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INVESTIGATING MECHANISMS OF CHANGE IN IMPLEMENTATION PROCESSES: THEORETICAL AND METHODOLOGICAL PERSPECTIVES

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Investigating mechanisms of change in implementation processes: theoretical and methodological perspectives

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ABSTRACT

Background: The implementation of research findings into practice is complex and challenging. Recurrent reports point to the failure of implementation and a costly gap between current knowledge and the services provided to end users. To overcome these challenges and to improve our understanding of implementation, it has been suggested that researchers make use of theory and study the change mechanisms that describe how and why implementation strategies influence outcomes in a specific context. Yet, such studies remain scarce.

Aim: The overall aim of this thesis is to investigate change mechanisms in implementation. This is done through a theoretically based analysis of how behavior change interventions (study I and II) and leadership style (study III) influence employees' initial (study I and III) and sustained (study II and III) use of a teamwork work process (study I and II) and an occupational health intervention (study III).

Methods: Teamwork implementation was studied with a comparable case study design (study I), and teamwork sustainability was further studied with a design based on realistic evaluation (study II). Data were collected with interviews, observations and document analysis. Both studies used the theoretical framework DCOM® to analyze behavior change interventions and observations of teamwork behaviors as the outcome. The influence of line managers' leadership style on implementation was investigated in a longitudinal intervention study (study III). Data were collected from questionnaire surveys at baseline and follow-up at 12 months. Employees' use of the web-based intervention was collected from electronic data logs and used as the outcome.

Findings: An implementation strategy based on communication, daily feedback, ongoing problem-solving and adjustments to the teamwork intervention was found to be successful for the implementation of teamwork. The fallback in the implementation strategy had a negative influence on sustainability. The analysis describes how and why the implementation strategy influenced implementation outcomes in a complex organizational context. Line managers' supportive change activities, which are directly related to the intervention implemented, had a significant influence on employees' initial and sustained use of the web-based occupational health intervention. The line managers' transformational leadership did not have a direct influence on use but an indirect influence mediated by their supportive change activities.

Conclusions: The DCOM® framework and realistic evaluation provided useful theoretical and methodological frameworks for the investigation and understanding of how the implementation strategy and contextual factors interact and cause behavior change. The findings imply that an implementation strategy should be based on a theoretical understanding of change mechanisms and an analysis of context to successfully influence behavior change. Furthermore, the findings points to the dynamics of context and suggests that context needs to be continuously updated and in turn used to guide updates to the

implementation strategy. Finally, the thesis underlines the importance of line managers' dedicated focus on supportive change activities and challenges previous research suggesting that transformational leadership is the leadership style of choice for successful implementation.

LIST OF SCIENTIFIC PAPERS

I. **Frykman, M.**, Hasson, H., Muntlin Athlin, A. & Von Thiele Schwarz, U. 2014. Functions of behavior change interventions when implementing multi-professional teamwork at an emergency department: a comparative case study. *BMC Health Services Research*, 14.

II. **Frykman, M.**, Von Thiele Schwarz, U., Muntlin Athlin, Å., Hasson, H. & Mazzocato, P. 2017. The work is never ending: uncovering teamwork sustainability using realistic evaluation. *Journal of Health Organization and Management*, 31.

III. **Frykman, M.**, Lundmark, R., Hasson, H., Villaume, K. & Von Thiele Schwarz, U. 2017. Line managers' influence on an intervention process: perspectives on transformational leadership and managers' supportive change activities. Manuscript.

CONTENTS

LIST OF ABBREVIATIONS

BCI   Behavior Change Intervention

BCW   Behavior Change Wheel. A theoretical model for analyzing and designing behavior change interventions.

COM-B   Capability, Opportunity, Motivation and Behavior. A behavior system that serves as the hub of the Behavior Change Wheel.

DCOM®   Direction, Competence, Opportunity and Motivation. A framework for analyzing behavior change mechanisms.

DLQ   Development Leadership Scale

ED   Emergency Department

NA   Nurse Assistant

RN   Registered Nurse

TDF   Theoretical Domains Framework. A theoretical framework for analyzing behavior change interventions.

1 INTRODUCTION

Every year, vast resources are invested in research providing new scientific findings and interventions that aim to improve health and well-being. Despite these efforts, there are recurrent reports on the gap between current knowledge and the services provided to end users (Fixsen et al., 2005; Grimshaw et al., 2012). This failure to successfully implement research findings and new innovations into practice has been called "one of the most consistent findings in clinical and health services research" (Grimshaw et al., 2012). For instance, health care research suggests that patients on average receive 55% of recommended care, and as much as 20-30% of patients may receive unneeded care (McGlynn et al., 2003). The total cost of inefficient care has been estimated to be 20-40% of the total cost of care (Sollecito and Johnson, 2013). A better understanding of the implementation of research findings has the potential to increase the delivery of efficient and evidence-based service to society. Given the resources invested in health and well-being, the potential value for society is huge.

Implementation research aims to understand the process of implementation and the factors that facilitate successful integration of research findings in a specific context (Colditz, 2012). The broad definition makes implementation research relevant for intervention researchers within both health care and public health and covers a wide array of interventions such as: clinical effectiveness interventions, programs for preventive medicine and occupational health and safety interventions (Dearing and Kee, 2012; Peters et al., 2013). Even though the typical setting and intervention can differ between studies, and even though different fields of implementation research have developed, implementation researchers are united by the attempt to understand how research findings are translated into behavior change and come to be used in real-world settings (Peters et al., 2013); that is, not in the controlled setting of a laboratory but in the complex setting of actual organizations that consists of real workplaces with real employees.

In the real world, there are a multitude of factors that can influence the effectiveness of an implementation strategy (Greenhalgh et al., 2004; Lau et al., 2015; Lau et al., 2016; Robert and Fulop, 2014). Such factors constitute the settings' context and can include the organizational culture, social environment, economic and physical resources and other factors that are part of the setting but are separate from the implementation strategy (McCormack et al., 2002; Robert and Fulop, 2014). Research in real-world settings is complicated by the fact that the context of one setting is not like the other (Greenhalgh et al., 2004; Lau et al., 2015; Lau et al., 2016). For example, two emergency departments (EDs) can have different cultures and available resources and might thus respond differently to the same implementation strategy. This was learned the hard way by early implementation researchers, around and before the millennium, which tended to rely on rather simplistic empirical research that lacked a theoretical underpinning (Chambers, 2012; Davies et al., 2010; Eccles et al., 2005; Nilsen, 2015). The research successfully identified implementation strategies and organizational factors associated with successful

implementation (Chambers, 2012). However, the results from this research were mixed, and implementation strategies that were successful in one setting were not necessarily successful in another (Bero et al., 1998; Grimshaw et al., 2001; Grol, 1997). The empirical research approach did not allow for a deeper analysis and understanding of how and why implementation was achieved in the context of application. Thus, researchers could not provide a meaningful answer as to why implementation success varied and, most importantly, could not predict effective implementation strategies for use in a given setting (Grimshaw et al., 2006; Grol, 1997). During these early years, the implementation process was referred to as the "black box" of implementation (Fixsen et al., 2005).

Building on the early years of implementation research, the last decade has seen a shift and promising development. There is an increasing interest for methodological approaches and theoretically based research that allow for a deeper analysis of implementation strategies and that seek to understand the underlying mechanisms that explain how implementation strategies influence behavior change and why implementation strategies are successful in a specific context (Greenhalgh et al., 2004; Lau et al., 2015; May et al., 2016; Michie et al., 2009; Wilson et al., 2017). The following sections describe three areas of implementation research that are recurrently described as important for the future development of implementation (Davies et al., 2010; Eccles et al., 2005; Grimshaw et al., 2006; Michie et al., 2009; Nielsen, 2013; Proctor et al., 2011; Sandstrom et al., 2011). The areas reflect the need for researchers to embrace the complexity of implementation and to open the "black box" for a detailed analysis of the mechanisms of change that drive successful implementation. This thesis investigates these three areas, as specified in the aim.

Firstly, there is a call for the use of behavior change theory in implementation research (Davies et al., 2010; Eccles et al., 2005; Michie et al., 2009). Such theories allow for a theoretically based analysis of the mechanisms that underlie behavior change and subsequently describe how and why implementation strategies are successful (or not) in a given context (Dalkin et al., 2015; Eccles et al., 2005; Greenhalgh et al., 2004; Michie et al., 2009). Recommendations include the use of psychological and sociological theories of change (Eccles et al., 2005; Grol, 1997; Johnston and Dixon, 2008; Michie et al., 2005). A recent review presents 17 implementation research studies that are guided by behavior change theory, thus indicating that there is an increasing use of theory in implementation research (Francis et al., 2012). Still, the integration of behavior change theory in implementation is quite recent, and there is a call for more studies that add to the application of theory and understanding of behavior change mechanisms in implementation (Wilson et al., 2017).

Secondly, line managers have been suggested as having a key role in the implementation of organizational change (Gilley et al., 2009; Higgs and Rowland, 2011; Nielsen, 2013; Sandstrom et al., 2011). They are typically responsible for the actual implementation activities, and some previous research has found that the leadership of line managers can influence the implementation of organizational change in health care (Aarons and

Sommerfeld, 2012; Sandstrom et al., 2011) and occupational health (Nielsen, 2013; Nielsen and Randall, 2009). However, the research on line managers' role in implementation has lacked in theory and has been unable to describe how line managers influence the implementation process (Aarons et al., 2014). Thus, it has been suggested that implementation research uses leadership theory to investigate the role of line managers with a focus on understanding how different leadership styles influence the implementation process (Aarons et al., 2014; Nielsen, 2013).

Thirdly, previous studies have relied on outcome measures of varying quality, for instance, including distal outcomes such as clinical effectiveness, to evaluate implementation (Grimshaw et al., 2006; Proctor et al., 2011). This is a problem if you want to understand implementation processes since inadequate outcomes leave us ignorant about how potential effects were achieved (Dobson and Cook, 1980; Proctor et al., 2011). Rather, implementation evaluation should be based on implementation outcomes that measure the actual effects of implementation strategies (e.g., the extent an intervention is actually implemented) and thus allow for a more detailed analysis of what happens during the implementation process and, subsequently, a better understanding of what aspects of the implementation worked or not (Proctor et al., 2011). It is suggested that implementation research uses implementation outcomes and develops theory and methodology related to implementation outcome measures (Wilson et al., 2017).

2 AIM

The overall aim of the thesis is to investigate change mechanisms in implementation processes. This is done through a theoretically based analysis of how behavior change interventions (study I and II) and leadership style (study III) influence employees' initial (study I and III) and sustained (study II and III) use of a teamwork work process (study I and II) and an occupational health intervention (study III).

The specific aims of the studies are as follows:

Study I: To analyze the functions of behavior change interventions and to analyze and compare the influence of these interventions on teamwork behaviors at two sections of an emergency department.

Study II: To uncover the mechanisms influencing the sustainability of behavior changes following the implementation of teamwork at an emergency department.

Study III: To investigate the line managers' influence on a process outcome of an occupational health intervention.

3   BACKGROUND

The background is divided into four sections. The first section introduces basic concepts in implementation research that are of emphasis in the thesis. These concepts are implementation process, implementation strategies and behavior change mechanisms. The second section describes the behavior change theory and framework used in this thesis and theories and frameworks previously used in implementation research. The third section describes perspectives on the line manager's role in implementation and specifically how transformational leadership can be used to understand the influence of the line manager's leadership on implementation outcomes. The final section of the background looks deeper into the use of implementation outcome measures.

3.1   IMPLEMENTATION OF ORGANIZATIONAL INTERVENTIONS

Implementation can be defined as the deliberate and planned process of putting an intervention to use or integrating an intervention within an organizational setting (Rabin and Brownson, 2012). This section provides an overview of the implementation process and describes how behavior change mechanisms can be used to understand how implementation strategies translate into behavior change.

3.1.1   The implementation process

The process of implementation can be defined in stages that describe the gradual transfer of research findings into actual use and the full integration with an organizational system. There are a number of models and frameworks that describe the implementation process (Nilsen, 2015). The present thesis uses the common implementation process model proposed by Fixsen et al. (2005). The model describes the implementation process in six stages. An overview of the model is found in Figure 1.
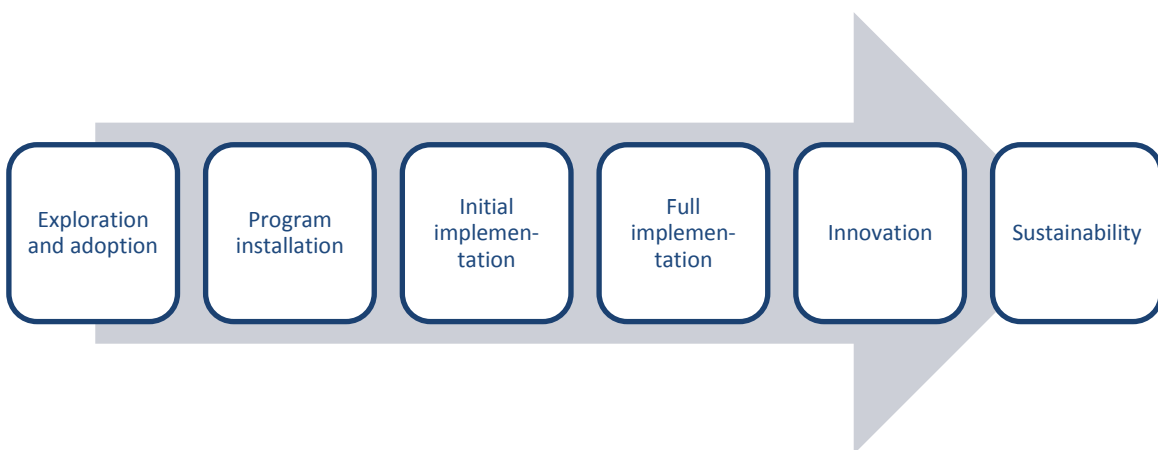

Figure 1. Stages of the implementation process as described by Fixsen et al. (2005).

The stages include *the exploration and adoption stage* where the stakeholders identify what an organization need, an intervention that corresponds to that need and make the decision to implement the intervention. After the decision to implement has been made, *the program*

installation stage follows. During program installation, the organization prepares for the implementation, secures funds and personal resources, involves stakeholders and so on. Actual change begins with *the initial implementation stage* when the intervention is actually implemented. This stage is described as a challenging stage of implementation that puts pressure on staff as well as management (Fixsen et al., 2005). When the intervention starts to integrate with the organizational structures and the staff and management have adopted the intervention, *the full implementation stage* is reached. *The innovation stage* refers to ongoing improvements and adjustments made to the intervention in the specific setting where it is implemented. Finally, *the sustainability stage* is about securing competence and doing ongoing adjustments that make sure that the intervention fits with the organization over time. Fixsen et al. (2005) acknowledge the complexity of the implementation process and the influence of contextual factors on the process. For instance, the process can move backwards due to changes in context, and the relative importance and length of the stages vary between implementations depending on the contextual factors of the specific setting. Thus, the process should be seen as a dynamic set of stages that guide the overall understanding of the process and not as a fixed process.

3.1.1.1 Sustainability of interventions

Of the stages outlined in implementation frameworks such as that suggested by Fixsen et al. (2005), most attention has been on the early stages of the implementation process (Greenhalgh et al., 2004; Proctor et al., 2015). This might be due to practical reasons. It takes time and resources to collect data throughout the implementation process, which can last for several years. However, the lack of studies has led to a limited understanding of the mechanisms involved in large-scale integration and sustained use of interventions (Greenhalgh et al., 2004; Proctor et al., 2015). This knowledge gap is problematic for at least two reasons. Firstly, early stage implementation does not automatically lead to the long-term sustainability of intervention implementation (Bowman et al., 2008; Shediac-Rizkallah and Bone, 1998). Thus, indicating that sustainability needs to be studied exclusively. Secondly, the costs related to failed sustainability are huge since the sustained use of interventions is when the implementation "pays off" and end users can benefit from research findings on a larger scale.

It has been suggested that effective implementation strategies, relevant outcome measures and the factors that influence the outcomes can differ between implementation stages (Proctor et al., 2015). For instance, during early stage implementation, it could make sense to use communication strategies to raise awareness and motivation among the staff to try the new intervention. The impact of such strategies could be measured with a survey that measures the intention to try the intervention. In contrast, during later stages of implementation, when the intervention is already in use and the focus is on securing sustainability, a more relevant implementation strategy might be to integrate training related to the intervention with the introduction of newly hired staff and thereby secure the skills of new staff to use the intervention. The outcome of such integrated training could be

measured with a competence test (Proctor et al., 2015; Proctor et al., 2011). In summary, it is recommended that implementation researchers study all stages of implementation and, when doing so, acknowledge the differences between implementation stages and adjust both strategy and measures in order to develop a fuller understanding of all stages of implementation (Greenhalgh et al., 2004; Proctor et al., 2015; Stirman et al., 2012). The current thesis study II and III answer the call for more research during later stages of the implementation process.

