all of this, it is the person's perceptions that stimulate concerns, not necessarily the reality of the situation"*. Therefore, while the reality of Food&Move had changed since the first attempt to assimilate the innovation, through the development of the technology, the nurses' perception of the innovation might have been tainted by the previous experience – something which could have significant impact for the assimilation.

Moreover, looking back at the same quote from Lucy, it can be understood that she attempted to establish a better dialogue and involve the nurses, perhaps to avoid a similar scenario to before, where the nurses had felt uninvolved. Involving staff is a way to refine the innovation by getting feedback from the adopters, but perhaps more importantly, it is a way to relate to their concerns and address them. Hall and Hord warns of the opposing pitfall of not listening or reacting appropriately to adopter concerns, as it is crucial not to *"put down, ignore, or inappropriately address intense personal concerns. In fact, doing so is an almost sure way to endanger the entire change process, and at a minimum, it creates a number of side issues and resistance that will then have to be addressed"* (Hall & Hord, 1987, p. 77). Non-involvement can, in this sense, have vital impact on the assimilation process – it is therefore a promoting factor that Lucy involves the nurses, as opposed to prior attempts. Thus, it is argued that while there are clear obstacles in terms of concerns among the nurses at Oakville, Lucy has taken

active steps towards addressing concerns which relates to previous technical issues and the non-involvement of nurses.

In terms of which part of Hall & Hord's (1987) model these concerns relate to, the recurring attempts to assimilate the innovation blur this distinction of the model: Initially, there had been concerns among nurses during early use in the first attempts to assimilate Food&Move, which during later attempts translated into concerns. These concerns began, perhaps, in the preadoption stage, but certainly became prominent during early use and conceivably persisted towards established users, as the nurses have had longer time to get familiar with the solution at Oakville. While Food&Move has been refined since the first attempts, there are still some technical and practical issues present. These include, a lack of images for certain meals on the menu (SH1, 7:57; LU1, 19:11) and issues of physical placement of the tablet (TH2, 42:31; LU1 47:34) which creates new concerns, but also makes it harder to clear the nurses of their concerns originating from former experiences. However, Lucy's action towards involving nurses and meet their concerns from previous experiences could promote the assimilation process.

Thus, strong concerns arose during initial attempts to assimilate Food&Move, as the technology was premature, and there was a lack of involvement; as these concerns were not tackled at the time, they have persisted until later attempts to assimilate Food&Move at Oakville, which have halted the assimilation and spread processes (Hall & Hord, 1987). Lucy has met these concerns later by involving the nurses better and attempting to "rinse" some of the prior experiences through one-to-one training. However, as some technical and practical problems persist, the concerns could be harder to meet.

5.2.3 Emerging patterns – The need for shifts in attitudes

In relation to compatibility, a clear pattern has emerged between the two cases, where the portable chemotherapy appears to have a significantly stronger compatibility with the adopter group than Food&Move. In particular, needs of adopters promote the assimilation and spread of Case A, as the mounting demographical pressure creates a need for cost reduction, whereas nutrition is deprioritized by the nurses of Case B, which reduce the need of adopters. In addition, the nurses of Case A have experienced a shift towards more outpatient care, which creates a strong compatibility with the portable chemotherapy, as this innovation

correspondingly supports this trend. By contrast, the nurses of Case B had no prior experience with patient involvement which is a core aspect of Food&Move. Hence, it is apparent that the previously introduced ideas supports the assimilation and spread of the portable chemotherapy, whereas it hinders Food&Move.

Along the same lines, the nurses of Case B believe it is difficult and time consuming to involve their patients, which Food&Move attempts to. Conversely, in relation to Case A, patients are believed to better off at home during treatment, as the portable chemotherapy allows. A similar pattern appears here, where the beliefs and values of the nurses promote the assimilation and spread processes for Case A and, oppositely, halt the processes for Case B. This had, conceivably, been a different scenario for Case A, if the doctors' concerns related to home chemotherapy treatment were not met – the values and beliefs of nurses could be influenced by the concerns of doctors, making the portable chemotherapy less compatible. Yet, while the doctors' concerns were addressed, the nurses of Case B still have concerns around the technical and practical issues – these concerns might have created an adverse synergy with the value and beliefs of nurses. If concerns exist around the use of Food&Move due to technical and practical issues, and it therefore appears troublesome to use, while patients are believed to be incapable of involvement, this could create such an adverse synergy, where the use of the innovation appears overwhelmingly laborious. With this in mind, it is argued, that concerns are, perhaps, even more important to address, when the innovation appears incompatible with the adopter group.

Overall, while concerns have existed for both cases, the key difference is that there have been early efforts to address the concerns in Case A, whereas such efforts have been lacking in Case B. More specifically, Lucy makes efforts to involve nurses now, however, previous non-involvement and an abundance of practical and technical issues have created concerns which, to some degree, persist at Oakville. Involvement of adopters has, to a larger degree, been an integrated part of the assimilation process for Case A from the beginning, which has been vital for the assimilation and spread process.

5.3 Organizational context

The forthcoming section will analyze the third layer of the conceptual framework, the organizational context, in relation to the two nominated cases. More specifically, each case will

be analyzed through the concepts of champions and dedicated time and resources, to facilitate a comparison of the two cases to reveal emerging patterns in-between the cases, but also among the theoretical components. The section will, throughout, aim to investigate how this layer relates to the spread and assimilation of the case innovations.

5.3.1 Champions

In a healthcare context, the need of champions to push the assimilation process is evident – project champions and organizational change champions ideally function synergistically to promote the assimilation process (Shaw, et al., 2012). This section will analyze how, for each case, that these roles have been pertinent to the assimilation and spread process, and how they have influenced the processes.

Case A – A "Kate" for each department

At Woodhill, Kate pushed the assimilation of the portable chemotherapy project internally – she insinuates her own approach in the role as a project champion, when talking about the assimilation process and the need for a dedicated person to drive a project:

> *"You have to assign dedicated personal to drive it. There should be someone, when you go through patients in the morning, who says: 'Hey, that patient can go home'. There should be one, who is dedicated – a first mover."*
>
> - Kate (KA2, 33:34)

Kate illustrates here, how she believes it is important that someone points out when the innovation can be utilized and thereby actively integrate it into the daily work. This view is, conceivably, a reflection of her own approach during the assimilation process. Thus, it can be inferred how she has actively promoted the portable chemotherapy at Woodhill. The active promotion of the innovation is an essential effort for a project champion to stimulate the assimilation process (Shaw, et al., 2012). Hence, it can be understood how Kate has, through the active promotion of the portable chemotherapy, pushed the assimilation process forward. Laurence recognizes the important role of Kate in the spread and assimilation process across the hematological departments, but also highlights how it is important that each department has a person dedicated to advance the assimilation process locally:

"There have been some crucial key persons, some 'Kates', somewhere else – I know that, definitely. [...] It is important to get someone onboard, who thinks it is exciting and wants to drive it locally. [...] It is crucial – Kate could not facilitate everything"

- Laurence (LA2, 1:24:25)

From the statement it can be understood, that Laurence acknowledges the importance of a project champion, as he believes it is crucial to have a person to drive it locally. At Sandford, Ann took on the role as a project champion. In this role, she actively promoted the portable chemotherapy – she notes this when talking about the assimilation process at Sandford and her approach:

"It has to be leadership driven – there is someone who has to say: 'If the portable chemotherapy is possible, then we have to do it!' and it is only allowed to deviate, if it is in the patients' interest. [...] There is a period where it is [more laborious] and that you have to get through by leading."

- Ann (AD1, 41:31)

As Ann intriguingly states, she believes that it is important to drive the process through leadership and avoid deviations in innovation usage (e.g. nurses not using the innovation). Thus, Ann clearly insinuates how she has been actively promoting the portable chemotherapy innovation, through leadership and by not allowing her colleagues to fall back into old practices by deviating from using the innovation. Thus, in accordance with Shaw et al. (2012), Ann has pushed the assimilation forward at Sandford hospital by actively promoting the innovation and further by providing leadership in relation to the innovation project.

Moreover, each interviewed nurse for Case A, Kate, Ann and Karen, who have been identified as project champions at each respective department, expressed how they trained other nurses at their department in using the innovation (KA2, 4:14; AN1, 1:06:40; AUKA1, 34:52). Karen explains her approach to educating and training her colleagues:

"I gathered them five nurses at a time – throughout the entire group of nurses – two hours for each training [session]. It was the first time they had the portable

chemotherapy technology in their hands, so they were educated thoroughly. Then, I took one person at a time, and assisted with setting up a treatment or two, until I believed they could do it themselves."

- Karen (AUKA1, 34:52)

It is displayed through Karen's portrayal of the process, that education and training was prioritized and executed in a thorough manner. This has, in accordance with Soo et al. (2009), been key to the assimilation process at Windston, as the study emphasizes how educating and training staff are central efforts in the champion role. Moreover, in relation to the value of the education and training, it is important to tailor the education to be meaningful to the receiver (Soo et al., 2009). Meaningful education is more easily achieved through intraprofessional training – e.g. from nurse to nurse, as has been the case for each of the project champions of Case A. The presence of intraprofessional training has, consequently, been a promoting factor for in the assimilation process of the portable chemotherapy innovation. An interesting remark in relation to the project champions of Case A is that each of them already were nurses at the department, before entering the role – which impact this could have is, however, hard to determine.

Shaw et al. (2012) argue how a project champion has a key role in the assimilation process – however, their efforts can be hindered, if an organizational change champion is not in place to support this change. At Woodhill, Kate states how her superiors have played into this role, as organizational change champions:

"Luckily, I have some leaders, heads of clinic, who have been able to advocate for [the portable chemotherapy] at a higher level, than what I have been able to. That is something, I haven't had to deal with."

- Kate (KA2, 14:23)

It is clear from Kate's statement, that there have been superiors who have been able to facilitate the assimilate process by advocating for the innovation at a higher organizational layer. The superiors have, in agreement with Shaw et al. (2012), acted as organizational change champions. These efforts have been augmenting the efforts of Kate – which in turn has promoted the assimilation process.

Thus, across the departments, there has been devoted efforts of project champions to advance the assimilation process. These efforts involved active promotion of the portable chemotherapy, maintaining change through leadership and providing intraprofessional training and education. Finally, Kate points to organizational change champions who have been able to sustenance the assimilation process by supporting the efforts of project champions.

