Promoting Innovation Implementation Behavior by Transformational Leadership: A Multiple Mediation Analysis

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May 2011
Acknowledgements

First and foremost, I would like to express my gratitude to my supervisor, Sabine Raeder, Associate Professor at the Department of Psychology at the University of Oslo. Raeder has been an invaluable resource throughout the process of writing my thesis. She has helped me develop the research project, and provided me with measures used in the data collection. I am especially thankful for the excellent methodological guidance and advice. Without her support and expertise, this thesis would not have been possible.

I would like to thank Volvat for their interest in my project, and in particular Christian Loennecken and Hilde Tamburplass for their help and assistance in acquiring a sample for my study. And of course, thank you to all the participants who contributed with their valuable time to complete my questionnaire.

I would like to thank Dr. Björn Michaelis at Heidelberg University for providing me with articles and with measures used in the data collection.

Thank you to my brother, Magnus Engh Halvorsen, for providing me with valuable advice on how to improve my thesis and for proofreading it. I also thank Natalie Stjernen for assisting in the translation of the English questionnaire items.

Thank you to my wonderful classmates for their support and advice regarding this thesis, and for providing me with many good laughs throughout the last year. In particular, I want to thank Kine Reegård, Nora Thorsteinsen Toft, and Bjørn Tore Hellesøy for commenting on my thesis in the process of writing.

Finally, I am grateful to my family and friends for all their support. A special thank you to my boyfriend, Eirik, for his patience and encouragement throughout the course of my thesis work.

Lene Engh Halvorsen,

May 2011
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Abstract

Organizational analysts have increasingly identified implementation failure as the main cause of many organizations’ failure to realize the intended benefits of the innovations they adopt. In many cases, innovations are ineffective because organizations do not gain targeted users’ innovation implementation behavior - their consistent and committed use of the particular innovation. The goal of this study was to investigate the effect of transformational leadership on innovation implementation behavior and the psychological mechanisms of this relationship. The sample consisted of 75 employees of a private medical clinic in Norway, which had introduced an electronic patient record (EPR) system 17 months preceding this study. Affective commitment to change, normative commitment to change, and perceived computer self-efficacy were tested as potential mediators of the relationship between transformational leadership and innovation implementation behavior in a multiple mediation model. A bootstrap procedure was used to test for mediation. The results demonstrate that transformational leadership had a positive influence on innovation implementation behavior, and that normative commitment to change was a significant mediator of this relationship. There was, however, no support for the proposed mediators affective commitment to change and perceived computer self-efficacy. The results from this study point out the importance of transformational leadership in promoting employees’ consistent and committed use of a particular innovation, and suggest that employees’ feelings of obligation is a significant psychological mechanism of this relationship. The findings indicate that organizations need to pay close attention to leadership style when an innovation is implemented, and that leaders need to be aware of the psychological mechanisms by which they promote employees’ consistent and committed use of an innovation.
Introduction

In order to stay competitive in a changing environment, organizations are continually introducing innovations to improve the quality, efficiency, and productivity of their services. Research has shown, however, that many organizations fail to realize the potential benefits of the innovations they adopt. For example, in a survey of the effectiveness of modern manufacturing processes in British companies, Waterson et al. (1999) found that more than half of the companies perceived the innovations to be failing in terms of effectiveness, with an estimated failure rate of between 50-70% in certain areas. In a similar study, Clegg et al. (2002) found that even the most successful practices have high failure rates and argued that there is a “considerable scope for improvement” (p. 186). Furthermore, it has been estimated that nearly 50% of attempts to implement new technology actually fail (Aiman-Smith & Green, 2002).