3.1.2 The use of the terms *implementation process* and *intervention process* in this thesis

The thesis includes two studies (study I and II) that relate to the implementation process described by Fixsen et al. (2005). The thesis also includes a study of an occupational health intervention (study III) based on an intervention process perspective that is somewhat different from that described by Fixsen et al. (2005). To avoid confusion, the following text briefly presents the occupational health intervention process model used in study III and relates it to Fixsen´s implementation process model. The intervention process model used in study III is a recently proposed model (Nielsen and Abildgaard, 2013) that describes a four-stage intervention process: (1) *the initiation stage* where the overall intervention strategy is developed; (2) *the screening stage* that identifies the problem areas to target; (3) *the action plan stage* that develops the intervention activities and (4) *the implementation stage* where the intervention activities are implemented.

Stage one to three in Nielsen and Abildgaard's model (Nielsen and Abildgaard, 2013) relate to the first stage of Fixsen et al. (2005). The last stage of the intervention process relates to stage two to six in the implementation process (Fixsen et al., 2005). Thus, it seems as if Fixsen et al. (2005) put greater focus on the details of the implementation stages, whereas Nielsen and Abildgaard (2013) focus more on the early stages where the organizational need and corresponding intervention activities are identified and developed. The differences reflect how the intervention process perspective, as it is used in occupational health research, does not rely on pre-packaged interventions to the same extent as implementation research (Nielsen and Abildgaard, 2013). Rather, the intervention process gives room for an intervention design process that is based on the contextual conditions of the organization (Nielsen and Abildgaard, 2013). However, despite some differences in focus, both models include an implementation perspective, and there are no differences in regard to change mechanisms. Thereby, for the sake of the current thesis that focuses on understanding the underlying mechanisms of change in implementation, the implementation and intervention perspectives are used interchangeably.

It should also be noted that intervention research uses the term process outcomes, as opposed to implementation outcomes, to describe outcomes measured during the intervention process (Nielsen and Abildgaard, 2013). Given that the intervention process includes an implementation stage, the term process outcomes is considered to include implementation outcomes. Thereby the term implementation outcomes is used to describe

process outcomes throughout the thesis. A deeper investigation comparing implementation and intervention research process models is beyond the scope of the thesis.

3.1.3 Implementation strategy and drivers of behavior change

In the current thesis, the term implementation strategy is used to describe the sum of activities used to implement an intervention. The implementation strategy consists of behavior change interventions (BCIs) that are defined as the actual activities, or set of activities, that drive behavior change. For instance, BCIs include activities such as staff selection, training, coaching and education.

Previous implementation studies have used different definitions to describe the activities that drive behavior change. For example, the activities have been referred to as implementation or intervention strategy (Grimshaw et al., 2004), core implementation components (Fixsen et al., 2005) and behavior change techniques (Michie et al., 2008; Michie et al., 2013).

It should be noted that Michie et al. (2008; 2013) also use the term BCI, but as a description of sets of behavior change techniques, rather than as the actual activities used to drive implementation. Thus, the use of the term behavior change techniques instead of BCIs in the present thesis would have made a better fit with the previous definition by Michie et al. (2008; 2013). Nevertheless, for the sake of consistency with the nomenclature in the thesis articles, the term BCI has been used to describe actual activities throughout the thesis.

3.1.4 Change mechanisms in implementation

Whereas implementation strategy and BCIs describe the activities that are performed to implement organizational change, they do not describe how these activities lead to behavior change. For this, we need to study change mechanisms. Change mechanisms describe the underlying function of BCIs, (i.e., how and why a BCI influences a target behavior in a specific context) (Dalkin et al., 2015; Eccles et al., 2005; Greenhalgh et al., 2004; Michie et al., 2009). The following example serves to illustrate how change mechanisms can be understood. The example is a training BCI that focuses on improving teamwork and communication skills for the staff at an ED. The aim of the BCI is to support the implementation of teamwork and thus lead to more teamwork behaviors. The basic assumption is that training will increase the staff's skills and knowledge, which in turn will cause behavior change. Thus, the mechanism of change is assumed to be increased skills and knowledge. This might seem reasonable, but there are several potential problems with this assumption. Firstly, the training will only cause behavior changes if a current lack of skills and knowledge hinder the performance of teamwork behavior. If skills and knowledge are sufficient, training is unlikely to cause behavior changes. Of course, the level of skills and knowledge pre-implementation can vary between settings, and thus, so will the effect of the training.

Secondly, training can have other functions than increased skills and knowledge. For instance, training could have a team-building function that increases the staff's motivation to help colleagues at work. If the motivation to help colleagues is important for the implementation of teamwork, then motivation might be the primary mechanism of change. Thus, the same training could influence the implementation of teamwork through different mechanisms at different departments.

Thirdly, let's say that skills and knowledge are low and that the BCI training leads to an increase in skills and knowledge that can influence behavior change. The practitioners might still not change behaviors if they lack the motivation to do so. The motivation to change might be low because the practitioners do not see the purpose to change, for example, if the benefits of behavior change are unclear. Thus, despite increased skills and knwoledge the influence of the BCI training could vary between settings depending on the motivation to change in each setting. When motivation is low, the training might be successful in combination with a BCI that provides information that increases the motivation to change by making the purpose of the intervention clear and the value added explicit.

The example above illustrates why a BCI cannot be expected to have the same function in different settings. This is in line with previous research that has found that the varying effects of implementation strategies can depend on variation in the settings contexts (see below for a more detailed description of context) (Durlak and DuPre, 2008; Greenhalgh et al., 2009; Greenhalgh et al., 2004; Grimshaw et al., 2012; Lau et al., 2015; Lau et al., 2016; May et al., 2016; Michie et al., 2011; Pawson et al., 2005). Thus, a better understanding of the relationships between BCIs, change mechanisms and context could improve the efficiency of implementing research findings (Greenhalgh et al., 2004; May et al., 2016; Michie and West, 2012). The current thesis set out to investigate these relationships further.

Given the central role of change mechanisms and context, the following section describes a methodological approach, realistic evaluation, which is used in the thesis to study how implementation outcomes are caused by change mechanisms in relation to context. Thereafter follows a section that presents characteristics of context that can be important for implementation research. Realistic evaluation and context are followed by a more detailed description on behavior change theories that can be used to analyze change mechanisms in implementation.

3.1.5 Realistic evaluation

A methodological approach that is used to study change mechanisms in the context of application is realistic evaluation (Pawson and Tilley, 1997). The realist approach is based on the view that change is implemented in "real" social systems, that each one has different contextual factors and that the difference in context can explain why similar interventions can lead to different results (Pawson and Tilley, 1997, pp. 55-82). Obviously, the view that context influences the implementation outcomes is not unique for realistic evaluation.

However, realist evaluation describes the causal relationship between the BCI and context by stating that change mechanisms are activated by the context of application (Pawson and Tilley, 1997, pp. 55-82). This is illustrated with the so-called CMO formula that states that Context + Mechanism = Outcome (Pawson and Tilley, 1997, p.xv). Thus, the approach of realistic evaluation makes the role of context in relation to change mechanisms explicit. The understanding of context in this thesis is influenced by the realist approach, and the actual use of realism in the thesis is further described in the methodological framework in section 4.

3.1.6 Context in implementation research

There are multiple definitions of context in implementation (Robert and Fulop, 2014). One definition commonly used defines context in terms of outer context (laws, regulations, the health care system and other factors that lie outside of the organization) and inner context (the "hard" medium of organizational structures, work processes and priorities and the "soft" medium of organizational culture and ways of working) (Robert and Fulop, 2014). The definition implies that context is changeable and that the contextual factors that influence behavior change in one setting, at one point in time or during one stage of the implementation process might not be present or relevant in another (Greenhalgh et al., 2004; May et al., 2016; Stetler et al., 2009). Thus, researchers must be sensitive to changes in contextual factors that occur over time (Robert and Fulop, 2014; Stetler et al., 2009). An aspect of context that might be especially important for health care settings is organizational complexity. Complexity is often used to describe health organizations and arises when work processes and departments are interconnected and when changes in one part of the organization influence another (Bradley et al., 2006; Plsek and Greenhalgh, 2001; Rycroft-Malone et al., 2004). This means that complexity can make it difficult to predict the effect that changes within the organization will have on all the different parts of the organization.

3.2 THEORIES OF BEHAVIOR CHANGE IN IMPLEMENTATION

Theory can be defined as "a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of a phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena" (Kerlinger and Lee, 1999, p. 11). By nature, theories are abstract rather than content specific, and the generality (i.e., the broad application of theory) is important (Glanz et al., 2008). Theories of behavior change aim to explain the constructs that influence how people change their behavior and, importantly, can be used to predict future behavior change (Kerlinger and Lee, 1999, p. 11). Such theories are suggested to be used for the analysis and understanding of behavior change mechanisms in implementation (Eccles et al., 2005; Michie et al., 2009). It is suggested that such theories can be found in psychology (Eccles et al., 2005; Grol, 1997; Johnston and Dixon, 2008; Michie et al., 2005).

The following sections first describe criteria required for a theory to be used in implementation research. The DCOM® framework that is used to guide the analysis in the present thesis and its theoretical underpinning in operant learning theory are described. Thereafter follows a brief description of the theoretical domains framework (TDF) (French et al., 2012; Michie et al., 2005) and the behavior change wheel (BCW) (Michie et al., 2011). The TDF and the BCW are based on psychological theory and developed for analyzing behavior change mechanisms in implementation. They have had a substantial impact on the use of theory in implementation research (Atkins et al., 2016; Francis et al., 2012; McSharry et al., 2016; Sinnott et al., 2015; Steinmo et al., 2015; Suntornsut et al., 2016; Wilson and Marselle, 2016) and serve as a description of the current state of behavior change theory in implementation. At the end of the section, similarities and differences between the theoretical frameworks are reflected upon.

3.2.1 Which psychological theories are of use for implementation research?

There is an abundance of psychological theories of behavior change, among which many are based on the same or overlapping constructs (Ashford, 1998). The numerous theories make it difficult to choose the right one(s) to guide implementation. Eccles et al. (2005) presented three criteria for a theory to be of value for implementation research: (1) it has shown effectiveness in describing and explaining change in behavior; (2) factors that underlie the theory are changeable rather than unchangeable, such as gender or age; (3) factors underlying the theory are both volitional and non-volitional. The latter means that the theory should include factors that are under the individual's control as well as factors that are not under the individual's control (Eccles et al., 2005). In addition to these criteria, it has been argued that theories should take a broad stance and cover the whole range of factors relevant to understanding behavior change rather than a narrow perspective that cover only some aspects of behavior change (Michie et al., 2011).

3.2.2 Operant learning theory

Operant learning theory (Skinner, 1963) is one of the major psychological theories of the 20th century (Haggbloom et al., 2002) and has been suggested as a useful theory for implementation research (Grol, 1997; The Improved Clinical Effectiveness through Behavioural Research Group, 2006). In this thesis, studies I and II are based on operant learning theory (Skinner, 1963) and the application of operant learning theory with the use of the DCOM® framework (Johnson et al., 2008, pp. 67-70). The following sections first give a brief introduction to operant learning theory and then to the DCOM® framework.

Operant learning theory and its different applications, such as applied behavior analysis, explain behavior as a function of two types of contingencies: antecedents and consequences (Baer et al., 1968). Antecedents precede behavior and have the function to trigger behaviors whereas consequences follow the behavior and influence the probability that the behavior will be repeated in the future (Baer et al., 1968; Skinner, 1963; Skinner, 1969). The basic

principle is that learning occurs when human behavior is shaped by the consequences the behavior elicits.

Organizations are systems that provide antecedents and consequences and thereby trigger and shape work behavior within the organizational system (Rummler, 2007). For example, work-related feedback can take the form of a consequence in the sense that it is a positive or negative review of behavior that is fed back to the performer of the behavior as a consequence of performance. Feedback has been researched for decades and is known to influence work-related behavior (Alvero et al., 2001). Operant learning theory has been used successfully to analyze and explain behavior change in different settings, such as clinical (Butler et al., 2006), educational (Anderson and Kincaid, 2005) and organizational (Cooper, 2009; Stajkovic and Luthans, 1997; Stajkovic and Luthans, 2003), and corresponds to the criteria set by Eccles et al. (Eccles et al., 2005).

3.2.3 The DCOM® framework

The DCOM® framework is based on operant learning theory and is used to analyze and explain organizational behavior and to design organizational interventions (Johnson et al., 2008, pp. 67-70). The framework explains behavior as a function of four main dimensions: *direction*, *competence*, *opportunity* and *motivation* (see Figure 2).
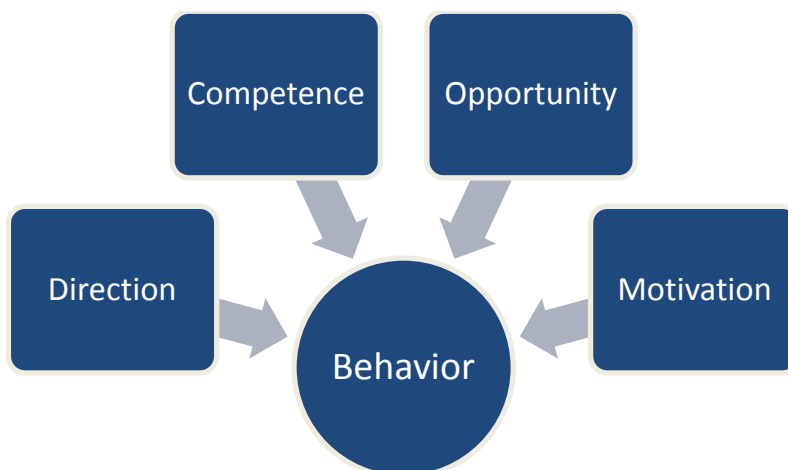
Figure 2. The DCOM® framework (Johnson et al., 2008).

Direction is the vertical and horizontal alignment of vision, goals and behaviors within the organization. When employees know what behaviors are expected of them and how their behaviors relate to colleagues' behaviors and the overarching goals of the organization, then *direction* is high.

Competence is an employee's ability, in terms of knowledge and skills, to perform expected behaviors. Thus, *competence* is high when the skills and knowledge to perform expected behaviors are high.

Opportunity comprises the tools and resources needed to perform behaviors. *Opportunity* includes the physical environment, financial resources and organizational processes that support behavior.

Finally, *motivation* is the drive that maintains behavior performance over time. The first three dimensions (i.e., *direction*, *competence* and *opportunity*) can be viewed as antecedents to behavior that trigger and enable the performance of behaviors (Johnson et al., 2008, pp. 68-69). *Motivation* is more related to the consequences that follow behavior and serves to reinforce behavior (Johnson et al., 2008). *Motivation* is high when behaviors that are important for the organization's mission and goals are reinforced on an individual level.

One of the main strengths of the DCOM® framework and the underlying theory of operant learning theory is that it helps the user to look beyond the descriptive attributes of BCIs and focus on the underlying function that the BCI has in a specific context. As described in the example in section 3.1.4, the effect of training is not only down to the quality of the training itself, but to the extent that increased *competence* is a driver of behavior change in a specific context. Also, and importantly, increased *competence* is not the only function of training. Training could increase *direction* if it serves to clarify what needs to be done. It could even be motivational if it leads to team-building among the employees taking the education and that team-building makes employees more motivated to work together once they know each other better. These are examples, but the point is that the framework and approach of the DCOM® guides a dynamic analysis of underlying functions as opposed to a static analysis based on functions previously related to the BCI in other contexts.

3.2.4 The theoretical domains framework

In contrast to the DCOM®, the TDF is an expert consensus framework that integrates several psychological theories of behavior change, including operant learning theory. The TDF describes the 12 most important theoretical domains that cause behavior change (French et al., 2012; Michie et al., 2005). The 12 domains are: (1) knowledge; (2) skills; (3) social/professional role and identity; (4) beliefs about capabilities; (5) beliefs about consequences; (6) motivation and goals; (7) memory, attention and decision processes; (8) environmental contexts and resources; (9) social influences; (10) emotion; (11) behavioral regulation; (12) nature of the behavior.

The behavioral domains describe key constructs but no causal links between the constructs (Michie et al., 2005). Thus, it does not say whether or how the constructs are interrelated. To my knowledge, the TDF is the first theoretical framework for analysis of behavior change mechanisms in implementation. A 2012 review of the use of the TDF found 133 citations of the framework and 17 studies that used it as the main theoretical framework to analyze barriers of implementation (Francis et al., 2012). The studies were published in 13 different journals, indicating considerable breadth of use. The TDF is used to analyze barriers for implementation and to tailor interventions aimed at influencing practitioners' behaviors (Francis et al., 2012). Recent publications include interventions that target

nurses' use of electronic records (Debono et al., 2017), diabetes prevention behaviors in Thailand (Suntornsut et al., 2016) and chest pain risk evaluation (Skoien et al., 2016).