Case B – Different obstacles for each nurse

At each department, respectively at Rockmore and Oakville, during later attempts, there had been hired a dedicated nurse to take responsibility for the assimilation process of Food&Move, Shirley and Lucy (LU1, 2:33; SH1, 1:01). As they lead the project locally, they have taken on the role as a project champion. This means that each have a time-limited role, as their job position is specifically related to the project; they had not worked as a nurse at the department previously. Lucy was moved into her position at Oakville a year before Shirley, in March 2017 – as Theresa talks about Lucy, she expresses how she believes that Lucy is fit for the role:

> *"We have gotten a golden nugget really, [Lucy], who intuitively can do these things. She commits and takes charge – and can systematize [the project]."*
>
> - Theresa (THRI1, 46:01)

Theresa's satisfaction with hiring Lucy can be interpreted from her statement, but further, it is illustrated how Lucy in her role has managed to take charge of the project – which can be translated into a display of leadership. As a project champion, leadership is key to driving an innovation project, such as Food&Move, and thus promote the assimilation process (Shaw, et al., 2012). In relation to effective leadership, it is important to empower personnel, in this case the nurses, through facilitative leadership (ibid.). Lucy displays this type of facilitative leadership, when she explains how she "makes an effort" to listen to and involve the nurses at her department:

> *"I make a big effort to listen to what [the nurses] say and encourage them to come to me, all the time – also with their ideas – and they do that often. […] So, they are*

heard constantly. If they give me fault reports [about the app], I handle it as quickly as possible and get back, as soon as I can."

- Lucy (LU1, 38:51)

As Lucy's statement displays, she puts great effort into listening and involving the nurses in the assimilation process – in this manner she empowers the adopters, but also by acting on the feedback they report. This is, in accordance with Shaw et al. (2012), a clear indication of Lucy performing facilitative leadership, as she, by involving and listening to the nurses, empowers them. This way to approach the role of a project champion has, arguably, been a promoting factor for the assimilation process (Shaw, et al., 2012). Lucy's approach to involving the nurses actively can also be perceived as active promotion of Food&Move which, similarly, advances the assimilation process. In the same way as Lucy, Shirley explains that she attempts to involve her peers, and that the nurses often come to her if issues with Food&Move arise (SH1, 19:48). This could, through the same line of argumentation, indicate facilitative leadership and consequently promote the assimilation process at Rockmore (ibid.). Both Lucy and Shirley highlight that they train and educate the nurses at their department in using the innovation (LU1, 39:50; SH1, 34:30). Shirley explains how the training was initially arranged by an employee from Smartware Ltd., until she was ready to take over herself:

"It began with an anthropologist from Smartware Ltd. that educated [the nurses] about [Food&Move], because she knew it well. […] I have taken over [the training] now – it is a structured education program. […] It has been done one-to-one as there can be different barriers for each nurse"

- Shirley (SH1, 34:30)

As clarified by Shirley, the nurses receive training on a one-to-one basis, through a structured program. Providing training and education is a key activity for the project champion and, thus, a promoting factor for the assimilation process (Soo, Berta, & Baker, 2009) – as both Lucy and Shirley have provided training and education, this has advanced the assimilation process at each department. To provide valuable training and education, it must be adapted to the receiver to be meaningful (ibid.). This has been achieved by providing training on a one-to-one basis, where Shirley emphasizes that each nurse has *"different barriers"*, what could be translated into needs in terms of education – meeting these needs are arguably more feasible

on a one-to-one basis and could provide a more meaningful education. Moreover, the training and education has been intraprofessional, as both Lucy and Shirley are nurses. This has, similarly, been improving the likelihood of a successful assimilation process, as this makes the training and education more meaningful to the adopter group.

In addition, when talking about enabling factors in her department at Rockmore, Shirley reports that the charge nurse, Felicia, has been an excellent leader for the nurses:

> *"I have a remarkably good charge nurse, Felicia, that is awfully positive and really good at engaging the staff. I have never experienced anything like it – and I have been in this profession for many years."*
>
> - Shirley (SH1, 11:35)

It can be inferred from the statement, that the charge nurse is able to engage the nurses. The ability to engage the nurses can arguably support the assimilation process, as she can advocate for the use of Food&Move. Felicia can be categorized as an organizational change champion with her more superior and less project specific role (Shaw, et al., 2012). The support from this type of role is crucial for the project champion, Shirley, as the effort of a project champion is often most effective with the backing of an organizational change champion (ibid.). In accordance with Shaw et al. (2012), this has propelled the assimilation process at Rockmore. However, Shirley points to that the charge nurse at Oakville is not as *"capable as Felicia – and not as visible"* (SH1, 47:51). Through Shirley's perception of this other charge nurse, the support of a capable organizational change champion might not be as pertinent at Oakville – this could limit the efforts of Lucy to promote the assimilation process.

Finally, it should be highlighted that while there is evidently a positive effect on the assimilation process at both Oakville and Rockmore from the presence champions, this has not been the case throughout the assimilation process – earlier attempts to assimilate Food&Move was without a dedicated role, like the one of Lucy and Shirley. Hence, while the champions roles currently promote the assimilation process at Oakville and Rockmore, the previous lack of these has hindered the process at an earlier stage and possibly, as discussed in relation to adopter concerns (see section 5.2.2), created issues later in the process. Hence, there have, in the later parts of the assimilation process, been a dedicated project champion at

each department of Rockmore and Oakville. The project champions have offered facilitative leadership, active promotion of Food&Move and meaningful education of staff – all with positive impact on the assimilation process. At Rockmore, there has been support from an organizational change champion, the charge nurse Felicia, where Oakville conceivably lack some support of an organizational change champion. In addition, the champion roles have been introduced later in the assimilation process, meaning that the beginning of the process has been halted by the lack of this role.

5.3.2 Dedicated time and resources

Given the established importance of dedicated time and resources (Fitzgerald et al., 2002), the following section will analyze how each case innovation has been influenced by the availability of these means. Moreover, it will be analyzed how certain factors related to the innovation could have enabled or hindered financial support for each case.

Case A – "Time is necessary"

To successfully assimilate an innovation, it is crucial not simply to allocate resources to purchase the most tangible parts of it (e.g. the technology) but also set aside dedicated resources and time to navigate and support the assimilation process. Fitzgerald et al. (2002) emphasize the importance of this, arguing that financial considerations are one of the most significant factors to determine the success or failure of the assimilation and spread process. Laurence recognizes the importance of the financial aspect, when talking about the lack of allocated resources for innovation in hospitals:

> *"We do not lack ideas. We have a hard time getting there, because it is extremely tough to drive change processes in an operationally focused organization. I am sure that private [companies] know this too – perhaps they have some resources allocated to exactly these things, which allows them to deliver their product cheaper or whatever. We do not have this in the public sector, and that is a huge problem."*
>
> - Laurence (LA1, 28:20)

It is clear that Laurence believes that the addition of dedicated resources would enable more innovation in the hospital – they are not struggling to find ideas, but struggle to support them

financially. Moreover, he interestingly points out that hospitals in many ways are like any operational business – employees are kept busy by a daily pressure to deliver a certain quantity of products or services, making it more difficult to drive change processes. This underpins the need for dedicated time and resources to drive assimilation and spread at hospitals. Kate substantiates this need further, when talking about the lack of time to push an assimilation process:

> *"The problem is often, for any department at any hospitals, that they do not have money or time to put aside the necessary resources to dedicate someone like me. If I can't get time… If I only get one office day per week, Tuesday between 13 and 15, then it simply cannot be done – time is necessary."*
>
> - Kate (KA2, 21:07)

Thus, both Laurence and Kate at Woodhill Regional Hospital have been aware of the significant influence of dedicated time and resources to push any assimilation process. In the context of the portable chemotherapy, the successful participation in Idériget had funded a year of dedicated time for Kate to focus on the innovation and had, at the same time, funded three doctors one day per week during the initiation of the assimilation process (LA2, 50:40). Moreover, at Woodhill, the project received two and a half million DKK support in total – two million DKK which were granted from a regional fund for home treatment, and half a million DKK was approved from the top management of the hospital (LA2, 1:41:49). This dedicated time and resources have, in accordance with the former statements from Laurence and Kate, had a substantial relevance for the assimilation process of the innovation – the process had, conceivably, been strongly halted without this type of financial support, especially at Woodhill, where they were the first to develop and assimilate the solution.

At Sandford, the resources that were funded from the hospital management were solely for purchasing the physical technology of the portable chemotherapy – the needed time to train staff and form procedures was taken within their operational schedule or enabled by working overtime (AN1, 57:20). However, they were able to get support from Kate, which was vital for the assimilation (AN1, 55:24) and recurring training from Meditech Inc. (AN1, 58:10). At Windston, Meditech Inc. granted funding to dedicate Karen to the project for three months during the initiation of the assimilation process (AUKA1, 4:21) and, similarly to Sandford,

they had help with training from Meditech Inc. as well (AUKA1, 14:42). The technology itself was funded by the hospital management (AUKA1, 14:14). Thus, while the financial support has been much more limited for Sandford and Windston than Woodhill, the external support and internal flexibility of staff has been sufficient to allow for successful assimilation and spread of the innovation.

Attracting resources for assimilation has for each hospital, perhaps, been more achievable due to the financial incentives related to the portable chemotherapy, as it reduces the costs of patient care. Fitzgerald et al. points to that innovation projects with financial incentives, such as cost reduction, will more likely achieve dedicated financial support (Fitzgerald et al., 2002). Karen from Windston indirectly supports this line of thought, as she believed that the cost reduction potential of the project was important to the hospital management, who granted them funds to purchase the technology itself (AUKA1, 17:51). Regardless, it is difficult to determine the actual influence of this factor on the funding process.

Thus, the importance of dedicated time and resources is not only theoretically recognized by Fitzgerald et al. (2002), but also outlined as a critical aspect by several of the interviewees. Further, Woodhill hospital was able to attain necessary dedication of time and resources to assimilate the solution within the department of hematology, but also support the spread to other hospitals by allocating Kate's time. By contrast, Sandford and Windston had less dedicated time and resources allocated from their management – however, the external assistance from Kate and Meditech Inc. conceivably bridged the remaining gap to foster successful assimilation processes. The attraction of dedicated time and resources has, conceivably, been more feasible for each department due to the cost reduction potential of the case innovation.

