NTNU – Trondheim
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Diffusion of Process Innovations in Public Hospitals

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Industrial Economics and Technology Management
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3. Masteroppgave

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Oppgavens (foreløpige) tittel **The diffusion of innovations in the Norwegian Health Services**	
Oppgavetekst/Problembeskrivelse The thesis will be a case study to investigate the diffusion of innovations in the Norwegian Health Services, specifically the diffusion of process innovations between hospitals. This study will build on the project thesis from 2013 and will go more in depth on the elements affecting the diffusion process and how these can be affected by deliberate efforts.	
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Kandidatene skal ha *individuell* bedømmelse
Kandidatene skal ha *felles* bedømmelse ☒

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Foreword

This diploma work is the authors' concluding part of a Master of Science degree in Industrial Economics and Technology Management at Norwegian University of Science and Technology (NTNU).

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Trondheim, June 6th 2014

Andreas Ebbesen

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Abstract

Norwegian hospitals are challenged by demographic changes, an increasingly complex clinical picture and longer waiting lines. At the same time hospitals struggle with adopting process innovations aiming at improving efficiency and productivity at a satisfactory rate.

This study is a specific contribution to an increased understanding of the diffusion of process innovations in public health care. The first question answered by this study is related to which specific determinants that affect the diffusion and adoption of process innovations in Norwegian, public hospitals. The second question considers how the efforts of process improvements observed in Norwegian hospitals relate to the innovation-decision model by Rogers (2003). To answer these questions a case study research was selected and 15 interviews with six unique case hospitals and three independent specialists were conducted. This provided the data needed to identify both the relevant determinants and new insight in the efforts for process improvement in Norwegian hospitals.

This study has four main contributions to theory. First, the five most relevant determinants for the diffusion of process innovations were found to be *reinforcement by management, meaning, professionalism, collective action,* and *experimentation*. Second, the findings suggest that interconnectedness of determinants plays an important role for process innovations. Third, the identification of three phases in the process improvement in hospitals resulted in a proposed modification to the innovation-decision model. Fourth, the framework of determinants applied to the phases of process improvement yielded insight in the different determinants affecting each of the identified phases. Implications for managers are a need for increased understanding of how the local process is affected by various elements depending on the phase of a project and increased understanding of the importance of reinforcement by management in facilitating process innovation. Implications for policymakers are that the diffusion of process innovations involves high degrees of inspiration and adaptation, making it hard to facilitate the diffusion of a particular innovation and that the direct influence of policymakers seems to be low despite their given mandate to facilitate development.

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1 Introduction

The healthcare sector has changed dramatically the last couple of centuries with regard to medical and technological advancement. The available technology for treatment has never been better and more conditions can be treated now than ever. However, the technological advancement seems to significantly supersede the innovation rate of process innovations aimed at increasing the efficiency of the system, which means that hospitals today represent modern technologies embedded in old fashion structures (Mintzberg & Glouberman, 2001). This discrepancy might prevent hospitals from achieving the full potential of technical innovations (Christensen & Grossman, 2009). Demographic changes, an increasingly complex clinical picture and longer waiting lines constantly challenge the Norwegian health care sector. The lifestyle changes of our society leading to an increase in lifestyle related diseases, the fact that the population is getting older as a result of the aging "baby boomers" and the increase in life expectancy are all examples of trends that will keep on challenging the health care systems in the years to come. This imposes a higher demand for efficiency to cope with the declining health worker to patient ratio and expected workload (Pedersen & Thonstad, 2008).

Increasing the health care output comes with a cost, and for the public sector the distribution of resources for future investment is a political issue (Christensen & Grossman, 2009; Trisolini, 2002). Public health related expenditures are constantly on the rise in terms of volume even though the percentage of the GDP is relatively stable (Statistisk Sentralbyrå, 2014). In 2013 these expenditures amounted to 288 billion NOK, of which 110 billion were granted the Specialized Health Care Service (Statistisk Sentralbyrå, 2014). While the cost is increasing, a grave concern is how the productivity is still lower than expected, despite a rapid development in technology (Djellal & Gallouj, 2007; Merry, 2003). One of the major cost drivers in hospitals is the number of treatment days, and a recent report evaluating hospital efficiency in Norway found the potential of reducing the days of treatment for only four procedures by 30 000 annually. The reduction would be realized if all hospitals achieved the same efficiency, as the top performing hospitals (Riksrevisjonen, 2013) and illustrates the possible gains by diffusion of process innovations in public health care.

An important part of the challenges related to the discrepancy between technical and non-technical innovation in Norwegian hospitals seems to be that the diffusion of administrative and process innovations is very slow. This is partly caused by a lack of attention, focus and knowledge about how this process actually unfolds. An example that clearly shows these challenges is the process innovations at Namsos Hospital. Their innovation project documented an average of 40% increase in surgical activity after the second year, but despite being exposed to surgeons and a range of hospitals the diffusion of the innovation is still very limited. This phenomenon of slow and fragmentary diffusion is especially prominent within the public sector (Naranjo-Gil, 2009). Studies have also shown great individual differences in how this plays out in

different organizations and that many organizations do not adopt innovations despite the potential benefits they present (Naranjo-Gil, 2009). The problem of increasing efficiency in health care was recently pointed out by the report of 2012 from the Office of the Auditor General of Norway (Riksrevisjonen, 2013). It was stated that significant efficiency gains in hospitals could be achieved by organizing tasks more efficiently, have clear routines, and utilizing the free time in surgical rooms. It was argued that this could be achieved without reducing the quality of the services. The report showed great differences in efficiency between hospitals, and it was concluded that gains could be achieved by adopting practices from the hospitals that had the best efficiency. The problem of low diffusion rates impacts the health care system as a whole, and a better understanding of why this phenomenon occurs is necessary to cope with this challenge.

1.1 Problem definition

Based on the current situation, one of the main perceived problems for Norwegian public hospitals is the inertia of diffusion of process innovations and the lack of understanding, focus and knowledge about the process itself. The following research questions are sought to be answered:

RQ1 *Which of the determinants from the theory of diffusion of innovations are relevant in the diffusion of process innovations in somatic hospitals within the public health care sector in Norway?*

RQ2 *How does the efforts aimed at process improvement in the somatic hospitals, within the public health care sector in Norway, fit with the innovation-decision process by Rogers (2003)?*

The purpose of this research is thus to explore the apparently slow diffusion by identifying the most impeding and facilitating determinants and compare the innovation process from theory with the observed process in the hospital as it relates to the diffusion.

Both questions are answered on the basis of the evidence collected through a qualitative case study research. RQ1 is answered deductively based on the synthesized list of facilitating and impeding determinants affecting the diffusion process of non-technical innovations, which was yielded by the authors' pre-diploma work. RQ2 is answered inductively by comparing the generalized situation to existing theory on the local adoption process in the diffusion of innovations. The two RQs complement each other in achieving greater insight in the diffusion of process innovations, as they focus respectively on the diffusion system with several adopters and the generalized process at each adopting unit. To ensure that the results are clear and separately applicable, the two questions will be answered independently, in their stated order, and presented with separate findings and discussions.

1.2 Content preview

This initial chapter raises the issues regarding the research questions of this study and placed them in a proper context. In Chapter 2 the conceptual background will be presented. Chapter 3 will describe and rationalize the methodology used in this current study, and present the complete research process and the choices made along the way. Chapter 4 deals with the concrete findings of the research process in relation to the two initial research questions. In Chapter 5 the findings of the previous chapter will be discussed in order to answer the two research questions on the basis of the findings and relevant theory. This chapter will also elaborate on the implications of the research results, limitations of the study and suggestions for further research. Chapter 6 presents the conclusion of the study. Supporting material can be found as attachments in the Appendix. Figure 1 illustrates the structure explained above.

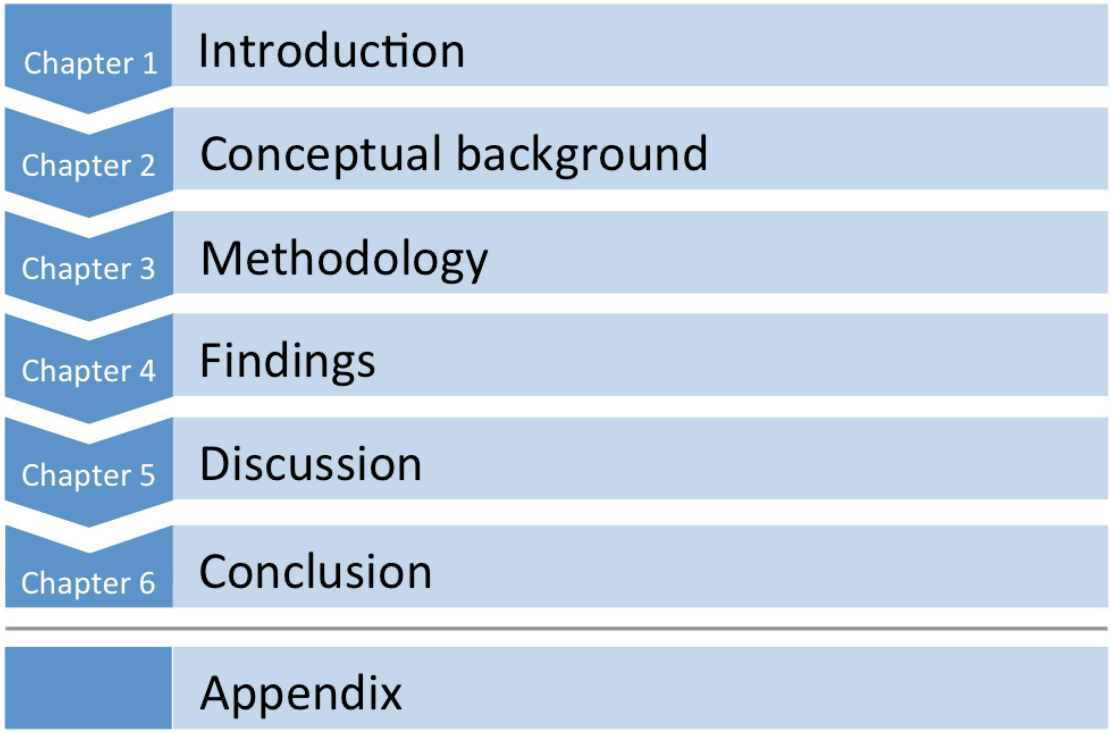

Figure 1: Content preview

2 Conceptual background

This chapter will present relevant theory on innovation, diffusion processes and characteristics of Norwegian public hospitals to enlighten the reader in preparation for the coming chapters dealing with findings and discussion.

2.1 Innovation

The many definitions of the term innovation vary slightly depending on their origin and intended purpose of use. Their common denominator is the understanding of the importance for both economical and social development and sustained competitive advantage (Damanpour & Wischnevsky, 2006; Van De Ven, 1986). Rogers (2003) defines an innovation as:

> *"An idea, practice, or object that is perceived as new by an individual or other unit of adoption."*
>
> *(Rogers, 2003, p. 61)*

2.1.1 Innovation types

Damanpour and Wischnevsky (2006), among other researchers, make a distinction between innovations of technical and administrative or non-technical nature and the diffusion patterns have shown to be different for the different types (Teece, 1980). Administrative innovations refer to superior methods of organization and management. They will in most cases involve organizational disruption and significant set-up cost because the implementation typically requires major reassignment of tasks and responsibilities. As a consequence of the larger change process of interconnected organizational parts for these types of innovations, incremental implementation, testing or partial adoption may not be feasible (Teece, 1980).

Within the category of administrative and non-technical innovation we find process innovations. There are two complementary definitions found in the literature. First, Baer and Frese (2003) define process innovation as the deliberate and new organizational attempts to change production and service processes. If an innovation improves productivity or efficiency in a process by changing the utilization of technology or input factors, but without adopting new technology or new technical solutions, it is a process innovation. Second, The European Commission (2006) defines process innovation as the implementation of a new or significantly improved production or delivery method, which also incorporates new practices. This definition complements the first one by referring to the actual implemented innovation, as opposed to being concerned with the behavior and actions of the organization and therefore includes the attempts to change processes.

2.2 Diffusion of innovations

Rogers (2003) defines diffusion as:

> *"[...] the process by which an innovation is communicated through certain channels over time among the members of a social system."*
> *(Rogers, 2003, p. 151)*

This means the diffusion process for an innovation consists of several innovation adoptions and to understand the diffusion process it is therefore important to understand the adoption process at the adopting unit level (Rogers, 2003). While dissemination of innovations is used to describe the act of deliberately spreading an innovation, diffusion of innovations is used to describe the natural spread without interference from an innovation broker or other incentives promoting the adoption of particular innovations.

2.2.1 Innovation-decision process

The innovation-decision process (Table 1) proposed by Rogers (2003) describes how an organization adopts innovations from the environment. The model consists of five stages: *knowledge, persuasion, decision, implementation,* and *confirmation*.

Stage	Definition
Knowledge	Exposure to the innovation. Lack of information and no inspiration to investigate the option yet.
Persuasion	Rising interest in the innovation. Actively seeking information about the innovation.
Decision	Advantages and disadvantages weighed against each other leading to adoption or rejection.
Implementation	The innovation is employed in various degrees depending on the situation. Usefulness is determined and more information might be required.
Confirmation	Decision regarding continued use is made.

Table 1: The innovation-decision process by Rogers (2003)

2.2.2 Motivation for innovation adoption

Literature on diffusing practices, process innovations and administrative technologies has taken two approaches to explain the motivation for the initiation and adoption process. First, the rational actor model is based on rational decisions and actions by organizations with a desire for technical or efficiency gains that translates into economic performance. The innovation is seen as an opportunity with the uncertain potential of economic gains (Kennedy & Fiss, 2009). It tends to focus on a growing level of general information about the value of a diffusing innovation, which can be seen as information cascades. As more organizations adopt, the available information about the innovation increases and becomes more accurate, which creates more momentum in the process and higher degree of imitation as it reduces search cost and need for experimentation. (Ansari, Fiss, & Zajac, 2010)

Second, the sociological perspective argues that the adoption of innovations by organizations can be explained by a desire to appear legitimate (Kennedy & Fiss, 2009) and a growing pressure toward social conformity as the innovation diffuse (Ansari et al., 2010). The social embeddedness of organizations requires them to appear legitimate to powerful constituents, peer organizations, or outside stakeholders, which creates motivation for adopting appropriate innovations (Kennedy & Fiss, 2009). In this perspective the innovation, or rather the lack of adoption of the innovation, is seen as a certain threat to the organizations legitimacy (Kennedy & Fiss, 2009).

The two approaches can be integrated in a two-stage model, which proposes that the rational actor model has been argued as most appropriate in the early lifecycle of an innovation, while the sociological pressure model is most useful to explain the behavior of late adopters (Kennedy & Fiss, 2009). It has been suggested that motivation grounded in efficiency concerns drives the adoption of customized practices, while the legitimacy pressure drives motivation for adopting conformist innovations (Westphal, Gulati, & Shortell, 1997). Kennedy and Fiss (2009) argue that the motivation to achieve gains is associated with more extensive implementation of the innovation than the motivation to avoid losses.

2.2.3 Adaptation

The term adaptation refers to the process of changing either the innovation or the organization to make adoption and implementation meaningful and suitable within a specific organizational context (Ansari et al., 2010). The theory of diffusion presented by Rogers (2003) is to a large degree based on invariant innovations, which are either adopted or rejected. Other research shows that most process innovations and practices are in some way changed by the adopting organization (Ansari et al., 2010). Ansari et al. (2010) argue that innovations such as management practices often cannot be adopted as "off-the-shelf" solutions. Particularly practices are likely to be subject to custom adaptation, domestication, and reconfiguration in the implementation process. Adaptation is argued to be easier for organizations with slack in resources as slack allows more experimentation and allows managerial attention to move from short-term performance issues to more uncertain innovative projects (Nohria & Gulati, 1996).

Connecting the rational actor model to adaptation leads to a proposition that misfit is more likely to occur among early adopters, which leads to more adaptation early in the diffusion processes. While over time more is known about the innovation and a larger stock of the earlier adaptations are available which leads to adoption of better fitting innovations and less adaptation (Ansari et al., 2010). Risk aversion is likely to decrease the deviation from the previous versions as well as to encourage a cautious and incremental adoption (Kennedy & Fiss, 2009). In the perspective of the sociological accounts and conformity pressures early adopters will have little incentive to adopt innovations that are perceived to not fit as the conformity pressures are low in the beginning. (Ansari et al., 2010)

Compatibility

Researchers have identified the compatibility, or organizational fit, as a critical feature in adaptation. Examples of poor fit can be experienced during assessments, feedbacks, employee resistance and increased dissatisfaction levels (Ansari et al., 2010). Nadler and Tushman (1980) define compatibility as:

> *"[…] the degree to which the needs, demands, goals, objectives, and/or structures of one component are consistent with the needs, demands, goals, objectives, and/or structures of another component."*
>
> *(Nadler & Tushman, 1980, p. 45)*

The fit is frequently divided in three components, technical fit, cultural fit and political fit. The types of fit may be predictors of timing of adoption and the type of adaptation that is seen. Technical fit is the degree that the technological foundation and characteristics of the innovation are compatible with the technologies already in use by the potential adopters. With the strong cultural characteristics of hospitals, cultural misfit could be more relevant for process innovations. The cultural fit refers to the degree the cultural values and beliefs in the organization are compatible with the diffusing innovation. A way to overcome this is to adapt so that the innovation becomes useful in relation to the cultural expectations, which can be done by changing the naming and positioning of the innovation. It is proposed that conformity pressures and the sociological perspective is the dominant mechanism affecting these responses. As conformity pressures are low in the beginning, much adaptation can occur, but when conformity pressures increase adaptation is restricted. Cultural misfit is therefore more likely in the later stages of the diffusion process as later adopters are restrained from adapting. Political fit is the degree of compatibility between the implicit and explicit normative characteristics of an innovation and the interests and agendas in the adopting organization. Organizations with heterogeneous political environments will lead to counter mobilization and compromises which is likely to lead to adaptation. Ansari et al. (2010) argue the importance of considering the compatibility or fit not only in a static matching, but also accounting for dynamic and multidimensional fit, where changes may happen to both the innovation and the organization.

Dimensions of adaptation

Researchers have identified two dimensions, extensiveness and fidelity, that characterizes the adaptation that an innovation undergoes. Extensiveness considers the degree of implementation in the organization compared to the previous version. It has been argued that adaptations with increased extensiveness in implementation represent a more far-reaching effort, than less extensiveness, which indicates restricted efforts in implementation (Ansari et al., 2010). Fidelity is how the innovation resembles or deviates from the previous version or the version that is diffused to the adopter, which means that it is not relative to the original prototype. Fidelity covers both the scope and the meaning and ranges from "true" to "distant" (Ansari et al., 2010).

Determinants affecting diffusion of innovations

Theory and research on diffusion has introduced the term "determinants" for characteristics or elements that affect the diffusion-process. The determinants are often organized in frameworks or lists and ordered by the area they belong to, which often are called factors. The factors are named after the areas they cover: *innovation, adopting unit, organization* and *external.* A display of determinants described in the literature, including their definitions, can be found in Appendix C.

The determinants may be positively or negatively correlated with diffusion and adoption rates. A determinant can represent a continuum from either impeding to facilitating, from impeding to neutral of from neutral to positive, depending on the it's nature. Many determinants will represent a continuum from negative to positive, meaning that the absence of a positively correlated determinant could have an impeding effect and vice versa. The facilitating or impeding effects of determinants must be seen in the relative context of all the factors, to detect the overall effect on the process (Damanpour, 1991).

2.3 Organizational learning

A central concept in organizational learning is the relationship, balance and allocation of resources between exploration to find new ideas and the exploitation of old ideas (March, 1991). In the classical rational actor model and rational search models it is assumed that there are several investment opportunities with a probability distribution that is initially unknown. Over time the actors may choose to accumulate information on the distribution and returns of the uncertain investment opportunities by allocating resources for exploration. The other alternative is or to allocate resources to exploitation of the current and better-known opportunities.