Organizational analysts have increasingly argued that failure of innovations to meet with expectations is not due to an intrinsic lack of efficacy. In most cases the reason is unsuccessful implementation. That is, the innovation is ineffective because the targeted users do no employ it with the consistency, skills, and care required to achieve its expected benefits (Klein & Sorra, 1996; Klein & Knight, 2005; Repenning, 2002). This indicates that there is a need for a better understanding of factors that promote innovation implementation behavior – “an individual’s consistent and committed use of a particular innovation” that an organization is using for the first time (Choi & Price, 2005, p. 85; Klein, Conn, & Sorra, 2001). Research by Michaelis, Stegmaier, and Sonntag (2010) demonstrated that transformational leadership has an important influence on employees’ innovation implementation behavior. They examined the effect of transformational leadership in promoting employees’ consistent and committed use of an innovation, and investigated affective commitment to change as a psychological mechanism of this relationship. They found that transformational leadership was positively related to innovation implementation behavior, and that affective commitment to change completely mediated this relationship. This study draws on the model by Michaelis et al. (2010) and advances the concept of affective commitment to change as a psychological mechanism. Thus, this study extends the model by including normative commitment to change and computer self-efficacy beliefs as potential psychological mechanisms by which transformational leadership is related to employees’ innovation implementation behavior.

This study is a multiple mediation approach to the investigation of innovation implementation behavior, which involves examining “simultaneous mediation by multiple
variables” (Preacher & Hayes, 2008, p. 880). The goal was to explore the influence of transformational leadership behaviors in promoting employees’ consistent and committed use of an innovation, and the psychological mechanisms of this relationship. Specifically, the employees’ belief that a particular computer technology initiative is beneficial (affective commitment to change), their feelings of obligation to support the computer technology initiative (normative commitment to change), and their belief that they are able to competently use it (perceived computer self-efficacy), are examined as potential mediators by which transformational leadership promotes employees’ consistent and committed use of the particular computer technology. The overall purpose of this study was to contribute to a better understanding of innovation implementation behavior and factors that relate to it.

**Innovation Implementation Behavior**

Within the context of innovation implementation, the term innovation refers to a technology or practice that an organization is using for the first time, irrespective of whether other organizations have previously used it (Klein, et al. 2001). In this study, an innovation is referred to as a computer technology that is used for the first time within an organization.

The process of implementation begins with a decision to adopt, or purchase, an innovation, a decision that is typically made by the top management (Klein & Sorra, 1996). Next, there is a period of time during which the innovation is initially tried out in the organization until its full-scale operation is attained (Jayanthi & Sinah, 1998). This is the implementation phase, described as the process in which targeted users ideally become increasingly skillful and committed to using a specific innovation, gradually becoming a matter of routine use (Klein & Sorra, 1996). Failure of implementation thus occurs when the targeted users of the innovation lack the necessary skills, and if the innovation is not used with the consistency and care required to achieve its expected benefits (Klein & Knight, 2005). Consequently, an organization that adopts an innovation may nevertheless fail to implement it successfully. The implementation process is therefore critical because it ultimately determines the eventual success or failure of the introduced innovation (Jayanthi & Sinah, 1998). In other words, when an organization introduces an innovation its success is heavily reliant on the employees’ acceptance and use of it.

Klein and Sorra (1996) conceptualized the use of an innovation as a three-dimensional continuum ranging from avoidance (nonuse), unenthusiastic use (compliant use), to skilled and consistent use (committed use). The concept of innovation implementation behavior represents the last dimension. It refers to an individual’s behavioral response to an innovation,
and has been defined as an “individual’s consistent and committed use of a particular innovation” that is used for the first time within an organization (Choi & Price, 2005, p. 85). The study of innovation implementation behavior is therefore considered as a special case within the field of change implementation (Michaelis, et al., 2010).

Most of the research on innovation has focused on development and adoption of innovations, while there exists relatively little research on innovation implementation and on implementation behavior by individuals (Klein & Knight, 2005; Klein & Sorra, 1996; Noble & Mokwa, 1999). Nevertheless, Noble and Mokwa (1999) have argued that research on the implementation process and the factors that influence it can be grouped into three categories: structural views, interpersonal process views, and individual level processes.

The first category, structural views, includes research at the organizational level, and is concerned with the effects of various organizational structures, control systems, and organizational climate on the implementation process. For example, research has demonstrated that availability of financial resources, innovation implementation policies and practices (Klein, et al., 2001), an organization’s learning orientation (Edmondson, Bohmer, & Pisano, 2001), and climate for implementation (Holahan, Aronson, Jurkat, & Schoorman, 2004; Klein & Sorra, 1996) are important success factors.