Case B – Only words from top management

The critical importance of dedicated time and resources, as outlined by Fitzgerald et al. (2002), has, conceivably, been evident in the assimilation and spread processes of Case B. The first attempts to spread Food&Move at two departments encountered different challenges, as previously discussed – for instance in relation to the prematurity of the technology (THRI1, 07:00, 38:47, 40:39; LU1, 28:42). However, as Rita reflects upon the process, she suggests

how the lack of dedicated resources could have been problematic duri2ng the first assimilation attempts as well:

> *"But that is also a realization of that [the department] never got the extra resource influx that is probably required."*
>
> - Rita (THRI, 44:48)

This illustrates how Rita, in retro perspective, understands the fundamental need for dedicated resources to drive the assimilation process. As a reinforcement to this observation, Lucy, who is responsible for navigating the assimilation process at Oakville, strongly believes that dedicated time is paramount in the assimilation process:

> *"I think it is really important that there is some time put aside for [implementation], otherwise it simply drifts out. The procedures are not held on to or the technical issues that can arise are not tackled [...] I am convinced, that some time should be dedicated when implementing something. There should be some key persons and there should be good support from the management."*
>
> - Lucy (LU1, 31:07)

It is illustrated here, that lack of procedures and technical support can hinder a successful assimilation process, and that dedicated time is necessary in this regard. Further it can be derived from her statement, that it is important with certain key staff, but also support from management. Management support connects with this topic naturally, as the decisions over resources tend to converge towards the higher layers of the hierarchy – thus, management support can often allow for better dedicated time and resources (Birken et al., 2013). Here, there is a certain divide – Theresa expresses how middle management display strong support, where top management provide nothing beyond verbal encouragement:

> *Internally, within the department, there has been great support. That, I cannot say enough. [...] We have a [middle] management that are exceptional, when it comes to finding money, wanting to do these things, and supporting them. [...] There is also goodwill from further above, but that is just words."*
>
> - Theresa (THRI1, 36:48)

Hence, importantly, there is a supportive middle management, who can assist in dedicating time and resources to the project – on the contrary, top management do not offer this type of support, only cheerleading. Thus, while the support from middle management has established some dedicated time and resources, the additional support from top management could propel the assimilation and spread process further. Fitzgerald et al. (2002) argue, that lack of financial incentives, such as cost reduction, could decrease the possibility of receiving financial support. While Theresa argues that nutrition related issues for patients creates huge costs for the healthcare sector (THRI, 23:45), it is hard to measure to what extent Food&Move could alleviate this issue, and therefore it is hard to quantify which amount of money could be saved. The unclarity around the potential for cost reduction could perhaps pose as an issue here, as it becomes harder to prove a financial incentive for this type of solution. In accordance with Fitzgerald et al. (2002), this could explain the lack of financial support from top management. Fortunately, while top management refrain from offering financial support, Theresa has been able to attain external funding through several applications to different foundations and funds – she estimates this funding to be approximately 1,9 million DKK (THRI, 35:00). The dedicated resources have enabled Lucy and Shirley to be hired to lead the assimilation at their respective departments at Rockmore and Oakville – something that has been vital for the assimilation process (THRI1, 45:54).

However, additional dedicated time and resources could be useful to free up the nurses' time better, so that they could better allocate time to involve the patients. Shirley explains how her colleagues most often extremely busy:

> *"[The nurses] are extremely swamped. Some days are busier than others, but it is never calm. Never. You have to prioritize your time."*
>
> - Shirley (SH1, 15:49)

It is clear that with the busy workday of the nurses, adding additional time could allow for them to use Food&Move and instruct patients better, as this is deprioritized often when they are under pressure. Hence, it is argued that further dedication of time, could foster an improved assimilation and spread process.

Thus, several of the interviewees of Case B recognize the determining influence of dedicated time and resources, which in particular has been lacking during early parts of the assimilation process. This early absence of dedicated time and resources has been hindering the assimilation process. Support from middle management has been important to attract resources, however, lack of support from top management has resulted less dedicated resources and time. The absence of top management support could be attributed to the lack of financial incentives of the solution, as it can be hard to quantify how it could reduce costs in the long run. External funding has been crucial, through which Theresa has attained a substantial part of the dedicated resources. Finally, further dedication of time for the nurses could promote the assimilation process, as lack of time is currently hindering the assimilation process.

5.3.3 Emerging patterns – Resources required to unlock champions

As a naturally emerging similarity, it is evident for each case, there have been valuable project champions: Kate, Ann and Karen for Case A and Shirley and Lucy for Case B. It is observed that the project champions of Case A were employed as nurses prior to entering their specific role, whereas Shirley and Lucy are employed on a time-limited basis. This relates to the formation of project champions, which could have an impact on their effectiveness; however, neither theory nor the collected data indicate the impact of this dissimilarity. Conversely, across both cases, each project champion has actively promoted the case innovations among their peers, which in accordance with Shaw et. al (2012), supports the assimilation and spread processes. Leadership has, similarly, been valuable to navigate the process at each department, while intraprofessional education and training has allowed for better use and assimilation of the innovations (Soo et al., 2009). However, a vital difference here, is that in the context of Case A, these factors have been present since the initiation of the assimilation processes – each project champion was dedicated to foster the assimilation process as it began at each respective hospital, whereas for Case B, Shirley and Lucy were hired years after the assimilation process had begun.

This connects well with the dedicated time and resources, where, as opposed to Case A, there had barely been any dedicated time and resources to support the assimilation process initially. This was problematic as training, forming procedures and other important assimilation activities are time and resource consuming – but further, in connection with champions, more

dedicated resources could have allowed for hiring project champions earlier. This initial starvation of resources could be attributed to the lack of support from top management – Theresa did, however, manage to attain external funding eventually, which later, allowed for hiring Shirley and Lucy. The difference in top management support between the two cases could, in accordance with Fitzgerald (2002), be explained by the less clear financial incentive of Food&Move in contrast to the portable chemotherapy, in terms of the potential of cost reduction. Moreover, the project champions efforts at large have been supported by organizational change champions in both cases – yet, Lucy's efforts are not supported to the same extent, as Shirley points to her charge nurse as less capable. This could hinder the assimilation process at Oakville. Finally, Shirley reports that nurses are often extremely busy, which is a hindering factor for the spread and assimilation of Food&Move; with further dedicated time, the nurses would, conceivably, use the innovation in a more involving manner, as intended.

5.4 Inter-linkages

In this section of the analysis, the fourth layer of the conceptual framework is used to investigate the inter-linkages. These linkages are central to the innovation spread process as they enable assimilator units by transferring information and resources from the first-mover unit or external actors (Rogers, 2003). Although, inter-linkages can exist in a variety of forms, the collected data from the two cases emphasized one type of link – boundary spanners – both as individuals and organizations. These will be analyzed in the section below.

5.4.1 Boundary spanners

To enable the spread of innovation, individuals and organizations often serve an important role as boundary spanners that transcend the local context, in which the innovation was first introduced. However, communicating the potential benefits of an innovation is a complex process where numerous boundaries exist between the boundary spanner, adopter groups and assimilator units. From the collected data of the two cases, the same boundaries are shown to reoccur, although, the boundary spanners apply different approaches to overcome them. The analysis presents three boundaries to the spread efforts of the boundary spanners; (1) social boundaries, (2) knowledge boundaries and (3) resource boundaries.

Case A – From "nurse to nurse"

By applying the conceptual framework, three boundaries were identified as relevant determinants when spreading portable chemotherapy from Woodhill Hospital to all hematology departments in Denmark. The section below analyzes how each boundary was approached by the boundary spanners relevant for Case A.

Throughout the data collection process, there were consensus among respondents that one nurse had a significant role in the spread of innovation (LA1, 56:16; AN1, 08:03; KAAU1, 36:01). This can be demonstrated from the following quote, when a charge nurse at Sandford Hospital was asked about individuals which were important for the spread of innovation:

> *"I believe that Kate plays a huge, huge part in all of this, in every way. Also, at other regional hospitals, such as Rainfall, Sunhaven and Stonearm – all of us have relied on Kate."*
>
> - Ann (AN1, 58:52)

Kate, a project nurse from Woodhill Hospital, facilitated the spread efforts through her role as a boundary spanner by contacting other hospitals and informing them about the portable chemotherapy (KA2, 38:36; KAAU, 13:53). It is emphasized that Kate's role as a boundary spanner is markedly different than as a project champion. To be an effective boundary spanner some degree of homophily must best established with the adopter, since this have a direct effect on the credibility and trust of the boundary spanner (Rogers, 2003). Rogers states that this is inherently difficult for boundary spanners, as they, by definition, represent someone from outside the unit. This is Kate's own reflections on how she was perceived by other nurses:

> *"[...] I understand their daily work and I understand the pressure. It's hard for external consults to have the same level of understanding. That's why it is so important that the interaction happens nurse to nurse."*
>
> - Kate (KA2, 32:02)

Kate's experience as a nurse, demonstrates how she was able to overcome the social boundaries of nurses at other regional hospitals, because of their shared profession. Social boundaries represent important factors for innovation spread in multi-professional

organizations, since such boundaries are often enforced (Ferlie et al., 2005). However, when spreading portable chemotherapy, doctors represent another important adopter category, where Kate could face stronger social boundaries. When asked about the interaction between nurse and doctor, relating to the spread of innovation, Kate states the following:

> *"It's always a bit harder, you need to have your arguments in order [...] But it's an advantage to have worked with hematology for eight years, since I can answer a lot of their questions – at least to some degree."*
>
> - Kate (KA2, 55:32)

For this reason, clinical nurse specialist are often effective boundary spanners, since they understand the professional context of nurses, while possessing specialized knowledge about treatments and procedures (Hilz, 2000). Although, Kate is not a clinical nurse specialist, it can be argued that she possesses the same specialized knowledge, because of her involvement with the portable chemotherapy, which helped her overcome the social boundaries of the doctors. However, in some situations the social boundaries between nurse and doctor were too strong for Kate to overcome, as demonstrated from the following quote:

> *"[...] some places still have a sort of hierarchy, which makes it harder [to convince them] as a nurse [...] When this was the case, I could always ask Laurence to 'push' them a bit next time they had a meeting."*
>
> - Kate (KA2, 56:03)

Laurence, the head of clinic at Woodhill, is stated to have provided support to Kate when addressing doctors at other regional hospitals, which is continuously highlighted in the collected data (KA2, 22:51; LA2, 1:20:30). Thus, Laurence, a former doctor, is a relevant boundary spanner who was able to overcome the social boundaries of doctors. Doctors within the same field, even across different regional hospitals, share the same profession which creates smaller social boundaries (Ferlie et al., 2005). Both Kate and Laurence have engaged in spread efforts outside of the boundaries of their unit and have been important in overcoming the social boundaries of the adopter groups.

Knowledge boundaries are related to different knowledge bases between adopter groups and represent another significant boundary that must be overcome to enable spread of innovation (Ferlie et al., 2005). Knowledge boundaries can be especially difficult to overcome as boundary spanners, since the epistemology of each department can differ. Since portable chemotherapy represents a new treatment, new procedures must be created along with training of the staff. To overcome the knowledge boundaries, Kate developed a set of standard procedures relating to the assimilation and use of the portable chemotherapy. The importance of the standard producers for other nurses, is shown below:

> *"At Woodhill Hospital they had develop some material with all the standard procedures for portable chemotherapy [...] I relied on their material quite a lot, since much of it was useful for us."*
>
> - Karen (KAAU1, 34:12)

The material and standard procedures developed by Kate were made freely available to all regional hospitals that wished to assimilate the portable chemotherapy (KA2, 39:20). Developing procedures reduces the knowledge boundaries, since nurses represent an adopter group that is highly familiarized with medical treatment procedures (Ferlie et al., 2005). Furthermore, nurses from other regional hospitals were invited to Woodhill Hospital to observe the portable chemotherapy in practice and ask Kate questions. This can be seen below:

> *"[...] I visited Woodhill Hospital to see the portable chemotherapy and the department, also to exchange experiences with Kate, mostly in terms of the implementation process."*
>
> - Karen (KAAU1, 14:33)

First-hand experience can change the opinions of adopters, so that they are more likely to adopt the innovation – or even create project champions (Rogers, 2003). This is also useful when breaking down knowledge boundaries, since new knowledge and experience are slowly introduced (Ferlie et al., 2005). Enabling the nurses through training, have also been a significant factor in reducing knowledge boundaries. The following quote demonstrates how nurses were supported during the early use of portable chemotherapy:

"We had to plan within the confines of the hospital, so some nurses had to meet at work early [...] but fortunately we could repeat the training process with [Meditech] and they were present when we started the first treatments."