By exploring, the organization implicitly reduces the resources for gaining and improving skills and knowledge of the existing ideas. In the same manner, improvements in existing procedures, techniques and other known elements will make experimentation with new ones less attractive and more difficult. It is recognized that this problem of balancing efforts occurs at all levels of the organization, from the individual level to the organization and social system level (March, 1991). Due to the differences of the nature of the two, adaptive processes improve exploitation more rapidly than exploration and over time this accumulates. This circle of increased exploitation efforts may be argued to be self-reinforcing as the increases in competence and engagement in an activity will increase the likelihood of return from this activity, hence suggesting further exploitation (March, 1991). It is argued that in industries with low technological opportunities and modest investments by other firms for search and exploration, there will be low incentives for a particular firm to draw from external knowledge and a higher reliance on internal sources (Laursen & Salter, 2006).

Capabilities for mutual learning is a central part of the search for new ideas. It is the interplay between the stored knowledge, values, norms, procedures accumulated over time in an organization, called the organizational code, and the

socialization of the individuals in the organizational context. They both affect each other and converge over time (March, 1991). The old-timers in the organization will often know more and their knowledge will often be redundant, and newcomers who frequently deviate from the code will contribute more (March, 1991). It has been recognized that learning processes that involve introducing new elements from exploration often will increase average performance, but in the short-term increase the variability due to the limited experience with the new elements. It is therefore a trade-off between the expected performance gains and the disadvantages of unfamiliarity. March (1991) argue that one coordinated effort often will realize higher average results, but the variability of the result may offset this benefit. Smaller, independent efforts may in turn have greater reliability in total, but pay the price with lower average results.

2.4 Hospital characteristics

This section presents the most important characteristics of the hospital organization and its culture.

2.4.1 Hospitals as public institutions

Institutional theory and theory of bureaucracies are central in the description of hospitals. “Bureaucracy” describes the administrative system governing a large, public institution and receive criticism for their complexity, inefficiency, and inflexibility (Store Norske Leksikon, 2007). Private and public organizations differ in many ways, such as environmental demands, managerial roles, managerial perceptions of external control, and work-related attitudes among employees. Higher levels of bureaucratic control in public than private organizations are caused by the high degree of external control characteristics, which negatively influence managers' desire to delegate authority (Damanpour, 2001). The institutional perspective emphasizes that the goal of the organization is stability and persistence and that the normative embeddedness in the institutional context is a source of resistance to change (Lam, 2004). Noneconomic factors play a significant role and include external conformity pressures from regulatory bodies or parent organizations, social pressures from other organizations with ties to the focal organization and pressures from the environment to conform to conventional beliefs. Legitimacy for the organization is created by establishing appropriate structures and processes that fit with these beliefs and are adjusted to the pressures (Walston, Kimberly, & Burns, 2001).

2.4.2 Complexity in hospital organizations

Hospitals are characterized by how the work is variable and complex, often of a non-deferrable nature, have a low tolerance for error and is hard to measure in terms output, which separate them from many other organizations (Djellal & Gallouj, 2007; Grund, 2006; Shortell & Kaluzny, 2006). The highly interdependent work activities contribute to the complexity by requiring coordination of professionalized roles with an extremely high degree of specialization (Shortell & Kaluzny, 2006). Up to 260 different occupational

groups with different views of the world can be found in a hospital (Shortell & Kaluzny, 2006) and studies show that the loyalty to the profession result in dual lines of authority between the administration and the profession leaders (Djellal & Gallouj, 2007; Shortell & Kaluzny, 2006; Trisolini, 2002).

The complexity and emphasis on intangible factors in quality of care result in difficulties in measuring productivity (Carney, 2004). The hospital as a service organization is characterized by intangible and immediate consumption of output and interaction between customer and client for complete delivery. Employees must therefore deal with client variety and unpredictability, which drive complexity. Porter and Teisberg (2007) argue that there is awareness and frustration among many physicians about the poor coordination, poor information sharing, inefficiency and redundancy in today's hospital.

2.4.3 Professionalism

Professional organizations like hospitals tend to be inward looking bureaucracies (Quinn, Anderson, & Finkelstein, 1996) and they are often created for stability and persistence. The members have a stability-oriented mindset, considerable responsibility for defining and implementing goals, setting and maintaining performance standards, which could inhibit change (Mintzberg, 1979; Scott & Davis, 2007). Change resistance may be reduced by clearly demonstrating the benefit for the patients and letting the professionals "have their say" (Miller & Kearney, 2004). Strong professions make it hard for innovations to penetrate the organization from the outside as the professionalism often leads to self-exaltation and a "we know better" mentality (Melhus & Eriksen-Deinoff, 2013). This mentality is triggered by the *not invented here syndrome*, which is defined as:

> *"[...] the tendency of a project group of stable composition to believe that it possesses a monopoly of knowledge in its field, which leads it to reject new ideas from outsiders to the detriment of its performance."*
> *(Katz & Allen, 1982, p. 7)*

In many cases changes are viewed as a threat to the autonomy and competence of the health professionals, and may therefore be opposed actively (Miller & Kearney, 2004). Members of a profession regard their own profession as "the elite" and are often reluctant to share knowledge and insight with other professions (Van De Ven, 1986). Lam (2004) argues that the innovative capacity within the domain of the professionals may be high, but that the difficulties of coordination across functions and disciplines limit the organizations innovative capacity as a whole.

2.4.4 Change in hospitals

Managing change in hospitals is challenging, largely as a consequence of professionalism, as professions often disdain the values and evaluations of those outside their discipline (Bate, 2000). They are reluctant to subordinate themselves to others and to support organizational goals not completely congruent with their special viewpoint (Bate, 2000). According to institutional theory hospitals are designed to be stable, which causes high inertia and

innovations are often met with resistance (Caldwell, Chatman, O'Reilly, Ormiston, & Lapiz, 2008; Davies, Nutely, & Mannion, 2000; Jones et al., 2008). Bate (2000) argues that there is an incompatibility between the stability orientation of the traditional professional bureaucracy of hospitals and the newer demand for change-oriented health care organizations. At the same time the pressures on the hospital as a public institution influence and motivate the health care managers to a significant degree (Walston et al., 2001). Porter and Teisberg (2007) also emphasize how attempts for change are imposed from the outside and that the changes are often incremental and focused on increasing productivity by minimizing costs. Walston et al. (2001) argue that external pressure is found to often be superficial and that motivation for organizational innovation must exist within the hospital. It is therefore necessary with an organization where employees' perspectives and subcultures are aligned around the same values, away from the individualistic culture of professionalism and with a positive orientation towards change (Caldwell et al., 2008; Grund, 2006; Trisolini, 2002).

Lega and DePietro (2005) argue that the focus of the change should be on quality and creating care-focused organizations. The main features should be integration of clinical functions, focus on patients and their needs, sharing and integration of resources, and engagement of clinicians into hospital management roles. Moch and Morse (1977) propose that the medical staff will only actively support adoption of innovations related to treatment and diagnosis. Consequently hospitals require leaders with the ability to lead disciplines and exhibit high relational skills (Melhus & Eriksen-Deinoff, 2013) and it is argued that change processes are most successful when led by physicians (Porter & Teisberg, 2007). Giving the professionals and staff the feeling of ownership over the processes of patient care and administrative services is necessary for the process to succeed (Trisolini, 2002; Young, Charnis, & Shortell, 2001). Research shows that innovations often diffuse between hospitals through leaders and management, but that the success is context specific and that it demands local adaptation every time (Rowe & Hogarth, 2005; Trisolini, 2002).

2.5 Overview of the Norwegian Health Care system

The public health sector is governed by the government and financed by the tax-system. Two organizations are responsible for control centrally, the Norwegian Directorate for Health and the Ministry of Health and Care Services. The public health sector is divided in primary health care and specialized health care, where the latter is of interest for this study. The specialized health care is controlled by four, separate, legal entities called Regional Health Authorities (RHA), which control the hospitals in the region (Lindahl, 2012).

The Ministry of Health and Care Services (hereafter the Ministry) is lead by a representative from the Government. The Ministry owns health institutions and the four regional health authorities in Norway. The Ministry directs the health services by means of a comprehensive legislation, annual budgetary allocations

and through various governmental institutions (Høyre, 2013). The Norwegian Directorate of Health (hereafter the Directorate) is an executive agency and competent authority subordinate to the Ministry. Three roles are assigned to the Directorate:

- Serve as an administrative agency and competence center and help to implement and pursue national policy in the health and social services sector.
- Provide advice to central authorities, municipalities, health enterprises, voluntary organizations and the general public.
- Help to facilitate the development of quality and the ranking of priorities in health and social services.

(Helsedirektoratet, 2011a)

As a means of achieving these tasks the Directorate is responsible for the national professional guidelines, which contain systematically developed recommendations, which establish the national standard for diagnosis, treatment and follow-up of various patient groups. (Helsedirektoratet, 2011a)

The Specialized health care has since the Norwegian Hospital Reform in 2002 been supervised and controlled by RHAs. The Ministry regulates the RHAs' budgets and decides what to prioritize, achieve and report. The RHAs has a responsibility to "ensure" that the tasks are performed according to guidelines and directives among these are goals within research, education and training. Regulated by law, they have the responsibility for supporting, promoting and guiding the hospitals in ways to achieve synergies, increased efficiency and coordination between hospitals. (BDO, 2012)

2.6 The Norwegian, public hospitals

According to the Patients' Rights Act, all citizens in Norway have the right to choose hospitals freely (Stortinget, 1999). The hospitals are governed as publicly owned corporations with an executive board approved by the Ministry. In the current governmental platform is it stated that there are too big variations in the quality of the services in Norwegian Hospitals and that the Government will seek to improve this. (Høyre, 2013)

2.6.1 Hospital types

For many services the local hospitals are the preferred service-provider, as they represent local knowledge, proximity and broad competency. University hospitals differ from local hospitals by being connected to a medical faculty that engage in research and clinical and theoretical education of medical professionals. The last few years some hospital services have been centralized, which has raised some concern for the future of the local hospitals. Hospital foundations are privately owned hospitals that are financed by treatment of public patients in the public health care system. (Helse- og omsorgsdepartementet, 1996)

2.6.2 Hospital management

Traditionally hospital managers have been chosen among highly qualified and educated professionals, preferably a doctor of medicine. This strong focus on competence-based leadership, where leaders are expected to maintain their medical expertise to retain their legitimacy, has in some parts of the system lead to a lack in transformational leadership (Melhus & Eriksen-Deinoff, 2013). As a consequence of the introduction of professional neutrality for managers in public health care, there is an increasing number of managers without clinical background (Kjekshus, 2004). This leads to complications, as terminology and values not always are congruent across different disciplines and lack of medical background can cause problems with legitimacy in the organization (Melhus & Eriksen-Deinoff, 2013).

2.6.3 Functional departments

Hospitals are organized in functional departments based on the medical profession and other related support functions are organized within each department. Surgery is divided in acute surgery and elective surgery. While elective surgery is predictable, acute surgery requires emergency facilities, which means that the working schedules of teams for operations must be adjusted for nighttime and that the competence for the emergency team must be sufficient for many types of operations.

The patient path through the hospital and the health services has been given increasing attention the last years. The process starts with a consultation with a specialist in a polyclinic, continues with pre-surgery activities, the surgery and post-surgery, and finally the follow-up. In such a path several functions from various departments are involved and must coordinate efforts. In essence there are two waiting lines in the patient path, the first for consultation at the polyclinic and the second for surgery.

2.6.4 Funding

The Ministry funds the four RHAs that in turn finance the hospitals. The hospitals are financed through fixed-allocations, activity based allocations, refund and patient co-payment and earmarked allocations. The fixed-allocations are 60% of the total funding and depend on demographic specifics like population size and age distribution in the region (Helsedirektoratet, 2011b, 2012). Activity based funding in combination with co-funding from municipalities and policlinic refunds accounts for 40% of the ordinary funding. The refund covers the ordinary operating expenses based on an average calculation for the type of treatment, the condition of the patients and how the treatment is performed. Strict economic budgets and high focus on available resources are a part of the daily life in public hospitals. The department leaders can operate autonomous within these budget-constraints, i.e. controlling the schedule and the amount of services produced (Harris, 1977).

3 Methodology

This chapter will cover the methodology used to arrive at this study's final result. Figure 2 illustrates the sequence of this chapter, starting with the research strategy, then the data collection and data analysis will be reviewed in terms of methodological choices. The relevant part of Figure 2 for the methodology to cover in the last step is the research quality in terms of replicability, reliability and validity. This will express the general limitations on the methodology presented in the three previous subchapters.

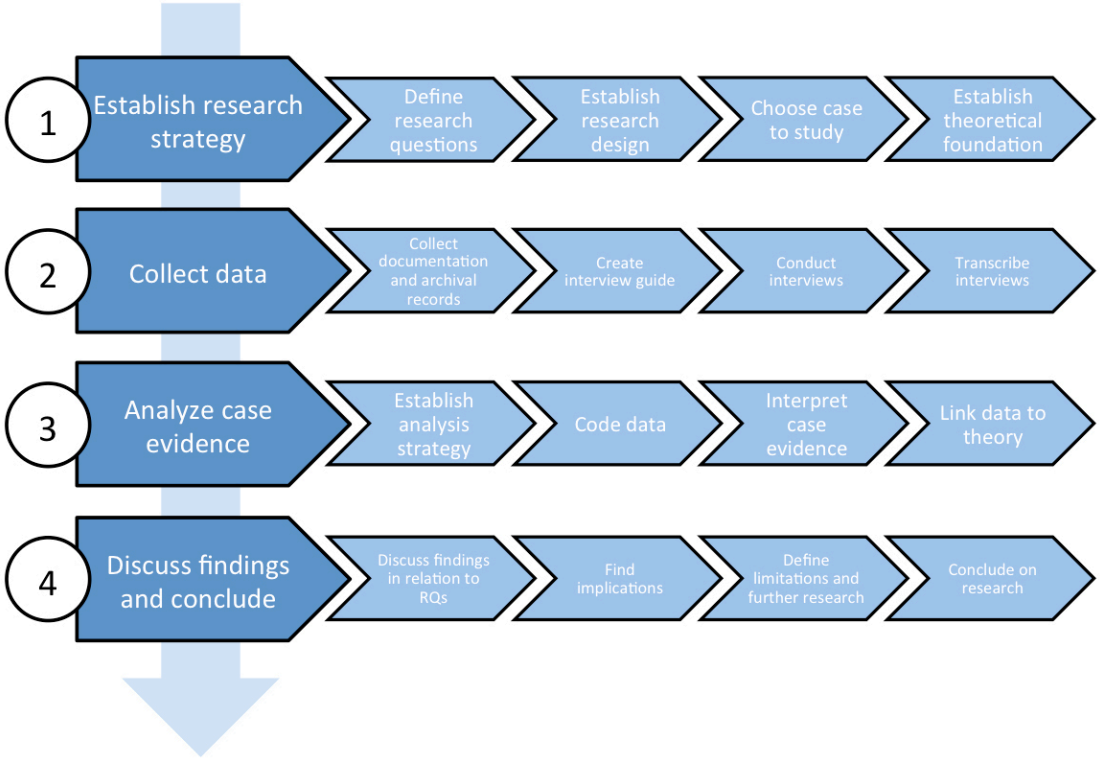

Figure 2: Illustration of the steps of the research process

3.1 Research strategy

To address the defined research questions in an optimal way, an exploratory, qualitative, multiple-case study research was chosen. The nature of RQ1 led to the use of a deductive approach, as the established theory provided sufficient structure and basis for the purpose of the RQ. An inductive approach was used for RQ2, allowing an iterative process for building knowledge (Bryman & Bell, 2007).

The ontological position of this study is critical realism, as there is assumed to exist a reality that is imperfectly and probabilistically apprehendable due to human cognitive limitations and the intractable nature of phenomena (Guba & Lincoln, 1994). The epistemological position of this study is modified dualist/objectivist, as dualism is largely regarded as impossible to maintain yet objectivity is still considered the regulatory ideal (Guba & Lincoln, 1994).

3.1.1 Defining the research questions

The pretext to this research was an in depth literature review conducted within the theoretical field of innovation diffusion, in the context of process innovations in public sector. This literature review and the example of limited diffusion of the successful process innovation at Namsos Hospital, formed both the motivation for the current study as well as the foundation for the RQs presented in *1.1 Problem definition*.

The preparations formed the understanding for both the public health care in Norway and the theory related to diffusion of innovations. With focus on the seemingly slow diffusion among hospitals, the RQs were formed with the aim of revealing the cause of this and hopefully also reveal possible solutions to increase the diffusion rate.

3.1.2 Research design

The research design is built after the five components for a good design given by Yin (2014). The first component is the RQs, which both have an explanatory focus and are on a form suited for case study research. The explanatory nature of this study justifies the lack of clear propositions as guidance, which is the second component. The exploration in itself will reveal and provide the new knowledge that will determine the relative success of the study. The third component, unit of analysis, is the individual hospitals that all have in common that they are public, Norwegian, somatic hospitals. According to theory they are coinciding with the cases and the units actually being investigated (Yin, 2014). The fourth component, logically linking the data to the propositions refers to the analytical techniques used for interpreting the gathered evidence, and will be described in greater detail in *3.3 Analysis of research data*. For the fifth component, criteria for interpreting the findings, the major strategy was to use pattern matching.

3.1.3 Choice of case

Based on the known example from Namsos Hospital that motivated this study, it was natural to restrict the scope of the study to the public sector where the particular behavior was observed. The private sector was out of question for comparison since it can be assumed to be driven by other, non-comparable mechanisms. The observed behavior was also restricted to somatic hospitals, which seemed like a natural constraint for the scope, as it allows for a big pool of potential research material and case opportunities.

This scope initially left all Norwegian, public, somatic hospitals as case candidates. University Hospitals were eliminated from the pool due to features like size, complexity and focus on education and research that severely separated them from the local hospitals. The pool had to be further narrowed down in order to comprise a manageable number of cases. Utilizing the contact network of the observed example project at Namsos Hospital, a list of nine potential cases was developed. The list consisted exclusively of people with a genuine interest in process improvements, innovations and effective hospital management. This ensured that the people contacted at each hospital were

management. This ensured that the people contacted at each hospital were acquainted with the hospitals' innovation practices. Figure 3 illustrates the restriction for the feasible case alternatives.

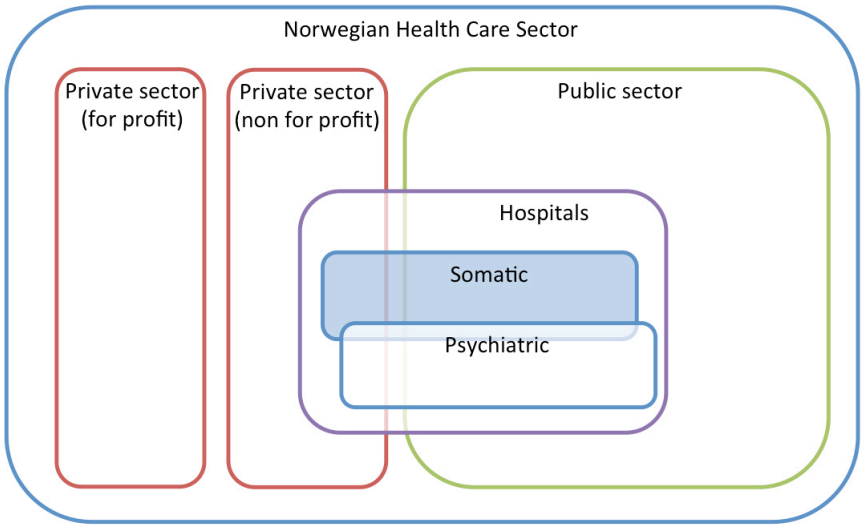

Figure 3: Narrowed segment for case selection indicated with blue color

The aforementioned list was a shortcut to get in contact with the right people in a hierarchical network that often can be very inaccessible without the proper connections. These people also worked as gate openers to others that could provide useful information.