The second category, interpersonal process views, consists of research on the effects of for example leadership, implementation styles, and strategic consensus. For instance, studies have shown that management support (Klein, et al., 2001), charismatic leadership and trust in top management (Michaelis, Stegmaier, & Sonntag, 2009), and transformational leadership (Michaelis, et al., 2010) influence innovation implementation behavior.

The third category, individual level processes, is concerned with the influence of commitment, cognition, and organizational roles on the implementation of an innovation. For instance, some of the individual level factors identified by research are perceived usefulness, perceived ease of use, and user acceptance of the innovation (Davis, 1989), emotional reactions toward the innovation (Choi, Sung, Lee, & Cho, 2011), person-innovation ability fit, and person-innovation value fit (Choi & Price, 2005).

In the examination of innovation implementation behavior, this study will focus on the influence of factors within the two categories of interpersonal process views and individual level processes. In particular, it explores the importance of transformational leadership in gaining employees’ consistent and committed use of a particular computer technology. Furthermore, it investigates the mediating effects of employees’ belief that the specific computer technology initiative is valuable (affective commitment to change), their feelings of
obligation to support it (normative commitment to change), and their belief that they are able to competently use the particular computer technology (perceived computer self-efficacy).

**Transformational Leadership**

Transformational leadership has been argued to represent the most effective form of leadership (Rubin, Munz, & Bommer, 2005). Unlike traditional leadership theories that focused mainly on rational processes, theories of transformational leadership emphasize emotions and values (Hetland & Sandal, 2010). One example of traditional leadership is transactional leadership, which is characterized by a continuing and mutual exchange process between a leader and an employee in which the leader provides feedback and rewards in return for the employee’s effort (Bass, 1990; Podsakoff, MacKenzie, Moorman, & Fetter, 1990). In contrast, transformational leadership has been described as exerting additional influence by broadening and advancing followers’ goals, making followers aware of the value and importance of task outcomes, and motivating them to surpass their self-interests for the sake of the organization (Dvir, Eden, Avolio, & Shamir, 2002; Podsakoff et al., 1990). Thus, transformational leadership transforms the followers, helping them to reach their full potential, and to perform beyond the expectations specified in the implicit or explicit exchange agreement (Dvir et al., 2002). Transformational leaders build followers’ trust and respect, which is one of the main reasons why followers are motivated by them (Yukl, 1989). Transformational leaders, closely related to charismatic and visionary leaders, are therefore sometimes called outstanding leaders (Pillai & Williams, 2003).

According to Bass and Avolio (1994), transformational leaders achieve superior results by employing one or more of the following behaviors: charismatic behaviors/idealized influence, intellectual stimulation, individualized consideration, and inspirational motivation. Charismatic behaviors/idealized influence means that the leader articulates a vision that can be shared by everyone in the organization, that the leader has great power and influence through serving as a role model, and receives a high degree of trust, respect, and confidence from the employees (Bass, 1990). Intellectual stimulation is described as questioning old assumptions, enhancing employees’ interest in and awareness of problems, and increasing their ability to consider problems in new ways (Bass & Avolio, 1994; Hetland & Sandal, 2010). Individualized consideration involves the leader paying close attention to individual differences among the employees in terms of their needs, desires, achievements, and growth (Bass & Avolio, 1994). Last, inspirational motivation implies that the leader clearly communicates expectations and goals that the employees want to accomplish, provides
meaning and challenge at work, and expresses statements that build motivation, confidence, and optimism (Bass, 1990; Bass & Avolio, 1994).

In short, transformational leadership can be described as a process that changes the basic values, beliefs, and attitudes of followers, helping them to reach their full potential and to generate the highest level of performance (Dvir, et al., 2002; Podsakoff, et al., 1990). Through this process, transformational leaders have the ability to build employee commitment to the organization’s mission, goals, and strategies (Yukl, 1989). In other words, transformational leaders transform individual employees to make them more receptive to organizational change (Bommer, Rich, & Rubin, 2005). This indicates that transformational leadership skills might be important when leading organizations through change processes such as the implementation of an innovation (Michaelis, et al., 2010).