- Ann (AN1, 57:53)

Meditech Inc. represents the third relevant boundary spanner in Case A and was important in overcoming knowledge boundaries among nurses. Meditech Inc. could be hindered by social boundaries among nurses, since they do not belong to the same profession (Ferlie et al., 2005). However, Meditech Inc. possessed technical knowledge necessary for the nurses and was complemented by project champions. The following quote show the reflections of a nurse at Windston Hospital, when considering Meditech Inc.'s role:

"We worked a lot with Meditech Inc., who participated in the training of the staff with 'skill labs' [...] It provide some comfort since they were experts in the technical part."

- Karen (KAAU1, 14:44)

Meditech Inc. was also an important boundary spanner in overcoming resource boundaries. Resource boundaries are sometimes significant for organizational units that do not have the necessary resources to enable their own assimilation (Rogers, 2003). Although Meditech Inc. had a clear financial incentive, they provided extraordinary funding to project champion to be dedicated to the spread process (KAAU1, 05:01). As a boundary spanner, Laurence have also overcome resources boundaries by funding Kate's innovation spread efforts. The importance of Laurence's funding is demonstrated below:

"[...] when we didn't receive any support [for the spread efforts] from [hospital management], financially or otherwise, Laurence decided that we would fund ourselves with internal means."

- Kate (KA2, 44:17)

Within the hospital setting, resource boundaries can be strong since most hospitals are heavily focused on costs (LA1, 28:33). Adopter groups do not always command the resources necessary for assimilation, which represent the essence of the resource boundaries. Middle

managers are often effective boundary spanners since they have enough autonomy to allocate internal resources to the spread efforts, as is the case with Laurence (Birken et al., 2013).

This section has described the important spread efforts of three boundary spanners in Case A, concerning social, knowledge and resource boundaries. The boundary spanners have occupied different roles, but all have transcended the original boundaries of their own unit which, consequently, promoted the spread process of portable chemotherapy.

Case B – Developing procedure and 'hustling' funding

Again, the conceptual framework will be applied for analyzing the boundaries central to the spread of Food&Move across physically separated departments at Rockmore and Oakville Hospital. Although this case is comparatively smaller in scale, than the previous case, the same challenges are faced by different boundary spanners. The efforts of the boundary spanners are analyzed below.

As a research manager Theresa could be considered a boundary spanner, even before the spread of Food&Move, since her primary task was to assimilate new knowledge into her own department at Rockmore Hospital. Working as a researcher manager, Theresa started a collaboration with Smartware Ltd. about developing an app to improve the nutritional care of older patients (THRI1, 16:31). After the development of Food&Move, Theresa continued her spread efforts as a boundary spanner. The quote below demonstrates the spread efforts of Theresa:

> *"[…] We did seminars and workshops with the staff, we also made 'flip boards' with new procedures and guides describing 'when does it happen, who is involved' – we did everything you're supposed to and thought 'now we are ready to implement.'"*
>
> - Theresa (THRI1, 41:21)

As a boundary spanner, Theresa facilitated the communication to the adopters to enable the assimilation, which is the primary task of the boundary spanner (Rogers, 2003). However, when considering the homophily of Theresa (a research manager) compared to the nurse staff, communication might not be effective in spreading the innovation. Since the boundary spanner and the adopters represent two different professional groups, there could exist

significant social boundaries between them (Ferlie et al., 2005). This can be viewed from the following quote:

> *"I put on a uniform, along with a Ph.D. student, and tried to help teaching [the nurses] […] But we realized, that you can't come as an outsider, with a Food&Move logo on your back and teach them – they just tell you they don't have time. It has to be a colleague."*
>
> - Theresa (THRI1, 54:56)

There are significant social boundaries for Theresa when communicating with the nurses at the two departments. These boundaries can be extremely hard to overcome and will make the spread efforts of the boundary spanners ineffective. Ferlie et al. (2005) provide only limited advice on how to cope with these boundaries, such as continuous social interaction, developing trust and motivation. However, in Theresa's case, this can be difficult, since she is already perceived as an 'outsider'. This problem was addressed by introducing a secondary boundary spanner to support Theresa's spread efforts, as shown below:

> *"Rita experiences as a clinical nurse specialist, where she is used to convincing nurses about adopting new practices, has been extremely important. I simply don't have the same kind of experience. So, I think we are more likely to succeed now."*
>
> - Theresa (THRI1, 44:05)

Rita, a Ph.D. student at Rockmore Hospital and former clinical nurse specialist, has become involved in the spread of Food&Move. Her role as a former nurse helped her overcome some of the social boundaries when communicating with the local nurses, since they belong to the same professional group (Ferlie et al., 2005). Again, clinical nurses should be highlighted as effective boundary spanners, as they possess knowledge relating to both practice and technical aspects (Hilz, 2000). By overcoming social boundaries, Rita was also able to understand the challenges faced by nurses when introduction new technology and empathize with the nurses (THRI1, 42:13).

Knowledge boundaries were also significant between the boundary spanners and adopters. Throughout the innovation spread process, Theresa has developed reports and feasibility studies to show the value of Food&Move. In her own words:

> *"Afterwards, we tested the technology in a number of research projects – feasibility studies – and received a lot of positive results during this, even on measurable variables such as physiology."*
>
> - Theresa (THRI1, 03:02)

Conducting feasibility studies is likely a valid way of presenting the potential benefits of an innovation to other researchers or high-level hospital managers, since they are within the same knowledge boundary. However, according to Ferlie et al. (2005), nurses represent a different professional group which have a different view on this type of evidence. The knowledge boundaries faced by Theresa can make it difficult to convince nurses to adopt the innovation – the efforts to create new treatment procedures were not prioritized, although this would be more appropriate to surmount the knowledge barriers of the nurses. Alternatively, Rita aimed to investigate why Food&Move was not being spread effectively:

> *"We heard some stories at the office that the app wasn't working. So, we decided to do a full-scale audit from bed to bed [...] Previously there had been a lot of focus on the context and the personal, but we saw that there were a lot of system errors. So, it was understandable for the night-shift nurse to say, 'I can't do this.'"*
>
> - Rita (THRI1, 48.39)

The audit introduced by Rita was viewed as a turning point for the spread process and the audits are a standard practice in both assimilator units today (THRI1, 49:20). By introducing new procedures in the early use of Food&Move, Rita enabled the nurses to detected errors within the system, which made the app more usable to the nurses. The introduction of practical procedures is useful for this specific adopter group when overcoming knowledge boundaries, as this type of information is valued by nurses (Ferlie et al., 2005). When overcoming social and knowledge boundaries, Rita have been more successful, primarily because of her former experience as a nurse.

The last boundary relevant to the boundary spanners of Case B, is the resource boundary. Although, Theresa has no autonomy over the internal budget, she has been critical in providing external funding for the spread efforts. The quote below demonstrates the various external sources of funding:

> *"I received funding from Kvalitetspuljen [...] two rounds of funding from Helsefonden. The kitchen also had a bag of money from a failed project which I also got. So, I've 'hustled' around 1.9 million in funding for the project."*
>
> - Theresa (THRI1, 35:00)

Theresa have, as a boundary spanner, been successful in acquiring external funding for Food&Move. Enabling the spread by providing additional resources to assimilator units are important task of the boundary spanner (Rogers, 2003). Although, Birken et al. (2013) states that middle managers are advantageous when providing funding and extraordinary support, Theresa can be argued to fill the same role, even though she does not have the same autonomy over internal funding. Most of the funding have been allocated, specifically, to the development of the app, however, some funding was allocated directly to the innovation spread efforts. This can be viewed below:

> *"[...] some money from Helsefonden [was used] to hire a nurse who's partly dedicated to the project, to support the process, and partly dedicated to the clinical practice. The extra dedicated nurse was simply what we needed."*
>
> - Theresa (THRI1, 43;39)

Dedicated project champions are critical in the spread process, even more in the case of Food&Move, as Theresa have, as boundary spanners, faced significant social and knowledge boundaries. Yet, Theresa has been effective in acquiring resources, allowing the spread efforts to continue, even though resources within the assimilator units are scarce (THRI1, 36:00).

Resource boundaries were also addressed by the Smartware Ltd., which is the final boundary spanner in Case B. Although, the primary task of boundary spanners is to communicate the potential benefits of the innovation, it is also important receive feedback from adopters and modify the innovation accordingly, to ensure continued use (Rogers, 2003). Often, adopters

or assimilator units lack the resources and expertise to modify the innovation themselves, as was the case with Food&Move app. This is highlighted, by a project nurse at Oakville Hospital:

> *"[...] [sporadically] we discuss: 'How does it work now? Could we do something differently? Do you have something new we could develop in the system?', and so forth. Then, I'll take these points to Smartware Ltd., who will help develop the additions that are possible."*
>
> - Lucy (LU1, 35:28)

The continued development of Food&Move would not be possible for the hospitals without the technical expertise and support from Smartware Ltd. This is supported throughout the collected data (THRI1, 18:25; SL, 13:28). Thus, by supporting the hospitals with technical resources, the spread of innovation is strengthened (Rogers, 2003).

In this section the relevant boundary spanners of Case B have been analyzed. The boundary spanners have faced multiple boundaries relating to social, knowledge and resource factors. From this, and the previous section, it is clear that the boundary spanners of the two cases varies widely, as does the challenges they face. The next section will compare the boundary spanners of the two cases and conclude on the inter-linkage findings.

5.4.2 Emerging patterns – Initial successes and reinforced boundaries

The previous section analyzed the role of boundary spanners in overcoming social, knowledge and resource boundaries, which were significant in both cases. Multiple individuals and organizations acted as boundary spanners; indeed, it seems unlikely that a single boundary spanner would be effective in overcoming all three boundaries, especially, considering the multi-professional context of healthcare (Ferlie et al., 2005). Thus, it could be argued that multiple boundary spanners have a positive effect on the spread of innovation. It is important to emphasize that organizations, such as Meditech Inc. and Smartware Ltd., that act as boundary spanners, possess considerable resources compared to individuals – yet, overcoming social boundaries could prove difficult which supports the notion of multiple boundary spanners.

In both cases a 'primary' boundary spanner can be identified, which is the first individual involved in the innovation spread process. In Case A, Kate, the project nurse from Woodhill was the primary boundary spanner and was supported by Laurence and Meditech Inc. during the spread process. In Case B, Theresa, the research manager at Oakville acted as the primary boundary spanner and was supported by Smartware Ltd. and, later, Rita.