3.1.4 Theoretical foundation

The theoretical foundation of this study originates from two main sources. The first one is the literature review on innovation diffusion, which was the main contributor to the theory of the conceptual background. It also formed the understanding of the concept of innovation and the idiosyncrasies of health care and hospital management.

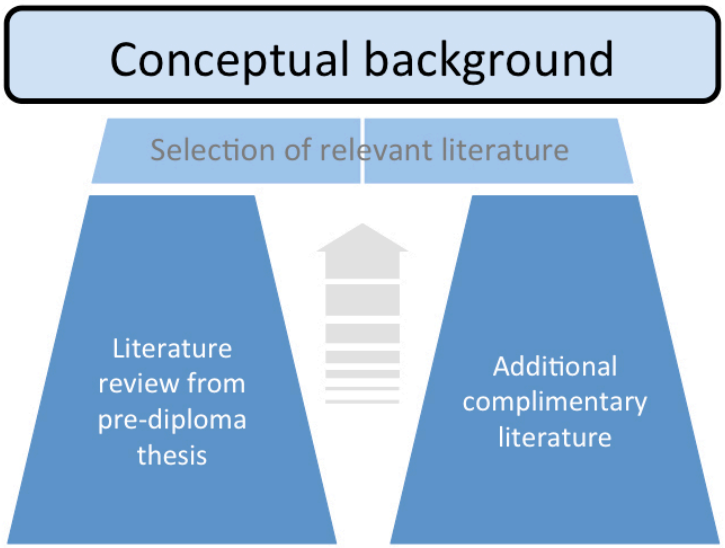

Figure 4: Sources of the theoretical foundation

The second source of theory was the complementary literature. As the research design of the current study gradually developed, literature outside the scope of the pre-diploma work was added through electronic literature searches and material received from the project supervisors. No matter which of the two sources of literature the theoretical elements originated from, they were thoroughly evaluated against the strategic goal of the research questions to ensure their relevance (Figure 4).

3.2 Data collection

This section will discuss the three different sources of evidence used in this research in their respective order: interviews, documentation and archival records (Figure 5). No single source of evidence has a complete advantage over the others. This complementary nature of the data sources makes the reliance on multiple data sources an important trait for a good case study (Yin, 2014). This case study benefits from triangulation by convergence of data from different sources, which substantiate the consistency of the findings (Yin, 2014).

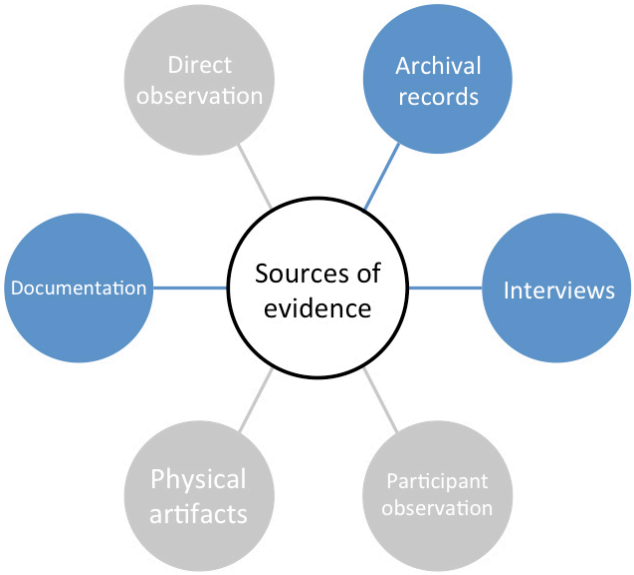

Figure 5: Six sources of evidence (blue sources are used in this study)

3.2.1 Interviews

For this study, interviews were the main source of case study evidence. Interviews are considered one of the most important sources of evidence for case studies and allow for the interviewer to obtain targeted and insightful information (Yin, 2014). The choice of interviews as the main source of evidence was a natural consequence of RQs that are of qualitative nature. Before the case interviews one informal interview was conducted with an experienced researcher in the health sector in order to prime the interviewers for the upcoming interview situation.

In total, 15 interviews were conducted. Initially, two interview objects were chosen for each case hospital, one surgical department leader and one subordinate with personnel responsibility. However, through the continuous coding of the gathered data it was clear that the value of the department leader

interviews by far surpassed that from the other interview objects, and it was therefore decided to focus the resources toward interviews with department leaders. Among the 15 interviews, three were conducted outside the boundary of the individual cases. These interviews included external specialists acting respectively as regional hospital coordinator, evaluator and consultant. These experts contributed with differentiated views on the challenges in question, as well as opinions fueled by other motives than the insiders interviewed in each case.

The interviews were all held in a semi-structured fashion in order to let the interview object speak freely (Bryman & Bell, 2007). This made it possible to adjust each interview slightly to pick up on the local differences at the different hospitals (Bryman & Bell, 2007). An interview guide (Appendix A) provided a tentative plan for the interview, with questions covering fairly specific topics. This guide ensured all the questions were asked in similar wording in each interview. The interview guide was revised (Appendix B) after conducting about half of the interviews to support emerging patterns by selecting the themes that by experience provided the most unaided and relevant response. The expert interviews were closer to being unstructured as the proceeds from these interviews were a lot more uncertain than the hospital interviews.

3.2.2 Documentation

Documentation as a stable, unobtrusive, specific and broad source of evidence was important for this study (Yin, 2014). This documentation came from multiple different sources including presentations slides, administrative documents and news articles. Despite the strengths exhibited by this source of evidence, all data was handled with care and was never presumed to be totally objective and unbiased. Various news articles were evaluated especially to get an outside perspective on the individual cases. Media appearances, work related documentation and general background information was retrieved for all interview objects and served as material in preparing for the interviews.

Internal PowerPoint presentations and administrative documents were used to support the interviews and verify facts regarding the cases. Some documentation was also available from an earlier case database on one of the specific cases, which was used in preparation purposes.

3.2.3 Archival records

In conjunction with other sources, archival records contributed primarily as supporting evidence for the interviews by being somewhat more precise and objective (Yin, 2014). “Public use files” as part of archival records, and the fact that the scope of this study is limited to public hospitals makes archival records an important source. Statistics Norway, Office of the Auditor General of Norway and Ministry of Health and Care Services does all provide publicly available material on the public health sector.

3.3 Analysis of research data

The result of the data collection was large amounts of unstructured textual material, most of it transcripts, which is data of highly qualitative and unstructured nature. Although there are no clear-cut rules for analysis of qualitative data according to Bryman and Bell (2007), there are some methods that can provide results ready for interpretation without leaving the results to contingency. This section will further explain the systematic approach taken in analyzing the case data.

3.3.1 Analysis strategy

Coding was used as the key technique in analyzing the case data. This technique is considered the main process in grounded theory, which the strategy of this study is partially based on (Bryman & Bell, 2007). Through grounded theory, theory can be developed in parallel with the collection of evidence allowing the theory to be adapted to the context it illustrates (Glaser & Strauss, 1967; Widding, 2003). The interpretive analyzing technique of coding was used to break down qualitative data and sort it in different codes.

Coding technique

RQ1 was coded deductively using the 37 determinants from Appendix C as codes, to check whether they applied to the chosen set of cases. RQ2 was coded according to grounded theory by inductively letting the code system develop in accordance with the data as the research unfolded. This coding procedure made sure nothing was excluded from examination and further interpretation (Widding, 2003).

The CAQDAS (Computer Assisted Qualitative Analysis Software) named MAXQDA (version 11.0.5) was chosen for the electronically supported coding of the interview transcripts. This software made it possible to generate analyses based on the coded material and permitted multiple users to work on the same project.

Considering that Appendix C provides definitions of every determinant, the room for subjective influence was limited to the interpretation of the coded segments itself. Since coding of qualitative data always to some degree will be subject to subjective influence, a weighting system (Table 2) was used for the coded segments. By weighting each coded segment, it was possible to account for their relative strength when later analyzing all the different segments.

Weight	Explanation
0	Segment interpreted to support the coded determinant
1	Lower degree of unsolicited support of the coded determinant
2	High degree of unsolicited support of the coded determinant

Table 2: Explanation of weights assigned to coded segments

There is an established understanding that the set of determinants used as codes to some degree is intertwined and in some cases hard to separate (Ebbesen & Undrum, 2013). By using coding to interpret the qualitative data, the same text

segment can be assigned to multiple codes if the circumstances require it, hence no data was excluded from further analysis due to overlapping codes.

The coding process

Figure 6 visualizes the four steps of the coding process. The first step of the process was to transcribe all the interviews to make them suited for coding. In total 15 interviews were transcribed. To give an impression of the magnitude of data represented by these interviews, they amounted to a total of 133 390 words and about 250 pages.

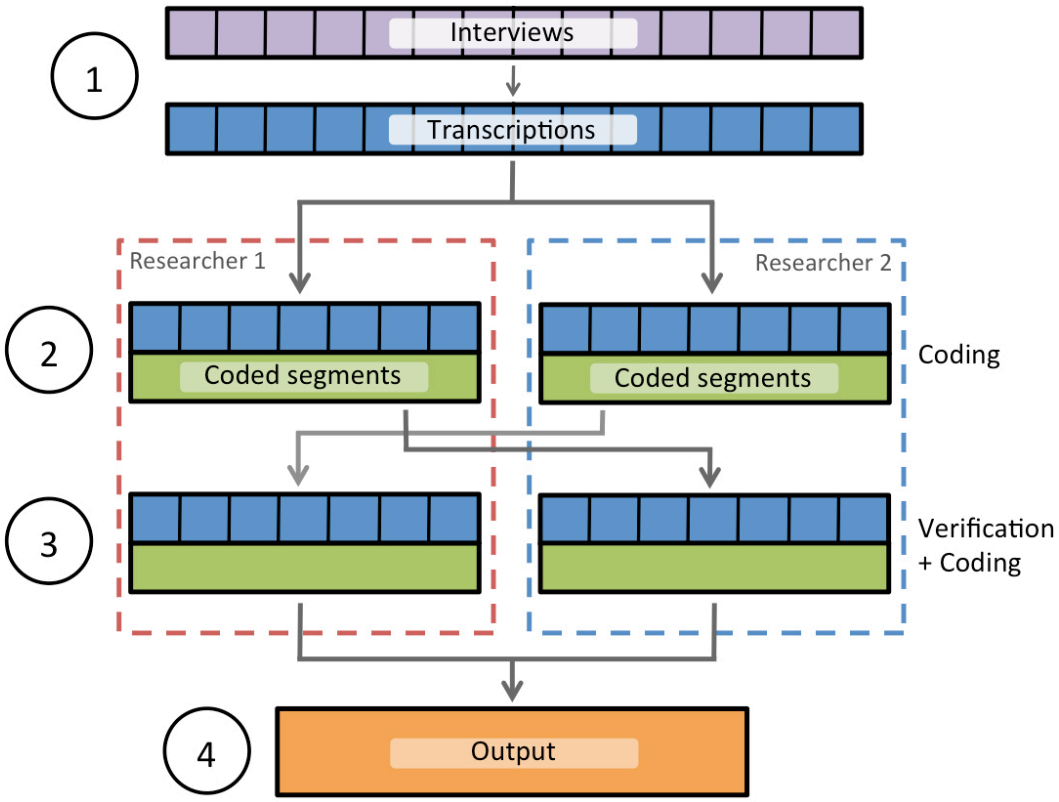

Figure 6: The four steps of the coding process

The second step of the process was to code the transcribed interviews. The transcribed interviews were divided in two arbitrary groups and thereafter coded by two separate researchers independently. This amplified the importance of clear guidelines to ensure a congruent output from the two coding processes.

The third step of the process was to cross-check and verify the coding by switching the transcribed interviews and corresponding coding. This made it possible to ensure a mutual understanding of the criteria was established for the coding procedure and to pick up on segments that might have been overlooked. To check the consistency of coding between the two researchers, a comparison was made between the distributions of coded segments coded by each of them.

The fourth and last step of the coding process was to generate output for further analysis. This output included summaries of the coded segments, graphic data and statistical summaries of the coded data. Some of this will later be presented in *4 Findings*.

3.3.2 Finalizing the analysis

The QACDAS counts the number of segments assigned to every code, the frequency. It also measures the magnitude of each segment, indicating how extensively the code was emphasized and talked about. Both parameters were used when analyzing the coding results. The statistical summaries then represents a quantitative representation of qualitative data, which makes it possible to compare their relative importance in the data. As the results show, the outcome of the two coding parameters was quite coinciding (Appendix D).

While frequency is only dependent on the number of coded segments, the total magnitude depends on both the number of coded segments and the average area of each coded segment. The variance of the area of a coded segment, due to factors like varying articulate skills of the different interview objects, will naturally have a smaller impact as the number of coded segments increase and the segments becomes subject to the laws of large numbers, and will eventually get evened out. It can be assumed that frequency is subject to a much smaller variance than the code area, making it the preferred measure at lower frequencies where the variance of the parameters has a greater impact on the result. This means that sorting the codes after total magnitude makes sense for the codes that occur many times.

The assigned weight was used to verify the relative strength of the codes to ensure consistency among the codes represented in the findings and were also a precaution meant to ensure that determinants of equal frequency or magnitude could still be ranked by another parameter.

To analyze the material in light of RQ2, an inductive coding approach was used. The segments relating to the efforts of process improvements were identified and coded with a number ranging from 1 to 6 according to their appearance in time. If the segment occurred in the very beginning of the process, it would be coded with “1”, and if it occurred close to implementation, it would be coded with “6”. These codes were further analyzed, refined and then grouped to eventually form codes representing individual phases with certain characteristics.

3.4 Quality of research

The following section will explain the elements affecting the quality of research and how they were handled to minimize the limitations they impose on the research. First, the reliability of this research will be evaluated. Second, validity and its three sub categories: construct validity, internal validity and external validity will be accounted for. (Yin, 2014)

3.4.1 Reliability

The reliability of a study shows to what extent the same case research can be repeated at a later time yielding the same results. The coinciding results should be the same both in terms of findings and conclusion. The goal of this factor is to take the biases and errors out of the study. (Bryman & Bell, 2007; Yin, 2014)

Everything done in preparation and execution of this study was planned and documented, which makes the study replicable. The more detailed and better the documentation is and the more steps that are be made operational, the more closely can the research be replicated (Yin, 2014).

A case study protocol was developed for practical and methodological reasons as interviews were an important contributor of data. The case study protocol functioned as an interview guide (Appendix A) for the semi-structured interviews and ensured that all routines were followed from the initial contact with the interview object until the recorded interview was transcribed. The multiple case study design enhanced the importance of the research procedure being highly replicable in each case (Yin, 2014).

A case study database was established to ensure safe and organized collection of data and resources and increase the reliability of the study (Yin, 2014). To ensure easy access the database was stored electronically in a sky storage platform, accessible on all computers and platforms with Internet connection. All files were categorized and stored in a folder structure to make it possible to retrieve old drafts and files if necessary. This way of organizing and storing the research material made the research work easier and it also allows for review and verification of the material if needed.

Semi-structured interviews are subjectively influenced and hard to replicate and might yield different answers when repeated, even if the interview object is the same. Performing the same research procedure at a later time interviewing the same people and expecting to receive the same answers might prove difficult due to cognitive limitations and selective memory. Time will also be of essence in regard to the strength of this study's reliability. The characteristics defining the context of this research might change in the future, making the whole premise for the research no longer relevant, meaning reliability could fade with time.

3.4.2 Validity

Validity refers to whether the measure of a concept in fact measures that concept in as satisfactory way. This means that the credibility of the results and conclusions of a study relies on the validity of the research performed. The three types of validity: construct validity, internal validity and external validity will all be assessed in relation to the current study and the tactics used to deal with the different forms of validity (Yin, 2014).

Construct validity

Construct validity concerns the identification of appropriate operational measures for the concept being studied, and is especially challenging to establish in case study research because subjectivity easily influences the data collection (Yin, 2014). Multiple sources of evidence were used to increase the construct validity of the study. To ensure a great variety in the interviews, multiple cases and multiple interview objects within most cases were used. This allowed data triangulation within each case, as well as for the total set of collected data. Although interviews represented such a dominating part of the collected data,

the findings from the individual sources of evidence seemed to converge and thereby ensure a higher degree of construct validity for the study. To further strengthen this pattern of convergence, external and independent experts were consulted about the same topics to see if there was a distinct discrepancy in the information provided by the involved and external sources. These expert interviews further supported the convergence from the case interviews and thus supported the construct validity of the study.

Internal validity

Internal validity concerns the establishment of a causal relationship between conditions and assumed results of those given conditions (Yin, 2014). One of the most effective ways to enforce the internal validity of a study is by using pattern matching, where an empirically based pattern is compared to a predicted one (Yin, 2014). By conducting interviews with two different groups of objects, two patterns were retrieved. The conceptual background forms a predicted pattern, which was matched with patterns emerging from the analysis of the independent case interviews and the specialist interviews. The consistency of the patterns strengthened the internal validity of the study.

External validity

External validity concerns the degree to which a study's findings can be generalized beyond the study itself, and is often addressed through random and representative sampling (Bryman & Bell, 2007). This definition automatically imposes some limitations on the external validity of this study since the sampling was not completely random (see *3.1.3 Choice of case*). Cases were chosen from a limited number of hospitals, and University hospitals were intentionally left out. The apparent limitation imposed by leaving hospitals with certain characteristics out, does not affect the external validity to a high degree since the findings of the study does not claim to be generalizable for the all types of hospitals. Even though the case hospitals were chosen from a limited selection, the hospitals represented on the list can be assumed to be random.

4 Findings

This chapter presents the data retrieved through the research process. The findings are divided in three parts. The first two parts will present the findings related to RQ1 and RQ2 respectively. The last part will present findings resulting from a combining the analysis of the two first parts.

4.1 Determinants affecting diffusion of innovations

This section provides the general findings concerning which determinants identified by the literature that affect the innovation processes in Norwegian hospitals the most. First, a general overview of the findings generated by the output from the coding process will be presented. Second, findings regarding the five most prominent determinants will independently be presented.

4.1.1 Determinants identified through coding

Out of the 37 determinants identified by the literature, 34 determinants did at one point or another occur throughout the interviews (Appendix D). The sorted list of determinants based on total magnitude, after the rationale provided in *3.3.2 Finalizing the analysis*, is presented in Table 3.

Rank	Coded determinant	% of coded material
1	Reinforcement by management	**9,3%**
2	Meaning	**7,5%**
3	Professionalism	**7,1%**
4	Collective action	**7,0%**
5	Experimentation	**6,6%**
6	Opinion leaders and change agents	**5,6%**
7	Relative advantage	**5,4%**
8	Compatibility	**5,1%**
9	Managerial attitude towards change	**4,6%**
10	Interpersonal networks and internal communication	**4,3%**
11	Structural and administrative links	**4,3%**
12	Standards and political influences	**3,9%**
13	Observability	**3,3%**
14	Financing	**3,0%**
15	Market pressures	**2,9%**

Table 3: The 15 most prominent determinants identified through coding

4.1.2 Determinants with high influence on the diffusion processes

This section will elaborate on the five most important determinants, *reinforcement by management, meaning, professionalism, collective action* and *experimentation*. What constitutes the coded segments and how the determinant affected the innovation process in the hospitals will be explained for each determinant.

Reinforcement by management

Segments concerning the management's continuous focus on change through building a culture for change related to process improvements, but also more concrete actions and reinforcements, have been coded under this determinant.