Transformational leadership has been found to relate to positive outcomes at the individual, group, and organizational level (Liu, 2010). For example, research has shown that transformational leadership has a positive influence on individual outcomes such as employee satisfaction and organizational commitment (Bycio, Hackett, & Allen, 1995), followers’ development and performance (Dvir, et al., 2002), and on trust in leader and organizational citizenship behaviors (Podsakoff, et al., 1990). Furthermore, transformational leadership behaviors have been demonstrated to be particularly effective during organizational change (Liu, 2010). As such, transformational leadership has been intensively studied in the context of innovation and change research (Bommer, et al., 2005; Jung, Chow, & Wu, 2003). For instance, studies have shown that transformational leadership has a positive impact on team innovation (Eisenbeiss, van Knippenberg, & Boerner, 2008), organizational innovation (Gumusluoglu & Ilsev, 2009), and on reduction of employee cynicism (Bommer et al., 2005). These findings suggest that transformational leadership might be an important factor in gaining employees’ consistent and committed use of an innovation.

The quality of transformational leadership corresponds well with the criteria for successful innovation implementation. In the absence of a strong and convincing leadership support for implementation, employees might not commit to the new innovation and the implementation effort will fail (Klein & Knight, 2005; Repenning, 2002). For instance, the employees might be happy with the existing computer technology and thus are initially skeptical to the introduced innovation. It is therefore important that the leader clearly communicates an attractive and engaging vision of a possible future that the employees can identify with, as well as the goal and the purpose of the introduced innovation (Eisenbach, Watson, & Pillai, 1999), in order for the employees to understand the need for the introduced
innovation. Furthermore, by providing individualized support, the transformational leader demonstrates support and respect for the individual employees’ feelings, needs, and desires with regard to the introduced innovation. This might reduce employee skepticism and increase employee support for the particular innovation. As noted earlier, transformational leaders possess these talents and abilities. This suggests that transformational leadership behaviors will have a positive influence on employees’ innovation implementation behavior.

Michaelis, et al. (2009; 2010) found that charismatic leadership and transformational leadership were positively related to innovation implementation behavior. To my knowledge, these are, to this date, the only that have investigated this relationship. In line with these researchers it is hypothesized that transformational leadership, as perceived by the employees, has a positive influence on employees’ consistent and committed use of a particular innovation.

Hypothesis 1: Transformational leadership is positively related to innovation implementation behavior.

Affective Commitment to Change and Normative Commitment to Change

Depending on the innovation’s nature and the opportunities and challenges it presents for the organization, its usage might lead to changes in the managerial practices and even to a transformation of the organization’s structure (Lam, 2004). Moreover, the targeted users of the innovation often experience considerable changes in roles, norms, routines, and practices. In addition, many innovations often require individuals to acquire new technological knowledge and skills (Klein & Knight, 2005). Thus, innovation implementation is closely related to change processes. This study therefore combines the two fields of change and innovation research.

One way of assessing employees’ reaction toward a change initiative is by measuring their commitment to the specific change (Conway & Monks, 2008). Based on Meyer and Allen’s (1991) three-component model of organizational commitment, Herscovitch and Meyer (2002) developed a model of commitment to change. Herscovitch and Meyer defined commitment to change as “a mind-set that binds an individual to a course of action deemed necessary for the successful implementation of a change initiative” (p. 475). Furthermore, they described three dimensions of commitment to change: affective, normative, and continuance commitment to change. Affective commitment to change reflects a desire to support the change based on a belief in its inherent benefits. Normative commitment to
change reflects a sense of obligation to support the change, whereas continuance commitment to change reflects a recognition that there are costs associated with resisting the change. In other words, employees can feel bound to support a change initiative because they believe that the change is valuable, because they feel an obligation to support it, or because they feel that it will be costly to resist the change (Conway & Monks, 2008). However, commitment is more than just a positive attitude towards the change, it also includes an intention to support the change and a willingness to work towards successful change implementation. Thus, commitment represents a psychological attachment to the change rather than just reflecting absence of resistance or a favorable disposition such as openness or acceptance of the change (Fedor, Caldwell, & Herold, 2006; Herold, Fedor, Caldwell, & Liu, 2008).