A critical difference between the two cases was the initial success of the primary boundary spanners. Kate was able to overcome both social and knowledge boundaries when spreading the portable chemotherapy to other regional hospitals. This was in large part due to her comprehensive knowledge about the portable chemotherapy and hematology, along with her position as a nurse (Hilz, 2000). Conversely, Theresa was not able overcome social boundaries which reinforced the knowledge boundaries – although Rita was later able to improve the spread effort of Food&Move. Since the social and knowledge boundaries persisted for longer, the spread of innovation was slower in Case B.

When multiple boundaries persist, they often reinforce each other, such boundaries can only be overcome by continuous efforts to establish trust (Ferlie et al., 2005). If social boundaries persist it can affect the knowledge boundaries, since the knowledge communicated by the boundary spanner is not perceived as credible, subsequently the resource boundaries become stronger, since more resource needs to be allocated when the communication is ineffective. Theresa, however, was able to ensure adequate external funding so that project champions could be employed at each department. Theresa's approach to overcome boundaries is not adequately covered by literature but could be related to degree to which an induvial, often middle managers, can secure funding (Birken et al., 2013).

This section highlights the importance of multiple boundary spanners that complement each other when overcoming social, knowledge and resource barriers. Strong or reinforced barriers have been an important factor in determining the spread of innovation for the two cases and can be difficult to overcome.

5.5 Interactions between the four layers of innovation spread

This thesis proposes that the four layers of innovation spread, previously analyzed, should not be considered as isolated constructs. Instead, dynamic interactions exist between the layers

which have a profound effect on the process of innovation spread. This section analyzes the interaction of the four layers relevant for both cases and demonstrates how these have affected the innovation spread. Three interactions were found to be relevant for both cases.

5.5.1 Interactions between boundary spanners and innovation interpretation

The innovation interpretation is a significant determinant of the innovation spread; thus, it is critical that the interpreted advantage among adopter groups is successful. In this regard, it has already been demonstrated how observability can affect the soft periphery (see section 5.1.3)

Observability of the benefits of an innovation is important in the early spread process and during continued use of the innovation, for the interpretation of adopter groups to be positive (Rogers, 2003). In each case, the boundary spanners have been important in establishing observability when first introducing the innovation to the assimilator units. However, as previously demonstrated, the boundary spanners face multiple boundaries related to their position as an "outsider", which can inhibit their spread efforts (see section 5.4). It is therefore interesting to analyze the interaction between observability and the boundaries faced by the boundary spanner.

Concrete evidence and first-hand experiences primarily relate to the knowledge boundary, which determines the adopter groups' ability to accurately observe the benefits (Ferlie et al., 2005). Although, the social boundaries are important to overcome when establishing the credibility of observable benefits, they are not related to this specific interaction. Similarly, strong observability of benefits could enable flow of resources within the assimilator unit, which could reduce resource boundaries. Øvreteveit et al. (2002) state that boundary spanners should leverage observability, such as concrete evidence, to highlight the benefits of the innovation to key stakeholders or motivate continued use by adopters. In Case A, Kate presented the data from the pilot study and experiences from her own department, which were important for the regional hospital management to initiate the assimilation process (KA1, 10:46). In Case B, the two feasibility studies conducted by Theresa functioned similarly, so that middle management formally approved the initiation of the assimilation process (THRI1, 39:51). In both cases, the boundary spanners overcame the knowledge barriers related to

management and effectively presented the benefits – however, as previously stated, the nurses could hold stronger knowledge boundaries towards this form of observability.

According to Ferlie et al. (2005), health professionals that are closely involved with patients, such as nurses, have a more "holistic approach" to concrete evidence, by considering practicality and other related factors. In each case, the boundary spanners introduced new procedures and training to overcome the knowledge boundaries of the adopter groups, which better appeals to the more practically oriented mindset of nurses. While procedures and training cannot accurately be defined as a form of observability, they are important to reduce the soft periphery of the innovation (Denis et al., 2002). A smaller soft periphery enables the nurses to effectively apply the innovation as intended, in which, they are more likely to observe the subsequent benefits first-hand. Thus, the actions of the boundary spanners can have an indirect, but significant, impact on the first-hand observability available to the adopter groups and, thus, overcome the knowledge boundaries. Procedures and training related to the portable chemotherapy, were performed by Kate and Meditech Inc. respectively (KAAU1, 14:44, 34:12). With Food&Move, Theresa initially conducted workshops with only limited effect, while Rita established new procedures to remove observable disadvantages, for instance system errors (THRI1, 41:21, 48:39).

It can prove difficult for boundary spanners to have direct effect on the first-hand observability, although knowledge boundaries relating to first-hand experience could be considered weaker, than those relating to concrete evidence. According to Rogers (2003) first-hand observability happens when the adopter groups apply the innovation themselves; during this process, boundary spanners are rarely present. Direct first-hand observability can still be provided by boundary spanners when demonstrating the benefits of the innovation in a real-life setting. Through demonstration, the soft periphery of an innovation can be minimized, as adopter groups can observe the benefits and accurate use of the innovation (Denis et al., 2002). Knowledge boundaries can challenge the effects of a demonstrations if the adopter groups lack technical capabilities or the capacity to interpret the benefits (Ferlie et al., 2005). In both cases, demonstrations were used by boundary spanners – however, the collected data did not indicate the effects of the demonstration regarding the benefits of the innovations (THRI1, 36:16; KA2, 25:57). Presumably, the benefits pertaining to Food&Move are harder to observe,

because of the preventive nature of benefits, which could limit the success of the boundary spanners in overcoming the knowledge boundaries to establish observability.

This section has analyzed the interaction between the knowledge boundaries faced by boundary spanner and the observability of the innovations, both on a theoretical and practical level. In each case the boundary spanners have been successful in overcoming knowledge boundaries relating to hospital management and concrete evidence. However, the boundary spanners of Case A have been comparatively more successful in overcoming knowledge boundaries relating to first-hand experience. The boundary spanners of Case B were successful in removing observable disadvantages but could not overcome the knowledge barriers relating the benefits of Food&Move. This could explain the difference in the rate of innovation spread between the two cases.

5.5.2 Interactions between adopter attitudes and organizational context

As highlighted previously, to promote the assimilation process, it is crucial to address adopter concerns – this theoretical relevance pointed to by Hall and Hord (1987) translated well onto the observed cases, as each case mutually displayed concerns among the adopters. Where the nurses of Case B were troubled by concerns regarding technological and practical issues, some which had arisen from early assimilation attempts, Case A displayed concerns among both nurses and doctors at different stages. The determining factor for spread was, however, not the mere existence and severity of the concerns. Rather, the contrast between the cases was mainly that the concerns among adopters in Case A were addressed as they were exposed, whereas, in Case B, they were not addressed initially – the nurses had not felt involved in the assimilation process and, overall, there appeared to have an absence of efforts to address the concerns (LU1, 29:05). These overlooked concerns have, however, been turned to later. The effort to counteract the concerns has, for both cases, been a fused product of project champions and dedicated time and resources in particular.

Hall & Hord (1987) refer to change facilitators as significant when addressing concerns – the role of a change facilitator is its definition closely tied to that of a project champion, as the activities of a change facilitator equally revolves around, for instance, leadership, support of adopters and advocacy of the innovation. By linking theory through this close resemblance in terminology, it can be understood that project champions ought to recognize each individual

adopter's concerns, to then address the individual's concerns appropriately (Hall & Hord, 1987). In the role as a project champion, Shirley recognizes part of this mechanism when referring to that *"there can be different barriers for each nurse"* (SH1, 34:30), where a *"barrier"* can be interpreted as a form of concern. In practical means, Shirley attempts to address these concerns at one-to-one training sessions, where it is arguably more feasible to recognize the individual nurse's concern, in accordance with Hall & Hord (1987). It is clear, that there is a link between the layers of organizational context and adopter attitudes, where project champions should act in their role to address adopter concerns to propel the assimilation process.

To support these types of activities, such as one-to-one sessions, dedicated time and resources must be attained – it can be time consuming to, not only plan this type of effort, but to simply facilitate it. Overall, supportive activities that can alleviate concerns of adopters, such as planning, training and forming procedures, are time consuming (Hall & Hord, 1987) – and time consuming activities translates into costs to allocate staff. In this manner, dedicated time and resources function as a foundation for addressing concerns. Beyond this, it can be pointed out that the mere availability of project champions has, evidently, in both examined cases been strongly reliant on the availability of dedicated resources – each project champion's dedicated role has been (with the exception of Ann, where no explicit statement points to this) funded partly or fully by allocated resources (LU1, 2:33; SH1, 1:01; LA2, 50:40; AUKA1, 4:21). Hence, dedicated time and resources influence the scope for addressing adopter concerns directly, as many activities related to addressing these concerns are fueled by time and resources, it also indirectly links, as time and resources appears to often fuel the activities by project champions which aims to address concerns.

As outlined, where concerns were dealt with timely for Case A, concerns grew and persisted for an unfavorably extended period among the nurses of Case B. Through the established link between adopter concerns, project champions and dedicated time and resources, it can be understood how the concerns of adopters could be addressed best if time and resources had been allocated at an earlier point. An earlier influx of resources and time would not only support the necessary efforts related to meeting concerns, but also enable the devoting of project champions at an earlier point, which, similarly, could lessen concerns of adopters and thereby propel the assimilation and spread processes.

5.5.3 Interaction between boundary spanners and project champions

In this section the interaction between the third and fourth layer of innovation spread will be analyzed. This investigates how project champion, over time, can evolve into boundary spanners and the implication related to the social, knowledge and resource boundaries. Furthermore, this section analyzes the effects of the complementary relationship between the boundary spanners and project champions.

According to Shaw et al. (2012) the role occupied by project champions can evolve during the duration of the innovation spread process, following numerous emergent pathways. This thesis argues that one possible pathway for project champion could be to evolve into boundary spanners. This is supported by the empirical finding pertaining to Kate, a project nurse from Woodhill Hospital, that effectively occupied the role of project champion and later boundary spanner (KA2, 33:34; AN1, 58:52). Kate's previous role as a project champion could have a profound effect on her ability to overcome the boundaries faced as a boundary spanner.

Rogers (2003) states that the previous experience of boundary spanners, relating to their spread efforts can have a significant impact on their strategy for approaching adopter groups. Although the collected data have not supported the existence of strong internal boundaries during the assimilation process, Kate's efforts as a project champion could still equip her with valuable experience to support her as a boundary spanner.