The findings show that management on the levels above the department leader play a negligible role when it comes to reinforcing innovation processes, although one specialist strongly argued the importance of creating systems that enforce change in the vertical plane. Every interview object emphasized how hard it is to change behavior and how easily people fall back to their old routines if the change is not reinforced. The reinforcement could either be in form of reminders, incentives or orders, but the common denominator was that there had to be a consistency to how the change was reinforced. The reinforcement of change needs to originate from a source of authority, preferably a leader or manager with legitimacy. As one manager explained his view on the matter of how to lead the surgeons:

> *"To not alienate the surgeons [...] you have to introduce changes with care, and in that regard I think it is very favorable that I am a surgeon myself."*
>
> *(Interview object 4)*

Many hospital managers select reinforcement as a strategy to handle the naysayers. Some hospitals even reinforce the proposed changes by including the naysayers in the change process to give them a feeling of pride and ownership to the outcome. Reinforcement can also done by presenting benchmarks for a desired state. It is emphasized that in order for this strategy to be effective, the benchmarks must be relevant. Another, similar way is using internal examples and results to show improvement. In this presentation the emphasis by management on quality indicators, such as infection rates, are valued as it is a way of silencing the negative voices and reinforce the current path. Both managers and specialists emphasized the perceived problem of unhealthy leadership culture in hospitals, where managers partially neglect their responsibilities as leaders to maintain their clinical competency. This makes it harder for the leaders to provide reinforcement through setting a good example.

> *"Being a manager at a hospital of a certain size demands that you let your surgical practice go and be a manager 100% of the time. It is very hard to combine both when you pass a certain size."*
>
> *(Specialist 2)*

Meaning

This determinant have been coded to the segments concerning how the perception of the innovation, improvement project, idea or change is inconsistent across the organization and sets a barrier for the implementation.

There is often a discrepancy in the perceived meaning of process innovations between employees and management. While the staff often attributes increased workload as the meaning of a process innovation, the management attributes smarter and more efficient practices. The different perception of meaning of the change often originate from misunderstandings based on different value systems in staff and management functions. "Efficiency" or "productivity" is an academic terminology that resonates with management, but which among health care staff often has a negative connotation associated with lower quality of patient care. Implicit in efficiency or productivity gains from management's point of view, is a constant or increased quality, due to shorter waiting lines, better planned operations and shorter exposure for infections. Several managers deliberately focus on conveying the meaning of process innovations by focusing on patient care to create that shared meaning. As one of them said:

> *"[...] it is easier to persuade the opposition if you can say that we are keeping an eye on quality [...] and we will reverse the change if the quality suffers".*
>
> *(Interview object 7)*

Multiple leaders also emphasize the vital importance of a shared meaning to get acceptance for new processes. The interviews show consensus around the need for early involvement of the employees across professions and avoid the typical top-down management in order to create a feeling of ownership across the organization. One case object explained how the implementation of a new process innovation failed as the anchoring of the meaning among all the employees was insufficient:

> *"We made a very neat process improvement suggestion, but we forgot to involve the assistant surgeons in the work [...] That was a mistake, they reacted strongly."*
>
> *(Interview object 6)*

This determinant is seen to have some connection with opinion leaders and change agents, as these often attribute a different meaning to the process innovation than the initiators. The negative opinion leaders would in most cases argue either with claims that changes related to productivity and efficiency increases will detriment the quality of treatment or make the work related stress unbearable. A large part of the different meanings are concerned with the professional interpretation of the change, usually referring to a risk of reduction in quality of treatment. The presentation of the innovation is in this situation argued to be important as it lays the foundation for the interpretation of the current situation, and interpreted meaning of the innovative interventions. In achieving better buy-in for these processes a focus on new equipment as an improvement in quality alongside the process change can be utilized. This is exemplified by interview object 4:

"Choosing new equipment as leverage to increase the efficiency might be a cheap investment, although the efficiency could have been increased just as much without it. But new equipment is needed over time anyway, and by hiding the message like this, I can introduce the changes without using the terms that trigger resistance."

(Interview Object 4)

Professionalism

Segments concerning professionalism in hospitals are accounted for in this code. This includes both the interface between different health professions and between health professions and other groups, as well as the idiosyncratic features of the relevant health professions.

The impact of professionalism manifests itself in two ways throughout the interviews. First, the strong presence of professionalism limits the legitimacy of innovations originating from outside the hospital, resulting in claims of low compatibility. It is stated by most respondents that by changing the terms "productivity" and "efficiency" with "quality", the nurses and doctors will not react as strongly to the characteristics of the innovation. Second, the interference with the established boundaries of the professionals that occur when attempting process changes. As one of the respondents puts it:

"Interfering with these professions is like stirring a hornet's nest."

(Interview object 2)

The established boundaries are argued by some respondents to act as a barrier by laying the foundation for which system changes that can occur. The boundaries are sensitive to health care professionals with another specialization but particularly to outsider such as economists or general management. Some of the interview objects argue that these boundaries only can be altered by forces from inside the boundary. This is in many cases done effectively by comparing processes of particular professions across hospitals, and in a sense relying on a domino effect. The analysis of the data indicates that the professional boundary between anesthesia and operation are of great importance when considering process innovations. This is argued to be because these professions are traditionally organized in different units, with different budgets and goals and the anesthesia department having a perceived role as an "internal service provider". As one interview object puts it:

"The patients are not here to get anesthesia, they are here to be operated."

(Interview object 5)

Collective action

Segments concerning the need for a collective effort in order to succeed with a new innovation and reflections on how to gain traction in the organization by making everyone interested in moving the project forward, are all coded towards this determinant.

Most hospitals take a holistic approach to the patient-treatment, which results in a large degree of individuals involved in implementation. The findings point to the immense complexity of hospitals as a source making collective action an important determinant. Not only are hospital practices argued to be resource demanding in terms of manpower, the people involved are also vastly separated in terms of education and professionalism. This hospital characteristic seemed to present leaders with the great challenges of appealing to all groups and professions to engage a collective effort.

> *"[...] it was too comprehensive to incorporate the whole flow of patients through surgery, with all the different diagnosis and people involved."*
>
> *(Interview object 10)*

Tasks will sometimes have to be moved from one group of employees to another to reap benefits of the changes due to a high degree of collective action. In general this consequence was considered unproblematic and some managers emphasized the positive effect this could have. As long as the tasks were moved down the perceived ladder of recognition, some employees would be happy with getting an easier work routine, while the employees getting the task felt that their competence and value in the organization increased. A failure to gain support from resisting opinion leaders and successfully communicate across departments to achieve collective action was said to impact the innovation process. In the change effort good interpersonal networks were argued to be essential as it allows a greater flexibility in the day to day planning of operations.

Experimentation

The coded segments for this determinant are a combination of three main areas. The first is the interview objects' statements regarding the importance of experimenting with concepts and ideas before implementation.

> *"We have to try it out first, to make sure that it works here."*
>
> *(Interview object 2)*

The second area is concrete examples of experimentation with process innovations or process improvements, often performed with a project based approach. The third area concerns the free resources to perform experimentation in the hospital, or the lack thereof. Examples of the last area are the shift-work structure of the hospital, lack of available time for key-personnel and management, a pressing operations schedule that does not allow upsets in production and personnel on sick leave. The findings show that the everyday challenges and constant need for treatments are short-term endeavors that limit the ability to experiment with possible long-term improvements. Experiments with new processes are done by particularly interested individuals in project groups, and the success and longevity of the projects seem to heavily rely on these individuals.

> *"You won't get the system to take responsibility, you depend on key players who drive the process forward."*
>
> *(Interview object 12)*

The most frequent arguments against the applicability of the achieved results of experimentation, is that by concentrating the focus on the achievement of a single project goal, the level of effort is artificially high and that the project is disconnected from core-work of the hospital. One of the respondents said that since the focus tends to be to make the project work, other groups might suffer as the free resources are directed towards the experiment, which rarely would be the case if the innovation was fully implemented.

Experimentation is a way for hospitals to see whether the innovations can be used in a larger scale, and to determine which adaptations that must occur to make it work. No respondents make the connection to trialability for the process innovation, which can be a consequence of high trialability being taken for granted for process innovations. The findings reveal that the results of the experimentation is highly valuable within the organization, and that it is used to display the benefits and the quality of the innovation in a way that can't be denied.

> *"They tell me: 'This is dangerous, [...] this is going the wrong way, it will lead to hurt patients.' Then I can say that it doesn't, that we keep track of the results and indicators. We have to be able to document that this will not go about uncontrolled. "*
>
> *(Interview object 5)*

4.2 Stages in the improvement process

The following section will first present findings on the observed phases of process improvements. Second, findings related to the characteristics of the individual phases will be presented in terms of the sources affecting them.

4.2.1 Overview of the process

The coding and analysis based on the phases of process improvements in hospitals resulted in the identification of three phases, *motivation phase, inspiration phase* and the *adaptation phase*. According to the described methodology, the initial coding divided the process in six segments according to their appearance in time. These segments were grouped based on similarities, resulting in the three given phases. The phases occur in the listed sequence, but it might be hard to clearly draw the line between two phases in a practical setting. Some support was given to the process having elements of an iterative nature particularly between the motivation and the inspiration phase. The degree of iterativeness seems to be determined by encountered complications, lack of resources and barriers to change. This is incorporated in the proposed model illustrated by Figure 7, by merging the two boxes for the motivation and inspiration phase.

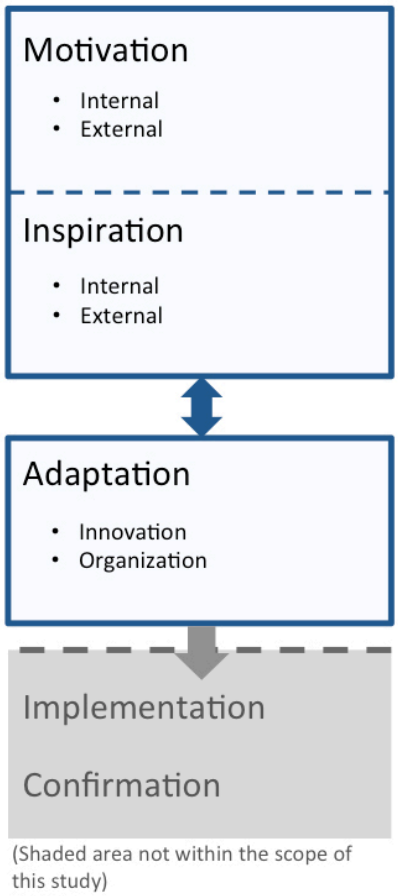

Figure 7: The proposed modification of the innovation-decision model

The motivation phase was given its name based on the nature of the elements affecting the project initiation. These range from concrete financial pressures to more internally generated drives for doing better. The inspiration phase got its name due to the interview objects not mentioning imitation, adoption and copying, but rather combining innovations, ideas and inspirations as ways of making changes. This leaves "inspiration" as the best word for describing these fragmented influences. One of the specialists evaluated the value of external process innovations like this:

> *"As a copy, I don't think it will add any value. As inspiration and a reference, on the other hand, it can be very valuable! I don't believe in copying processes in competency organization, remember that these people value the possibility to create their own routines […]"*
>
> *(Specialist 2)*

The adaptation phase got it's name from the observation of high degrees of adaptation, as opposed to pure adoption or imitation. The phase was given strong support in the interviews, although it may in certain cases be intertwined with the subsequent implementation stage, which lies outside the scope of this study. Some support was given for a separate experimental phase, between the inspiration phase and the adaptation phase, but this observation differed among hospitals and it was therefore incorporated in the adaptation phase.

Many of the hospitals refer to some form of methodology as important for guiding and structuring the process improvement project. The methodology is reinforced in some hospitals by delegating this responsibility to a suited individual. There was a common belief among hospital managers and specialists that the methodology used by one hospital for identifying and implementing changes could be copied by others. However, the findings show no sign of a common methodology, although some of them bear resemblance. The methodology is suggested as a way of giving structure to reinforcement activities initiated by the management, as described by interview object 10 in the following way:

> *"Changes need systematic monitoring. Even if you copy something you have to follow up on it and continue to develop it, otherwise you will stagnate. In order to manage the continuous follow-up I believe a methodology is important."*
>
> *(Interview object 10)*

4.2.2 Characteristics of the phases

The following sections present some of the findings for each of the three phases in their chronological order.

Motivation phase

The hospitals recognize that the initiation of their projects are motivated by both internal and external elements. These two sources of motivation will in the following section be discussed in that respective order.

Internal sources of motivation

The realization of a need for change and innovation is to a varying degree founded among the employees. It seems to be stronger for the hospitals that are foundations, as there is a more common understanding of the financial situation, and therefore a better alignment of course of action across hierarchical levels. This was described by interview object 4 in the following way:

> *"Everyone understands that our costs have to be balanced by our revenues. We cannot afford to lose money. Unlike the public health authorities, which are protected from bankruptcy by law, we can be shut down and sold at foreclosure."*
>
> *(Interview object 4)*

Employees' awareness of inefficient time usage was often mentioned as one of the motivations for looking at how the processes were performed. This was in some cases used by the managers as a stepping-stone to introducing process improvements that gained support across hierarchical levels. Some respondents argue that employees recognize that many tasks are performed in sequences, even when they could be performed in parallel. Reducing the waiting time could also tie into the internal motivation of bettering the quality of care, which is observed to be a strong motivation.

"A lot of what we do is to better the situation for the patients. There is no doubt about that. We want to provide a better care for the patients so they don't have to spend ages waiting for treatment."

(Interview object 12)

This situational awareness is also grounded among many managers, which in itself is regarded by many respondents as a source of motivation for change. Some of the managers recognize that their experience from the private sector is implicitly a part of how they react to various change efforts and that it has concrete carryovers in terms of suggestions for improvement. Varying experiences among managers result in different ambitions for their department, which is argued by some to be the reason for the differences between departments in motivation for initiating process improvements.

In some cases the different attitude towards improvement and change between the older generation and the young generation is recognized and suggested as an internal source of motivation for change for the hospitals with a younger staff. The difference was observed in their reactions to presentations of new concepts and projects as well as in the daily confrontations regarding more or faster work processes. This changing of organizational code is argued by respondents to be an internal driver for changes in all organizations in the health care system.

External sources of motivation

Some of the hospitals recognize that the initiation of their projects is results of an external factor, usually an uncertainty in the future of the hospital. This uncertainty stems from the funding system combined with being a small, local unit where the activities potentially could be absorbed by a larger regional hospital.

"A couple of years ago this hospital was among the least efficient in Norway. The department of surgery was almost in danger of being shut down and we lost areas of surgery because we did not have enough activity in these areas. We saw that the reason was that everything was going slow. Then we hired a consultancy firm [...] that specializes in improving efficiency in hospitals"

(Interview object 5)

The free hospital choice act and *the coordination reform* is by most of the department leaders and specialists argued to create a market pressure on the hospital services which forces a stronger emphasis on productivity. Motivation for changes in processes is also present from regulations and standards imposed by the government and central institutions. For example, the recent standard for cancer diagnosis and treatment is argued to create strong motivation for change, although it tends to be interpreted more as a necessity than a motivational choice.

The private sector also serves as a benchmark for private hospitals. A good benchmark serves as a pressure for change in order to achieve the performance at the benchmark-level. Many respondents argue that the two hospital types are not comparable, but that a common ground may be found in certain patient

treatments and on parts of the treatment sequence. All interview objects that are confronted with this observation recognize this element.

Inspiration phase

An important observation is that the process improvement in hospitals has a high degree of adaptations and that implemented changes are combinations of ideas from several sources. As a consequence, the innovation must be interpreted as an enlarged entity, which incorporates a set of influences that may be hard to distinguish and track over time. Nevertheless, the implemented result can still be regarded as an innovation for the adopters as the result still is new to the organization. This phase is therefore identified by the actions performed to find ideas to solve the challenges determined by the motivation phase, either internally or externally, and how these are evaluated for introduction in the subsequent adaptation phase.

Most interview objects recognize that in order to achieve greater gains, more departments and separate parts of the system must be integrated and evaluated in a holistic manner. This result in increasing complexity for increasing scope, as larger parts of the hospital has to be involved. The hospitals perception is that the problems are a local, systematic problem rather than a problem originating from an isolated part such as the operation room. Relating this to the many processes at the hospital, it is recognized that the alignment and coordination of the flow of patients or the patient is the process to improve, rather than the smaller parts of the surgical procedures. This is strongly supported by findings and adds tremendously to the complexity of the change processes. The interview objects recognize, although some of them implicitly, that the solution scope has implications for the search process, as well as the subsequent need for adaptation.

Internal sources of inspiration

Inspirations to find solutions to problems are often argued to come from within the hospital organization. Many hospitals argue that the origin of the process improvements is internal. Few hospitals mention concrete origins of their implemented changes.

The hospitals use three main approaches in finding or generating ideas and solutions to their challenges. The first search process is to create project groups with interested and experienced individuals. Their task is to come up with improvement suggestions, which may originate from the group itself or from links that the group creates or already have. In this phase it is argued that the understanding of the current situation at the department or hospital impacts how the process proceeds. Particularly the specialists argue that the internal idea generation may be impacted by wrong or skewed analysis of the current situations resulting in improvement processes that are not really bottlenecks. The second search process is somewhat the opposite. The managers or someone with legitimacy in the organization have an idea for improvement, which usually originates from an earlier workplace. Then, in order to generate momentum for this suggestion, it is adapted and tried implemented by utilizing the experience and legitimacy of the initiator. The third observed search process is to some

degree a combination of the above. The initiator has a clear picture of the outcome of the idea generation, but to gain legitimacy, appropriate adaptations and momentum in the organization, the initiator uses work groups to generate internal ideas. The work groups tend to be mixed and with wide permissions and scopes, but the outcome from the process is managed so that the outcome is close to the outcome envisioned by the initiator.

Newcomers are recognized as a way of gaining inspirations and ideas for new behavior. Secondments, for the purpose of education of medical personnel, are argued to be an important source, but this mechanism of influence is differing among objects whether it is considered internal of external.

> *"New employees are perhaps our most important source of inspiration. And secondments are also important. To send employees to visit hospitals where they have started with new methods."*
>
> *(Interview object 5)*

External sources of inspiration

Most hospitals recognize misfits between process innovations originating from outside the organization and the requirements, which in many cases is attributed to lack of technical fit. The frequent occurrence of technical misfit limits the number of relevant sources and poses severe restrictions on the search performed by the hospitals. The technical fit is either connected to hospital characteristics or type of patients. As interview object 8 said:

> *"I don't bother visiting someone unless their procedures are orthopedic. Preferably it should be as specific as implant surgery, because if it isn't the discrepancy is too big and I can't use their experiences."*
>
> *(Interview object 8)*

Some of the hospital characteristics that result in misfit are high complexity, lack of appropriate space, lack of free resources in implementation and lack of resources to experiment. This results in adaptations in various forms or rejection of the innovation. Many respondents refer to high complexity as a reason for low compatibility and argue that the complexity in the processes at each hospital is different. Most of the respondents attribute much weight to actual lack of technical fit in material resources such as the hospital building, personnel and equipment, shift-work structure and maintaining necessary functions such as the emergency room. Professionalism on the other hand is argued by respondents to be a driver for a desire to create solutions in-house and result in a perception of low compatibility for external sources. The compatibility relates to the solution scope in the inspiration phase, as increasing complexity in the problem perception may be a reason for adaptation when the likelihood of good compatibility is reduced. The perception of low compatibility will in many cases not inhibit the hospitals from being interested in the underlying idea. The possibility of experimentation and reinvention efforts is argued by respondents to reduce the effects of the low compatibility.

The ideas generated in work groups may sometimes originally originate from outside the hospital. This is in most cases harder to detect as the respondents

either have trouble recognizing that parts of the implemented solution have resemblance with some external source or that the respondent want to keep the perception of idea originating internally. The external inspiration in the work group may be on both an individual and a group level.