3.2.5 The behavior change wheel

The BCW is a theoretically based model that can be used to analyze and design BCIs (Michie et al., 2011). The wheel can be seen as a development of the TDF that takes a comprehensive approach to behavior change in implementation and connects policy and intervention functions with a theoretically based behavior change framework. Figure 3 gives an overview of the BCW and describes how policy (outer layer), intervention functions (middle layer) and basic components of behavior change (inner layer) are linked together. The following sections first give a brief description of the BCW and then describe how the BCW can be used in practice.
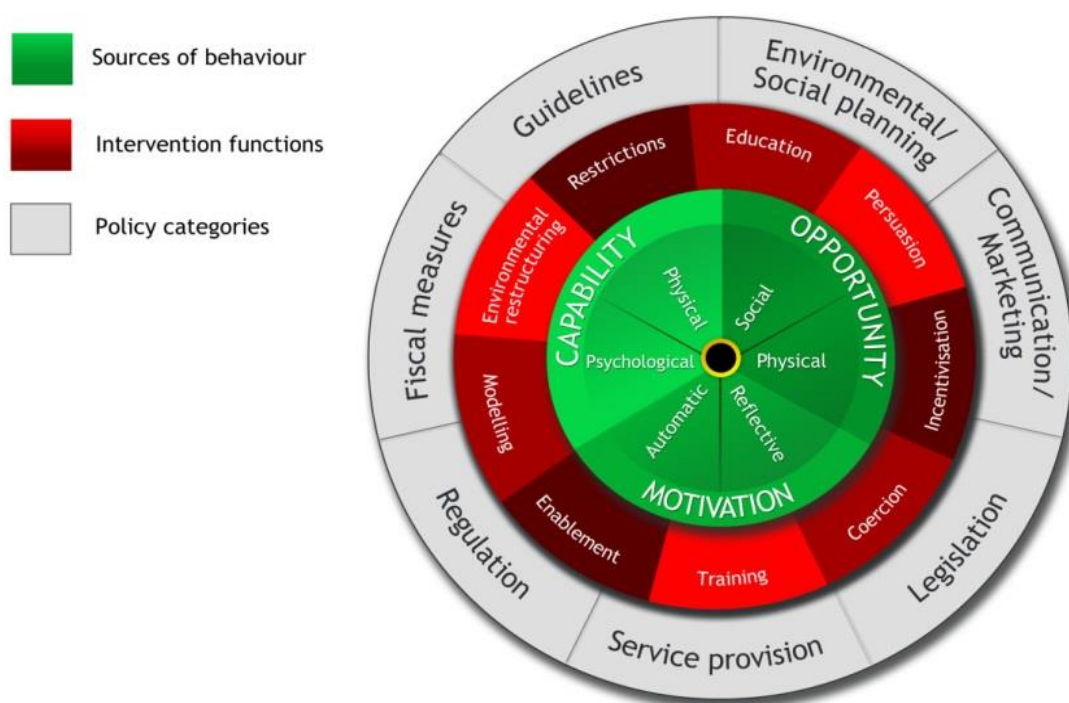
Figure 3. The behavior change wheel (Michie et al. (2011). Reproduced with permission from the publisher

The inner layer of the BCW contains the COM-B framework that describes three basic components of behavior change. The components are inspired by a principle of US criminal law and theoretically based on a psychological expert consensus model originally developed to influence health-related behaviors (Fishbein et al., 2001; Michie et al., 2011). The expert consensus did not explicitly include operant learning theory (Fishbein et al., 2001), but rather social cognitive theory (Bandura, 1986), the health belief model (Becker, 1974; Janz and Becker, 1984), the theory of reasoned action (Fishbein, 1980; Sheppard et al., 1988), self-regulation and self-control theory (Kanfer and Kanfer, 1991) and the theory

of subjective culture (Triandis, 1972). The components are defined as follows (Michie et al., 2011).

Capability is the physical and psychological capacity that is needed to engage in a behavior.

Opportunity is described as the context of the setting and consists of the factors that lie outside of the individual and prompt behavior. Such factors include both the physical environment and social aspects of the context, such as organizational culture.

Motivation is the drive that directs behavior and includes reflective processes, such as planning, and automatic processes, such as emotions and associative learning.

In relation to the TDF that describes a list of 12 domains useful for understanding behavior change (Michie et al., 2005), the COM-B is a more complete framework that sets out to cover all aspects of behavior change and the interrelationships between the components. In addition, the BCW elegantly links the basic components of behavior as described in the COM-B to a second layer of the BCW that consists of nine intervention functions. The intervention functions describe categories of activities used to influence behavior. An intervention can be linked to more than one component, and there are no restrictions as to which interventions can be linked to the different components. The third layer of the BCW describes seven policy categories that can support the intervention functions. The interventions and policy categories were developed out of an analysis of 19 intervention frameworks that each alone describes a limited aspect of intervention and policy but when added together gives a comprehensive picture. Since first presented in 2011, the BCW has been used to design implementation interventions in health care (Atkins et al., 2016; McSharry et al., 2016; Sinnott et al., 2015; Steinmo et al., 2015; Suntornsut et al., 2016) and other areas of human behavior, such as energy efficiency (Wilson and Marselle, 2016).

3.2.6 Reflections on the theoretical frameworks

There are obvious similarities between the DCOM® framework and the COM-B hub. Both are theoretically based comprehensive frameworks that set out to cover all aspects of behavior change. The dimensions *competence* (DCOM®) and *capability* (COM-B) are close in definition, and the dimensions of *opportunity* and *motivation*, found in both the DCOM® and COM-B, are not identical but share many features. Thus, all dimensions of the COM-B are found in the DCOM®. Looking at the details of the dimensions, the COM-B dimensions are more closely defined and all three COM-B dimensions have subcategories that explain the content of the dimensions. However, the most striking difference is the dimension *direction* in DCOM® that has no obvious counterpart in the COM-B. The frameworks' similarities and differences and their importance for understanding behavior change in implementation are further elaborated in the discussion section.

3.3 LINE MANAGERS' ROLE IN IMPLEMENTATION

Study III investigates the influence of line managers on the implementation of an occupational health intervention. Line managers have been described as important actors in the implementation of organizational change, occupational health interventions and evidence-based practice (Gilley et al., 2009; Higgs and Rowland, 2011; Nielsen, 2013; Sandstrom et al., 2011). Thus, despite differences between types of interventions and settings, the importance of line managers can be seen as one of the similarities between different fields of implementation research. The empirical evidence presented in the following sections is primarily based on occupational health settings, but also relates to implementation of organizational change in other settings such as health care.

3.3.1 Line managers' supportive change activities

Line managers, managers directly above non-managerial workers, are in a position to influence, and are typically responsible for, the implementation of organizational interventions (Gilley et al., 2009; Higgs and Rowland, 2011). Thus, the realization of BCIs such as feedback, training and changes to the physical environment is likely to rely heavily on the actions of line managers. For instance, Higgs and Rowland (Higgs and Rowland, 2005; Higgs and Rowland, 2011) found that acting on barriers for change, communicating the importance of change and the confidence to successfully carry through change were important managerial activities for successful implementation of organizational change. These activities are also among those described as key managerial activities in Kotter's influential 8-step organizational change model (Kotter, 1996) and recent studies that support the key elements of Kotter's model (Appelbaum et al., 2012; Gilley et al., 2009).

Findings from research on occupational health intervention processes give a similar picture (Nielsen and Abildgaard, 2013; Nielsen and Randall, 2009). Managers that are more active in the intervention process have a positive influence on outcomes such as well-being and work ability (Lundmark et al., 2017; Nielsen and Randall, 2009). Some studies also suggest that line managers can have a negative influence on intervention implementation by restricting employee participation or not communicating about the change (Dahl-Jorgensen and Saksvik, 2005; Saksvik et al., 2002). The importance of line managers' supportive change activities is also found in research on implementation in health-care settings (Ovretveit, 2010; Sandstrom et al., 2011). In a review of implementation of evidence-based practice, Sandstrom et al. (Sandstrom et al., 2011) found that managers' active support for evidence-based practice, feedback, communication and creating opportunity for education could influence successful implementation. Another review on the leader's roles in quality improvement concludes that the leaders' focus on implementation-related activities appears important for successful implementation outcomes (Ovretveit, 2010). Thus, the importance of line managers' supportive change activities for implementation of organizational change is well grounded in the empirical evidence. However, it has been suggested that the research on supportive change activities gives an incomplete description of line managers' influence on implementation and that the current research should be completed with

theoretically based research on the influence of line managers' leadership in implementation (Nielsen, 2013; Sandstrom et al., 2011). One such leadership theory that has gained much interest is that of transformational leadership (Aarons, 2006; Nielsen, 2013).

3.3.2 Transformational leadership

Transformational leadership is very well researched, and several reviews have found that transformational leadership relates to organizational outcomes such as job satisfaction and work performance on individual, team and organizational levels (Judge and Piccolo, 2004; Lowe et al., 1996; Wang et al., 2011). However, there is less research on how transformational leadership influences implementation of organizational change. Transformational leaders are defined by their ability to stimulate followers' intrinsic motivation and align the personal goals of followers with that of the organization (Bass, 1985; Burns, 1978). They are role models with a congruent moral standard and they actively care for their followers. Transformational leaders also challenge and empower their followers to take ownership and lead for themselves. It is presented as a change-oriented form of leadership and some studies has found transformational leadership to be related to organizational change outcomes such as employee commitment to change (Abrell-Vogel and Rowold, 2014; Bass and Riggio, 2006; Herold et al., 2008; Seo et al., 2012). There is also some support that transformational leadership is positively related to innovation climate in health-care settings (Aarons and Sommerfeld, 2012), and the recent implementation leadership scale (Aarons et al., 2014) is heavily influenced by transformational leadership. One recent study of the implementation of an organizational-level occupational health intervention found that transformational leadership can have an indirect effect on distal outcomes such as self-rated health and workability (Lundmark et al., 2017). Thus, previous studies have related transformational leadership to distal intervention outcomes and constructs such as commitment to change and organizational climate. However, there is a lack of research that studies how transformational leadership relates to the actual implementation of intervention. For instance, there are no studies that investigate how transformational leaderships influence the extent that interventions are used as they are intended.

3.3.3 Integrating line managers' supportive change activities and transformational leadership

The supportive change activities and transformational leadership can be seen as two perspectives on line managers' influence on implementation. The perspective of supportive change activities can be described as what the line managers do in relation to the actual implementation. For instance, line managers provide BCIs such as feedback, communicate about the implementation and act on barriers that hinder implementation and so on (Higgs and Rowland, 2005; Higgs and Rowland, 2011; Sandstrom et al., 2011). The perspective of transformational leadership can be described as how the BCIs are performed. For example, transformational leaders not only provide feedback, but do it in a way that motivates

employees and challenges them to think for themselves (Bass, 1985; Burns, 1978). Thus, the understanding of line managers' influence on the implementation process might benefit from research that combines measures of line managers' supportive change activities and the line managers' transformational leadership.

The present thesis uses a scale that measure general transformational leadership behaviors (e.g., the line manager encourages employees to develop their abilities). Thus, the measure does not tell us if the line manager is transformational in relation to the intervention (e.g., the line manager encourages employees to develop abilities that support the implementation of a specific intervention). The difference in general and specific transformational leadership behaviors might be important to understand how transformational leadership influence the implementation of change. Previous research has found that a manager's focus on a specific organizational change (Abrell-Vogel and Rowold, 2014; Hill et al., 2012) and focus on a specific work domain such as workplace safety (Barling et al., 2002) can be important for understanding how transformational leadership influences outcomes. Given that supportive change activities per definition are related to the intervention, the previous research suggests that the supportive change activities and general measures of transformational leadership can be interrelated. In addition, the findings also indicate that it might be interesting to look deeper into the influence of intervention-specific transformational leadership, which is transformational leadership that is explicitly directed toward the implementation of interventions.

3.4   OUTCOME MEASURES IN IMPLEMENTATION RESEARCH

This section gives a brief introduction to the use of outcome measures in implementation research. Because all three studies in this thesis use measures of behavior change as implementation outcomes, the section also describes different methods for measuring behavior change.

Implementation outcomes can be defined as "the effects of deliberate and purposive actions to implement new treatments, practices, and services" and are used to evaluate what happens during the implementation process and what aspects of the implementation worked or not (Proctor et al., 2011). For instance, a common implementation outcome is fidelity, which is the extent to which the intervention is delivered as intended (Gearing et al., 2011; Hasson, 2015; Proctor et al., 2011). As such, implementation outcomes are essential for a deeper analysis and understanding of implementation. However, many intervention studies do not include measures of implementation outcomes at all (Naleppa and Cagle, 2010; Perepletchikova et al., 2007), and when included, implementation outcomes seem to be of poor quality (Grimshaw et al., 2006). A meta-analysis of implementation effectiveness reported that the studies lacked detailed information on implementation outcomes and various outcome constructs (Grimshaw et al., 2006). Furthermore, clinical intervention outcomes were used to evaluate the implementation process (Grimshaw et al., 2006).

The lack of adequate measurements of implementation outcomes leaves us unaware of how potential effects were achieved and does not discriminate between potential intervention and implementation failure. Intervention failure is when the intervention does not have the desired effect, whereas implementation failure is when the intervention is not fully implemented (Dobson and Cook, 1980). A classic example that highlights the importance of separating these types of failures is Dobson and Cook's (1980) study of an intervention for ex-offenders. They found that only 5% of the ex-offenders received the full intervention and that the extent to which the intervention was implemented influenced the intervention outcomes. Without measures of implementation outcomes, the intervention could have been regarded as a failure, when in fact the program was effective to the extent that it was implemented (Dobson and Cook, 1980). Thus, the lack of implementation outcomes can lead to the evaluation of intervention effects without knowing whether the interventions were implemented to begin with. Implementation outcomes are necessary to develop an understanding of implementation processes; therefore, it is highly recommended that implementation researchers use implementation outcomes and develop theory and methodologies related to implementation outcome measures (Proctor et al., 2011; Wilson et al., 2017).

Recent years have seen advances in the concept of implementation outcomes. Proctor et al. (2011) have created a taxonomy of eight distinct implementation outcomes that facilitate effective measurement of the implementation process. The taxonomy includes outcomes such as adoption (intention to try an innovation), fidelity (the degree to which the innovation is implemented as originally intended) and sustainability (the extent to which the intervention is maintained). Given that successful implementation of research findings requires practitioners to change their behavior, measures of behavior change in the target group are an important implementation outcome. Thus, behavior change measures reflect the actual use of the intervention and directly correspond to implementation outcomes such as fidelity and sustainability as proposed by Proctor et al. (Proctor et al., 2011).

3.4.1 Behavior measurements in implementation

All three studies in the thesis use measures of practitioners' behavior to study implementation outcomes. The following section gives a brief presentation of the pros and cons of different methods for measuring behavior in implementation.

There are at least four ways to measure behavior change in implementation: intention to change behavior, self-reported behavior change, observations of behavior change and objective measures of behavior change (Proctor et al., 2011).

Intention to change behavior is theoretically based in the theory of planned behavior (Ajzen, 1985) and social cognitive theory (Bandura, 1986). A meta-analysis has found that medium to large (d = 0.66) change in intention to change behavior engenders small to medium (d = 0.36) change in behavior (Webb and Sheeran, 2006). In a systematic review of how intention predicts physician behavior, Eccles et al. (2006) conclude that intention is

a useful predictor of behavior change. Thus, intention to change can be used as an indicator of behavior change, but intention is not enough to fully explain whether behavior actually changed or not.

Self-reported behavior change is provided by the target individuals, for example, through diaries or interviews. This can make self-reports relatively easy to administer as compared to structured observations, but self-reports are suggested to be subject to several kinds of potential bias, such as social desirability or recall bias (Kimberlin and Winterstein, 2008). When evaluating the validity of self-reports, they are sometimes compared to objective measures of behavior (Celis-Morales et al., 2012, Junco, 2013). Objectivity in behavioral research is defined as when "agreement among observers is at its maximum" (Kerlinger and Lee, 1999, p. 708) and objective measures typically include tests and scales and can also include data collected from data logs (Junco, 2013; Kerlinger and Lee, 1999, p. 708). Empirical comparisons of self-reported behavior and objective measures of behavior change have found significant differences (Celis-Morales et al., 2012; Junco, 2013). For example, students self-reported using Facebook 145 minutes (SD = 11) a day, which was significantly less than 26 minutes (SD = 30) obtained through software that monitored their computer activity (Junco, 2013). Self-reported physical activity underestimated health risk biomarkers by up to 50% as compared to objective accelerometer measures (Celis-Morales et al., 2012). In a meta-analysis by Webb et al. (2006), the relationship between intention and behavior change was moderated by measurement characteristics. The impact of intention on behavior was greater when objective measures of behavior were used (d = 0.67) than when self-reported behavior was used (d = 0.30). Thus, the empirical evidence suggests that self-reports can deviate substantially from objective measures of behavior. The use of self-reported behavior as an implementation outcomes measure has been referred to as one of the main methodological limitations in intervention research (Hasson et al., 2012).