According to Soo et al. (2009) effective project champions are competent communicators that possess comprehensive knowledge about the innovation itself and the organizational actors. Through her role as project champion, Kate has engaged with multiple adopter groups and stakeholders (nurses, doctors, hospital pharmacy, managers, etc.) which provide her with knowledge of how to approach a wide range of relevant actors (KA2, 25:46). This knowledge could have been a significant factor contributing to her success in overcoming the social boundaries, as presented by Ferlie et al. (2005), because she understood their views and their language from previous interactions at her own hospital (KA2, 32:02). Project champions are also heavily engaged in training and education of adopter groups, in which, it is emphasized to create meaningful education among each adopter group (Soo et al., 2009). In the case of portable chemotherapy, nurses require more thorough education than doctors, since they represent the primary adopters. The knowledge boundaries described by Ferlie et al. (2005)

exhibit a similar pattern, in which different groups of adopters require different form of knowledge, such as education. Kate's experience, regarding the training of different adopter groups, have had a significant effect on her ability to overcome the knowledge boundaries. It was during her project champion role that she developed standard procedures for the use and assimilation of the portable chemotherapy which was particularly helpful in overcoming the knowledge boundaries of nurses (KA2, 39:20). As previously stated, Kate's role as a boundary spanner was not directly significant in overcoming resource barriers (see section 5.4.1).

The interaction between the project champion and boundary spanner analyzed above is highly context dependent. Indeed, Case B did not exhibit the same pattern of the evolving roles of project champions. One explanation, as formerly mentioned, could be the emergent nature of the project champion roles (Shaw et al., 2012).

However, Soo et al. (2009) findings indicate another interesting interaction between project champions and boundary spanners. Soo et al. (2009) point to a complementary relationship between project champions. It is argued that this relationship can exist between project champions and boundary spanners, which could help overcome the boundaries of innovation spread. In Case B, Theresa was not able to effectively overcome the social and knowledge boundaries, as presented by Ferlie et al. (2002) (THRI1, 54:56). Instead, the local project champions at Rockmore and Oakville communicated the advantages and facilitated training, as they did not face the same boundaries. Still, Theresa was successful in overcoming resource boundaries which enabled project champions to be appointed (THRI1, 43;39). To have a complementary relationship between project champions and boundary spanners, their spread efforts must be aligned (Shaw et al., 2012). This was supported by the collected data for Case B, in which, the project champions and boundary spanners still attend collaborative meetings, evaluating the spread efforts (LU1, 35:28)

As outlined above, two interactions between project champion and boundary spanners were analyzed, one for each case. In Case A, the evolving role of Kate allowed her to overcome social and knowledge boundaries which increases the rate of innovation spread. In Case B, Theresa and the local project champions had complementary relationships in which the boundaries of spread were overcome. The interactions in each case cannot accurately explain the difference

in innovation spread, however, the difference can partly be explained, as the complementary relationship in Case B was established comparatively late in the spread process.

6. Discussion

Subsequent to the analysis, reflections in the findings will be outlined in this section. This will entail a discussion around the main findings of this thesis, limitations of these findings and avenues for further research.

6.1 Discussion of the main findings

The following section will summarize and discuss the major findings of the analysis. The discussion will follow the structure of the sub-questions, to emphasize a clear relation between the findings of the analysis and the overall research objective of this thesis. Each section will elaborate on; (1) the findings related to the pertinent sub-question, (2) the relevancy of the findings and (3) the relation to previous findings from the literature.

6.1.1 The relation between innovation and adopters

The findings related to the first and second layer of innovation spread in relation to each case, along with the subsequent emerging patterns, can be applied to answer the first sub-research question presented below:

> *How can the relation between innovation and adopters explain the disparity between the cases in terms of assimilation and spread of innovations?*

The first two layers in the conceptual framework highlights the relation between innovation and adopters, but with distinct difference in theoretical approaches. Each layer offered important findings related to the disparity in assimilation and innovation spread.

The successful interpretation of relative advantages varied widely between the adopter groups of each case. In Case A, the interpreted relative advantage of increased quality in patient treatment was strengthened through interactions across adopter groups (Ferlie et al., 2001). Comparatively, in Case B, the interpreted relative advantages diverged significantly, since empowerment of older patients was not interpreted as feasible by the adopter groups. The small soft periphery of the portable chemotherapy allowed new interpreted advantage to develop which aligned with the initially proposed value, such as the use of the innovation on inpatients and mixing medicine in batches (Denis et al., 2002). The larger soft periphery of

Food&Move allowed unintended use, in which adopter groups only interpreted advantages relating to efficient nutritional registration. In Case A, the potential negative consequences of organizational politics were prevented, and longer shelf-life of the medicine was approved by the regional hospital pharmacies, which was necessary to ensure a successful interpretation of the advantages (Fitzgerald et al., 2002). Oppositely, Case B faced multiple regional stakeholders, where the lack of alignment with these stakeholders clouded the interpreted advantages. Finally, despite the lack of RCTs, some degree of concrete evidence was available to display benefits of the portable chemotherapy. However, the first-hand observability played a relatively larger role. When using the portable chemotherapy, nurses were able to observe happier patients and significant structural changes in their departments – this led to a stronger degree of observability (Rogers, 2003). Similar to Case A, the concrete evidence was relatively weak for Food&Move. In particular, the concrete evidence would have been beneficial, since first-hand observability was also lacking. As such, improvement in nutritional care when applying Food&Move was difficult to observe for nurses, diminishing the overall observability of the innovation.

The compatibility of an innovation was found to affect the assimilation and spread of innovation, in both cases (Rogers, 2003). The previously introduced ideas were markedly different for the adopters in each case. Portable chemotherapy aligned with an overarching trend among the regional hospitals, in particular to move treatment plans from hospitalizations to the ambulatory. By contrast, Food&Move represented the first efforts to empower older hospitalized patients, which led to a low compatibility with previously introduced ideas. Furthermore, in Case A, the nurses believed that treatment as outpatients could be safer, in terms of infection risk, than hospitalization. Oppositely, in Case B the nurses' beliefs did not align with the innovation, as they believed training of older patient would be overly time consuming and questioned the patients' capabilities to be involved. Further, the hematology departments faced increasing demographical pressure which the portable chemotherapy would assist them to accommodate. Comparatively, nutritional care represents a low priority area for nurses, in which the adopter needs for Food&Move is considerably weaker. Finally, in accordance with Hall & Hord (1987), the concerns among adopter groups should be addressed during the assimilation and innovation spread process to avoid. Adopter concerns in Case A were effectively addressed continuously through committed efforts – the nurses received around-the-clock support to meet potential concerns and doctor concerns

were addressed through sharing concrete results of the innovation. By contrast, in Case B, while devoted efforts to involve nurses were made later during the assimilation process, technical and practical issues during the early process created concerns among the nurses that were not readily addressed, which created concerns later.

From the findings presented above the disparity between the cases in assimilation and spread of innovation can be explained by the vastly different innovation interpretations and adopter attitudes. In Case A, the portable chemotherapy demonstrates contentiously successful innovation interpretations and highly favorable adopter attitudes. In Case B, Food&Move exhibits a different trajectory of innovation interpretation, in which, the value of the innovation is contested, along unfavorable adopter attitudes that reduces the relevancy of the innovation.

The findings of this thesis also indicate interesting patterns of interaction between the components of each layer. The patterns of *adverse synergies* exist between relative advantage and observability, along with compatibility and adopter concerns. For instance, when first-hand observability is lacking and the innovation possess a large soft periphery, the likeliness of a successful innovation interpretation diminishes even further. Likewise, if an innovation lacks alignment with value and beliefs and adopter concerns are prominent, adopter attitudes likely will be additionally unfavorable. These adverse synergies can be difficult to address and pose significant challenges for the assimilation and spread of innovation as demonstrated in Case B. Although, the importance of these interactions has been proposed previously, prior studies have not sufficiently investigated their effect in relation to assimilation and innovation spread (Wejnert, 2002; Greenhalgh et al., 2004). These findings are important as they highlight the complex process that exist when assimilating and spreading innovation in a healthcare context. The findings related to this sub-question indicates special care should be taken to consider the components surrounding adopter attitudes and how they should be addressed. Furthermore, the continuous process of innovation interpretation should be carefully supported to ensure favorable interpretations.

It is appropriate for the discussion to consider if other theoretical concepts can complement the findings presented above and elevate the understating of this thesis, related to the disparity between the two cases. Conceivably, the degree of novelty could have implications for the

assimilation and spread of innovation. Incremental innovation often builds upon the existing practices to create improvements in efficiency, quality or cost, whereas, radical innovation departs from previous practices requiring new ways of thinking (Schilling, 2017). Relating this notion to Case B, Food&Move could be considered more radical than portable chemotherapy, as it aimed to enable older patients to actively engage in their own treatment during hospitalization, which represented an entirely new idea. Indeed, radical innovations are more likely to lack comparability (Rogers, 2003). This was supported by the findings of Foy et al. (2002) which states that new healthcare practices that align with current beliefs and values are more easily assimilated and spread. Interestingly, it was found that new healthcare practice that clashed with established beliefs and values had more significant improvements on healthcare. Thus, in accordance with this finding, the potential value of Food&Move in improving nutritional care could be substantial. Although, the degree of novelty could complement the understanding of innovation compatibility within adopter attitudes, it cannot account for unsuccessful innovation interpretations which diminish the potential value.

The findings presented could further be discussed in relation to the role of communication. Through the analysis, the process of how innovation interpretation developed and diverged to become successful or unsuccessful was investigated. However, little attention was given to how the initially proposed value was communicated, which could significantly influence the innovation interpretation among adopter groups, according to Dearing & Meyer (1994). Interestingly, innovations that are communicated as complex or radical are more likely to negatively affect the innovation interpretation. Conversely, when efficiency and applicability are emphasized during the initial communication, the innovation interpretation is more likely to be successful (Dearing et al., 1994). Furthermore, Dearing et al. states that innovators tend to focus communication on radicalness rather than applicability of the innovation – while the radicalness could seem appealing to the innovator, this puts an emphasis on a negative factor for the adopters. The theories presented could provide nuances to the authors' understating of how innovations are interpreted by adopters, during the initial stages of the assimilation and spread processes, which could help explain the disparity between portable chemotherapy and Food&Move. Effective communications could also have implication for other components in the conceptual framework, such as champions and boundary spanners. However, as Rogers (2003) argues, the experience of adopters when applying an innovation will always take precedence in forming the interpretation of the innovation.

The two previous discussion was primarily founded in the spread literature; however, it is interesting to consider how associated, yet different theoretical fields could elevate the understanding of the results. Innovation and change are closely intertwined, particularly in healthcare, and often overlapping – yet, change management literature hold inherently different assumptions pertaining to several of components in the conceptual framework. In the previous analysis, the compatibility of an innovation was considered a, somewhat, static component, in which the previously introduced ideas, beliefs and values and adopter needs, could not be altered within the scope of the assimilation or spread process (Rogers, 2003). Under this assumption, Food&Move will be exceedingly challenged, as it simply does not align with the adopter groups. According to change management researchers, such as Kotter (2012), the antecedents for innovation can be affected by champions and boundary spanner alike, by establishing a sense of urgency in the organization. One method proposed is creating a *burning platform*, emphasizing the need to assimilate novel solutions, if the organization is to survive (Palmer & Dunford, 2017). Such methods could establish adopter needs or change the values and belief of adopters, which could, if changes aligned in favor of compatibility, increase the rate of assimilation and spread of Food&Move. Although, these implications are interesting, creating burning platforms should be approach cautiously, as it conceivably can increase the adopter concerns, which have adverse effects on assimilation and spread.