> *"[...] it is the responsibility of the doctors, or other people in the work group, to incorporate new expertise in the group, even if it means going outside of the group to acquire it."*
>
> *(Interview object 9)*

The findings reveal that the doctors on the individual level are peer-oriented and have a form of reference group in fellow professionals in their contact network, and some of the respondents recognize these influences as important when working with ideas in the work group. The external inspiration on group level may be on the form of visiting other hospitals, cooperating with coordinators or consultants and formally pursuing ideas via conferences.

In general, the health conferences, particularly the Surgeons fall meeting, seems to be a good inspiration source for all types of innovations.

> *"In my department, sending representatives to the Surgeons fall meeting so they can learn is highly prioritized. Their job is to take back new impulses and, at least to some degree, show others what we are doing here."*
>
> *(Interview object 4)*

Interestingly none of the respondents recognize the Directorate as an influencer in any other way than setting certain standards. The findings also give little merit to the role of private hospitals as a source of imitation, as the resources available are different, but that they have some influence as inspirations.

> *"Projects are often taken from the private sector, [...] but in private entities, they only hire the best surgeons, those who don't fumble and are to the point all the way. [...] And working hours isn't an issue - there are few in the private sector who has to pick up children from day care."*
>
> *(Interview object 2)*

Inspiration from other industries seems to be limited to methodologies, such as *lean* and *business process reengineering*. Particularly one of the hospitals with a thorough implementation of the lean methodology, have a clear inspiration from the private sector. The same hospital also emphasized the influence from local industry actors and consultants in the inspiration phase. One hospital had significant benefits from the inspiration of consultants, although most hospitals argued that the support and value of external consultants are of little help. The difference in the approaches of the successful consultants and the unsuccessful ones seems to be the way they present data and suggestions. The crucial point in the process of inspiration in the staff seems to be the presentation of the current situation and benchmarks for the same processes. The successful ones are said to have enough knowledge to understand which elements that can be compared and which that cant, given the characteristics of the particular hospital.

Adaptation phase

The adaptation phase is recognized as the preparation for implementation based on the local idiosyncrasies. The use of words related to "inspiration", as opposed to "imitation" or "copying", indicates high degree of adaptation. Respondents clearly convey this by emphasizing descriptions of non-comparable situations and case-specific solutions. The findings show that the motivations to some degree are grounded in concerns for efficiency and a motivation to achieve gains. The respondents argue that most changes are of high extensiveness.

The foundation for how the process of adaptation unfolds is in some cases determined by a methodology for process improvement. The same methodology anchors the change process in the organization and prepares it for change. It was stated that a methodology creates a systematic approach more likely to include the perspectives of all the relevant participants in the adaptation phase, and thereby increase success rate of implementation. In this process many respondents recognize the importance of staff-functions, coordinators and consultants for the necessary structure. The findings related to the two types of adaptation, innovation adaptation and organizational adaptation, will be presented respectively.

Innovation adaptation

The data reveals that most hospitals generally have low fidelity in the implementation of ideas originating from outside the hospital. The presence of a need for high degree of adaptation to the innovation is as noted a consequence of low compatibility but poses a problem for the researchers, as it can be hard to identify what is an internally created idea, and what is a local adaptation. It seems like this distinction is not easy to identify for the ones involved either.

> *"[...] their project is systematized to an extreme degree and they have a very limited number of surgical procedures this is suited for. I think that if you want to implement such a project in a department like mine, you would have to modify it."*
>
> *(Interview object 4)*

The low fidelity in adaptation can be attributed to two main reasons. First, as the compatibility is perceived as low, the respondents argue that the adaptations resulting in low fidelity is a consequence of a real need for adaptations grounded in different local characteristics, such as political or cultural misfit. The second identified element is the use of inspirations and combinations of sources, which results in low fidelity for any particular implemented innovation. On the other hand it seems that many hospitals have higher fidelity in the temporary projects and experimentation, which is argued to be possible due to greater efforts by the participants and motivated project leaders.

The observed efforts for improvement process focus either on the flow of one diagnosis group of patients across the hospital functions, or improvements within one department. The first is argued to require more adaptations to the innovation as it has higher extensiveness, while both in general are observed to have low fidelity. One of the hospitals experienced that aiming for an even

broader perspective in the adaptation phase was too resource demanding in the adaptation phase and led to too much resistance to handle at once.

> *"We agreed on how it should be implemented, but during the implementation we didn't manage to gather enough resources to stay on target."*
>
> *(Interview object 3)*

Some changes to the innovation occur as a result of cultural misfit. It is stated by most respondents that adapting the terms used from "productivity" and "efficiency" to "quality", that the medical professions will not react as strongly to the implementation. Another example encountered in the interviews is how task shift from a particular innovation is only moderately implemented, as it is not perceived by the professionals to be beneficial for the overall process

Organizational adaptations

The data suggest that the political and cultural fit affect the adaptation phase to a high degree, while technical fit may have less impact. Lack of cultural fit triggers changes both in the organization and the innovation. A lack of political fit in terms of individual interests in the hospital may also in some cases be handled by changes to the organizational elements. This is most effectively seen as explained by respondents as changes happening in management, where the old leaders in retrospect were seen as blocking process improvement. Some respondents emphasize the need for organizational change, and argue that a mutual change process is a goal.

> *"We do small changes all the time, adjusting and trying to get more out of the money invested by doing it better. And thereby getting more patients treated."*
>
> *(Interview object 2)*

Some respondents emphasize the continuous focus on smaller, incremental changes, leading to large changes over time, with emphasis on organizational changes. The extensiveness is high in terms of focusing on the totality of the hospital system and having a holistic view of the processes, regardless of department. This approach has in many forms similarities to continuous improvement and kaizen mentality, but resembling more of a top-down approach and somewhat distinct increments. The data gives strong indication that this approach is also the one with the lowest fidelity, and each step is tailored for the particular situation at hand.

4.3 Determinants affecting the phases

This section presents a general finding, which is not directly answering the RQs but still is of high importance and interest and is therefore regarded a contribution to theory. By combining the coded segments from RQ1 with the coded segments and analysis done in RQ2, an analysis of where coded segments from the two RQs overlap was retrieved. Table 4 shows the results from the analysis, where the five most frequently occurring determinants within each of the identified phases are listed.

Motivation	Inspiration	Adaptation
Financing	Resource links	Reinvention
Reinforcement by management	Institutional links	Compatibility
Standards and political influences	Meaning	Complexity
Market pressures	Compatibility	Collective action
Relative advantage	Organizational innovativeness	Experimentation

Table 4: Cross coding of RQ1 and RQ2

5 Discussion

This study has four main contributions to the theory. First, the identification of a list of determinants of relevance for diffusion of process innovations increases the understanding of which determinants that are particularly relevant in diffusion of process innovations in a public health care system. Second, the explanation of interconnected determinants gives additional insight into how determinants are affected by the innovation type and provides additional refinement to the framework. Third, the proposed model for the observed efforts in process improvements in hospitals presents a viable alternative to Rogers (2003) Innovation-decision model for process innovations. Fourth, applying the framework of determinants to the local phases of process improvement connects this process with the overall diffusion of innovations. The following chapter will discuss these contributions in their respective order and result in 11 propositions for process innovations.

5.1 Determinants influencing the diffusion of process innovations

The following discussion seeks to explain why some determinants are more dominating than others in the innovation diffusion process for Norwegian hospitals. First, the five most prominent determinants, *reinforcement by management, professionalism, meaning, experimentation* and *collective action*, have been selected for a thorough discussion. Second, the interconnectedness of some of the identified determinants is discussed with particular focus on the connections to *reinforcement by management* and *collective action*, as well as the connections between the five most prominent.

5.1.1 The five most prominent determinants

The historical challenges with hospital management and the importance of management in change processes are elements emphasized in the literature, and *reinforcement of management* as a high impact determinant can therefore be expected. With high competency employees in charge of the activities at the lowest level in the organization, top-down control of changes becomes infeasible. Reinforcement is then a way of convincing and ensuring that proposed changes will be followed. It is likely that this determinant is dependent on the extensiveness of the implementation and the inertia of the particular hospital caused by tradition and structure, The effectiveness of this determinant also depend on the particular leader characteristics and the findings give some support to the theory suggesting that the change efforts are most successful when lead by a physician. The strong emphasis on reinforcement rather than the determinant *managerial attitude towards change,* can be due to the duration in implementation of process changes. As the duration is high, the need for reinforcement is more important than the actual attitude in the initiation. In a larger diffusion perspective the success in implementation depends on this determinant and will therefore be important with regards to observations of

results by possible adopters. The resources available for reinforcement may also be limited in a given adopting unit, which could result in rejection as a consequence of not being able to follow up a resource-demanding project. This leads to the following proposition:

Proposition 1: *A high degree of reinforcement by management at the adopting unit level, supports diffusion of process innovations by increasing the success-rate of implementation.*

From the theory of hospitals, *professionalism* is the strongest characteristic of the culture. In light of these observations it is expected that changes not directly oriented towards quality will challenge the professional boundaries and create a strong barrier for diffusion. The barrier is seen as an unwillingness to change and cooperate across professional boundaries. This impact is also a consequence of the inertia of the traditional processes within each profession, which ties into the perspective of stability of services from institutions. This is supported by the findings and as subsequent chapters will reveal, this has consequences for other determinants. Professionalism limits diffusion not only by mechanisms related to implementation, but also as the professional boundary of one hospital is threatened by innovations that originate from others, which also blocks the actual inspiration. This leads to a proposition specific to process innovations in health care:

Proposition 2: *Professionalism is a significantly impeding determinant for the diffusion of process innovations in public health care.*

A differing *meaning* attributed to the process innovation slows down the diffusion rate as the adoption and implementation in the adopting units are impaired or delayed. As the process innovation refers to a need for increased productivity and efficiency the results from earlier implementations often will refer to the results of increased production. This is attractive for management as they have performance indicators aligned with this perspective. At the same time, the process innovation at the local level triggers other meanings, particularly as the performance indicators and attention at this level is tied to quality of care, patient contact and the daily work pressure. The differing meaning can therefore be attributed to the discrepancy between the performance indicators that are given value in the different hierarchical levels. This difference is likely to occur for all process innovations that involve a high degree of manual labor, as there is a need for sense making to change behavior. The impact on the diffusion rate is likely to be higher for high competence organizations, where the competence is distributed and differing meaning therefore often has root in analysis and beliefs as opposed to lack of information. This leads to the following proposition:

Proposition 3: *Meaning is a significant, impeding determinant for the diffusion of process innovations between high competence organizations.*

Theory argues that resources to do *experimentation* are important when the compatibility is perceived as low and the need for adaptation is high, which is in line with the observation of this determinant as highly influential. Experimentation may also be seen as a strategy for anchoring in the organization, as it can involve a selected set of personnel and have a limited scope where results are visible and easy to achieve. As institutions have responsibility for delivering a stable service, experimentation and a gradual implementation is a way of reducing risk. The lack of resources to do experimentation may be an issue that the interview objects encounter so frequently that it easily comes to mind when considering process changes. The financing is tied to the actual production, which causes limitations to what and how much experimentation that can be done with processes. The willingness and possibility of taking short-term losses in order to achieve long-term efficiency might not be there. Experimentation may also be a way of creating legitimacy and showing off for outside peers, as it becomes clear that something is being done to improve the situation, even if implementation is still months ahead. As will be discussed in more detail in *5.1.2* Interconnectedness of determinants, experimentation may act as a way of coping with other determinants.

The high degree of collective action in process innovations can be expected from theory emphasizing high complexity and coordination of activities in patient treatment. The importance for the diffusion process relates to the demands that are put on the organization by collective action in terms of coordination and managerial attention. With high demands on the organization, the interest in the innovation may be reduced. The lack off ability and resources to perform the necessary tasks and organizational changes could lead to rejection. One can also expect that the diffusion to be delayed as more people are involved in adaptation and implementation. This increases the time before the benefits are observable.

5.1.2 Interconnectedness of determinants

This section discusses how the interconnectedness of determinants affects the diffusion of process innovations and how this interconnectedness affects the overview of influential determinants. First, the general findings of interconnectedness will be discussed. Second, *reinforcement by management* will be used as a focal point to discuss the connections it forms with other determinants. Third, the same will be done with *collective action*. Fourth, the remaining connections between the top five determinants will be discussed. Figure 8 shows the observed and deducted interconnections.

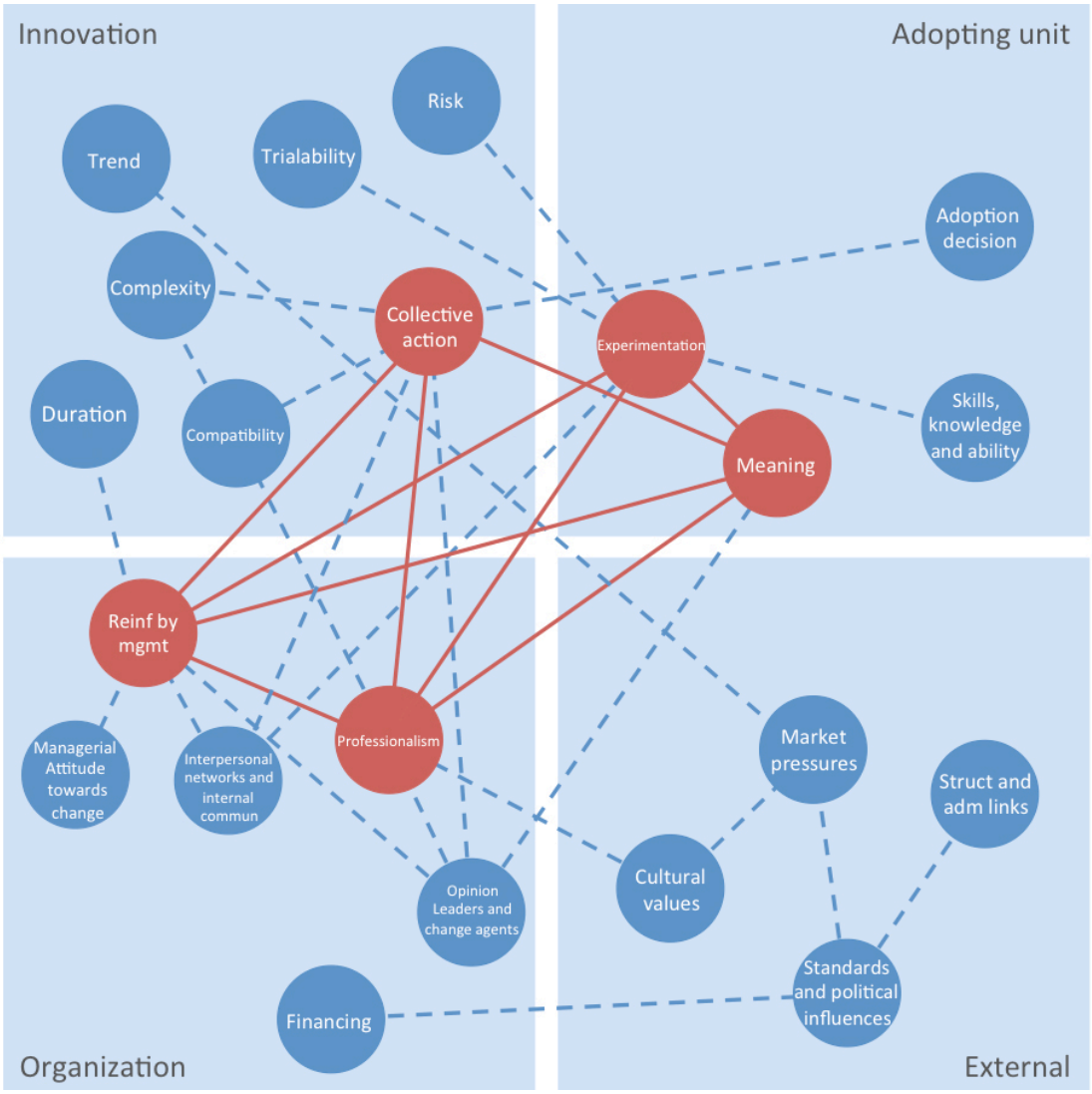

Figure 8: Interconnectedness of determinants

In the case of increased interconnectedness of determinants for process innovations, effects that reinforce each other will impact the diffusion. The objective of the framework of determinants is to isolate determinants that are particularly significant in the diffusion process and analyze them one by one. The interconnectedness of determinants related to process innovations results in a change to the significance of determinants as synergic barriers can be created. The increased understanding of how this interconnectedness works for process innovations, can serve as a basis for further refinement of the framework and a clearer picture of the foreseeable effects from increasing or lowering the effects of one determinant.

Findings suggest that connections between determinants result in a domino effect as high importance of one implicate high relevance of others. This suggests that diffusion of process innovations may be more complex than the framework of determinants alludes, as the determinants cannot be analyzed completely isolated from their effects on other determinants. The presence of interconnected determinants could change the climate for diffusion, as an incremental change in one of them may result in an incremental change in a range of others and magnify the effect. Figure 8 shows many proposed

connections either observed or deducted through this research, but only the most important will be subject to discussion. There seems to be a correlation between the degree of interconnectedness of a determinant and it's relative importance for the diffusion process. This is due to the effect that determinants that have many connections are triggered not only by their own occurrence but also by the occurrence of others. Figure 8 shows this by the centrality and many connections that the top determinants have in the web, as well as the high interconnectedness among these five. The inverse is seen from end nodes in the web, more often than not, being the determinants with low frequency. This leads to the following proposition:

Proposition 4: *The significance of determinants in diffusion of process innovations is dependent on their Interconnectedness.*

Connections to reinforcement by management

Reinforcement by management may be seen as a strategy for mitigating the effects of the impeding determinants and will therefore be important whenever a barrier is created. Figure 9 clarifies the connections between this determinant and others. The high need for *collective action* requires strong and smart leadership, as everyone needs to pull in the same direction. Since the hospital is a high competence organization, the collective action is easier to achieve through milder forms of reinforcement than by using the hierarchical structure to enforce changes. By keeping a focus on the pressure for change, the innovation process gains legitimacy in the organization, which is a way of reducing the barrier of *professionalism*.