Commitment to change is considered a necessary condition for successful implementation of change (Herold, et al., 2008; Parish, Cadwallader, & Busch, 2008). Although research (Herscovitch & Meyer, 2002; Meyer, Allen, & Smith, 1993) has identified three distinct dimensions of commitment, this study will focus on affective commitment to change and normative commitment to change. There are two reasons for this.

First, research has shown that affective commitment and normative commitment are positively related to desirable work behaviors such as attendance, organizational citizenship behavior, and job performance (Meyer, Stanley, Herscovitch, & Topolnytsky, 2002). Furthermore, Herscovitch and Meyer (2002) have demonstrated that affective commitment to change and normative commitment to change are associated with higher levels of support behavior. They found that both are related to willingness to work cooperatively with others, exerting extra effort to achieve the objectives of the change, and to advocating the change. This suggests that affective commitment to change and normative commitment to change might be important factors in gaining employees’ consistent and committed use of a new computer technology initiative.

Second, most studies that have investigated the relationship between transformational leadership and commitment to change have only included affective commitment to change. Some have argued that the reason for this is that affective commitment best reflects a positive attitude toward a specific change, and therefore, is most likely to be influenced by leadership behavior (Herold, et al., 2008). However, research has shown that transformational leadership has a positive impact on both affective (Bycio, et al, 1995; Herold, et al., 2008; Michaelis, et al., 2010) and normative commitment (Korek, Felfe, & Zapernick-Rathe, 2009; Meyer & Parfyonova, 2010; Moss, McFarland, Ngu, & Kijowska, 2007). This point will be elaborated in the following sections.
Herscovitch and Meyer (2002) have argued that affective commitment develops when individuals are involved in, recognize the value of, or derive their identity from association with an entity such as the organization, or from the pursuit of a specific course of action. As noted earlier, transformational leaders have the ability to articulate a shared vision, to communicate expectations and goals that followers want to accomplish, and to express statements that build motivation, confidence, and optimism (Bass, 1990; Bass & Avolio, 1994). Transformational leaders thus have the ability to encourage feelings of emotional attachment to the organization or to the change initiative (Bycio, et al., 1995). Transformational leadership behaviors might therefore contribute to the development of employees’ affective commitment to change.

Herscovitch and Meyer (2002) have furthermore argued that normative commitment develops through socialization experiences, acceptance of the terms of a psychological contract, from obligation, or as a means of reciprocation of benefits received such as training (Meyer, et al., 1993; Conway & Monks, 2008). When the employees feel that the organization, or the leader, fulfill its obligations they might therefore view cooperation with change initiatives as a way to reciprocate (Herscovitch & Meyer, 2002). The transformational leader, through charismatic behaviors, intellectual stimulation, individualized consideration, and inspirational motivation, reflects an engaging leader who focuses on employee development and employee investment (Dvir, et al., 2002). Moreover, it has been argued that truly transformational leaders base their vision for followers on a sense of moral duty and legitimate values such as social justice and equality, and that they also behave in accordance with these values (Meyer & Parfyonova). This suggests that transformational leadership might also contribute to the development of employees’ normative commitment to change.

Transformational leadership is generally regarded as important during organizational change because of the transformational leader’s ability to motivate and engage employees (Herold, et al., 2008). For example, research by Bommer, et al. (2005) has demonstrated that transformational leadership behaviors might effectively reduce employee cynicism about organizational change. They suggested that organizations could use transformational leadership behaviors to develop employees who are more receptive and committed to organizational change. In general, to provide a shared vision, to stimulate and empower individuals, to tend to individual needs, and to build motivation and confidence, are leadership behaviors likely to influence individuals’ affective and normative commitment to a particular change. This study therefore examines whether transformational leadership has a
positive impact on both affective commitment to change and normative commitment to change.