Structured observations of behavior change (i.e., observations using a structured protocol that guides observations) can be used in implementation research. For instance, structured observations have been used to study drug administration (Barker et al., 2002) and teamwork in EDs (Morey et al., 2002). Structured observations have been suggested as especially useful for health-care settings with a high frequency of omission, predictable work processes and a high level of verbal behavior (Carthey, 2003). Despite the potential value of structured observations, they are also subject to bias. For instance, common biases for observational research are (1) the influence of the observer on the observed and (2) observation bias. The observer might influence the observed when they know that they are being observed and might not act naturally. Observation bias occurs when the observer's own knowledge and expectations influence what they observe (Kerlinger and Lee, 1999, pp. 727-752). Potential bias can be reduced with tests of interrater reliability of observations and training the observer in observational research (Carthey, 2003; Kerlinger and Lee, 1999, pp. 727-752).

Based on the collective evidence, it seems that implementation research would benefit from an awareness of the limitations of using measures of intention and self-reported behavior and when possible, use objective measures of behavior change. The use of structured observations is ambiguous, but given that the methodological limitations are handled, structured observations can be a good choice for data collection. In the present thesis, all three studies use either structured observations or objective measures of key behaviors.

4 METHODOLOGICAL FRAMEWORK

The methodological framework presented here is used in study II and integrates the methodological approach of realistic evaluation with the theoretically based DCOM® framework (see figure 4). The realistic evaluation research approach uses CIMO configurations that allow a researcher to study the mechanisms (M) through which interventions (I) influence the outcomes (O) in the context (C) of application. The CIMO is an extended version of the original CMO configuration (Denyer et al. 2008). The (I)ntervention component was added to make the purpose of the intervention more explicit in the model (Denyer et al., 2008).
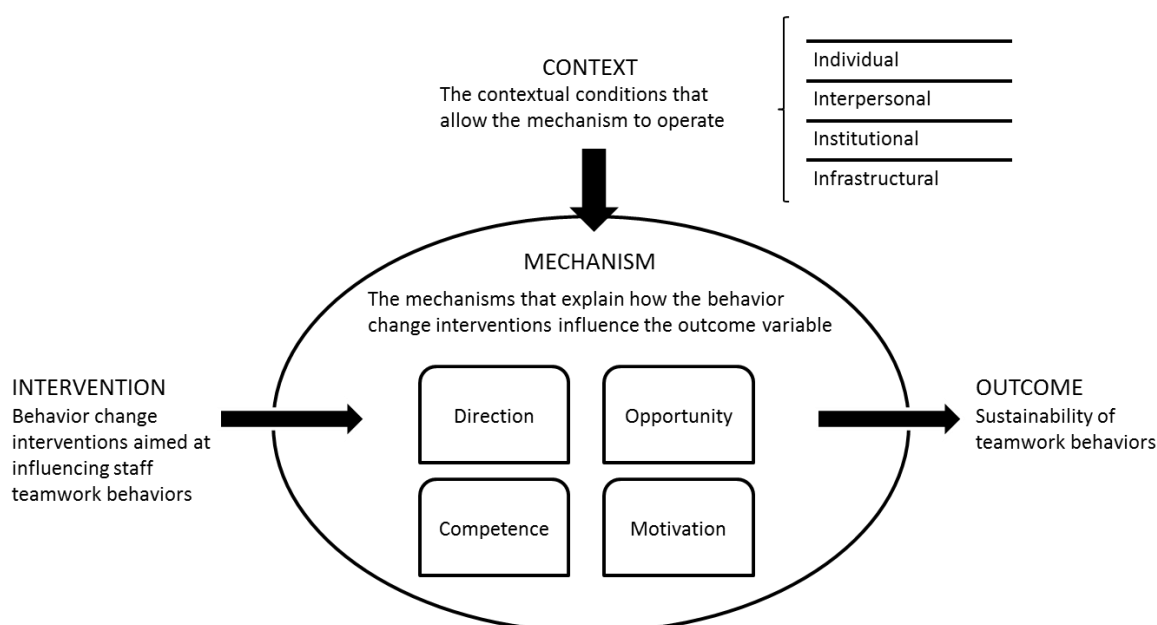
Figure 4. Methodological framework (Frykman et al., 2017). Reproduced with permission from the publisher.

The realistic evaluation approach is incomplete in the sense that it does not include a theory of behavior change to be used in the analysis of behavior change mechanisms (Pawson and Tilley, 1997). Rather, realistic evaluation leaves it to the researcher to apply a relevant theory of choice. Thus, the present thesis integrates realistic evaluation with the DCOM® framework. In so doing, the DCOM® dimensions are used to categorize BCIs as: *direction*, *opportunity*, *competence* or *motivation*. The Intervention category is defined as the BCIs used to influence behavior change. Contextual factors are used to describe the setting and include four layers (Pawson et al., 2005): the *individual* (e.g., individual capacities), *interpersonal* relationships (e.g., relationships between individuals), *institutional* setting (e.g., organizational structures and policies) and the *infrastructural* system (e.g., the welfare system). The outcome, as used in study III, refers to the observations of sustainability of teamwork behaviors in the specific context of an ED.

5 METHODS

The thesis is based on three studies conducted within two different research projects. Studies I and II are part of the TEPPP project (teamwork, efficiency, patient safety, patient satisfaction and personnel work environment) that studied the implementation of a teamwork intervention at an ED. Study III is part of the Work with Flow project that developed and studied the effects of an interactive web-based occupational health intervention implemented in 10 white-collar organizations with the aim of enhancing occupational health, workability, efficiency and work satisfaction.

The methods section first describes the TEPPP project and methods used for studies I and II and thereafter describes the Work with Flow project and the methods used for study III.

5.1 THE TEPPP PROJECT - TEAMWORK AT AN EMERGENCY DEPARTMENT

5.1.1 Setting

The teamwork intervention was implemented in two sections of an ED located at a university hospital in Sweden. During the study period, the ED employed approximately 120 registered nurses (RNs) and nursing assistants (NAs). An additional 180 physicians worked shifts at the ED but were employed within different specialties at the hospital. The department was led by the head of the department, an ED manager, a senior medical manager in each section and nurse managers who managed the daily activities of each section.

The ED was deemed an interesting empirical setting for studies I and II since the department had two comparable sections that implemented teamwork half a year apart. This framed them as an excellent case for comparing the implementation strategies within reasonably similar contexts. In addition, emergency care is characterized by high complexity. For example, the patients assessed in the ED might need specialist care in other departments, and relocation to other departments sometimes means complicated logistics and wait times outside of the ED's control but that severely affect the ED's functioning. The complexity was exacerbated by the use of physicians employed in other departments who only work in the ED a couple of weeks per year. Both these characteristics of the ED added organizational complexity to the analysis. The ED context can be described as typical for health-care contexts that often are described as complex. Thus, organizational complexity is an important factor to investigate and include in implementation research.

5.1.2 The teamwork intervention

The senior management of the ED decided to implement teamwork as a means of increasing the efficiency of care, patient safety and employee and patient satisfaction. The intervention was developed by a working group with representatives from the ED as well as two performance-improvement consultants. The two sections partly shared staff and locations. The sections implemented teamwork six months apart and decided on how to implement teamwork separately.

The teamwork intervention was defined as a work process based on small multi-professional teams consisting of a physician, a RN and a NA. Teams were formed for each shift. A coordinator assigned patients to the teams. The patients were assessed by the team physician, and work tasks were assigned within the team. Each team had its own examination room and work room and worked closely together during the shift. To guide implementation, five specific teamwork behaviors deemed relevant for all employees were decided: (1) assemble when tasks have been performed, (2) work in parallel, (3) communicate the work plan, (4) coordinate work and (5) communicate decisions to change the plan. The five key teamwork behaviors were based on a collaborative process in which performance consultants, ED staff and management pinpointed key behaviors for teamwork. Thus, it stemmed from a performance-consultant process that identified behaviors important in the specific case rather than key behaviors for teamwork collected from the research literature (Braksick, 2007).

5.1.3 Research project

The project applied an interactive research design that involved the researchers early in the implementation process (Svensson et al., 2002). In addition to designing the research project, the researchers played an active role in developing the implementation strategy and assisted in the implementation. The research project was designed to evaluate the teamwork intervention. Publications within the project have studied nurses' perceptions of multitasking (Forsberg et al., 2015), teamwork's influence on patients' perceptions of quality of care (Muntlin Athlin et al., 2016), the relationship between throughput rates and staff's perceptions of efficiency (von Thiele Schwarz et al., 2016a), implementation of teamwork (Mazzocato et al., 2011) and effects of teamwork on lead times and patient flow (Muntlin Athlin et al., 2013). The findings suggest that the teamwork intervention has led to a small but significant reduction in lead times (Muntlin Athlin et al., 2013) and has found positive relations between teamwork and patient perceptions of quality of care (Muntlin Athlin et al., 2016).

5.1.4 Research design

Studies I and II applied qualitative research designs based on interviews, document analysis and observational data. In the following sections, the research design of each study is described in more detail.

Study I was a comparative case study that analyzed and compared the implementation strategy for teamwork at each of the two sections of the ED (the Section of Internal Medicine and the Section of General Surgery). Data from individual interviews and documentation were used to (1) specify the implementation strategy into BCIs and (2) analyze the function and influence of the BCIs on teamwork implementation. Observational data on the five key teamwork behaviors were used as the implementation outcome.

Study II investigated the sustainability of teamwork in the Section of Internal Medicine two and a half years after initial implementation. The Section of Internal Medicine proved more successful at implementing teamwork and was selected for a study on sustainability. A realist

research design was used to guide the research process. Data from study I, an additional individual interview and a group interview were used to analyze the underlying mechanisms describing the influence of BCIs on the sustainability of teamwork in the specific context of the ED. Data on teamwork behaviors were collected through team observations using the same procedure as in study I.

5.1.5 Participants and data collection

The studies use data collected from interviews, document analysis and observations. An overview of the data collection and timeline for studies I and II is presented in Figure 5.
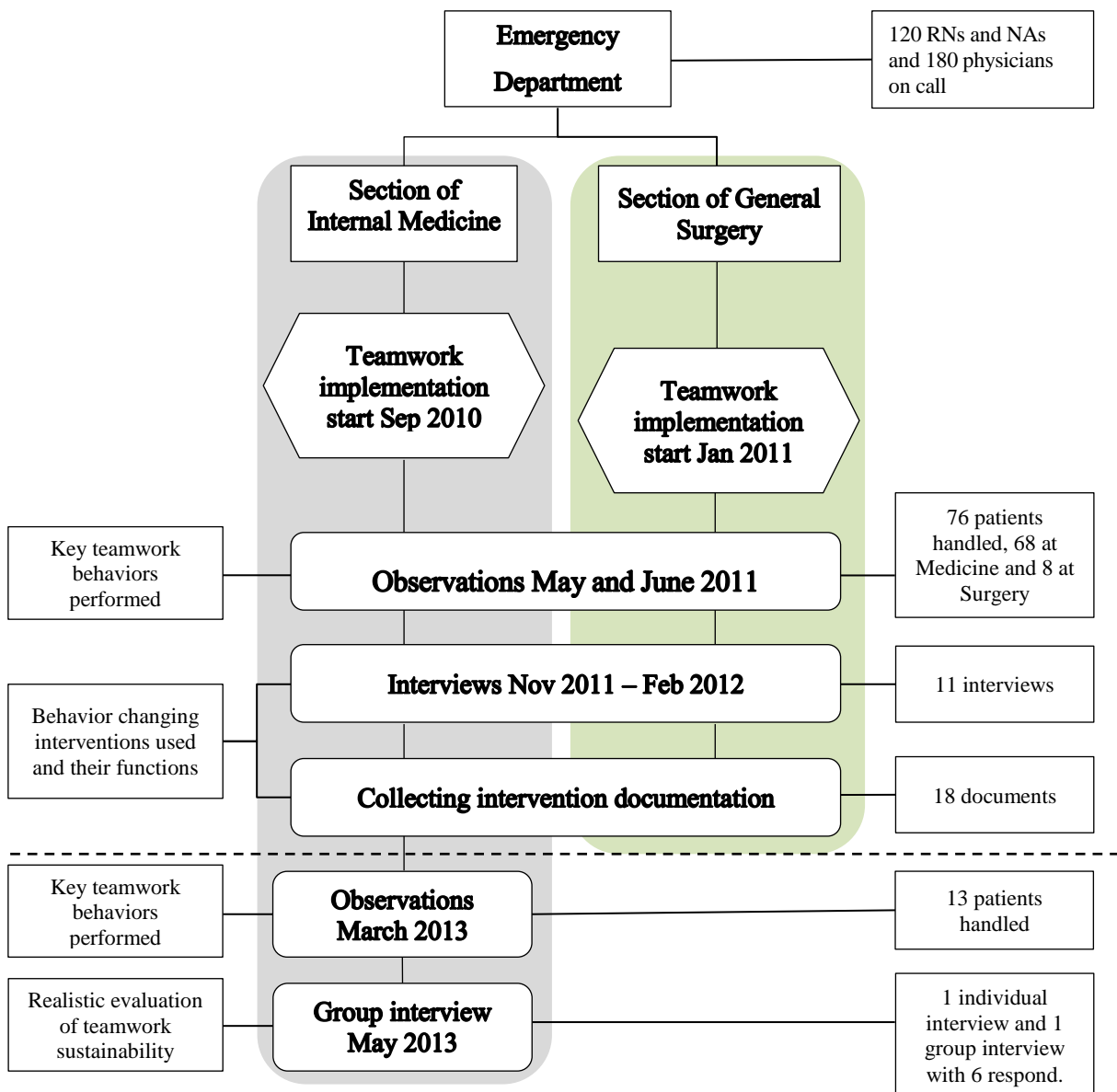
Figure 5. Overview of the data collection and timeline for studies I and II. Under the dotted line refers exclusively to study II.

5.1.5.1 Interviews

Study I interview data were collected from 11 semi-structured interviews (see appendix A – interview guide (Frykman et al., 2014), reproduced with permission from the publisher). The interviews were guided by the DCOM® framework and covered the following themes: Perceived intervention changes and outcomes, Program theory, Description of activities and behaviors during the different phases of the implementation, Challenges, How challenges were handled and Challenges for sustaining change. A purposive selection criterion was applied, and four respondents with a central role in the implementation were recruited for interviews. This included the two senior medical managers (one from each section), the change facilitator in the Section of Internal Medicine and the nurse manager working in both sections. Snowball sampling was used to identify seven additional respondents (both managers and staff) who were also interviewed. The interviews were performed by the author of this thesis and lasted for 30-90 minutes. The interviews were recorded and transcribed verbatim. Before the interviews, respondents were informed that participation was voluntary and that the interview data would be handled in a confidential manner.

For study II, one individual interview with a nurse manager who played an active role during the initial implementation was conducted. The main data collection in study II was a three-hour group interview. Selection criteria for the interview were ED staff from all professional groups and participants who had experience working both before and after the implementation of teamwork. With the help of a nurse manager two physicians, two registered nurses and two NAs were recruited for the interview.

5.1.5.2 Documents

Eighteen documents related to the teamwork intervention and implementation of teamwork were identified in the individual interviews and by the performance-improvement consultants. The documents included information about the intervention, teamwork checklists and role descriptions. The documents were used to triangulate data collected in the interviews.

5.1.5.3 Observations of teamwork behaviors

Studies I and II used observed teamwork behaviors as the outcome. Observations were performed by the researchers and followed a structured protocol consisting of the five key teamwork behaviors that represented fully operational teamwork. The researchers observed one team at a time but changed team to observe during the work shifts, and most teams operational during the shifts were observed. When two or more researchers were conducting observations, they worked in parallel, observing different teams. When difficult to identify a specific behavior, the researchers asked questions of the team members for clarification. The teamwork behaviors were rated as performed or not performed. That is, the range of teamwork behaviors performed was zero to five. The number of teamwork behaviors performed by the team during the handling of a patient was calculated and used as the main outcome.

5.1.6 Analysis

A common feature of studies I and II were that they specified the implementation strategy in terms of BCIs and analyzed change mechanisms using the DCOM® as a theoretical framework. The main methodological differences between the studies can be traced to the analytic process.

In study I, the interview data were analyzed using a hybrid thematic analysis (Fereday and Muir-Cochrane, 2008) that integrates a theory-driven deductive approach with a data-driven inductive approach. The analysis then followed a step by step process suggested by Schilling (Schilling, 2006). The interview data were condensed into BCIs that were coded into predefined categories based on the DCOM® framework. This was done by the first and last author independently, and differences in the authors' coding were analyzed and discussed until an interrater reliability (rated by the second and third author) of 75% or more was achieved. The process focused explicitly on the identification and categorization of BCIs with the DCOM® framework. The DCOM® framework categorizes BCIs based on their function, and data collection included information on how the BCIs influenced teamwork behavior. For example, for a BCI to be categorized as *directional*, interview data had to contain information that the management launched an information campaign regarding teamwork and that the information was important for shaping alignment among staff on the most important aspects of teamwork. Thus, both mechanisms and context were included in the present analysis.

Study II built on the analysis of BCIs performed in study I and applied a realistic evaluation approach using the methodological framework presented earlier in this thesis. The realist research process was performed in four phases, which are described in figure 6.