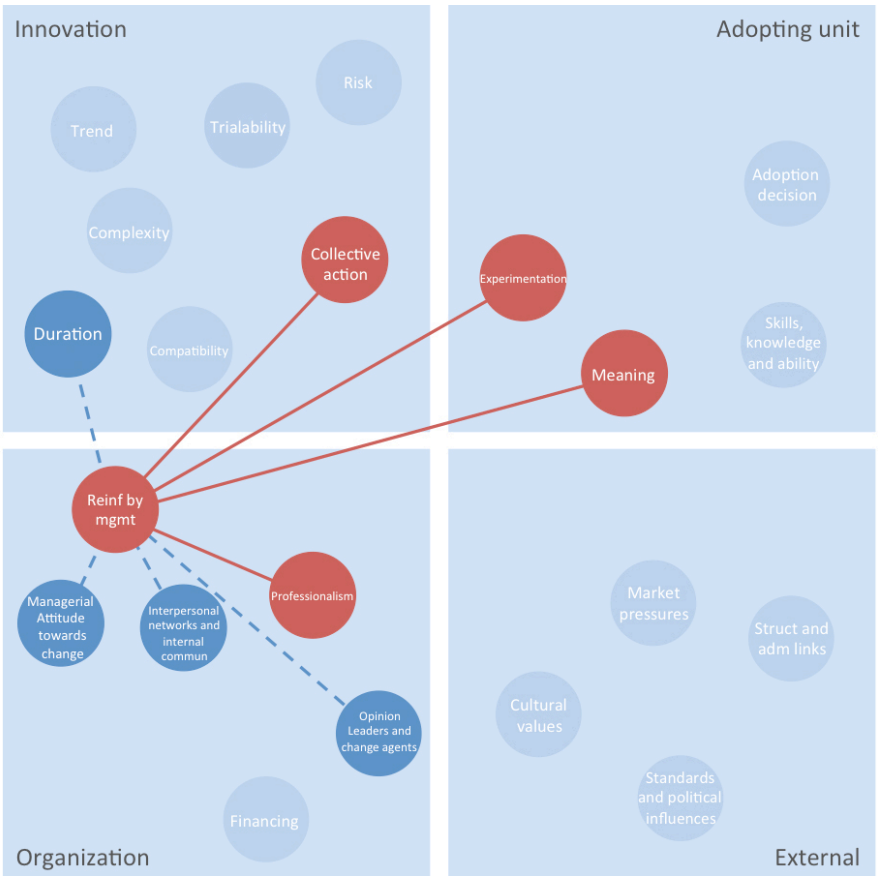

Figure 9: Connections from *reinforcement by management*

Reinforcement includes monitoring change and presenting relevant data, which speaks strongly to the high competence and quality orientation of the professionals. In this process, a clearer picture of why the changes must happen and how the innovation is perceived will contribute to creating a right picture of the innovation among the individuals. A way of doing this is through *experimentation*. Theory suggests that free resources for experimentation frees managerial resources and therefore allows higher degrees of reinforcement and continuous focus. The internal results from experimentation can also contribute as valuable information in reinforcement efforts. The reinforcement efforts will need to target *opinion leaders and change agents*, as they are the opposition of this change. By doing so the differing *meaning* in the organization is also reduced further, as either the opinion leaders agree with the proposed changes or they are silenced over time. In the same way *interpersonal networks and internal communication* comes into play, as the changes often will demand continuous efforts by management and communication across departments. These connections are suggested in theory as a requirement of high importance for relational skills for managers in hospitals. *Managerial attitude towards change* connects with reinforcement by management as those with an attitude favoring and initiating change also seem to be interested in reinforcing the proposed changes and thereby being only two parts of the same managerial trait. Reinforcement ties into *duration* of the implementation as continuous improvement and incremental changes increase duration. Since management controls the duration of the implementation, this can be used as a mechanism in the reinforcement strategy, and depending on the need, the duration can be altered to suit the needs. Long duration in implementation is known to increase the barriers to diffusion since it ties up resources and increases the time before results are seen. High focus on reinforcement in itself ties up resources, which is based on the duration of the effort, clearly linking them together. While reinforcement by management at the adopting unit level will increase diffusion rates as the success of the innovation will increase, the increased duration that in some cases follow in order to achieve this, creates a barrier for adoption for others.

Connections to collective action

Collective action is a characteristic of the process innovation that requires actions on several areas in order to be accounted for by the adopter. Figure 10 shows the proposed connections between this determinant and others. The collective action in hospitals will often involve cross-departmental actions, which makes a strong argument for the dependency in well functioning *interpersonal networks and internal communication*. The lack of understanding and will to cooperate across professions could make *professionalism* the strongest barrier in achieving collective action in hospitals. The higher the degree of collective action, the more professional boundaries could be invoked. As a result, both determinants would act simultaneously as barriers for adoption locally and thereby limit the diffusion rate.

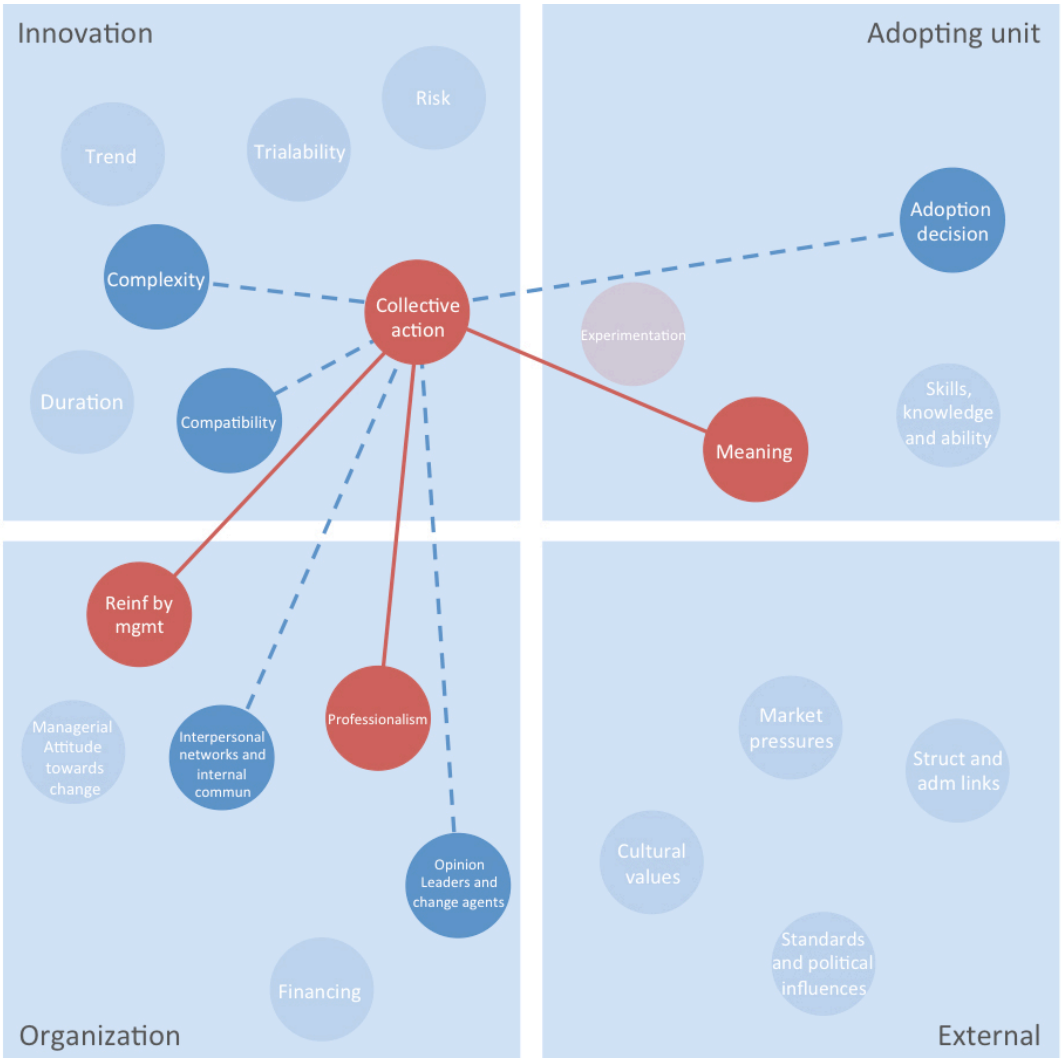

Figure 10: Connections to *collective action*

A need for high degree of collective action for an innovation is observed to result in perceptions of low *compatibility* partly due to the resource demands it puts on the organization, which cannot be met in the short-term. Extensive collective action will also contribute to increasing the *complexity* of the innovation as more people are involved, and new structures for communication and task flow is needed. As a consequence the collective action serves as a reason for dismissing the innovation quickly by arguments of low compatibility and high complexity, thereby creating a strong three-folded barrier in the diffusion process. For high degrees of collective action it may be that the adoption decision in its practical sense will change from a managerial decision and into a decision by many individuals, and thereby increasing the barrier that the *adoption decision* creates. The effect of incorporating many individuals in the change process is likely to affect the importance of *opinion leaders and change agents*. Opinion leaders tend to create an opposition and reduce the ability to achieve collective action. Such effects are more likely the more people that are involved. The meaning that the opinion leaders and those involved in the adoption decision therefore becomes critical for the ability to achieve change. The ability to achieve a meaning that is congruent across the adopting unit will strongly be affected by who and how many that is involved, and therefore the need for collective action can be a driver for increased influence from meaning.

Proposition 5: *Process innovations that require high degrees of collective action will decrease the perception of compatibility and increase the organizational resistance and need for experimentation.*

Other important connections

The remaining connections between the top five determinants calls for a more thorough explanation as this interplay results in reinforcing effects of their importance and great impact on the diffusion in totality. *Professionalism* is the basis for the discussion of quality in patient treatment versus efficiency and productivity. Professionalism may therefore be a source of a differing *meaning* of the innovation across the organization, particularly vertically between management and health professionals. It is likely that the professionally contingent barriers are less of a challenge for other innovation types as these can be assumed to operate within fewer boundaries and be less conflicting in terms of the objective. A differing meaning will also be more visible when attempting cross-departmental actions that drive the professions into each other and create a need for coordination, which clarifies the connection between meaning and professionalism. As a mean to reduce the viability of professional arguments and the barriers towards change that are based in efficiency concerns, *experimentation* could serve as an activity that legitimizes the innovation. Experimentation is likely to encourage cross-communication in the hospital, which over time increases learning and understanding of the meaning of the change across the disciplines. The results from experimentation will increase the understanding. The results are also not easy to dismiss based on professional concerns for quality and local compatibility as it involves the local professionals. This clarifies the connection between experimentation with professionalism. In the same manner, a differing meaning across the organization could be changed if local results from experimentation prove to be beneficial and the demonstration clarifies the objective of a forthcoming implementation. For both a difference in meaning and strong barriers from professionalism, the importance of experimentation becomes increasingly important as it is mitigating these effects. The discussion leads to the following proposition:

Proposition 6: *Reinforcement by management and experimentation both have a high significance in the diffusion of process innovations because they mitigate the effects of several impeding determinants.*

5.2 Proposed model for process innovations in hospitals

The contribution to theory from RQ2 is a proposed modification of the innovation-decision model aiming at describing the phases of process improvements in hospitals. First, the modifications and its consequences for the adopting level where the process takes place will be discussed. Second, the modifications and consequences will be discussed in the light a diffusion system, consisting of many local processes at various adopting units. Figure 11 shows the proposed model alongside the innovation-decision model.

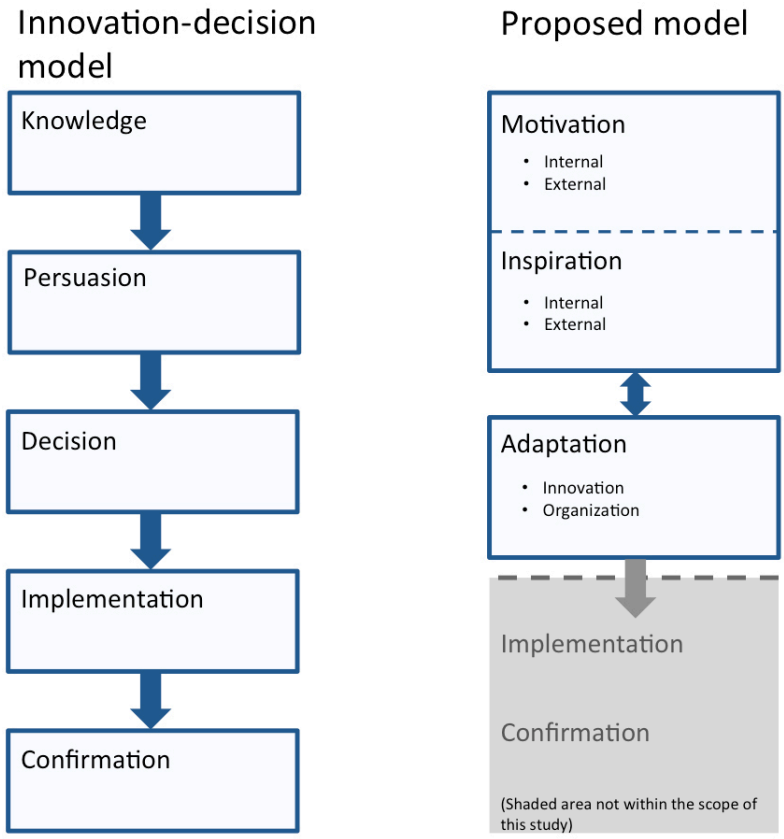

Figure 11: Innovation-decision model by Rogers and proposed model for process improvement.

5.2.1 Consequences of the proposed model for the adopting unit

When comparing the innovation-decision model and the proposed model for process improvement in hospitals, an important contributor to the discrepancies between the two models is the innovation type. The classic innovation-decision model by Rogers (2003) primarily considers technical innovations, which are normally quite static. They allow for only small alterations resulting in a binary adoption decision with complete adoption or no adoption as the two alternatives. The observed phases in the hospitals show that for process improvement involving process innovations, the innovation-decision is different. Process innovations impose a different set of conditions and are more adaptable

in regard to alteration. They can also be implemented in parts to achieve an optimal fit with the adopting unit. The implications of these differences lead to the development of a proposed model (Figure 11) that is more flexible than the innovation-decision model. It is not rigidly focused on the innovation itself, but rather focuses on the process as a whole by allowing multiple involvements of different innovations.

Motivation phase

The motivation phase encompasses a wider range of sources and a longer time perspective compared to the knowledge stage in the innovation-decision model. The knowledge stage is a consequence of perceived need for innovation that is implicit in the innovation-decision model. The proposed model deviates from this by recognizing that motivation itself might impact how the subsequent phases evolve, thus playing a role in the decision process. Further, the knowledge of an advantageous innovation could in itself be seen as a motivation. This may result in larger scopes for the change processes and increase extensiveness in the adaptation phase. The findings support the theory in the proposition of a need for internal motivation alongside external pressures, which supports the need for a phase that incorporates a variety of sources. Theory suggests that there are conflicting motivations regarding change-orientation and stability for hospitals. The motivational forces for process innovations may therefore be inhibited if these concerns are not aligned, or the subsequent phases does not account for this discrepancy by ensuring stability of output in the short-term.

Inspiration phase

The inspiration phase covers both the awareness element of the knowledge stage and the legitimacy and benefit concerns of the persuasion stage. The stages in the innovation-decision model consider a single innovation, while the inspiration phase allows flexibility in that the innovation is built up of several ideas. This allows better anchoring in the organization in the adaptation phase by blurring the lines between external and internal sources of inspiration. It also allows selection of parts of innovations that are easier to anchor and at the same time allows valuable input from low compatibility innovations. Figure 12 shows the adoption of a technical innovation based on imitation, and process improvement based on adaptation of several process innovations.

The extensive use of work groups for idea generation may restrict the sources of inspiration and the search in two ways. First, the latent beliefs and understandings of the work groups, caused by professional inheritance, reduce the legitimacy of external sources of inspiration. Second, as the group has a quite narrow reference frame, narrow mandate and project scope due to a high degree of specialization, the inspiration base of the group is likely to be equally narrow. A broader scope would be outside the expertise of the group, and pose challenges on the other groups and departments, which is likely to add and increase resistance from these other groups. The theory suggests that a historical focus on exploitation will be reinforcing and emphasize that hospitals will often try to improve productivity by reducing costs in existing systems. This results in a favoring of exploitation of current schemes in this phase and limited

exploration efforts. The trade-off favoring exploitation is also impacted by the need for low variability in output, which in theory is recognized as the trade-off between performance gains and the unfamiliarity of an innovation. The unfamiliarity of innovations found through exploration could increase variability. The low degree of exploration is in theory suggested to be a consequence of low investment for search by other firms and low technological dependence. This fits well with the observations of the inspiration phase as the search allocations are low and the search can be characterized as shallow due to an idea and inspiration focus instead of imitation.

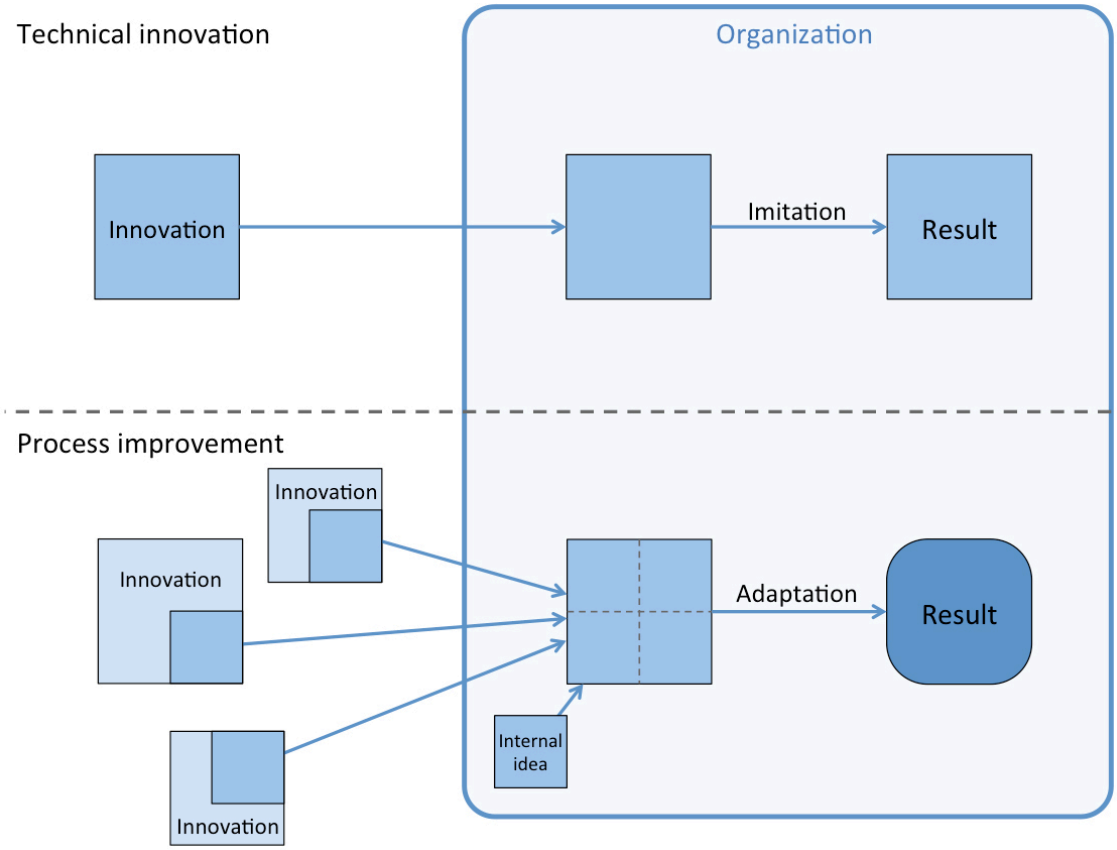

Figure 12:Technical innovation and process improvement.

The organization of the work groups could drive the need for an adaptation phase, since the inspirations are diverse and concerning only parts of the complete process. The management is crucial in keeping pressure for change in this phase, legitimizing sources and preparing for adaptation. The findings show that a methodology is beneficial in this phase, and in transitioning between phases, since the anchoring of ideas becomes stronger and the goal clearer. This bears resemblance with the actions associated with reinforcement by management. The methodology could be a template for proper reinforcement and a structure that balances the resources between exploration and exploitation in the search. As a sufficient anchoring in the organization is a goal for the methodologies, the barrier created by different meanings across the organization can be reduced. This discussion leads to the suggestion that it may be more efficient to disseminate the successful methods used by hospitals than focus on facilitating the diffusion of particular innovations.

Adaptation phase

The findings show high degree of extensiveness and low degree of fidelity in the adaptation of process innovations. The high degree of extensiveness is in accordance with theory emphasizing the importance of improving patient pathways and the suggestion that the focus in change efforts should be towards integration of activities. In the two-stage model, the adoption of customized practices are argued to be tied to innovations concerning efficiency, which fits well with the observed need for adaptation to process innovations. The need for adaptations also fits well with the theory of professionalism, particularly the *not invented here syndrome*, as adaptation allows a higher degree of participation in the process, which could circumvent some of this resistance. A high degree of adaptation is therefore not only a result of low degree of compatibility, but also a way of anchoring the change process within the organization. Theory suggests that the involvement of employees is necessary to succeed, and the findings show that particularly the adaptation phase is used for this activity. The anchoring process in itself contributes to organizational learning in the long run, as new elements are introduced. The adaptation efforts also contribute to organizational development as a process for developing the perceptions in the organization and communication across departments and disciplines is initiated. This suggests that for process innovations the characteristics of fit are dynamic, since mutual adaptations to both the organization and innovation occurs. Following this argument, the organizational ability to change and learn becomes increasingly important as the process of organizational adaptation may prime the organization for further innovation and create a friendlier climate for process improvement.