**Hypothesis 2: Transformational leadership is positively related to affective commitment to change.**

**Hypothesis 3: Transformational leadership is positively related to normative commitment to change.**

Research has demonstrated that commitment to change contributes significantly to the prediction of employees’ behavioral support for change initiatives (Herscovitch & Meyer, 2002; Fedor, et al., 2006; Parish, et al., 2008). This indicates that employees with high levels of commitment to change also will be more likely to commit to usage of an innovation, that is, engage in innovation implementation behavior. In a similar study, Michaelis, et al. (2009; 2010) found that affective commitment to change was related to employees’ innovation implementation behavior. However, research by Herscovitch and Meyer (2002) has shown that also normative commitment to change contributes uniquely to the prediction of change-relevant behavior. This study therefore examines whether a belief that the change initiative is beneficial as well as feelings of obligation to support the change initiative have a positive influence on employees’ consistent and committed use of a particular innovation.

**Hypothesis 4: Affective commitment to change is positively related to innovation implementation behavior.**

**Hypothesis 5: Normative commitment to change is positively related to innovation implementation behavior.**

Commitment to change might be a potential mediator of the relationship between transformational leadership and employees’ innovation implementation behavior. It has been argued above that transformational leaders change the basic values, beliefs, and attitudes of the employees, that they have the ability to build employee commitment to the organization’s mission, goals, and strategies, and thus make employees more receptive to organizational change such as the implementation of an innovation (Bommer, et al., 2005; Dvir et al., 2002; Podsakoff, et al., 1990; Yukl, 1989). Furthermore, transformational leadership behaviors encourage employees’ feelings of emotional attachment to the change initiative (Bycio, et al., 1995). In addition, transformational leaders focus on employee development and on employee investment, and base their actions and vision on moral duty and legitimate values such as
social justice, which might evoke employees’ feelings of obligation to support the specific change (Dvir, et al., 2002; Herscovitch & Meyer, 2002; Meyer & Parfyonova, 2010). This indicates that transformational leadership behaviors increase employees’ affective and normative commitment to the specific change initiative, and as such promote employees’ consistent and committed use of the particular innovation. That is, transformational leadership behaviors have a positive influence on the employees’ belief that the change is beneficial and on their feelings of obligation to support the change, which in turn encourage the employees’ consistent and committed use of the particular innovation. It is therefore hypothesized that:

Hypothesis 6: Affective commitment to change mediates the positive relationship between transformational leadership and innovation implementation behavior.

Hypothesis 7: Normative commitment to change mediates the positive relationship between transformational leadership and innovation implementation behavior.

Perceived Computer Self-Efficacy

The concept of perceived computer self-efficacy originates from Albert Bandura’s (1986) self-efficacy construct, which is a widely acknowledged construct within the field of social psychology (Stajkovic & Luthans, 1998). Self-efficacy is concerned with an individual’s judgments of his or her capabilities to organize and execute performance on a specific task (Bandura, 1986; Gist & Mitchell, 1992). In the context of technology use, perceived computer self-efficacy refers to a person’s beliefs about his or her abilities to competently use a technology in the accomplishment of a particular task or job (Compeau & Higgins, 1995; Speier & Venkatesh, 2002). Compeau and Higgins (1995) have described two aspects of the computer self-efficacy construct. First, it involves self-assessments of what one will be able to do with one’s computer skills in the future, rather than judgments of what has been done in the past. Second, it concerns more than managing simple component sub-skills, such as entering data in a spreadsheet: it refers to judgments of one’s ability to apply those skills to broader tasks, for example preparing written reports.

In short, self-efficacy does not concern generalized feelings of mastery, rather, it represents an individual’s perceptions about his or her ability to handle a specific situation or to perform a particular behavior (Jimmieson, Terry, & Callan, 2004). These perceptions affect how people feel, think, and motivate themselves, and as such also a person’s choice of behaviors (Bandura, 2006). Moreover, perceived self-efficacy influences the amount of effort and persistence exerted when an individual is confronted with obstacles or unpleasant
experiences (Bandura, 1982; Compeau & Higgins, 1995; Pillai & Williams, 2003). To put it simply, people who believe they can perform well on a task do better than those who believe they will fail (Gist & Mitchell, 1992).