(1) Building on the data collected in study I and a complementary individual interview with a nurse manager, the researchers generated a program theory. The program theory described the main features of the implementation strategy that had a positive influence on initial implementation; it was assumed that the same implementation strategy was important for the sustainability of teamwork as well.

(2) The program theory was specified into 11 preliminary CIMO configurations that described the mechanisms explaining how a BCI influences an outcome in a specific context (Pawson and Tilley, 1997).

(3) The preliminary CIMOs were tested during the three-hour group interview. The interview followed a structured process in which participants were introduced to the 11 preliminary BCIs and the researchers facilitated the interview to collect data to confirm, falsify and refine the preliminary CIMOs (Pawson and Tilley, 1997).

(4) The group interview was recorded and the transcript was used by the researchers to analyze and refine the 11 preliminary CIMOs into five revised CIMOs that constitute the main findings of the study. In comparison to, as well as a development of, the analysis in

study I, the realist approach made the analysis of mechanisms and the role of context in the analysis explicit by means of the CIMO configuration.
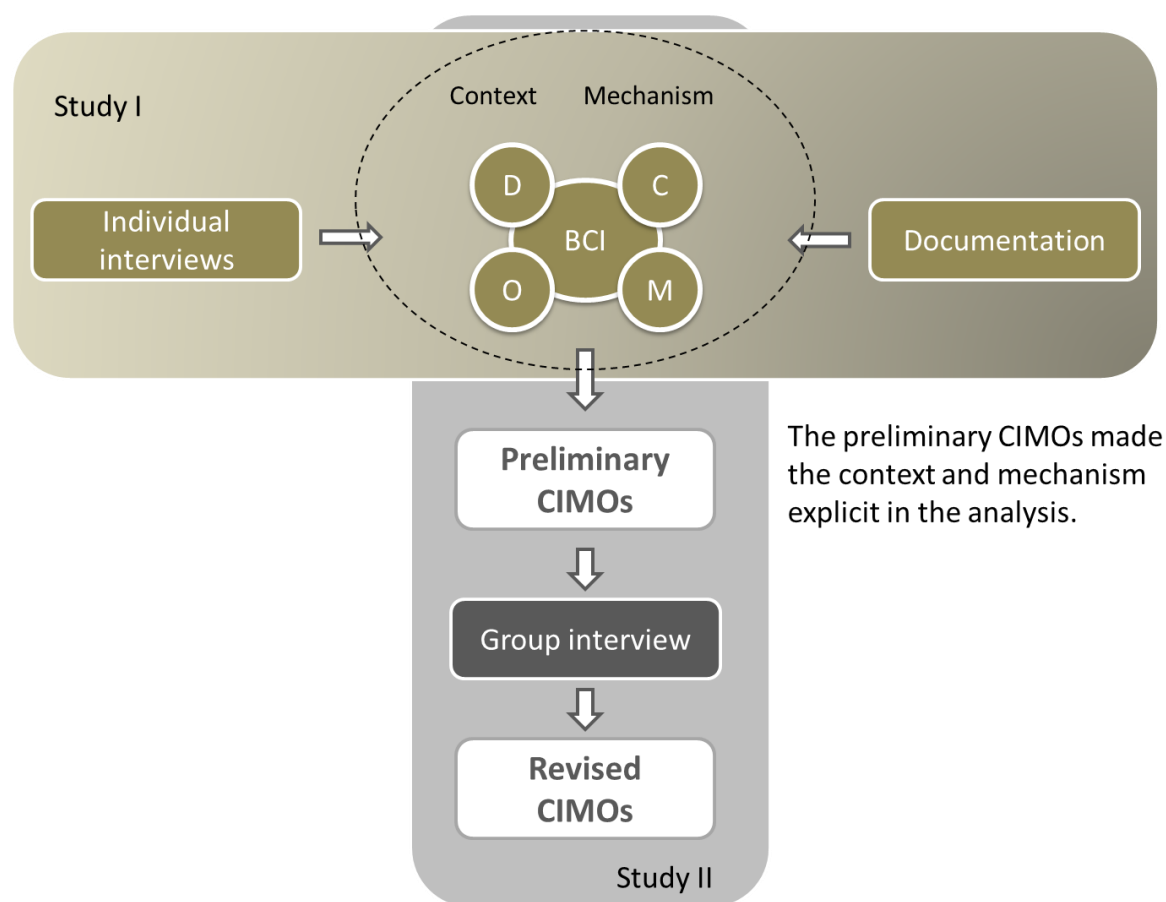
Figure 6. Description of the realist research process used in study II and how the study II research process connects to that of study I.

5.2   THE WORK WITH FLOW PROJECT - A WEB-BASED OCCUPATIONAL HEALTH INTERVENTION

5.2.1   The research project

The project developed and studied the effects of an interactive web-based occupational health intervention that consisted of web-based tools directed at the individual, group and organizational level. The overall aim of the project was to improve the work environment, prevent long-term sick leave and reduce short-term sick leave for participating organizations.

Previous publications regarding the same project have investigated the intervention implementation (Hasson et al., 2014a; Hasson et al., 2014b) and line managers' leadership influence on self-rated health and workability (Lundmark et al., 2017).

5.2.2   Participating organizations and procedure for introducing the intervention

Ten organizations from both private- and public-sector white-collar organizations with a total of 2500 employees were recruited to participate. Management in the recruited organizations

was provided with information on the intervention. In medium and large companies, the line managers decided if they wanted their work unit to participate; in small organizations, all units enrolled. All participating work units were introduced to the web-based intervention and the expected outcomes through a seminar held by the researchers. After the seminar, all participants were invited to the web-based system and the baseline questionnaire through an e-mail.

5.2.3 The web-based intervention

At the individual-level, the web-based intervention provided each participant with a brief questionnaire measuring well-being. The questionnaire could be used with any frequency and provided the user with instant feedback on the results. Based on the results, the system suggested self-help exercises that were directly accessible within the web-based system. Extended surveys that evaluated the psychosocial work environment and work-related health were provided. The frequency for extended surveys varied based on the organizations' requests.

At the group-level, line managers could monitor work units' aggregated results on the brief and extended questionnaire through a web-based interface. They were encouraged to involve their work group in a participatory process to discuss the results, and the web-based intervention provided tools for creating action plans together with the work unit. The intervention also included exercises for managerial skills training on, for example, goal setting, feedback and work-environment issues. The human-resources department in the participating organizations provided support to the line managers during the intervention process.

At the organizational-level, data from the brief and extended questionnaire were aggregated for the organization and provided to the senior management. The researchers assisted the human-resources department and the senior management in the process of creating action plans at the organizational level.

5.2.4 Study sample

Overall, 1284 of the 2519 invited employees agreed to the data to be used in research. Participants who held a managerial position (161), respondents who started to use the intervention at a later point than their work unit (362) and respondents who responded to the follow-up questionnaire outside of the time frame of 16-52 weeks (545) were excluded. Therefore, the final sample consisted of 216 respondents working in six organizations and 73 work units. The average age was 45 years, 90 (42%) were men and 117 (54%) had an academic degree. There were no significant differences between the sample and the population regarding age, sex and education level.

5.2.5 Research design

The study was a longitudinal intervention study that investigated how line managers' leadership style influenced the use of an occupational health intervention. Questionnaire data

on leadership style were collected at two measurement points. Transformational leadership was measured at time 1 (baseline), and managers' attitudes and actions were measured at time 2 (an interval of 16-52 weeks after baseline). Attitudes and actions were measured at time 2 since the questionnaire asked for the managers' attitudes and actions during the intervention, meaning that the intervention had to have begun for the questions to be answered. An interval was used because the measurement time points varied between organizations and units in light of their request for adjustments. The participants' use of the intervention was collected from electronic logs. Initial use was measured at time 2, and sustained use was measured at time 3 (an interval of 53-144 weeks after baseline). Data were collected from 2011-2013.

5.2.6 Measures

Transformational leadership was measured with a short scale consisting of four slightly modified items from the Developmental Leadership Questionnaire (Larsson, 2006). The questionnaire is based on developmental leadership, a leadership style inspired by transformational leadership and validated in a Swedish context (Larsson, 2006). The scale items are described in table 7. A verbal rating scale with five descriptors was used. The coefficient alpha for the scale was .83.

Attitudes and actions were measured using four items from the Intervention Process Measure (see figure 7) (Randall et al., 2009). Three items were taken from the original scale, and item four was added since feedback was considered a key managerial activity in the intervention. A verbal rating scale with five descriptors was used. The coefficient alpha for the scale was .82.

Transformational leadership short scale

1. Does your immediate superior act in accordance with their expressed views?
2. Does your immediate superior encourage you to develop your abilities?
3. Does your immediate superior handle difficult employees?
4. Does your immediate superior take responsibility for the organization?

Attitudes and actions short scale

1. My immediate superior (or similar) has worked actively to introduce the intervention
2. My immediate superior has had a positive attitude toward introducing the intervention
3. My immediate superior has informed me about everything he/she knew about the implementation of the intervention
4. My immediate superior (or similar) has given regular feedback on the results in the intervention

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Figure 7. The Transformational leadership and the Attitudes and actions scales and items.

Use of the intervention was measured as the employee's weekly frequency of logins to the web-based intervention. A dummy variable was created to adjust for traditional Swedish vacation periods.

5.2.7 Analysis

Since the dependent variable (i.e., individual employees' frequency of use of the intervention) was count data and clustered in work units, mixed Poisson regression analysis that takes the random effect of work-unit level into account was used. The mixed Poisson analysis used the GLIMMIX procedure in SAS 9.4 with Laplace approximation.

The analysis explored the effects of transformational leadership (baseline) and attitudes and actions (time 2) on the frequency of logins (time 2 and time 3). Two sets of analysis were performed. One using frequency of logins during time 2 as dependent variable and the other using frequency of logins during time 3 as dependent variable.

Each analysis used two mixed Poisson regression models. The first model was a two-level random effect model that considered the employee the second (highest) level and the frequency of logins nested under the employee. The second model was a three-level random effect model that added work unit as a third level in which the employee was nested. Likelihood ration tests were used to determine which model was preferable. In addition, each analysis included a linear regression that tested the indirect effect of transformational leadership on the frequency of logins mediated by the attitudes and actions.

5.3 ETHICAL CONSIDERATIONS

Ethical approval for the TEPPP project and study I and II was granted by the regional ethical review board in Uppsala (Dossier number 2010/170). All participants received written information about the project. The interview participants also received oral information about the project and were assured that all research material would be managed in confidence. Written consent was obtained from the interview participants, and oral consent was obtained from the team members before the observations.

The Work with Flow project and study III were approved by the regional ethical review board in Stockholm (Dossier number 2011/5:2). All participants received oral and written information about the project. Written consent was obtained from participants.

6 SUMMARY OF FINDINGS

The following sections describe the main findings. A more detailed description of the findings of each study is found in the manuscripts at the end of the thesis. In the first paragraph, the observations of teamwork behaviors in study I and II are presented together. Thereafter follows a description of the specific findings for each of the three studies.

6.1 OBSERVATIONS OF TEAMWORK BEHAVIORS

Data on teamwork behaviors performed during the full implementation stage (study I) and sustainability stage (study II) were collected from 89 observations. Seventy-six observations were conducted to assess the initial implementation of teamwork in 2011 (68 at the Section of Internal Medicine and 8 at the Section of General Surgery), and an additional 13 observations were conducted in 2013 to assess the sustainability of teamwork in the Section of Internal Medicine. Observations were performed for a total of seven workdays (four days in 2011 and three days in 2013) by three different observers. None of the teams approached declined to be observed.

Figure 8 describes accumulated percentages of teamwork behaviors observed for each section in 2011 and the Section of Internal Medicine in 2013. For example, during the full implementation stage in 2011, at least three teamwork behaviors were observed in 50% of the observations of the Section of Internal Medicine, compared to 0% in the Section of General Surgery. In 2013, the number of observations in the Section of Internal Medicine dropped from 50% to 23%. Overall, the observational findings were supported by the interviews. Respondents from the Section of Internal Medicine described deviations from teamwork as unusual, whereas the respondents from the Section of General Surgery described teamwork as somewhat active during the first month of implementation, though it faded out.

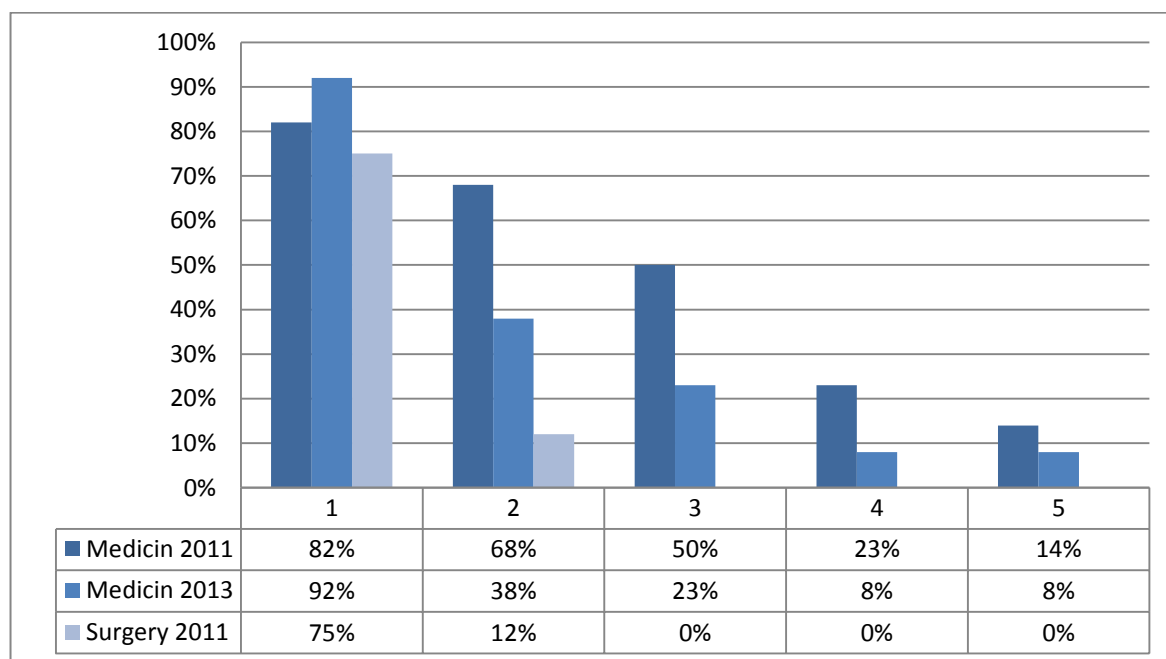|	1	2	3	4	5
■ Medicin 2011	82%	68%	50%	23%	14%
■ Medicin 2013	92%	38%	23%	8%	8%
■ Surgery 2011	75%	12%	0%	0%	0%

Figure 8. Observed teamwork behaviors in 2011 and 2013.

Observations of specific teamwork behavior were not used as the main outcome since teamwork was defined as the combination of teamwork behaviors without an internal hierarchy. Nevertheless, the observations of specific teamwork behavior are included in this thesis (figure 9) to give a broader description of the teamwork implementation and sustainability.
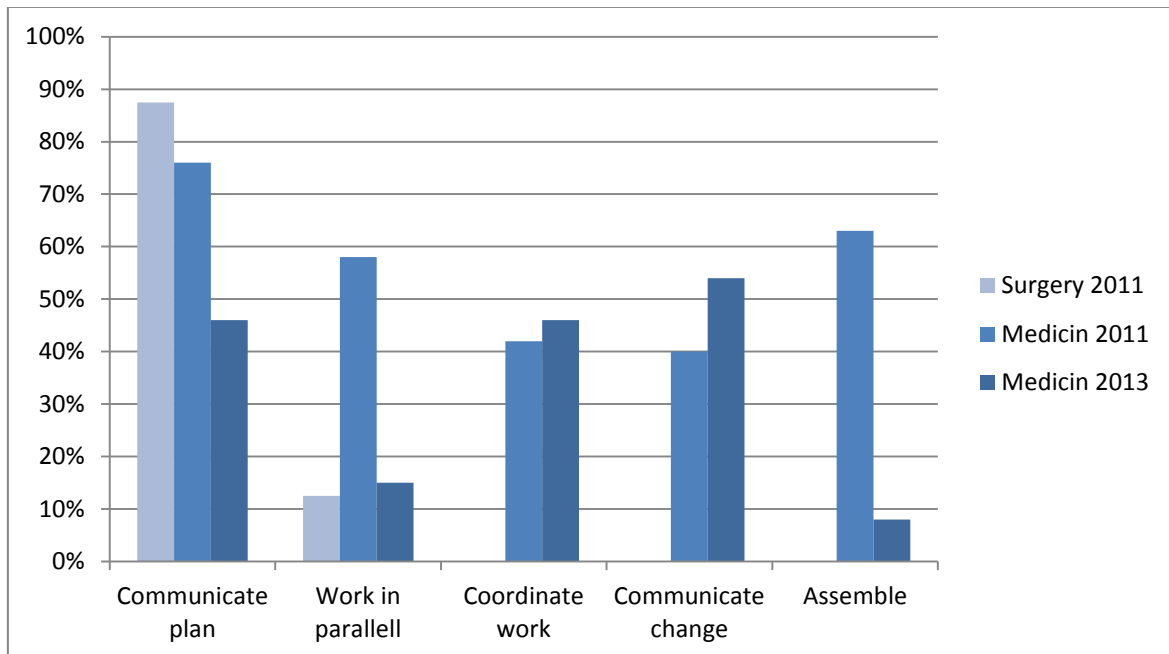

Figure 9. Performance of specific teamwork behaviors in 2011 and 2013.