The theory on institutions state low risk taking is imperative and the theory on adaptation state that selecting many small projects, rather than a single big one, decreases risk. The high degree of observed experimentation and adaptation aimed at achieving gradual or partial implementation might therefore function as a risk mitigating mechanism. In the institutional perspective, the concern for stability of services will also drive this type of adaptation, as it is shown by theory of organizational learning to reduce the variability of the output. In this way, although the extensiveness over time will be high, the extensiveness per time unit is low, which keeps a sense of stability. The low risk taking is also seen in the observation of high resource allocation for exploitation in the search, and low emphasis and value attributed to exploration. Theory links the possibility of achieving benefits from adopting the innovation, to the subsequent extensiveness in implementation. The findings reveal no clear pattern on this, which could suggest that the extensiveness is more a result of the organizational characteristics than the benefits associated with a particular process innovation.

5.2.2 Consequences of the proposed model for the overall diffusion

Since the innovation-decision model by Rogers (2003) is the building block in the diffusion of innovations, the revised model will affect how the diffusion rate and diffusion pattern for process innovations develop over time. The proposed model incorporates that the innovation not only could be partially adopted and object to low fidelity implementation, but also combined with other ideas in the inspiration phase. This results in great challenges in tracking and determining the path of a particular innovation in such a system. The diffusion of process innovations bears more resemblance with the diffusion of ideas and inspirations. Connections between adopters in the inspiration phase results in intertwined systems of diffusion for process innovations and inspirations for process improvements. The connection between two adopters may work both ways, as the adopters have different networks and new information on innovations may come from both sides. This leads to the following proposition:

Proposition 7: *The diffusion patterns of process innovations will over time become intertwined and partially merged, which makes it hard to identify the origin of an innovation and distinguish it from other innovations.*

The rational actor models builds on the growing accuracy of information about an innovation, which acts as a motivation for higher degrees of imitation. While an innovation in itself can be beneficial, the local adaptations may alter the perception of the innovation, thereby impacting the diffusion path by making it artificially more or less appealing to a third party. The adaptations therefore interfere with the accuracy, and the growing information becomes less valuable and actionable. This reduces the motivation for imitation. The results could be more stable pressures over the lifecycle of process innovations. The pressures are more tied to the perception of possible benefits at the adopter level than the observed benefits achieved by others. The need for adaptation and experimentation should therefore be maintained throughout the lifecycle of an innovation and not decay as proposed in theory.

Since conservatism and the focus on stability are key features of hospitals, conformity and legitimacy pressures in the sociological perspective should drive adoption rates. The findings show low impact of such pressures, which should be one explanation for low degree of imitation in the current state. The low motivation for appearing legitimate can be argued as the result of two mechanisms. First, the diffusion pattern merges with patterns of other innovations, and the adopted version of the innovation will change so frequently that a state of strong conformity pressure never will be reached for one particular process innovation. Second, the legitimacy pressures arising from institutional and stability concerns are different than the legitimacy pressures for creating efficient systems. This gives the effect that conformist pressures for process innovations will not prevail before the lack of process improvement threatens the stability of a particular institution. Theory then proposes that the

adopters have little incentive to adopt innovations that do not fit, which may be a reason why many innovations either are completely reinvented in the adaptation phase or simply rejected in the inspiration phase. The degree of adaptation and variation of process innovations needed in order to adjust for local differences could be too high for conformist pressures to appear also in the longer term, as no common standard can prevail. This leads to the following proposition:

Proposition 8: *Since sociological and rational actor pressures will be constant, as long as there are no changes in the degree of external interference to the system, the adoption rate of process improvements in hospitals will be stable over time.*

5.3 Determinants affecting the phases of process improvement

The interconnected systems, partial adoptions and high degree of adaptation that takes place in the phases of process improvements, will affect the diffusion of process innovations and the theory of determinants will therefore give valuable insight. This section contributes to theory by proposing relationships between the phases of process improvement and the determinants affecting each phase. The relationships, as suggested by the analysis in *4.3* Determinants affecting the phases, are outlined in Figure 13. The three phases will be discussed individually and result in a proposition considering the influential determinants in each phase.

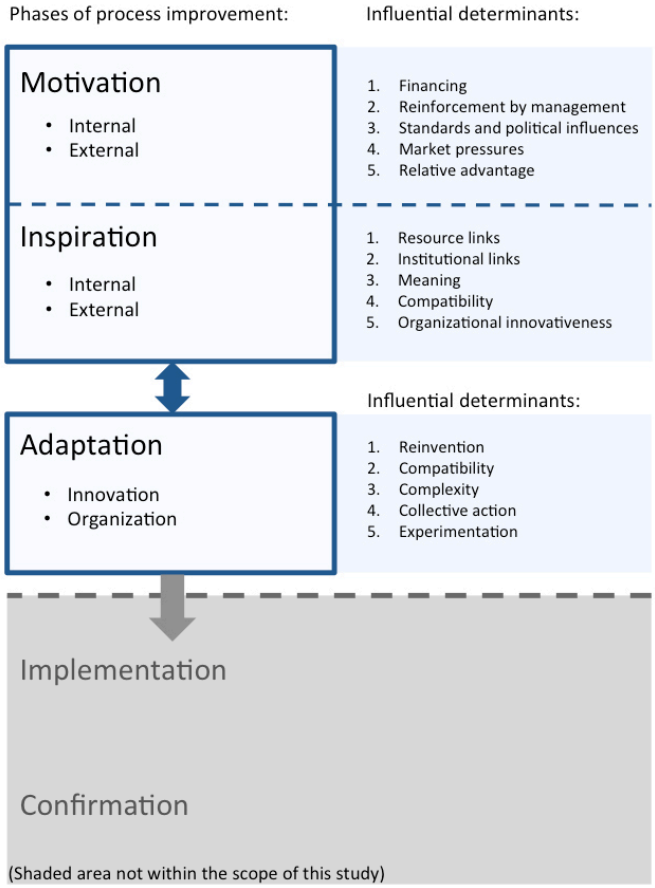

Figure 13: Phases of process improvement and influential determinants

5.3.1 Motivation phase

In accordance with the rational actor model and the established theory arguing the importance of external forces, *financing*, *market pressures* and *standards and political influences* are important. These determinants can be seen in the health care setting as sides of the same aspect, as they work in interaction in the public system. The political influences create both the system for financing and to some degree the market pressures. This is seen clearly by political influences such as "The Free Hospital Choice Act" and "The Coordination Reform", which creates a stronger market pressure by increasing competition for patients as the financing is partially based on the number of patients treated.

The external pressures are not experienced to the same degree throughout the organization, and there seems to be some disparity between the perception of need for change when comparing management and employees. This can be explained by theory of professionalism and change in hospitals, where resistance from the professions is expected, particularly for motivations concerning efficiency or productivity. This is likely to result in a need for *reinforcement by management* to achieve a common understanding of the challenges. Reinforcement also ties into this phase as management encourages change and communicates the external motivations. As *relative advantage* concerns the comparison of the current solution and the innovation in question, it could in itself serve as a trigger for change in order to do better, and is therefore a natural part of the motivation phase. Seen in the light of the innovation decision model, this determinant resembles some of the characteristics of the knowledge stage. In the perspective of the rational actor model, the observed relative advantage depends on the level of information about the potential benefits of the innovation, which proposes that this determinant will increase in importance over the duration that a particular idea is diffused. At the same time it is imperative in the model that the innovation is adopted and can be observed. This could reduce this pressure, since the degree of adaptation is high and innovations may not be distinguishable.

Proposition 9: *Financing, reinforcement by management, standards and political influences, market pressures and relative advantage are five of the most influential determinants of the motivation phase.*

5.3.2 Inspiration phase

Concerns for *compatibility* in the inspiration phase can be attributed to a minimum of comparability to gain acceptance among professionals and a corresponding need for resources to do adaptation. Following the sociological perspective a perception of low fit will make it easy to dismiss inspirations that can be argued to not fit. Compatibility is shown to be important in the adaptation phase as well, but it is reasonable to assume that the types of fit that impact the inspiration phase differs from those relevant to adaptation. A lack of technical fit is likely to be most dominating in this phase since it determines what sources that are considered relevant. Arguments concerning lack of technical fit is easy to assess and carries strong legitimacy in hospitals as a disqualifier, which

increases its importance. Given the attributed influence of the *meaning* determinant in the overall diffusion analysis in RQ1, its influence on process improvements was expected. Meaning could also be important in this phase, as it is an element in the intersection between the presentation originating from the inspiration source and the local interpretation.

Within the determinant of *institutional links* other hospitals in particular serve as legitimate sources of inspiration. Theory suggests that many innovations spread between hospital managers, which supports the importance of this determinant. At the same time the findings show that the number of legitimate hospitals for benchmarking and inspiration are limited to a few. It is likely that this is an impact of professionalism and *not invented here syndrome* in combination with low compatibility. It is noteworthy that the findings reveal little or no direct inspiration from the central health institutions despite their objectives to facilitate these processes. One reason might be that the influence from these institutions is seen through standards and political influences in the motivation phase, which may be a reasonable tactic given the need for local processes and local adaptation. *Resource links*, such as the exchange of doctors or nurses, is likely to be effective due to the legitimacy and knowledge of local characteristics. At the same time, the barrier of professionalism may be reduced when the source can be interpreted as internal to the organization and the profession, which in turn may reduce the barrier of achieving a common meaning in the organization. Another resource link that have a similar feature is the link between the medical equipment industry and the hospital. The link is highly regarded by the medical employees and may trigger new ideas for process improvement as the new equipment could requires processes changes.

Organizational innovativeness plays into the inspiration phase, since it is the foundation for what can be achieved in terms of learning and changing. This can be observed through the recognition of the value of new employees, which fits with the mutual learning process, where the new employee assimilates to the culture, but at the same time the organizational code is changed. The observed effects of exchanging doctors for the purpose of training, contribute in the same way. The organizational innovativeness will also play into the perception of what is possible and not in adaptation and reinvention, resulting in a larger base of inspiration for innovative hospitals. Following this thought, it can be proposed that high degree of organizational innovativeness will increase the exploration efforts in the search. The innovativeness should also decrease the fear of unfamiliarity with innovations and recognize the performance gains that theory suggests from introducing new elements. This should further carry over to increase the extensiveness and fidelity in adaptation as the capabilities to handle new elements is higher. This leads to the following proposition for this phase:

Proposition 10: *Resource links, institutional links, meaning, compatibility and organizational innovativeness are five of the most influential determinants in the inspiration phase.*

5.3.3 Adaptation phase

The dominance of determinants concerning the innovation and the low fidelity in adaptation suggests that adaptations to the innovation are the main focus and that adaptations to the organization are secondary. *Reinvention* can be considered a method of adaptation and its presence in this phase can therefore be expected. The need for reinvention is to a large degree a consequence of the low *compatibility* and the need for anchoring in the organization. Reinvention may be a way of circumventing other barriers, such as minimizing the impact of the *not invented here syndrome* and a possibility for scaling down the scope to reduce the need for *collective action*. This suggests that the need for innovations that are reinventable goes beyond the need for high compatibility since reinvention can mitigate the effects of low compatibility in this phase. The need for *experimentation* as a part of adaptation is well founded in theory. The slack resources to do experimentation support the adaptation process. The rational actor model argues higher degrees of imitation over the time that an innovation diffuses, which suggests lower impact of compatibility, reinvention and experimentation over time. If sufficient consensus on best practice evolves among Norwegian hospitals over time, this could result in a decrease in the importance of this phase in the overall process, or a change in the influential determinants.

The influence of *complexity* of the innovation as an impeding determinant for the adaptation phase stems from the inherent complexity of processes in hospitals and the corresponding complex innovations needed to handle this complexity. The perception of lack of compatibility can be interpreted as the drive for adaptation. Political misfit and cultural misfit are likely to be more contributing to low compatibility in this phase than technical misfit. Innovations and ideas with low technical fit are sorted out in the inspiration phase. Cultural misfit is seen as the disparity between the objectives concerning efficiency associated with the process innovation and the cultural values of the hospital concerning quality and patient care. It is a possibility that the cultural and political fit incorporates the aspects of meaning, professionalism and opinion leaders in this phase and is translated by respondents in the interviews as low compatibility with the organization when considering the adaptation phase. In the case of political misfit the actors with interests will use politics to achieve desired outcomes in terms of adaptations and reinvention to make the innovation fit with the existing or desired political scene. This is in part an explanation for the impact of compatibility and reinvention in this phase. This leads to the following proposition for the determinants affecting the phase:

Proposition 11: *Reinvention, compatibility, complexity, collective action and experimentation are five of the most influential determinants in the adaptation phase.*

5.4 Implications for managers

The main implication of RQ1 for managers is that the identification of the most relevant determinants for process innovations aids management in having a more proactive and conscious focus on the elements that are argued to be the biggest challenges for diffusion of innovation. As process innovation is likely to be under influence from a different set of important determinants than those most prominent with medical or technical innovation, a different approach for achieving change must be used in order to succeed. This paper strongly advocates the importance of reinforcement by managers as a necessity in innovation and improvement processes in hospitals. Reinforcement done in a smart way, adjusting for hospital characteristics, seems to act on several determinants and lower the barriers these create. This is a strong signal to managers still combining the leader role with doing surgery that dedicating all time to management is necessary to be successful.

The main implication for managers of RQ2 is the clarification of the process for improvements and how this relates to innovation. From the proposed model, managers can derive that inspiration seem to trump imitation when working with adoption of process innovations. A consequence is that external innovations not should be discarded solely on the basis of it not being directly imitable, which often seem to be the case today. The necessity of adaptations at the local level implicate that managers must give time and resources for this process and be open for adaptations of the organization as well. The research on how the local improvement process is affected by different determinants depending on the phase of the project, implicates that managers involved in the processes must shift their attention deliberately when going from one phase to the next in order to achieve the benefits of the facilitating determinants while mitigating the effects of the impending ones. Managers should also notice that good analyses and relevant benchmarks in process may give a basis for interventions and assist in anchoring, which implicate that managers must prioritize resources for this purpose. This paper supports the effectiveness of a methodology in the overall efforts for improvement, which implicates that managers should devote time and effort in implementing such structures.

5.5 Implications for policymakers

An implication of RQ1 and the most important determinants is that policymakers have a way to go in improving their influence in the diffusion process. The most relevant determinants for the overall diffusion of process innovations are not under the direct influence from policymakers, even though the public hospital services and its central institutions are likely to be in the position to do so.

Implications of RQ2 and the local improvement process are that policymakers should focus on creating motivation for change and create supporting systems to aid the process. Improved understanding of why the local process occurs, instead of direct adoption and how the benefits of the changes may be delayed, suggests that these effects must be incorporated in the systems created by policymakers to facilitate diffusion of process innovations. Among these systems this paper

suggest that methodology or concrete procedures for process improvement, ideally assisted by coordinators, should be disseminated. The determinants affecting each phase allow for a better understanding of how resources should be directed to trigger the local initiative and affect the process, favorably throughout the duration of the project. The importance of the financing structure, market pressures and political influences, all of which in this situation can be affected by policymakers imply that much can be achieved in creating pressures for change. This study shows the importance of relevant benchmarks between comparable hospitals and the possibility of subsequent diffusion of ideas. The implication for policymakers is that their centrality makes them appropriate as providers of this in a more easily accessible and relevant way for the benefit of the hospitals.

5.6 Limitations

Even though the study is focused on innovation, the research area has an extensive interdisciplinary reach that span from innovation theory through change management, social psychology and many other fields of research. This complicates the collection of relevant theory and opens the possibility for the contributions of this study to already being covered by earlier research within one of the related fields of research. The generalizations based on a relatively small sample size are another limitation to this study.

Further, as the process innovation may refer to a wide range of change types, many of which are aiming at improvements across departments, the interview objects at the department level could have limited insight in the overall process and concerns for the hospital as an entity in a larger system. The short time frame of the research is a limitation as it makes it hard to assess the development in the hospital over time. Another limitation is that the source of the results of the change is the same as the source explaining the elements affecting the change. Most of the interview objects from the hospitals talk about their own work, which could influence the presentation of the material, either unconsciously or consciously.

The use of semi-structured interviews could create a bias in relation to which elements that are focused on by the interview objects. The information given prior to the interview may also in some cases have created a cognitive map for the interview objects, which further could have altered how they approached the themes of discussion. Some interviews were, due to practical challenges, performed over the phone, which made it somewhat difficult to control the interviews, as interruptions were difficult and body language unavailable as support.

5.7 Further research

Further research should have a larger sample size to improve the generalizability and focus on how the effects of the nature of process innovations have consequences for the innovation theory. The 11 propositions could serve as a basis for such further research. The proposed intertwined relationships of diffusion networks that arise from the proposed model, should be a topic for further research as it changes how diffusion can be evaluated, and connects the diffusion process to network theory. This research suggests that there is important effects of interconnectedness of determinants, which further research should investigate in order to refine the framework of determinants. The proposed model for process improvement should be tested, particularly by doing a longitudinal study focusing on the local efforts of process improvement, giving additional insight in the proposed phases and the elements affecting them.

6 Conclusion

Based on the efficiency challenges and the low diffusion rates of process innovations, an increased understanding of this phenomenon is needed. This study shows that some of the efficiency challenges and low diffusion rates for process innovation in the Norwegian health care can be attributed to the distinct features of process innovations. This seems to complicate and slow down the diffusion process more than for other innovation types and at the same time hospitals have distinct characteristics making the adoption of these innovation types more complex, which combined slows down the diffusion rate. These concluding paragraphs increase the insight in this situation.

Five of the most influential determinants in the diffusion of process innovations in public health care are *reinforcement by management, meaning, collective action, professionalism,* and *experimentation*. The awareness of the importance of different determinants increases the understanding of how diffusion of process innovations in public health care works, and how they can be influenced.

Determinants influencing the diffusion of process innovations are highly interconnected, which affects their importance in the diffusion process. Reinforcement by management and experimentation facilitate diffusion by mitigating the effects of impeding determinants. Collective action is a significantly impeding determinant, particularly because it increases the effect of other resource demanding or impeding determinants. Meaning and professionalism are related and are particularly impeding determinants in hospitals due to the challenges of managing professions.

This study shows that the innovation-decision model by Rogers (2003) seems to come in short in describing the observed process improvement efforts in hospitals. A new model needs greater flexibility and refinement in terms of motivation sources, inspiration sources and adaptations before implementation. By replacing the three stages leading up to implementation, with the three observed phases, the *motivation phase, inspiration phase* and *adaptation phase*, a model better suited for describing the efforts for process improvement can be obtained. This may result in changes to overall diffusion patterns of process innovations, as the high degree of inspiration and need for adaptation in the phases of process improvement slows down the rate of diffusion and results in intertwined diffusion systems.

This study shows that there is room for improvement by embracing the ideas of others, but that local adaptation must take place in each hospital to reap the benefits of process improvements.

> *"Learning and innovation go hand in hand. The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow."*
>
> *(William Pollard)*

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Appendix A Interview guide

Avklares med intervjuobjektet:

- Presenter på en ryddig måte hva målet med vårt arbeid er, hvorfor vi gjør dette arbeidet og hvorfor vi ønsker å snakke med vedkommende.
- Vi har ingen interesse av pasientsensitiv informasjon.
- Du og ditt sykehus vi bli anonymisert i oppgaven. Omtalen vil kun trekke frem viktige karakteristikker ved det caset deres sykehus utgjør, som for eksempel at dere er et "mellomstort, norsk sykehus".
- Intervjuet vil bli tatt opp, men verken opptaket eller transkriberingen vil bli distribuert videre til andre enn Andreas Ebbesen og Michael Undrum m/veiledere uten din personlige godkjennelse. Når det er sagt vil innholdet bli anonymisert og brukt i oppgaven.
- Dersom vi føler at vi mangler viktig informasjon, håper vi det er greit å stille oppfølgingsspørsmål i etterkant?