Although, part of the disparity between the two cases could be explained by applying Rogers' (2003) framework, it is argued that the conceptual framework developed in this thesis allows a more nuanced analyzes to be conducted. Firstly, the conceptual framework is carefully constructed to fit a specific healthcare context based on theoretical and empirical relevance. Secondly, the analysis develops on Rogers' (2003) understanding by incorporating components such as the soft periphery, concrete evidence and adopter concerns. Lastly, the patterns of interaction and the underlying adverse synergy, between the component represent novel findings.

Although, the disparity in assimilation and spread of innovation could in part be described by the vastly different innovation interpretation and adopter attitudes of each case, the aim of this thesis was to structure a holistic analysis covering multiple areas of interest. As such, the

remaining sub-questions relating to context and dynamic interaction must be answered in the following sections.

6.1.2 Contextual components of organization and inter-linkage

The forthcoming section will discuss findings of the analysis which explicitly relate to the organizational context and inter-linkage. In this manner, pertinent findings will be outlined and reflected upon to qualify the answer to the second sub-question:

> *How can contextual components concerning organization and inter-linkage explain the disparity between the cases in terms of assimilation and spread of innovations?*

Thus, to appropriately answer this question, a discussion will be engaged around the contextual components which demonstrate influence on the assimilation and spread of innovations in relation to the nominated cases of the thesis.

As concerns the organizational context, the analysis found, in accordance with theory, that project champions and organizational change champions are key to promote the assimilation and spread of innovation (Shaw et al., 2012; Soo et al., 2009). These roles have been valuable in both cases; however, an organizational change champion was pointed to as less capable at Oakville, which, conceivably, have impacted the assimilation process negatively. The analysis further unveiled, that project champions are effectively employed on a continuous basis – thus, the project champion should be available from the initiation of the assimilation process. For Case A, each examined unit of assimilation had a project champion allocated to promote the assimilation process, whereas for Case B, the project champions only became available later in the overall process, halting the assimilation and spread processes.

Further, it was found that steady support through dedicated time and resources is crucial and that attracting such support was more feasible with a clear financial incentive related to the innovation (Fitzgerald et al., 2002). For Case A, there have been adequate dedicated time and resources to support the assimilation process – at Rockmore and Windston, gaps in time and resources have been bridged through external support from Woodhill and Meditech. By contrast, Case B had issues of scarce dedicated time and resources, which only became

available later in the process; the nurses, however, still appear to lack to dedicated time due given the pressure from work.

As concerns the analysis of inter-linkage, it was found that social, knowledge and resource boundaries had significant impact on the assimilation and spread of innovation. By extension, boundaries can be difficult to overcome and can act as mutually reinforcing (Ferlie et al., 2005). For Case A, Kate was able to overcome social and knowledge boundaries successfully, which promoted the spread process; this effort was further support by Laurence and Meditech. Conversely, for Case B, knowledge boundaries were reinforced as Theresa was unable to overcome the social boundaries. At a later stage, Rita was able to more successfully overcome these boundaries and some boundaries were circumvented by hiring project champions – however, as the boundaries persisted for a longer time, the spread process was diminished. These findings emphasize the effectiveness of multiple boundary spanners to surmount boundaries successfully. Additionally, Laurence and Kate met less significant social boundaries, as opposed to Theresa, due to their professional background; thus, boundary spanners can more easily overcome boundaries, if they possess a professional background that is homogenous with the adopter group.

As outlined, this thesis emphasizes the favorable presence of project champions as to promoting the assimilation and spread of innovation. This is in accordance with much established literature in the context of healthcare, which similarly point to the importance of champions (Cifuentes et al., 2005; Feifer & Nemeth, 2007; Cohen et al. 2005). However, this thesis further unveils the important synergy between the project champion and organizational change champion to push the assimilation collaboratively on different levels of the organization. Thus, where much research focus on either part in isolation (heavy focus on single individual pushing change or leadership driven change), the findings of this thesis further builds on the understanding of the synergistic relation between project champion and organizational change champion to foster assimilation and spread, as established by Shaw et al. (2012). This poses relevance for practice, as to suggest that project champions' efforts are more effective to drive assimilation processes with the support of one, or more, organizational change champion.

Limited attention has, in literature, been given to how champions arise (Shaw et al., 2012; Soo et al., 2009). As a contribution to close this gap in literature, this thesis found that project champions can effectively be formed by employing dedicated resources, as primarily observed in the two selected cases. Conceivably, this finding relates in particular to the healthcare sector; with the strong workload pressure often found in the healthcare setting, it can be increasingly difficult for individual staff to exercise champion efforts without being released from part, if not all, of the operational tasks. Thus, it is more likely that champions can continuously focus on activities, which foster stronger assimilation, if their schedule is freed up and their responsibilities are aligned with such efforts. This finding points to that dedicated resources ought to be employed to establish project champions during attempts to assimilate and spread innovations in a healthcare context.

While the findings of this thesis build on the favorable notion of champions, a study by Hendy & Barlow (2012) cautions of the overreliance on champions. More specifically, if change is to be driven by few individuals, it can drive the assimilation rapidly early, yet this can pose strong issues for the spread of innovation later. As the study argues, champions can display resistance, if the innovation is suggested to be spread beyond the initial assimilation unit or beyond professional boundaries (Hendy & Barlow, 2012). While the findings of this paper suggest otherwise, where the champion and boundary spanner efforts of Laurence and Kate have been paramount to the spread of the portable chemotherapy (and thus a strong reliance on single individuals was favorable), this caution could still hold relevance for other cases. Consequently, where this could pose a contrast to the findings, it should rather be understood as complementary to the findings of the thesis – in other words, while champions are key to the assimilation and spread of innovations, there is an underlying risk element to rely only few champions. This should not discourage undergoing efforts to drive assimilation given such conditions but rather allow for proactive planning in this given scenario.

As previously emphasized, the findings of this thesis argue the significance of social, knowledge and resource boundaries in relation to innovation assimilation and spread. As regards knowledge boundaries, the analysis point to the effectiveness of developing procedures, in accordance with Ferlie et al. (2005), to promote spread and assimilation. This finding is reinforced by previous findings, which state that non-tacit knowledge (explicit knowledge) is more feasible to transfer (Nonaka, 1991). Forming procedures in physical format can be argued to make knowledge more explicit, and therefore more easily transferred

to the adopter group. Thus, by pairing with this prior theoretical understanding, it can be understood that knowledge boundaries can be addressed effectively by minimizing tacit knowledge and, therefore, by explicating knowledge.

In addition, the boundaries unfold in the vacuum between boundary spanners and adopters, where it is critical to comprehend how to foster relations that can promote the spread and assimilation processes. In particular, the findings emphasize how social boundaries can reinforce knowledge boundaries, which highlights the central aspect of surmounting social boundaries to promote the assimilation and spread of innovations. In this vein, the analysis unfolds the relevance of heterophily among boundary spanner and adopters, as higher homogeneity among boundary spanner and adopters lessens the social boundaries (Ferlie et al., 2005). However, the findings of this thesis could be further nuanced by focusing on factors beyond boundaries. A theory proposed by Menon & Pfeffer (2003) stresses the importance of incentives for transfer and absorption of knowledge. This relates to both involved parties, boundary spanners and adopters, as each party can lack incentives to transfer or absorb knowledge. The study points to that incentives are crucial for knowledge transfer, as knowledge will often go unutilized if no incentives are in place, where social or monetary rewards can function as incentives (Menon & Pfeffer, 2003). Hence, while the findings of this thesis highlight the necessity to overcome social boundaries, there are other forces which impacts this; if incentives are not in place to transfer and absorb knowledge, crossing the boundaries could be meaningless. Social boundaries, consequently, pose strong relevance for spread and assimilation processes, however, they appear most comprehendible when paired with incentives.

Accordingly, the discussion of results related to sub-question two point to several pertinent findings. Firstly, the synergistically relationship between organizational change champion and project champion is highlighted to explain the disparity of assimilation and spread among the two selected cases; this finding builds on the scarce literature that emphasize this synergy (Shaw et al., 2012). Further, it was found that a later introduction of project champions in Case B halted the assimilation and spread processes – continuous availability of this role, as observed with Case A, is key in this respect. The favorable notion of champions was nuanced by reflecting upon findings by Hendy & Barlow (2012); over-reliance on few individuals can

endanger the spread process later. This reflection does not oppose the findings of this paper, but rather offers a more holistic understanding of project champions.

The aspect of dedicated time and resources was found to pose significance to the gap in innovation spread among the nominated cases, as this had been lacking for Case B initially but had been present for Case A continually. Along these lines, it was found that the initial lack of dedicated time and resources could be explained by a varying degree of clear financial incentives, echoing the findings of Fitzgerald et al. (2002); where Case A had a strong financial incentive, Case B lacked this. Moreover, dedicated resources were observed to be pertinent to forming project champions – this creates a link in theory between these two concepts, and sheds light on the formation champions, a somewhat unattended aspect of theory around champions (Soo et al., 2009).

In relation to boundaries, social, knowledge and resource boundaries were found to broaden the disparity of spread between the two cases; especially with the persistence of several boundaries simultaneously. More specifically, the long persistence of social boundaries for Case B halted the assimilation and spread processes, which were more effectively surmounted in Case A. Further, the efforts to overcome knowledge boundaries were, similarly, more successful for Case A – procedures were useful for the explication of knowledge, which relates to more effective transfer of knowledge as proposed by Nonaka (1991). Finally, while boundaries pose strong importance, the aspect of incentives of boundary spanners and adopters can advance this understanding – overcoming boundaries is somewhat futile without incentives in place, much like incentives can be futile without surmounting boundaries (Menon & Pfeffer, 2003).

6.1.3 The dynamic relationship between the four layers of spread

In relation to the third sub-question, this section will discuss the findings of the analysis which concern the interactions between theoretical components across the four layers of innovation spread. Consequently, this discussion will allow for reflecting upon findings to answer the third sub-question:

> *How does the dynamic relationship between the four layers affect the assimilation and spread processes?*

Accordingly, the unveiled interactions between the layers will be examined in their pertinence to the assimilation and spread processes.

As presented previously, it was found that boundary spanners can leverage observability to foster innovation spread, when knowledge boundaries are surmounted (Øvreteveit et al., 2002), providing an interconnection between observability and boundary spanners. Both Theresa and Kate were seen to utilize this, as they convinced management to initiate the assimilation process by presenting results that emphasized observability – in particular, Theresa convinced the head nurse through presenting her feasibility studies and Kate shared implications from experience and the pilot study to convince management of other hospitals. Hence, it can be understood that boundary spanners can stimulate the innovation spread and assimilation by overcoming knowledge boundaries and fostering observability.