All teamwork behaviors were performed at 40% or more of the observations in the Section of Internal Medicine in 2011, indicating a relatively even distribution of behaviors. In the Section of General Surgery, the picture is the opposite. Communication of the work plan, the teamwork behavior that initiates the teamwork process, was performed in nearly 90% of the observations, but only one other teamwork behavior, work in parallel, is performed. During the sustainability phase in the Section of Internal Medicine in 2013, two of the teamwork behaviors, coordinate work and communicate decisions to change plan, increased slightly in frequency relative to 2011. It should be noted, however, that these teamwork behaviors were performed intra-professionally (by RNs and NAs) rather than inter-professionally, which was the original purpose, and, in practice, the physicians were left out of the teamwork in 2013.

6.2 STUDY I: FUNCTIONS OF BEHAVIOR CHANGE INTERVENTIONS DURING IMPLEMENTATION

The aim of study I was to analyze the functions of BCIs and to analyze and compare the influence of the BCIs on teamwork behaviors in two sections of an ED. The findings presented below are based on individual interviews with ED management and staff and documentation related to the implementation of teamwork in the ED. The findings describe the main BCIs, the function(s) of the BCIs and a brief description of contextual factors that can explain the influence of the BCIs. The functions are based on the DCOM® framework and described as *direction*, *competence*, *opportunity* and/or *motivation*. The findings are

described for each section separately and compared in more detail in the discussion section of this thesis.

6.2.1 The Section of Internal Medicine

Overall the implementation efforts were more extensive at the Section of Internal Medicine as opposed to the Section of General Surgery. An overview of the main BCIs identified at the Section of Internal Medicine and the function(s) of the BCIs are found in Table 1.

Table 1. Overview of the main BCIs used in the Section of Internal Medicine and their relation to DCOM® dimensions.

	Direction	Competence	Opportunity	Motivation
Coordinated communication	X			
Initial adjustments			X	
Change team:				
- Support and correction	X			
- Feedback	X			X
- Ongoing problem-solving			X	
Task-related feedback				X

6.2.1.1 Coordinated communication

During the introduction of teamwork, the aim and content of teamwork were clarified in a consistent way on many different occasions by managers from different organizational levels and by external performance consultants. The repeated and consistent description of teamwork made its *direction* clear. A contextual factor that increased the need for *direction* was that the physicians working in the ED were employed in other departments and only worked in the ED a couple weeks per year; hence, the ED routines were not always familiar to them.

6.2.1.2 Adjustments supporting teamwork

Initial changes to the work environment and staff resources were made in order to support teamwork. The changes removed barriers for teamwork and, thus increased *opportunity*.

6.2.1.3 Change team

A change team consisting of a change facilitator (a full-time physician assigned to the project for the first three months to facilitate the implementation) and five nurse managers was formed. During the first three months of implementation, two or more members of the change team were in the ED during day shifts. The change team was described overall as vital for the implementation and performed a number of BCIs that had a major influence on *direction* and

opportunity as well as a minor influence on *motivation*. The change team carried out the following functions.

(1) Ongoing support and active correction of teamwork performance during the shifts was provided. These aspects had a *directional* function insofar as they made clear what was expected of them, and, importantly, they left no doubt that deviations from teamwork were not accepted.

(2) At the end of each shift, the change team met with each of the teams and had a structured discussion on barriers to and facilitators of teamwork and provided feedback on the number of patients handled during the shift. These meetings had a *directional* and *motivational* function.

(3) Information on barriers and facilitators were used by the change team to implement ongoing adjustments to the teamwork process. This was made possible because the change facilitator had regular meetings with senior management and had full authority to direct all staff and implement changes. The ongoing problem-solving was described as vital for the implementation and resulted in many small but important adjustments that increased *opportunity* for teamwork.

A number of contextual factors increased the need for the change team's activities. The physicians working a couple of weeks per year in the ED and frequent adaptions to the teamwork during the first three months of implementation increased the need for *direction*. The complexity of the organization made it hard to foresee all potential barriers to teamwork behaviors in the pre-analysis of teamwork. Thus, there was a need for ongoing problem-solving. Staff did not perceive the positive effects of teamwork during the first months of implementation; thus, there was a need for feedback and support from the change team to keep up *motivation*.

6.2.1.4 Task-related feedback

After roughly a month, staff described experiencing personally valued outcomes from teamwork. For instance, teamwork made staff work with fewer patients during the shift and allowed them to follow the patients from entering to leaving the ED. This was described as giving staff a better overview and made them aware of what happened to the patients. With fewer patients, staff knew the patients better and could relieve anxiety by giving them better information during their visit. Staff described perceiving a more efficient delivery of care and less stress overall. This was a result of teamwork rather than a planned BCI with the aim of increasing teamwork. Nevertheless, it was identified as an important *motivational* factor.

6.2.2 The Section of General Surgery

In relation to the Section of Internal Medicine, the Section of General Surgery used an minimalist implementation strategy. To contrast the findings of the two sections, the findings for this Section are presented with the same four categories as the Section of Internal

Medicine. The contextual factors that influenced the impact of the BCIs on the Section of General Surgery were similar to those found for the Section of Internal Medicine. Thus, the section discussing the Section of General Surgery provides an interesting reference as to what happened in response to a similar context and minimalist strategy.

Coordination of communication: Teamwork was introduced by the senior medical manager and a nurse educator. The support from the senior surgical management at the hospital was perceived as unclear. Overall, management's communication of the aim and content of teamwork was inconsistent and sometimes contradictory. Direction was perceived as low.

Adjustments supporting teamwork: During the initial phase of implementation changes to the physical environment, work description and schedules were carried out to facilitate teamwork and increase opportunity.

Change team: Instead of a change team, as utilized for the Section of Internal Medicine, the change was managed by this section's nurse managers and the senior medical manager. In contrast to the three months allocated for the change facilitator in the Section of Internal Medicine, only a couple extra shifts for the senior medical manager were allocated to manage the change. Monitoring, feedback and identification of barriers and facilitators were limited and lacked structure. Within the first month, barriers were described as accumulating and soon came to hinder teamwork. Opportunity was considered low overall. Management provided limited direction, opportunity and motivation.

Perceived positive effects of teamwork: Overall, teamwork was experienced as frustrating and, motivation was low.

6.3   STUDY II: MECHANISMS OF CHANGE IN SUSTAINABILITY

The aim of study II was to uncover the mechanisms influencing the sustainability of behavior changes following the implementation of teamwork in an ED. The decline in teamwork behaviors was analyzed and presented in the form of CIMO configurations. The CIMO configurations describe the mechanisms through which the BCIs influence the outcomes in the context of the ED. The categorization of mechanisms was based on the DCOM® framework, as described in the section on methodological framework in this thesis. The main findings are summarized as five revised CIMO configurations as described in Table 2 below.

Table 2. Overview of the five revised CIMO configurations (Frykman et al. 2017). Reproduced with permission from the publisher.

CIMO	Context	Intervention (BCI)	Mechanism based on DCOM®	Outcome
1	Conflicting objectives in the ED Physicians not employed by the ED High staff turnover	Limited coordination of direction	Decreased direction	Decreased teamwork behaviors
2	Physicians not employed by the ED High staff turnover	Limited clarification of work tasks	Decreased direction & competence	Decreased teamwork behaviors
3	Physicians not employed by the ED High staff turnover	Limited daily follow-up, positive attention and feedback on performance	Decreased direction & motivation	Decreased teamwork behaviors
4	Complex work processes High interdependencies with organizational processes outside of the ED	Limited problem-solving	Decreased opportunity	Decreased teamwork behaviors
5	Overall, staff mainly valued teamwork outcomes	No specific BCI – limited experience of teamwork	Decreased motivation	Decreased teamwork behaviors

The following section provides a summary of the findings (Frykman et al., 2017). A more detailed description of the five revised CIMO configurations are found in the manuscript for study II at the end of this thesis.

The period after initial implementation saw a fallback of implementation activities and very limited performance of the BCIs that were identified as important during initial implementation. The context of the ED was, to a large extent, the same as during initial implementation and characterized by organizational complexity. The ED struggled with conflicting objectives, such as finding a balance between productivity, patient safety, work environment and educational commitment. The functioning of the ED was dependent on processes at the hospital level (e.g., the scheduling of physicians was dependent on the rest of the hospital). The teamwork intervention itself was also complex as it included multiple professions working on multiple teams sharing common resources. This meant that if one of the teams did not follow the teamwork process, the other teams' *opportunity* to do so was hampered. The physicians worked on a casual basis, and staff turnover was described as accelerated with respect to staff turnover during initial implementation.

Given the context, the fallback in BCIs led to a decrease in *direction*, *opportunity* and, to some extent, *motivation*, which, in turn, had a negative influence on the performance of teamwork behaviors. For instance, the complexity of the organization and the intervention created new barriers to teamwork, and these barriers continued to arise after the initial implementation period. Since there was no structured problem-solving related to teamwork, barriers accumulated and thereby decreased *opportunity*.

6.4 STUDY III: LEADERSHIP STYLE'S INFLUENCE ON THE USE OF AN OCCUPATIONAL HEALTH INTERVENTION

The aim of study III was to investigate line managers' influence on a process outcome of an occupational health intervention.

The line managers' transformational leadership measured at baseline had no significant direct effect on the initial (-.04 [.13], $p = 76$) or sustained (-.02 [.07], $p = .80$) use of the intervention. In contrast, managers' attitudes and actions, measured during weeks 16-52, had a significant effect on both the initial (.28 [.11], $p = .01$) and sustained (.24 [.08], $p= .01$) use of the intervention. Analysis of mediation found that transformational leadership measured at baseline had an indirect effect, mediated by the attitudes and actions, on the initial use (indirect effect of .06 [.03], $p= .04$ and total effect of .04 [.13], $p = .73$) and sustained use (indirect effect of .06 [.02], $p= .01$ and total effect of .05 [.07], $p = .49$) of the intervention. A more detailed description of the findings is presented in the study III manuscript at the end of the thesis.

7 DISCUSSION

The overall aim of the thesis is to investigate change mechanisms in implementation. This is done through a theoretically based analysis of how BCIs and line manager's leadership style influence employees' initial and sustained use of a teamwork work process and an occupational health intervention.

The following sections first present the main findings of the three studies. Thereafter, they discuss the findings of studies I and II with a focus on the mechanisms of change found to influence the outcomes. The findings of study III and the line managers' influence on implementation outcomes is discussed, and finally, the methodological considerations and practical implications of the thesis are discussed.

7.1 MAIN FINDINGS

The main findings of studies I and II describe a clear difference in the implementation strategy that the two sections of the ED used and that this difference was related to the differences in implementation outcomes between the sections. The Section of Internal Medicine used an ambitious implementation strategy based on coordinated communication regarding the aim and content of the teamwork intervention, daily monitoring and feedback on teamwork performance and daily ongoing problem-solving and continuous adjustments to the teamwork intervention. The Section of General Surgery applied a minimalist strategy with unclear communication, limited monitoring and feedback and a lack of structured problem-solving. The organizational context and content of the intervention were similar at the two sections and characterized as complex. The context had a high level of organizational complexity, with physicians working on a casual basis at the ED, competing goals within the ED and the ED work processes' being integrated with other departments at the hospital and in the local health care system. In addition, the teamwork intervention in itself was complex and included multiple professions working in the teams. The teams shared common department resources further adding to the complexity. The findings show that the implementation strategy used at the Section of Internal Medicine was far more successful in the given context. During the years following implementation, the contextual factors remained and were added with high staff turnover rates at the same time, as the implementation strategy used during initial implementation was removed. The fallback in implementation strategy in the complex context had a negative influence on the teamwork sustainability.

Study III investigates the influence of line manager's leadership style on employees' use of a web-based occupational health intervention. The main findings suggest that the line managers' supportive change activities that were directly related to the intervention had a significant influence on the employee's initial and sustained use of the intervention. Line managers' transformational leadership did not have a direct influence on use but rather an indirect influence mediated by the managers' supportive change activities.

7.2 MECHANISMS OF CHANGE AT THE EMERGENCY DEPARTMENT

This section discusses the change mechanisms found to be the most important for the implementation of teamwork. The sections are structured based on the DCOM® dimensions.

7.2.1 Direction

Direction, defined as the vertical and horizontal alignment of vision, goals and behaviors within the organization, was provided via coordinated communication regarding the aim and content of the teamwork that was delivered by managers of different professions and on different levels in the hierarchy at multiple occasions. In addition, *direction* was further strengthened by the change team that performed daily monitoring and feedback on performance and thereby made clear to staff what teamwork was and what behaviors they were expected to perform. The importance of *directional* BCIs, such as clear communication and the use of influential messengers on different managerial levels for successful organizational change, has previously been described in the literature (Grimshaw et al., 2012; Self et al., 2007). A contextual factor that increased the need for *directional* BCIs was that the physicians who worked on a casual basis were not as familiar with the work processes as the full-time staff were, and thus, the communication about teamwork had to be extensive to reach all physicians. In addition, the strategy of monitoring teamwork performance and continuously adjusting the teamwork intervention had the effect that the content of teamwork changed and the need existed for frequent updates on the content of teamwork. Similar contextual factors were found at the Section of General Surgery, but in contrast, the *directional* BCIs at the Section of General Surgery were characterized by far less and sometimes contradicting descriptions of teamwork in combination with very limited monitoring and feedback. This resulted in a weak direction with a wide range of individual interpretations of the purpose and content of teamwork. The weak *direction* at the Section of General Surgery led to marginal behavior change in key teamwork behaviors. During the years following initial implementation, the context at the Section of Internal Medicine remained and was somewhat accentuated by high turnover and new staff. At the same time, the *directional* BCIs were reduced. The combination of a context that required clear *directions* and the fallback in BCIs decreased the *direction* of teamwork and led to different views among employees on how to work in teams. The findings can be seen as an in-depth description of why *directional* BCIs that align strategy and consensus on goals and priorities are important influencers of implementation and sustainability (Boswell, 2006; Bradley et al., 2006; Stirman et al., 2012).

Whereas previous research has focused on describing what BCIs influence implementation, the present thesis adds insight into the underlying change mechanisms of implementation that describe how the BCIs interact with the context and why they influence implementation outcomes. The specific case of the ED describes how the complexity of context triggers a demand for *directional* BCIs that, in turn, influence behavior change. The findings imply that it might be especially important to maintain directional BCIs for longer periods of time when complex interventions are implemented in complex organizational contexts, and that

interventions should be fully implemented and integrated with the organizational culture and system before BCIs are removed.

7.2.2 Opportunity

During program installation, before the initial implementation stage, a pre-analysis of barriers and opportunities for teamwork was performed and used to guide changes that supported teamwork. In addition to the pre-analysis, the change team at the Section of Internal Medicine performed ongoing problem-solving during the initial implementation stage. The problem-solving was used to identify and remove barriers for teamwork and thus increased *opportunity*. The ongoing problem-solving was identified as especially important for implementation success in the present case because the complex organizational context made it hard to foresee all barriers and the potential friction that arose when teamwork was implemented. Previous research has acknowledged that the complexity of emergency care can increase the demand for ongoing changes to and flexibility with the intervention when teamwork is implemented (Morey et al., 2002). The Section of General Surgery relied on a pre-analysis of barriers only. Consequently, barriers that were not included in the pre-analysis were not handled. This soon led to the accumulation of barriers for teamwork and subsequently made it hard to perform teamwork, decreasing opportunity, at the Section of General Surgery.

During the years after initial implementation, the Section of Internal Medicine saw a substantial fallback in problem-solving activities. The lack of problem-solving in combination with the complex organizational context meant that changes in other processes or at other departments at the hospital unintentionally created barriers for teamwork (Skår, 2014). For instance, changes to the physicians' work schedules that were administered at the hospital level hindered teamwork, and thus reduced *opportunity*. In addition, the fallback in the sustainability of teamwork behaviors created a negative domino effect. When one or more teams did not follow the teamwork procedure, the effective use of shared facilities was disrupted, and this made it harder for other teams to follow the teamwork process as intended. When no problem-solving process existed to handle these barriers, they accumulated and made it increasingly more difficult to work in teams.