Generelle retningslinjer i forhold til innfallsvinkel:

- Vis interesse
- Vær ydmyk
- Ikke fremhev styrkene ved andre sykehus på en måte som setter intervjuobjektet i en defensiv posisjon.
- Kan skape tillit å tydeliggjøre at intervjuobjektet intervjues i lys av hans/hennes spesielle posisjon og innsikt.

Intervjuguide:

- Begynn intervjuet med open-ended spørsmål. La intervjuobjektet stå for pratingen.
- Ikke stress fremgangen i intervjuet. La intervjuobjektet styre tempoet og føle seg bekvem.
- Ikke døm på bakgrunn av det som blir fortalt eller svar som blir gitt. Behold en helt nøytral holdning og sørg for at det er tydelig.
- *Ikke* still ledende spørsmål.
- Sørg for at alle planlagte emner dekkes.
- Still tydelige spørsmål som: Hvordan? Når? Hvor? Hvem? Hvor mange? Hvorfor?
- Når alle emner er dekket, spør intervjuobjektet om vedkommende har noe å legge til i lys av formålet med intervjuet og studien.
- Ikke hal ut intervjuet. Avslutt intervjuet når alt har blitt dekket, selv om det er før avtalt tid.

Rammer for intervjuet:

- Kirurgisk avdeling, nærmere bestemt bløtvevskirurgi
- Teknisk innovasjon er ikke av interesse for intervjuet

Hovedspørsmål	Utdypende spørsmål	Avklarende spørsmål
Intervjuobjektet		
• Kan du introdusere deg selv?	• Hva er jobben din her? • Hvor lenge har du jobbet her? • Hvor har du jobbet tidligere? • Offentlig/privat?	• Kan du utdype det? • Kan du fortelle meg litt mer? • Kan du gi et eksempel?
Sykehuset/avdelingen		
• Hva skiller forholdene ved dette sykehuset fra andre norske sykehus?	• Hva er særegent for måten dere arbeider på i operasjonsstuen her? • Har dere en spesiell spisskompetanse? • Hvordan vil du karakterisere pasientstrømmen deres? • Har dere noen spesielle forutsetninger økonomisk? • Sammenlignet med andre steder du har jobbet, hvordan oppleves arbeidsmiljøet og betydningen av profesjons-grenser her på sykehuset?	• Kan du utdype det? • Kan du fortelle meg litt mer? • Kan du gi et eksempel?
• Hva skiller forløpet ved et kirurgisk inngrep her fra hvordan det gjøres andre steder?	• Hvordan arbeider dere i team på tvers av profesjonene? • Hvordan forberedes inngrepene?	
Innovasjon		
• Arbeider dere med noen spesielle tiltak når det kommer til administrativ innovasjon eller prosessforbedringer for tiden?	• Hvordan forholder dette tiltaket seg til sykehusets overordnede strategi?	• Kan du utdype det? • Kan du fortelle meg litt mer? • Kan du gi et eksempel?
• Hvor har dere hentet inspirasjon til tiltakene dere driver med nå?	• Intern eller ekstern opprinnelse? • Spesielle samarbeid med andre sykehus? • Enderinger som pålegg fra høyere instanser?	
• Hva er målet med de endringsprosessene dere gjennomfører her hos dere?	• Er målet høyere effektivitet eller besparelser? osv	
• Hvordan jobber dere med administrativ innovasjon og nyvinninger generelt?	• Hvem tar avgjørelsene? • Hvem setter i gang tiltakene? • Hvem har ansvaret for at tiltakene gjennomføres? • Dokumenteres resultater eller prosedyreendringer? • Hvordan mottas endringer fra de ansatte? • Hvordan involveres de ansatte? • Har dere noen formeninger om hvilke insentiver som verdsettes høyest blant de ansatte?	
• Påvirker dere i noen grad andre sykehus og måten de gjør ting på der?	• Foregår det erfaringsutvekslinger etc?	
Konkluderende		
• Har du noe å legge til i lys av formålet med studien og intervjuet?		

Appendix B Revised interview guide

Avklares med intervjuobjektet:

- Presenter på en ryddig måte hva målet med vårt arbeid er, hvorfor vi gjør dette arbeidet og hvorfor vi ønsker å snakke med vedkommende.
- Vi har ingen interesse av pasientsensitiv informasjon.
- Du og ditt sykehus vi bli anonymisert i oppgaven. Omtalen vil kun trekke frem viktige karakteristikker ved det caset deres sykehus utgjør, som for eksempel at dere er et "mellomstort, norsk sykehus".
- Intervjuet vil bli tatt opp, men verken opptaket eller transkriberingen vil bli distribuert videre til andre enn Andreas Ebbesen og Michael Undrum m/veiledere uten din personlige godkjennelse. Når det er sagt vil innholdet bli anonymisert og brukt i oppgaven.
- Dersom vi føler at vi mangler viktig informasjon, håper vi det er greit å stille oppfølgingsspørsmål i etterkant?

Generelle retningslinjer i forhold til innfallsvinkel:

- Vis interesse
- Vær ydmyk
- Ikke fremhev styrkene ved andre sykehus på en måte som setter intervjuobjektet i en defensiv posisjon.
- Kan skape tillit å tydeliggjøre at intervjuobjektet intervjues i lys av hans/hennes spesielle posisjon og innsikt.

Intervjuguide:

- Begynn intervjuet med open-ended spørsmål. La intervjuobjektet stå for pratingen.
- Fokuser på "hvorfor"- fremfor "hvordan"-spørsmål.
- Ikke stress fremgangen i intervjuet. La intervjuobjektet styre tempoet og føle seg bekvem.
- Ikke døm på bakgrunn av det som blir fortalt eller svar som blir gitt. Behold en helt nøytral holdning og sørg for at det er tydelig.
- *Ikke* still ledende spørsmål.
- Sørg for at alle planlagte emner dekkes.
- Still tydelige spørsmål som: Hvordan? Når? Hvor? Hvem? Hvor mange? Hvorfor?
- Når alle emner er dekket, spør intervjuobjektet om vedkommende har noe å legge til i lys av formålet med intervjuet og studien.
- Ikke hal ut intervjuet. Avslutt intervjuet når alt har blitt dekket, selv om det er før avtalt tid.

Rammer for intervjuet:

- Kirurgisk avdeling, elektiv kirurgi
- Teknisk innovasjon er ikke av interesse for intervjuet

Hovedtema	Utdypende spørsmål
• Stilling og erfaring	• Hva er jobben din her? • Hvor lenge har du jobbet her? • Hvor har du jobbet tidligere? • Offentlig/privat?
• Forhold og karakteristika ved sykehuset	• Hva er særegent for måten dere arbeider på i operasjonsstuen her? • Har dere en spesiell spisskompetanse? • Hvordan vil du karakterisere pasientstrømmen deres? • Har dere noen spesielle forutsetninger økonomisk? • Sammenlignet med andre steder du har jobbet, hvordan oppleves arbeidsmiljøet og betydningen av profesjons-grenser her på sykehuset?
• Pasientforløpet	• Kan du kort beskrive hvordan dere jobber med endring og forbedring av pasientforløpet? • Hvilket fokus har dere? (helhetlig, kvalitet, økning, flyt) • Planlegging og forberedelse • Innleggelse, operasjon og utskrivning • Hvordan arbeider dere i team og på tvers av avdelinger med dette? (anestesi vs. akutt vs. Elektiv kirurgi)
• Pågående effketivitetstiltak eller forbedringsprosser/ innovasjoner	• Beskriv eventuelle endringsprosesser eller prosjekter? • Hva er målet? • Hvor kommer initiativet fra? Eksternt press? • Hvor henter dere inspirasjon fra?
• Tidligere innovasjoner og forbedringer	• Internt eller eksternt initiativ? • Hva var målet? • Hvor stammer ideene fra? • Spesielle samarbeid med andre sykehus? • Har andre sykehus sett på deres resultater? • Erfaringsutveksling
• Organisasjonens holdninger til endring	• Hvem har ansvaret for at tiltakene gjennomføres? • Dokumenteres resultater eller prosedyreendringer? • Hvordan mottas endringer av de ansatte? • Hvordan involveres de ansatte? • Er profesjonene en hindring for endringer? • Har dere noen formeninger om hvilke insentiver som verdsettes høyest blant de ansatte? • Ledernes betydning og holdning til prosessene
• Policymakers, sentrale instanser og organisasjoner	• Foregår det erfaringsutvekslinger i regi av Direktoratet/departmenetet eller Regionale foretak? • Hvordan legges det til rette for at innovajson skal foregå?
• Har du noe å legge til i lys av formålet med studien og intervjuet?	

Appendix C Factors and determinants affecting diffusion of innovation

Factor	#	Determinant	Definition	Source*	Corr.
Innovation	1	Relative advantage	The degree to which an innovation is perceived better than the idea it supersedes	(Fleuren, Wiefferink, & Paulussen, 2004; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Grol, Bosch, Hulscher, Eccles, & Wensing, 2007; Mustonen-Ollila & Lyytinen, 2003; Orlandi, 1986)	+
	2	Compatibility	The degree to which an innovation is perceived consistent with the existing values, past experiences and the needs of potential adopters.	(Fleuren et al., 2004; Greenhalgh et al., 2004; Grol et al., 2007; Mustonen-Ollila & Lyytinen, 2003; Orlandi, 1986; Rye & Kimberly, 2007)	+
	3	Complexity	The degree to which an innovation is perceived difficult to understand, use, explain and transfer.	(Damanpour, 2008; Fleuren et al., 2004; Greenhalgh et al., 2004; Grol et al., 2007; Mustonen-Ollila & Lyytinen, 2003; Orlandi, 1986; Rye & Kimberly, 2007; Sorenson, Rivkin, & Fleming, 2006)	-
	4	Trialability	The degree to which an innovation, and parts of an innovation, may be experimented with on a limited basis.	(Fleuren et al., 2004; Greenhalgh et al., 2004; Grol et al., 2007; Mustonen-Ollila & Lyytinen, 2003; Orlandi, 1986)	+
	5	Observability	The degree to which the results of the innovation are visible to others.	(Baldridge & Burnham, 1975; Fleuren et al., 2004; Greenhalgh et al., 2004; Greve, 2011; Grol et al., 2007; Mustonen-Ollila & Lyytinen, 2003; Sorenson et al., 2006)	+
	6	Price	The cost of an innovation.	(Damanpour, 2008; Grol et al., 2007; Mustonen-Ollila & Lyytinen, 2003; Orlandi, 1986; Rye & Kimberly, 2007)	-
	7	Trend	The degree to which like-minded and comparable organizations and clients begin to use an innovation or related systems, forcing the user to follow.	(Greenhalgh et al., 2004; Mustonen-Ollila & Lyytinen, 2003)	+
	8	Competitive edge	The degree to which the innovation is superior to other innovations.	(Mustonen-Ollila & Lyytinen, 2003; Rye & Kimberly, 2007)	+
	9	Reinvention	The degree to which the innovation can be adapted, refined or otherwise modified to best suit the needs or situation of the adopting unit.	(Barnett, Vasileiou, Djemil, Brooks, & Young, 2011; Greenhalgh et al., 2004; Grol et al., 2007; Orlandi, 1986)	+

	10	Risk	The degree of uncertainty about results or consequences of adoption.	(Greenhalgh et al., 2004; Greve, 2009; Grol et al., 2007; Orlandi, 1986; Rye & Kimberly, 2007)	-
	11	Collective action	The number of individuals involved in the evaluation and decisions about the innovation.	(Grol et al., 2007)	-
	12	Duration	The time period within which the change must take place.	(Grol et al., 2007)	-
	13	Magnitude of impact	The measures required by the innovation, and the proportion of the total work that is affected by the innovation.	(Fleuren et al., 2004; Grol et al., 2007; Katz, Levin, & Hamilton, 1963)	-
	14	Presentation	The quality and effectiveness of the presentation.	(Becker, 1970; Grol et al., 2007; Katz et al., 1963)	+
	15	Frequency of use	The potential frequency of use for the innovation given its centrality in the adopting unit.	(Fleuren et al., 2004; Grol et al., 2007)	+
Adopting unit	16	Skills, knowledge and ability	The degree to which the adopter is motivated, confident and able (in terms of skills and knowledge) to implement and use the innovation.	(Fleuren et al., 2004; Greenhalgh et al., 2004; Lam, 2004; Orlandi, 1986; Sorenson et al., 2006)	+
	17	Meaning	The degree to which the meaning of implementing the innovation is congruent across hierarchical levels.	(Greenhalgh et al., 2004; Mohr, 1969)	+
	18	Adoption decision	The degree of authoritative decision-making.	(Baldridge & Burnham, 1975; Greenhalgh et al., 2004)	+
	19	Adopter type	The individual propensity to try out new innovations.	(Berwick, 2003; Greenhalgh et al., 2004; Greve, 2009; Mustonen-Ollila & Lyytinen, 2003)	+
	20	Experimentation	The degree to which the there are possibilities, time and competence to perform testing on the innovation.	(Mustonen-Ollila & Lyytinen, 2003)	+
Organization	21	Decision-making structure	The degree of formalization through hierarchical procedures of the decision-making structure.	(Baldridge & Burnham, 1975; Collm & Schedler, 2013; Damanpour, 1987, 1991; Fleuren et al., 2004; Mustonen-Ollila & Lyytinen, 2003)	+
	22	Reinforcement by management	The degree to which formal reinforcements are made by management to integrate innovation into organizational policies.	(Collm & Schedler, 2013; Damanpour, 1991; Fleuren et al., 2004; Orlandi, 1986; Rye & Kimberly, 2007)	+
	23	Managerial attitude towards change	The degree to which managers or members of the dominant coalition favour change.	(Damanpour, 1991; Greenhalgh et al., 2004; Rye & Kimberly, 2007)	+
	24	Opinion leaders and change agents	The presence of individuals who influences clients' innovation decisions.	(Becker, 1970; Mustonen-Ollila & Lyytinen, 2003)	+
	25	Interpersonal networks and internal communication	The degree of communication among organizational units.	(Collm & Schedler, 2013; Damanpour, 1991; Greenhalgh et al., 2004; Lemon & Sahota, 2004; Mustonen-Ollila & Lyytinen, 2003; Rye & Kimberly, 2007)	+

	26	Professionalism	The amount of professional knowledge of an organization's members.	(Damanpour, 1991; Greenhalgh et al., 2004; Rye & Kimberly, 2007)	-
	27	Financing	The degree of incentive to innovate based on the financing structure and the resources beyond minimal requirement to maintain operations within an organization.	(Castle, 2001; Damanpour, 1991; Greenhalgh et al., 2004; Mustonen-Ollila & Lyytinen, 2003; Rye & Kimberly, 2007)	+
	28	Size and organizational complexity	The size and complexity of the organization.	(Baldridge & Burnham, 1975; Castle, 2001; Fleuren et al., 2004; Moch & Morse, 1977; Mohr, 1969; Naranjo-Gil, 2009; Rye & Kimberly, 2007)	+
	29	Functional differentiation and specialization	The degree to which different activities are specialized or differentiated.	(Damanpour, 1991; Greenhalgh et al., 2004; Mustonen-Ollila & Lyytinen, 2003; Rye & Kimberly, 2007)	+
	30	Centralization	The degree to which decision-making autonomy is dispersed or concentrated in an organization.	(Damanpour, 1991; Greenhalgh et al., 2004; Moch & Morse, 1977; Rye & Kimberly, 2007)	+
	31	Organizational innovativeness	The degree to which the organization have a history of successful innovations.	(Collm & Schedler, 2013; Fleuren et al., 2004; Lam, 2004; Lemon & Sahota, 2004)	+
External	32	Cultural values	Cultural beliefs concerning change.	(Mustonen-Ollila & Lyytinen, 2003)	+
	33	Structural and administrative links	The number of structural or administrative interorganizational links.	(Barnett et al., 2011; Castle, 2001; Goes & Park, 1997; Greve, 2011; Sorenson et al., 2006)	+
	34	Resource links	The number of links between organizations created by exchanges or transactions of resources.	(Barnett et al., 2011; Goes & Park, 1997; Greve, 2011)	+
	35	Institutional links	The number and quality of relationships to influential institutions.	(Barnett et al., 2011; Damanpour, 1991; Goes & Park, 1997; Greenhalgh et al., 2004; Greve, 2011; Winch & Courtney, 2007)	+
	36	Standards and political influences	The degree of outside pressure through political directives on the adopting unit to make changes.	(Greenhalgh et al., 2004; Rye & Kimberly, 2007)	+
	37	Market pressures	The influence from elements in the market such as customers and competitors.	(Baldridge & Burnham, 1975; Mohr, 1969; Naranjo-Gil, 2009; Rye & Kimberly, 2007)	+

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Appendix D Coding results

Rank	Coded determinant	Area*
1	Reinforcement by management	**9,3%**
2	Meaning	**7,5%**
3	Professionalism	**7,1%**
4	Collective action	**7,0%**
5	Experimentation	**6,6%**
6	Opinion leaders and change agents	**5,6%**
7	Relative advantage	**5,4%**
8	Compatibility	**5,1%**
9	Managerial attitude towards change	**4,6%**
10	Interpersonal networks and internal communication	**4,3%**
11	Structural and administrative links	**4,3%**
12	Standards and political influences	**3,9%**
13	Observability	**3,3%**
14	Financing	**3,0%**
15	Market pressures	**2,9%**
16	Competitive edge	**2,6%**
17	Skills, knowledge and ability	**2,6%**
18	Reinvention	**2,4%**
19	Institutional links	**2,2%**
20	Size and organizational complexity	**2,2%**
21	Cultural values	**2,2%**
22	Complexity	**2,1%**
23	Duration	**1,9%**
24	Resource links	**1,9%**
25	Functional differentiation and specialization	**1,8%**
26	Magnitude of impact	**1,8%**
27	Organizational innovativeness	**1,6%**
28	Presentation	**1,5%**
29	Adoption decision	**0,8%**
30	Risk	**0,6%**
31	Price	**0,4%**
32	Adopter Type	**0,4%**
33	Trend	**0,4%**
34	Centralization	**0,3%**
35	Frequency of use	**0%**
36	Decision-making structure	**0%**
37	Trialability	**0%**

Rank	Coded determinant	#**
1	Reinforcement by management	**43**
2	Professionalism	**35**
3	Collective action	**33**
4	Meaning	**32**
5	Managerial attitude towards change	**28**
6	Opinion leaders and change agents	**26**
7	Compatibility	**23**
8	Experimentation	**22**
9	Structural and administrative links	**19**
10	Standards and political influences	**19**
11	Relative advantage	**18**
12	Interpersonal networks and internal communication	**18**
13	Competitive edge	**18**
14	Observability	**16**
15	Reinvention	**16**
16	Financing	**15**
17	Skills, knowledge and ability	**13**
18	Size and organizational complexity	**13**
19	Institutional links	**12**
20	Functional differentiation and specialization	**11**
21	Duration	**10**
22	Complexity	**9**
23	Magnitude of impact	**8**
24	Market pressures	**7**
25	Resource links	**6**
26	Risk	**6**
27	Cultural values	**5**
28	Organizational innovativeness	**5**
29	Adoption decision	**5**
30	Presentation	**4**
31	Price	**3**
32	Adopter Type	**1**
33	Trend	**1**
34	Centralization	**1**
35	Frequency of use	**0**
36	Decision-making structure	**0**
37	Trialability	**0**

*Percentage of total coded material
**Number of coded segments