Perceived self-efficacy should not be mistaken with constructs such as self-esteem or locus of control. Whereas self-efficacy is judgments of one’s own capability to perform specific behaviors, self-esteem is judgments of self-worth. Moreover, locus of control is concerned with beliefs about outcome contingencies, that is, whether outcomes are determined by one’s actions or by forces outside one’s control (Bandura, 2006).

It has been suggested that one of the primary motivational mechanisms through which transformational leaders influence followers is by enhancing their self-efficacy (Pillai & Williams, 2003). Shamir, House, and Arthur (1993) have argued that through expressing positive evaluations of the followers, and by communicating high performance expectations and confidence in followers’ ability to meet the expectations, transformational and charismatic leaders enhance followers’ self-esteem and self-worth, and subsequently their self-efficacy. Dvir et al. (2002) tested the impact of transformational leadership on follower development and performance, and found that transformational leadership had a positive impact on follower development in terms of followers’ self-efficacy. In line with this it is hypothesized that transformational leadership behaviors enhance employees’ belief that they are able to competently use a particular computer technology.

_Hypothesis 8: Transformational leadership has a positive influence on perceived computer self-efficacy._

Research has demonstrated that perceived computer self-efficacy is an important determinant of computer adoption and use, and as such an important factor to successful implementation of technological systems in organizations (Compeau & Higgins, 1995). A study by Compeau, Higgins, and Huff (1999) showed that individuals’ beliefs about their abilities to competently use computers have important influence on their affective and behavioral reactions to computer technology. They found that self-efficacy had a strong and significant effect on individuals’ outcome expectations of computer use, their computer anxiety, and ultimately their use of computers. Furthermore, Venkatesh and Davis (1996) found that perceived computer self-efficacy was an essential antecedent of individuals’ perceived ease of use of a particular system, and argued that rejection or ineffective use of implemented systems often is caused by an underlying problem of low computer self-efficacy of the targeted users. These findings indicate that an individual who believes that he or she
will be able to competently use the introduced computer technology also will be more likely to engage in innovation implementation behavior. It is therefore hypothesized that:

**Hypothesis 9: Perceived computer self-efficacy is positively related to innovation implementation behavior.**

Perceived computer self-efficacy might be a potential mediator of the effect of transformational leadership on employees’ innovation implementation behavior. As noted above, one of the main motivational mechanisms through which transformational leaders influence employees is by enhancing their self-efficacy beliefs (Pillai & Williams, 2003; Shamir, et al., 1993). This suggests that transformational leadership behaviors enhance employees’ belief that they are able to competently use the particular innovation, and that this belief in turn promotes employees’ consistent and committed use of the innovation. It is therefore hypothesized that transformational leadership, through enhancement of the employees’ perceived computer self-efficacy, will positively influence innovation implementation behavior.

**Hypothesis 10: Perceived computer self-efficacy mediates the positive relationship between transformational leadership and innovation implementation behavior.**

**Method**

**Sample**

Data were collected at a private medical clinic in Norway. This medical clinic has four medical centers located in four cities. All four medical centers had simultaneously introduced an electronic patient record (EPR) system 17 months preceding this study. The EPR system is a patient record that contains health information about individual patients in digital format, which can be shared across different health settings, both within and between hospitals. This EPR system therefore replaces the old paper-based patient record system and enables an electronic workflow system. Most of the EPR users are hospital personnel like physicians, nurses, medical secretaries, and physiotherapists, but it is also partly used by the customer service and the administrative personnel. The EPR system is one example of the increasing global focus on eHealth development, which involves continuous improvements of the quality, safety, and efficiency of the national health services through the use of information technology.