The findings suggest that given the contextual conditions of the ED, the ongoing problem-solving at the Section of Internal Medicine increased *opportunity* and had a substantial influence on the implementation of teamwork. The later fallback in problem-solving had an equal negative influence on *opportunity* and consequently on the sustainability of teamwork. Previous research has identified problem-solving as an important ingredient in intervention implementation (Fixsen et al., 2005) and sustainability (Damschroder et al., 2009; Kochevar and Yano, 2006). Ongoing problem-solving is also a core component of improvement models, such as Plan-Do-Study-Act (Langley et al., 2009) and Kaizen (Bhuiyan and Baghel, 2005). However, less is known about how and under what circumstances problem-solving influences implementation outcomes. This thesis extends previous research with an analysis of the change mechanisms underlying ongoing problem-solving and the contextual factors

that trigger the need for BCIs that increase opportunity. Specifically, the thesis highlights how complex organizational contexts increase the demand for ongoing problem-solving activities long after the initial implementation.

7.2.3 Motivation

At the Section of Internal Medicine, the intensive efforts, support and feedback from the change team provided *motivation* to perform teamwork behaviors during the initial phases of implementation. This kind of managerial feedback has been shown to be related to work motivation (Kluger and DeNisi, 1996; Komaki et al., 1982), especially for newly founded teams (Kozlowski et al., 1996). During the initial implementation, the teamwork intervention started to run more smoothly. This meant that staff started to experience more task-related feedback that was grounded in the employee's own experience of valuable outcomes from working in teams (Kluger and DeNisi, 1996). For instance, this included experiencing less stress, a better overview of the work process, better care for patients and so on. As such, the teamwork had to be up and running to at least some extent before the task-related feedback increased. Task-related feedback has been related to high work motivation (Kivimaki et al., 1995), and it receives support from motivational theories, such as operant psychology (Skinner, 1969) and self-determination theory (Gagné and Deci, 2005). The present thesis describes how *motivation* from managerial feedback and task-related feedback had the complementary function of motivating teamwork during the initial implementation. At the Section of General Surgery, the management did not provide such feedback, and teamwork never worked well enough to provide any substantial task-related feedback. Rather, teamwork was perceived as complicated and hard to engage in. Thus, staff at the Section of General Surgery experienced much less *motivation* from both managerial and task-related feedback. This was also the case at follow up at the Section of Internal Medicine in 2013. The absence of managerial feedback might have been a lesser issue had the task-related feedback been obtained, but the fallback in teamwork as a whole obviously led to less task-related feedback as well.

The thesis points to the complementary *motivational* function of managerial feedback and task-related feedback for the performance of key behaviors. Whereas managerial feedback is under the control of management, task-related feedback is an indirect effect of a well-implemented intervention that is "free" of cost for the organization but also requires that the intervention be well maintained. The complementary function of different BCIs during stages of the implementation processes is recommended to be studied in future research.

7.2.4 Competence

A brief training activity that focused on inter-personal skills training was the only BCI used to increase competence for teamwork in the ED case. This is interesting because previous research has found training in inter-personal skills, work load management and team structure, to be a central BCI in the implementation of teamwork in emergency care (Morey et al., 2002). It should be noted that the training intervention that Morey et al. (Morey et al.,

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2002) described included a full program with implementation activities beyond classroom training and described that the program was successful in combination with senior and department management support, changes to the physical environment and ongoing support and coaching from management. Based on the findings in the present thesis, it is not possible to rule out that a more extensive training that focused on staff *competence* to work in teams would have had an additional positive impact on the outcome. At the same time, the thesis shows that it is possible to implement teamwork successfully without extensive training. It could be argued that the ED staff had "on-the-job" training during the initial weeks of working in teams when they developed teamwork skills, in terms of that they became familiar with the teamwork work process and their roles in the team. The "on-the-job" training could have even been more effective than traditional pre-intervention training because the change team provided ongoing feedback and direction on teamwork performance directly related to the work. However, in the present thesis, the feedback from the change team was categorized as *direction* rather than *competence*. Thus, the analysis suggests that the implementation of teamwork did not require new inter-personal skills but rather clear *directions* as to where and in what order the tasks were to be performed.

From a functional perspective, training does not necessarily have the function of increasing *competence*. That given, the training intervention that Morey et al. (Morey et al., 2002) described might not have had the main function of increasing *competence* but rather of increasing *direction*. Thus, the extensive efforts made in the ED with the purpose of strengthening the *direction* might have had the same function as the training intervention that Morey et al. (Morey et al., 2002) described. This is an example of the uncertainties that can arise when relying on descriptions of BCIs content rather than on their function. It is not enough to identify that training is important or to describe the content of the training if the function of the training and the contextual circumstances that elicited that function is unclear.

7.3 INVESTIGATING CHANGE MECHANISMS WITH THE DCOM®

The need for theoretical models and frameworks that can assist in developing an understanding of behavior change in complex organizational settings has been acknowledged for some time (Davies et al., 2010; Eccles et al., 2005; Michie et al., 2009). However, the actual use of such models and frameworks is still quite recent. Two of the most influential theoretical frameworks, the TDF and the BCW, were first presented in 2005 and 2011 (Michie et al., 2005; Michie et al., 2011). Thus, the potential exists to improve both theoretical models and frameworks and the methodology used to analyze change mechanisms. The DCOM® has not previously been used to analyze change mechanisms in implementation research. Neither has it been integrated with the methodological approach of realistic evaluation. The following section discusses what the thesis can add to the use of theory in implementation research and specifically compares the COM-B hub and the DCOM®. Thereafter follows a reflection on the integration of the DCOM® with realistic evaluation.

Looking at the dimension of the COM-B hub and the DCOM® framework, it is obvious that similarities exist. Both have the dimensions of *motivation* and *opportunity*, and the dimensions of *capability* (COM-B) and *competence* (DCOM®) are close in definition (Johnson et al., 2008; Michie et al., 2011). Thus, despite being based on different theories, the frameworks have a common ground in the understanding of the basic components that influence human behavior. However, the underlying theories still contrast when it comes to describing the details of each dimension. This is most clear for the dimension *motivation*. DCOM® views *motivation* from an operant perspective and defines *motivation* as the consequences that behaviors elicit, whereas COM-B defines *motivation* as both reflective and automatic processes, including planning and emotions (Baer et al., 1968; Michie et al., 2011; Skinner, 1969). The different theoretical perspectives are likely to influence the analysis. However, it is not clear how much the difference in perspective actually influence the analysis. It could be argued that the definitions reflect perspectives that overlap rather than unique perspectives (Ashford, 1998). For instance, planning can be seen as a process that is heavily influenced by reflecting on previous learning (consequences) and emotions as automatic responses that are also based on previous learning (consequences). A reflection based on the similarities found in the dimensions and differences in underlying theories is that the frameworks could be seen to provide two different things - first, broad dimensions that guide the categorization of mechanisms, and secondly, underlying theories that guide the analysis within dimensions. However, the most obvious differences between the frameworks are not found in the definitions of dimensions but in the dimension direction that is exclusive for the DCOM®.

Direction describes both the alignment of the overall aim of the intervention implementation but also what is expected of each employee and manager in relation to the implementation. *Direction* is suggested to be especially important in organizational, as opposed to individual, behavior change, as the work behaviors of employees can be inter-related (von Thiele Schwarz and Hasson, 2013). This means that the behavior of one employee is dependent on the behavior of another. For example, teamwork can exist only if the team members work together. Several previous studies identified *directional* activities as important for organizational outcomes and the implementation of organizational change (Aarons et al., 2015; Boswell, 2006; Fixsen et al., 2005; Grimshaw et al., 2012). Measures of employee "line of sight", which is the strategic alignment and employee understanding of the strategic goals of the organization, have been found to be positively related to work outcomes, such as work attitudes, employee retention and job strain (Boswell, 2006). Fixsen et al. (2005) state that an important aspect of core implementation components is that practitioners learn when, where, how and with whom to use new approaches and new skills. *Direction* is also a key component of implementation leadership (Aarons et al., 2015) in terms of the leaders' alignment of the intervention implementation with the organization's mission and emphasis on using the intervention (Aarons et al., 2015). Thus, the findings in this thesis are in line with previous research that offers support for the importance of direction in the implementation of organizational behavior change.

The COM-B does not include a *direction* dimension, but it could be argued that *direction* is integrated in the other dimensions of the COM-B. For instance, *capability* includes knowledge about the intervention (i.e., information on expected actions). COM-B *motivation* includes individual goals, and *opportunity* includes all factors that lie outside of the individual and prompt it (i.e., alignment among management). However, the question maybe is not if *direction* is important or not but rather if it is important enough to be an explicit dimension in theoretical frameworks that guide the analysis of behavior change mechanisms in implementation of organizational change. This thesis suggests that this is the case and points to the potential benefits of making *direction* an explicit dimension when analyzing behavior change mechanisms in implementation. Future research is encouraged to further study the influence of *direction* on implementation processes. Given the findings in the present thesis, special focus is recommended to be put on the relation between complex contexts and *direction*.

7.3.1 Reflections on integrating the DCOM® with realistic evaluation

The integration of the DCOM® with the CIMO configurations of realistic evaluation is considered a methodological contribution of the thesis. The contribution can be seen from two perspectives.

First, from the perspective of realistic evaluation, the DCOM® offers a useful theoretical framework for the analysis of change mechanisms. The theory underlying realistic evaluation acknowledges the need for such theories but does not suggest which change theories to use (Pawson and Tilley, 1997). Thus, DCOM® provides a potential theory to be used in future studies using realistic evaluation. Second, from the perspective of the DCOM®, the CIMO configurations added a structure that made the relationship among the context, BCI, change mechanism and outcome more explicit as compared with the structure used in study I. This is also described in Figure 6 in the methods section. As such, the CIMO provided a better overview of the analysis and potentially made it easier to follow and replicate. Especially the role of context was highlighted with the CIMO configurations. This might be important, not least from a theoretical standpoint, as the understanding of context is essential for the analysis of change mechanisms and thus should be investigated thoroughly (Blamey and Mackenzie, 2007; Greenhalgh et al., 2004).

Making the role of context explicit also points to a potential weakness in the thesis, and that is the lack of framework and theory that guided the collection of data on the context. The collection of data that described the context (in both study I and study II) was based on questions about barriers for the intervention implementation or open-ended questions about influencers on the implementation process. These questions were not wrong per se but might have limited the respondent's description of the context. For instance, if a theoretical framework or context model had been used to guide the data collection, the outcomes could have covered a fuller range of potential aspects of the context. This raises the question if an analysis of barriers is enough to understand context in implementation. The DCOM®, the TDF and the BCW all invites to a practical approach to context that focuses on identifying

and acting on barriers for change (McSharry et.al, 2016; Sinnott el. al., 2015; Suntornsut et.al., 2016). This is positive since a detailed focus on barriers is needed to identify change mechanisms. However, there might be contextual factors or descriptions of sets of barriers (i.e., organizational complexity) that can be of value for implementation research, but that are not easily identified when the focus on details is to narrow. Thus, the development and integration of a theoretical approach to context in the analysis of change mechanisms could add value for implementation research and be an important contribution for future research.

An attempt to include a contextual framework was made in study II (i.e., individual, interpersonal, institutional and infrastructural), but in practice, this framework had very little influence on the data collection or analysis. Reflecting on my own role as a researcher, the CIMO made me more aware of the role of context in the analysis. Overall, the integration of DCOM® and the CIMO was found to be very helpful and a combination that acknowledged both the change mechanism and the influence of context in a meaningful way. Future research is suggested to improve current theoretical models and frameworks used for analyzing change mechanisms. In addition, a theoretical approach that guides the investigation and analysis of context in relation to change mechanisms could be of value for the overall analysis of change mechanisms as described in the current thesis.

7.4 LINE MANAGERS' INFLUENCE ON IMPLEMENTATION OUTCOMES

So far, the discussion has focused on how and why BCIs influence implementation outcomes. The following section also focuses on BCIs but from the perspective of the line managers who typically are responsible for delivering them. It has been suggested that the line manager's leadership style can be important to understanding how they influence implementation outcomes (Gilley et al., 2009; Higgs and Rowland, 2011; Nielsen and Abildgaard, 2013; Nielsen and Randall, 2009; Sandstrom et al., 2011). The case studied in this thesis is an occupational health intervention implemented in six blue-collar organizations. As such, this case in combination with the ED case used for studies I and II reflects the broad application of implementation research. The findings of the present thesis suggest that line managers' supportive change activities influence the employee's initial and sustained use of the intervention. Thus, the findings add objective measures of intervention use to the previous research that has identified supportive change activities as important influencers of the implementation process (Sandstrom et al., 2011) and distal outcomes, such as health and well-being (Lundmark et al., 2017; Nielsen and Randall, 2009).

In contrast to what was expected, the line manager's transformational leadership did not have a direct effect on employee use. Three possible reasons for this are discussed here.

(1) Previous research has relied on subjective outcome measures, such as attitudes toward change and commitment to change (Aarons and Sommerfeld, 2012; Abrell-Vogel and Rowold, 2014; Herold et al., 2008; Seo et al., 2012). Commitment to change is, in turn, associated with the successful implementation of organizational change (Armenakis and Harris, 2009), but a lack of knowledge exists regarding the relation between the previously

used constructs and objective measures of use. Thus, the possibility exists that the outcome measure in the present thesis reflects something different than the outcomes in previous studies.

(2) There is some support that transformational leadership is more important when the implementation of change has more pronounced implications for employees' working situations (Herold et al., 2008). A possible explanation for this is that changes in work situations induce uncertainty, which makes the trust and commitment associated with transformational leaders more important. No indication exists that the web-based intervention had such an influence on the work situation, and thus, the need for transformational leadership could have been relatively low.

(3) The present thesis uses a general measure of transformational leadership. That is, it does not tell us whether the line managers are transformational in relation to the intervention itself or not. Some previous studies have found that how the transformational research is directed can be important for the influence on change outcomes (Abrell-Vogel and Rowold, 2014; Barling et al., 2002). For instance, leaders' commitment to change has been found to moderate the influence of their transformational leadership on employees' commitment to change (Abrell-Vogel and Rowold, 2014). In addition, transformational leadership that is specifically directed at safety has been found to influence safety outcomes (Barling et al., 2002). Thus, the findings raise questions about the importance of the direction of transformational leadership. This is a question that requires more research. For instance, with studies on how the leader's focus on the intervention implementation moderate's transformational leadership's influence on implementation outcomes.

The indirect effect of transformational leadership that was mediated by supportive change activities indicates that transformational leaders tend to engage in supportive change activities that, in turn, influence the use of the intervention. Given that transformational leaders are known to build trust and commitment and align employees' actions with the goals of the organization, there is some theoretical basis for this mediated effect (Bass, 1985; Burns, 1978). However, situations might exist where transformational leaders do not support the implementation of specific interventions. For example, if the leader does not see the value of an intervention, then he or she could choose not to prioritize the implementation and still be transformational in relation to the overarching goals of the organization. Thus, this further directs attention to the direction of transformational leadership, and it once again stresses the need for more research in this area.

The findings point to the importance of line managers' delivering BCIs related to the intervention being implemented. Future studies could look deeper into how transformational leadership can influence the impact of such BCIs. Because transformational leadership relates to how line managers inspire, stimulate thinking, act confidently and so on, it could be argued that their transformational leadership style influences the quality of the BCI they deliver. For instance, previous studies have identified good communication skills as an important leadership skill for the implementation of evidence-based practice (Sandstrom et al., 2011).

Thus, implementation communication can be delivered with different quality and given the transformational leadership style it could be hypothesized that transformational leaders might communicate better than others do. The functional analysis of BCIs does not explicitly consider who performs the BCI. Rather, the analysis is based on the contextual factors that can be used to identify barriers for the BCIs to target behavior change. Thus, transformational leadership could be used to refine the functional analysis by adding leadership quality. Nevertheless, it should be noted that it is not always the line manager who manages the implementation. For instance, in the ED, the change team had a key role in implementing teamwork and fell under the leadership of a change facilitator who was not formally a first-line manager. Thus, during the three months of implementation, it could be argued that the leadership of the change facilitator was at least as important as the leadership of the nurse managers and the ED manager. This suggests that it is not only the leadership of line managers that is important for implementation success but also the leadership of the ones who manage the implementation.

7.5 METHODOLOGICAL CONSIDERATIONS

The following sections discuss the methodological challenges of the studies, how they were handled and the limitations that remained. Generalizability to other settings and the pros and cons that the two cases offered are also discussed.

7.5.1 Credibility (study I and II)

Researchers using qualitative methods use themselves as tools in the research. Like everyone else, researchers have their own personal experiences and viewpoints that might influence the data collection and bias the interpretations of the findings. Thus, qualitative researchers need to be aware of how they bias the analysis and sometimes need to apply methods that reduce this bias and increase credibility, a term that reflects the extent to which the researcher manages to capture the phenomenon as it is seen in the eyes of the participants (Noble and Smith, 2015). No formal standards exist for how qualitative research should be evaluated (Rolfe, 2006), but the following section discusses the potential bias and credibility of studies I and II with inspiration from the strategies for increased credibility as described by Noble and Smith (Noble and Smith, 2015).

A common challenge of studies I and II was the complexity of the research that set out to identify not only the BCIs used to implement and sustain teamwork but also the underlying mechanisms and contextual factors relevant for analyzing the function of the BCIs. The identification of change mechanisms was a particular challenge as it relied on the researcher's ability to interpret the interviewee's description of the function of BCIs. The way in which we tried to meet this challenge was to use well-established qualitative research designs in terms of realistic evaluation (Pawson and Tilley, 1997) and hybrid thematic analysis (Fereday and Muir-Cochrane, 2008) and a framework (i.e., the DCOM®) based on operant learning theory for identifying and analyzing change mechanisms (Johnson et al., 2008).