In the same vein, it was found that boundary spanners can foster observability indirectly through procedures and training. The soft periphery of the innovation can be reduced through procedures and training, as these activities can foster a more appropriate use of the innovation among adopters, which, in turn, advances the observability of benefits (Denis et al., 2002). It should, however, be noted, that even though boundary spanners can provide training and procedures, these efforts are not effective before overcoming the knowledge boundaries. Thus, if knowledge boundaries are overcome, observability can be fostered indirectly by boundary spanners, thereby promoting the assimilation and spread processes.

Along these lines, the first-hand experience of adopters, which has a strong initial effect on the observability (Rogers, 2003), can be difficult to affect for boundary spanners – however, through demonstration, they can attempt to influence the first-hand experience, if knowledge barriers are broken down. Demonstration can, like training and procedures, reduce the soft periphery and thereby foster a stronger observability (Denis et al., 2002). This finding is reinforced by Nadler et al. (2003), who state that the adopter's performance outcome when utilizing an innovation will increase through demonstration of use (which translates well into observability), as opposed to simply relying on their own experience in isolation. Thus, the observability of an innovation can be improved by boundary spanners through demonstration, and thereby promote the assimilation and spread of innovations.

In relation to adopter concerns and project champions, interconnections were established between these concepts. More specifically, as adopter concerns vary among individual nurses, it is important that the targeted efforts are made to meet the individual's concern – in this context, it was found that project champion are pertinent to meeting these individual concerns, given their proximity to the adopter group (Hall & Hord, 1987). Shirley exhibited this type of behavior, as she emphasized the usefulness of one-to-one training to meet individual concerns of nurses. Hence, it was found that concerns of adopters are more effectively addressed through project champions. The relevance of understanding individual concerns is supported by Plsek (1999), who argues that understanding individual concerns is crucial to limit resistance to change – and further, the study emphasize to the potential damage that can occur if concerns are not met, as unmet concerns can, eventually, *"damage the relationships necessary to fostering cooperation"* (Plsek, 1999, p. 3). This underpins the importance of addressing concerns, and aligns well with observations made in Case B, where previous concerns were inhibiting for the assimilation process at a later stage.

Furthermore, adopter concerns were found to relate to dedicated time and resources. Activities connected to the assimilation process, such as planning, educating or creating procedures are valuable to meet concerns of adopters (Hall & Hord 1987) – however, as observed in both cases, these activities are rather time-consuming. In this manner, to effectively address the concerns of adopters, dedicating time is paramount – this further displays the interconnectivity among influential concepts to the spread and assimilation of innovations. In relation to Case B, it was observed that concerns arose initially and no dedicated time were allocated, whereas Case A had a continuous influx of time to support the assimilation and spread processes; thus, to meet concerns of adopters, a continuous allocation of time is crucial.

As regards the forming of boundary spanners, it was found that these can emerge from project champions favorably. Kate was observed to follow this transition, from being active as project champion at her own department, to function successfully as a boundary spanner when supporting other departments. Conceivably, her previous experience as project champion could be leveraged into the role of a boundary spanner. In her engagement with various stakeholders and through training nurses, Kate gained experience with overcoming social and

knowledge boundaries. Thus, while boundaries are typically more pronounced across organizations, navigating inside a larger organization as a project champion could provide some valuable experience in the role of the boundary spanner.

Finally, a synergetic relationship between project champion and boundary spanner was observed in Case B. As pointed to by Shaw et al. (2012), the synergetic relationship only function if efforts are aligned; by contrast, efforts by boundary spanners can hinder the efforts of project champions if their agendas are conflicting. Thus, it was found that efforts by project champions to promote assimilation and spread processes function more effectively through a synergetic relationship with boundary spanners.

6.2 Limitations

The limitations related to the results of this thesis is predominantly connected to the methodological approaches and will be reflected upon in the following section. The limitations presented below should not be consider exhaustive, but those with most significant implication for the findings.

The methodology section (see section 2.1) has already touched upon the advantages of comparative case studies when investigating complex and contextual settings. However, the purposive sampling employed in the case selection, could have implications for the results. Our findings are limited to healthcare innovations which are technological and centers on nurses as the primary adopter groups, while patients are relatively insignificant as adopters. Furthermore, the cases were purposively selected for their difference in innovation spread which could inadvertently have led to a bias among the authors to search for evidence to support this notion. To account for this bias, rigorous data processing and analyzing were conducted and matched with previous findings of the literature (see section 2.4). Still, emerging patterns, such as adverse synergies, could be affected by the purposive sampling.

Limited access to data also increased the limitation of the findings, in two ways. Firstly, Case A is slightly over-represented in the data, with two additional interviews conducted. This limitation could not effectively be addressed, since practical factor among the hospitals did not allow for additional interviews (see Section 2.3). The empirical data and subsequent findings, for Case A, could be considered stronger than for Case B. Secondly, no data was

collected from adopters without apparent key roles in the assimilation and spread processes, such as “regular” nurses or doctors. Again, this limitation could not effectively be addressed, as the staff of hospital experience busy workdays with limited time to participate in interviews. The authors of this thesis have relied on the ability of the respondents to accurately describe the experiences of other adopter groups, as they engaged in spread efforts, although these responses can be liable to biases.

The authors, for the majority of this paper, have used a combination of previous theories and findings to support the data collected, which helped infer relevant connections. However, the interaction of components between each layer is not supported by previous research, although multiple researcher argues its potential relevance (Wejnert, 2002; Greenhalgh et al., 2004). Although, the collected data supports such interaction, the findings could be considered weaker compared findings related to sub-question one and two.

6.3 Further research

Further research into multiple cases of varying context is necessary to infer robust generalizability of the findings related to the four layers of the conceptual framework. Although, each layer is supported by theoretical and empirical findings, the interactions between layers represent new addition to the literature (Wejnert, 2002; Greenhalgh et al., 2004). The authors stress the contextual nature of the conceptual framework, in which the components of each layer could vary between cases. Nevertheless, further research should aim to incorporate multiple angels of analysis, as the assimilation and innovation spread are complex process that cannot accurately be analyzed through isolated factors. Furthermore, throughout the analysis, multiple relevant research avenues, that fell beyond the scope of this thesis, were evident to the authors. These areas of interest will briefly be presented below, along with their relevancy.

Public-private partnership (PPP) have been widely studied in relation to healthcare innovation, yet, most studies investigate how PPPs can improve the innovation generation, not the spread of innovation (Roerich et al. 2014). This thesis has indirectly shed light on this aspect, as Food&Move was seen to be a PPP, where Smartware Ltd. played a role in the spread process, however, the collected data did not support further investigation of this aspect. Arguably, an increase in resources available and communication channels, often attained

through this type of partnership, could have a positive effect on innovation spread. Further research should investigate the influences of public-private partnerships on the innovation spread and ideally compare them to innovation developed exclusively by healthcare institutions.

Developing champions had a critical influence on assimilation and spread of innovation, which was possible through the dedicated time and resources available in each case. However, few studies have investigated the mechanisms in which champions are formed within healthcare (Greenhalgh et al., 2004; Shaw et al., 2012). Other researchers, such as Soo et al. (2009) points to the formal appointment and informal emergence of champions, but the underlying mechanisms are unaddressed. Further research should investigate the role of organizational structure, funding and training, in relation to forming and harnessing champions. Such findings could have implication for assimilation and spread of innovation in healthcare organizations.

Another interesting research avenue relates to the incentive to initiate innovation spread. Although adopter incentives are widely researched, no attention has been given to the incentives of boundary spanners (Rogers, 2003). In both cases, no formal structures incentivize the individual boundary spanners to spread their innovation beyond the first-mover unit, other than strong personal motivations “to do good”. Indeed, adverse incentives were present for the spread of portable chemotherapy that conflicted with DRG-rates. Further research should aim to understand the motivations of boundary spanners within healthcare and the implication for establishing incentives when aiming to successfully spread innovation.

7. Conclusion

This section will conclude on the most pertinent findings of this thesis as presented in the section of analysis and reflected upon in the section of discussion. Thus, an answer will be provided to the overall research question:

How does the dynamic interaction between innovation, adopters and context influence the innovation assimilation and spread processes of the two case innovations?

In particular, the findings will be presented in accordance with the three sub-question and thereby, in sum, answer the overall research question. Thus, each sub-question and related findings are outlined below.

1. **How does the relation between innovation and adopters explain the disparity between the cases in terms of assimilation and spread of innovations?**

The thesis concludes that the first-hand observability exhibited importance in determining the visibility of innovation benefits for adopter groups. In close relation, it was found that the soft periphery of the innovation posed significance to the continuous interpretation of the relative advantage. In particular, innovations with a broader soft periphery are found to be more susceptible to unfavorable reinterpretation of advantages. Additionally, the first-hand observability functions to lessen this mechanism, by diminishing the soft periphery. Another relation between adopters and innovations, which similarly displayed influence on the innovation spread within and amongst healthcare organizations, was the compatibility of previously introduced ideas. Notably, alignment between the innovations and contemporary trends among health professionals appear to promote the assimilation and spread processes. A misalignment in this regard was found to heighten the pertinence of addressing adopter concerns – in particular, an adverse synergy can emerge between the two components of adopter concerns and compatibility. Regardless, the authors stress the importance of devoted efforts to continually meet individual adopter concerns.

2. **How does contextual components concerning organization and inter-linkage explain the disparity between the cases in terms of assimilation and spread of innovations?**

Regarding contextual components, this thesis found that continuous commitment of project champions is vital to the spread and assimilation of innovations, as they provide promotional efforts, leadership and education. To enable the formation of project champions, it was observed that dedicated resources were generally necessary in a healthcare context. Additionally, dedicated time and resources were found to be a significant contextual component. To attain this, sufficient financial incentives is key – a lack of financial incentives related to the innovation was found to deter the attraction of top management support. Further, the persistence of strong social boundaries was recognized to inhibit the innovation spread between assimilator units; the effectiveness of the boundary spanner was largely determined by the ability to overcome this boundary. Moreover, boundaries were found to be mutually reinforcing, where the employment of several boundary spanners appeared to be most effective to overcome multiple barriers.

3. **How does the dynamic interactions between the four layers affect the assimilation and spread processes?**

Lastly, this thesis indicates the pertinence of dynamic interactions between the components of each layer. In this relation, it was found that as knowledge barriers are overcome, the observability can be leveraged by the boundary spanner to foster innovation spread – this establishes an interconnection between boundary spanner and observability. In addition, to effectively address individual adopter concerns, project champions were recognized as important given their proximity to the adopter group. In the same vein, dedicated time was indicated to be enabling to address adopter concerns through efforts of planning, forming of procedures and involvement. Further, boundary spanners that emerge from experienced project champions were implied to be more effective in surmounting social and knowledge boundaries. Correspondingly, alignment in the efforts between boundary spanner and project champion are suggested to be beneficial to overcome similar boundaries.

Despite the contextual nature of the findings on which this conclusion is based, the authors argue that the findings and learnings are applicable to other similar cases – therefore, the findings can be translated to a broader understanding of challenges of innovation spread within healthcare, however, with caution.

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