The TEPPP project was a longitudinal research project implying that the researcher worked with the ED for many years and developed a deeper understanding of the intervention and context of the ED. In addition, one of the members of the research team also worked clinically in the ED. In support of credibility, the long-term engagement of the researchers provided the opportunity for ongoing discussions of the findings with both each other and the managers and staff in the ED (Noble and Smith, 2015). However, the long-term engagement could also post a problem, for instance if the researchers came to close to and identified with the department staff and as a consequence were biased in their analysis of the data. Furthermore, the use of multiple sources of data collection, including documentation, observations and interviews that were triangulated, was also a way of strengthening the credibility (Noble and Smith, 2015). In addition, all of the researchers in study I and II were involved in the data analysis, increasing the credibility of the findings.

7.5.1.1 Interviews

Eleven interviews were performed in study I. The relatively low number of interviews increased the risk that not all perspectives were covered, as each interviewee contributed to a relatively large proportion of the data. Four respondents were selected for interviews based on their central roles in the implementation, and an additional seven respondents were selected based on suggestions from previous respondents, so-called snowball sampling (Coleman, 1958). The criteria for the snowball sampling were respondents who had been involved in the implementation and who were perceived to have insight into the implementation process. The selection criteria and snowball sampling served to make the selection efficient and to identify respondents who could provide as much information as possible. However, the method could have resulted in a selection bias that limited the perspective of the staff who were not perceived as fully engaged in the implementation (Smith and Noble, 2014). Respondents for the group interview in study II were recruited via a nurse manager at the ED. The selection criteria were two physicians, two RNs and two NAs, all of which had been working during the implementation of teamwork. In practice, the selection relied heavily on who was working during the three hours during which the group interview was performed, and given the high turnover, the population from which to draw was small. Thus, it is unlikely that the nurse manager biased the selection. One interviewer performed all of the individual interviews in study I, thus increasing the influence of personal bias (Smith and Noble, 2014). In hindsight, the use of multiple interviewers (such as in study II) could have strengthened the method and potentially could have increased credibility.

7.5.1.2 Qualitative analysis

In study I, two researchers analyzed the interviews separately, and inter-rater reliability was calculated. Thus, the process of analysis served to reduce the risk of personal analysis bias (Smith and Noble, 2014). The analysis in study II employed a realistic approach, meaning that the interview process actively engaged the participants to provide their views on the hypothesis that the researchers created. This is a kind of respondent validation that was considered a substantial strength of study II (Noble and Smith, 2015). The use of a

theoretically based model, such as DCOM®, is overall considered a strength because it reduces the risk that important aspects of (in this case) change mechanisms are not investigated. However, it should be noted that despite the fact that the operant learning theory that underlies the DCOM® is a comprehensive psychological theory, and despite the apparent high concordance between the DCOM® and the COM-B, it is difficult to be sure that the DCOM® covers all relevant aspects of change mechanisms. Whereas both studies used a theoretical model for behavior change, the actual use of the contextual framework presented in study II was marginal (Pawson el al., 2005). This could have increased the risk that important aspects of the context were not identified. It is recommended that future studies make use of a contextual framework that can be used for pre-analysis and the ongoing analysis of context as a factor for understanding change mechanisms in implementation.

7.5.1.3 Observations

A general challenge of structured observations as a data collection method is bias that can occur from the observer influencing the observed or from the observer's own expectations' influencing the interpretations of what is actually observed (Kerlinger and Lee, 1999, pp. 727-752). The observations at the ED case were also complicated by the complex work environment in the ED, with many things happening at the same time and at a high pace. The strategy for increasing credibility was based on using multiple observers and a structured observation protocol. In addition, the team behaviors in the observation protocol were collected from the key teamwork behaviors that the consultants and ED staff involved in the teamwork intervention project had decided, suggesting that the chosen behaviors reflected what the ED management and staff meant that teamwork should entail. The observing researchers met regularly to calibrate and discuss the observations. The observations were also compared with the description of the extent to which teamwork was performed as described in the interviews. Thus, multiple actions were taken to increase the credibility of the observations. However, the low number of observations performed at the Section of General Surgery during initial implementation and at the Section of Internal Medicine during the sustainability stage made each single observation important and thus added a limitation to the study.

7.5.2 Reliability and validity (study III)

The following section discusses the reliability and internal validity of the scales used in study III. Thereafter follows a short discussion on the outcome measure and the study's use of multiple source data.

The reliability of the short scales used to study transformational leadership (coefficient alpha .83) and attitudes and actions (coefficient alpha .82) were satisfactory. The validity of the short scale used to study transformational leadership, on the other hand, had some methodological concerns. The transformational leadership short scale consisted of items collected from the developmental leadership questionnaire (Larsson, 2006). The developmental leadership questionnaire measures developmental leadership, a leadership

style that is highly inspired by transformational leadership but that was adjusted to a Swedish context (Larsson, 2006). Looking at the factor loadings for each of the four items included in the short scale, they covered two out of three sub-scales of the developmental leadership questionnaire. Thus, the short scale did not in full cover all aspects of the full scale. In all, the short scale that was used had limitations and should be seen as an indicator of transformational leadership. The validity would have been stronger if for instance, the multiple leadership questionnaire, a scale commonly used to measure transformational leadership, had been used (Bass, 1999).

The use of an objective outcome measure in terms of login frequency (as used in study III) was overall considered a strength of the study (Hasson et al., 2012). Login in was the easiest way in which to access the web-based system and to use it and thus was a potentially good measure of use. Frequency is commonly used as a measure of the usage of IT applications (Junco, 2013). However, the login frequency did not display the duration of login or what was done during login. For instance, there was a possibility to login in and do nothing or to print the educational material and work intensively with the material without logging in.

Common method bias is a methodological bias that is well known in social science and comes from systematic errors that arise when data are collected from the same source data (Podsakoff et al., 2003; Podsakoff et al., 2012). Study III used multiple source data from surveys and login data collected from data logs and thus avoided common method bias, which can be considered as a strength of the study.

7.5.3 Generalizability

Generalizability is the extent to which the findings are relevant for other settings than the one studied (McBurney and Middleton, 1994). The following sections first look at generalizability of the study III findings and then discuss the generalization of study I and II from the perspectives of transferability and cumulation.

7.5.3.1 *Generalizability (study III)*

The study III investigation of line managers' influence on the implementation of an occupational health intervention was based on six white-collar organizations in Sweden, which limits the generalizability in terms of the type of industry and geography. For instance, the developmental leadership questionnaire was used because measures of transformational leadership with other questionnaires has been suggested as not optimal for use in Swedish contexts, thus indicating that cultural differences need to be regarded (Larsson, 2006). Thus, the generalization of findings should be made carefully and mainly in relation to a Swedish context.

7.5.3.2 *Transferability of the findings (study I and II)*

The qualitative findings in studies I and II is somewhat different from that of the quantitative study II and are discussed from the perspective of transferability. Transferability is the extent to which the findings can be transferred from one case (the ED) to another. Typically,

transferability is related to replication, which is the extent to which repeated findings will be found in comparable cases. However, the vast number of different interventions implemented in different settings with different contexts makes replication of limited use when studying change mechanisms. The number of possible multiples are simply too many. An alternative approach to transferability is the cumulation of knowledge (Pawson and Tilley, 1997). Cumulation is when the understanding of a phenomenon is gradually refined as researchers build on the previous analysis of how mechanisms are triggered under specific contextual conditions (Pawson and Tilley, 1997). Applied to the present thesis, this means that future researchers are encouraged to further investigate the importance of change mechanisms such as direction and opportunity when implementing complex interventions in complex health care contexts. Less focus should be placed on the replication of ongoing problem-solving in the implementation of teamwork in EDs. Thus, the cumulative approach to the transferability of findings looks beyond the content of the BCI and rather focuses on the underlying change mechanism.

7.5.4 The cases

The cases used in this thesis were not chosen specifically for these studies. Instead, the possibility of using them to address the aim of this thesis emerged as the understanding of implementation challenges in relation to two interventions became evident through other studies (Hasson et al., 2014a; Mazzocato et al., 2011). Thus, the cases were not specifically designed for the purpose of this thesis. Instead, they represent the messy real-world where interventions are implemented and, it can be argued, where implementation research should be conducted. Nevertheless, there are attributes of the cases that make them suitable for the studies in this thesis. The following text briefly discusses the methodological pros and cons of the cases used in the thesis.

The ED provided an interesting case for at least two reasons. First, the two sections of the ED had marginal differences in context, and the differences in context between initial implementation and sustainability were small. Thus, the context could be regarded as constant and provided good conditions to identify potential effects from differences in implementation strategy. Second, substantial differences existed in the implementation strategy used to implement the intervention between sections and a clear fallback in the implementation strategy between implementation and sustainability. This was unfortunate for the implementation of teamwork, but from a researcher's perspective, it made potential effects clearer.

The "work with flow" case provided several follow-up measures on different organizational levels for as long as three years, allowing the researchers to follow the development of the intervention implementation. In addition, the fact that the intervention was web-based made it possible to measure logins to the web-based system and thus collect data on an objective outcome measure. This provided a rare opportunity to study an objective behavioral outcome.

7.6 IMPLICATIONS FOR PRACTICE

The implementation of new work methods in complex organizational contexts is a dynamic process where the contextual conditions, and thus the implementation strategy, might change over time. Thus, based on the findings of the current thesis, implementers are recommended to base implementation strategies on the pre-installation investigation of the settings context. Such an investigation of context also needs to be continuously updated during the implementation process to identify changes to context that arise over time. Furthermore, the implementation strategy in turn should be updated according to changes to context. It's strongly recommended that implementation outcomes are measured ongoing to make sure that the implementation progress as intended. The investigation of context and the design of the implementation strategy are recommended to be based on a theoretical framework of behavior change, such as the DCOM® framework. The perspective described here is often long term with ongoing investigation, ongoing measure and ongoing adaptations. This requires a long-term perspective from the start and sufficient financial resources for long-term engagement.

Some more specific recommendations come from the findings. First, the extent to which BCIs that provide direction and opportunity are maintained should be carefully considered, especially in complex health care contexts. This is needed when things happen at a dizzying speed, staff and managers alike come and go and multiple parallel and sometimes competing changes are going on at the same time. Second, the importance of managerial motivation in terms of feedback and positive attention should be given special attention during the initial stages of implementation when the work itself is not necessarily motivating. However, the findings point to the importance of basing the implementation strategy on investigating the setting context and not solely relying on general conclusions from previous research.

Line managers are key players in the implementation of organizational change. They are recommended to actively manage each implementation process by engaging in activities related to the implementation strategy and through their overall support of the implementation. Senior management should support line managers with the tools and resources needed.

8 CONCLUSIONS

The thesis adds to previous research through a detailed and theoretically based investigation of the change mechanisms that describe how BCIs influence implementation outcomes. The combined use of the DCOM® framework and realistic evaluation integrates a theory of change with a theoretical approach to the context. The integration was found useful for understanding how BCIs, change mechanisms and contextual factors interact and cause behavior change. The findings imply that the implementation strategy should be based on a theoretical understanding of change mechanisms in combination with an analysis of context. Given the dynamics of context, such analysis needs to be updated continuously and should consequently guide updates to the implementation strategy. The findings also points to *direction* as a potentially important change mechanism for the understanding of how BCIs influence the implementation of organizational change.

Furthermore, the findings suggest that organizational and intervention complexity are factors that can increase the need for BCIs that provide *direction* and *opportunity*. *Motivation* was initially provided through managerial feedback, but the importance of managerial feedback diminished as the staff began to experience task-related feedback from the intervention. This indicate that different BCIs can complement each other in their influence on *motivation* and that *motivation* provided by management can be especially important during the early stages of implementation.

Overall, the implementation of organizational change in a complex health care context was found to be an ongoing process that required continuous management and adjustments during and after initial implementation. This implies that the sustainability of interventions should not rely on the passive maintenance of the implementation but rather on an active continuous process that must adapt to changes in the context were implemented. Thus, sustainability could be seen as an adaptive process of continuous improvement rather than episodic change.

To broaden the investigations of change mechanisms in implementation, this thesis studied the influence of line managers' leadership styles on the use of an occupational health intervention. The findings suggests that line managers' dedicated focus on supportive change activities, such as communication and feedback on the implementation, rather than their general transformational leadership style, is the key factor influencing employees' initial and sustained use of the intervention. Given the methodological limitations, especially regarding the scale used to measure transformational leadership, the findings should nevertheless be interpreted with caution.

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11 APPENDIX

11.1 APPENDIX A – INTERVIEW GUIDE

General interview guide

The following is the general interview guide, containing questions for the staff and managers at the Section of Internal Medicine and Section of General Surgery. At the time of interview, the questions were adapted based on the headings and instructions below.

Outcome - current

1. What are the biggest changes you have experienced? (as a result of the measures taken)
    a. What characterized the work before the implementation of teamwork?
2. What results were expected? (relate to program theory)
3. What results can be observed for a) patients, b) staff?

To staff:

Were you here before the implementation of teamwork? If not, what have you heard about the time before the teamwork?

Differences between General Surgery and Internal Medicine

Exploration and adoption (program theory):

Medical – During fall 2009, the decision was made to implement teamwork.

1. When did the decision process that ultimately resulted in teamwork begin?
2. What did you want to achieve?
    a. *What was the main goal/aim of implementing teamwork (were there more?)?*
    b. *In what way did they/you believe teamwork would contribute to the goal/aim?*
3. Were both General Surgery and Internal Medicine included from the beginning? Were there differences in the reasoning and conditions for General Surgery and Internal Medicine?
4. Has/have the development work/ideas been developed, refined, changed during this time?
    a. *We know this partially. The leader track was removed and the focus moved to the team in spring 2010.*

Additional questions:

1. What do you mean by teamwork?
2. Were there alternatives to teamwork?
3. If so, why did the result end up being teamwork?

Program installation

Between the decision to implement teamwork and its actual introduction in summer 2010...

1. What contributions were made (and by whom) to prepare for the implementation of teamwork?

> a. *Were the contributions at General Surgery and Internal Medicine different?*
2. What were the challenges you expected?
3. What was important during this period?
> a. What characterized the work?

Additional questions:

1. When and how was teamwork presented to the staff?
2. Were barriers/challenges analyzed?
3. If so, what were they?
4. To what degree did you experience that staff members were motivated or not?
5. The teamwork was refined by having a "test group" systematically test and evaluate it. Expand on this.
6. How was the teamwork concretized?

To staff:

1. When did you first hear that teamwork was being planned?
2. What did you think about it? What barriers/possibilities?
3. Looking back, what contributions for implementing the teamwork were important for you and your coworkers to be able to start working in teams?
> a. What characterized the work during this period?

Initial implementation

Surgical – At General Surgery, the teamwork was implemented later than at Internal Medicine...

1. How did the actual transition from traditional work to teamwork happen?
2. What contributions aimed at supporting and facilitating teamwork initially (the first 6 months)?
3. Which actors were especially active/participatory in the process?
4. How were you (management) able to follow up how it was going?

Additional questions:

1. Did the fact that the teamwork was implemented twice have any effect?
2. What barriers/possibilities became clear upon implementation?

To staff:

NOTE – Distinguish between the sections! Ask which one the interviewee means!

1. What do you remember from the first time the teamwork was implemented?
2. What do you yourself feel helped you change your behavior and start working within a team?
3. What parts of the teamwork were easier/harder to start doing? Why? (Were there no interventions?)
4. Are there differences in the teamwork between Internal Medicine and General Surgery? Expand on this – who and what are the differences due to?

Innovation

1. What have you learned about teamwork?
2. Has the way you work in teams developed in any way?

3. How has this development happened?
4. Have you identified barriers to efficient teamwork during the year?
5. How have you handled these barriers?

Surgical, cont'd from above...

1. What are General Surgery's future plans for teamwork?
2. What have you learned from Internal Medicine that you want to use in a new attempt at implementing teamwork at General Surgery?

To staff:

1. What have you learned about teamwork during the year you have worked in teams? What changes have been made?
2. How have the changes been made?
3. What during this year has made it easier for you to work within a team?
4. What has made it difficult?

Full implementation

1. What are your greatest challenges for this to be maintained and be a value-adding way of working in the future?

Other questions

1. What "outside" factors/occurrences have affected <u>the process</u>? When and how have they had an effect?

   a. *Different levels: national, county council, hospital*
   b. *Different aspect: organizational, management changes, other development projects, savings requirements, new IT system, etc.*
   c. *What has the interaction between different system levels looked like over time?*
2. How have the key actors worked with/affected the surroundings?
   a. *Acted upward/outward to create the right conditions, or inward to make it happen?*
3. What have the premises'/department's conditions been? In what way have these affected the course of events?
   a. *For instance support, resistance, resources, competence, experience of previous changes, culture, etc.*