A total of 436 EPR users were invited to participate in the study. Out of this initial
sample, 75 employees responded, which was 17% of the total sample. 28% of the respondents ($N = 21$) were male, while the majority, 72%, of the respondents ($N = 54$) was female. The age ranged from 24 years to 78 years with a mean age of 47 years ($SD = 12.4$). The low response rate of 17% was probably due to the fact that most of the EPR users are health personnel who spend a lot of their day treating patients, and therefore do not spend all their working time in front of a computer. Thus, it might also be that the employees have not had the time or capacity to take time out of their workday to respond to the questionnaire. In addition, the medical centers had finished another survey shortly before this questionnaire was administered, which might have contributed to the low response rate.

Procedure

All users of the EPR system at all four medical centers were invited to participate in the study. The management published information about the study on the organization’s intranet. In addition, emails with information were sent to all EPR users. The participants were furthermore assured that all survey responses would be treated confidentially, and that the data would not point out any individual respondent.

The data were collected by the use of an online questionnaire. An administrative employee at one of the medical centers administered the questionnaire electronically to the personnel’s work email. This was because the organization’s firewall did not allow the questionnaire to be administered from anyone outside of the organization. The participants were asked to respond to the questionnaire during work hours. Emails reminding participants to respond were sent out 1, 2, and 3 weeks after the questionnaire was distributed.

Measures

The questionnaire contained scales measuring transformational leadership, affective commitment to change, normative commitment to change, perceived computer self-efficacy, and innovation implementation behavior. All the scales were originally in English and had to be translated into Norwegian. The translation was done by me, the researcher. To ensure that the wording of the translated items did not convey a different meaning from that of the original items, a U.S. native with English as the first language and Norwegian as the second language translated the items back to English. The back translation was then compared with the original version. All items were measured on a 7-point Likert scale, with verbal anchoring ranging from 1 “strongly disagree” to 7 “strongly agree”.
Transformational leadership. This construct was measured using an adapted version of the Transformational Leadership Inventory Scale developed by Podsakoff and colleagues (1990). The respondents were asked to answer the scale based on the degree to which they viewed their division manager’s behavior as transformational in nature when the new EPR system was implemented in the organization. The scale was adapted to this study by specifying each item as being leadership behavior with regard to the introduction of the particular system, and the name of the EPR system was therefore included in each item. Only the two scale dimensions “articulating a vision” and “providing individualized support” were included in the questionnaire, in total 8 items. These two dimensions were chosen together with the organization’s management, and were included because they contained the most relevant items with regard to the implementation of the specific system. The two dimensions were treated as one scale. One item had to be deleted from the data set because it was negatively correlated with the other items. The lead-in for all of the items was “I believe my leader…” with an example item being “Has a clear understanding of the purpose of introducing the EPR system”. The Cronbach’s alpha of the scale was .95.

Commitment to change. The employees’ commitment to change was assessed using a scale developed by Herscovitch and Meyer (2002). Only items from the two dimensions of affective commitment to change and normative commitment to change were included in the questionnaire. 6 items measured each of the two dimensions, which totaled up to 12 items. The respondents were asked to indicate how well each item represented their feelings about the introduced EPR system. An example item from the affective commitment to change dimension is “I believe in the value of this change”, and an example item from the normative commitment to change dimension is “I feel a sense of duty to work toward this change”, where “this change” referred to the introduced EPR system. The Cronbach’s alpha of the affective commitment to change scale was .92, and for the normative commitment to change scale it was .85.

Perceived computer self-efficacy. The employees’ perceived self-efficacy to the EPR system was assessed with a 10-item scale developed by Compeau and Higgins (1995). Respondents were asked to indicate their confidence in using the EPR system. The lead-in for all of the items was “I believe I could complete my tasks in the EPR system…” with an example item being “If there was no one around me to tell me what to do as I go”. The Cronbach’s alpha of the scale was .87.

Innovation implementation behavior. This construct was measured with an adapted version of a 7-item scale developed by Choi and Price (2005). The respondents were asked to
indicate the extent to which each of the items represented their behavior and their use of the introduced EPR system. The scale was adapted to this study by including the name of the EPR system, and by giving examples of use relevant to the particular system. An example item is “I heavily use the EPR system at work”. The Cronbach’s alpha of the scale was .81.

*Control variables.* The respondent’s age and gender were added as control variables. Each respondent had to fill in his/her age in a text field. Gender was measured as a categorical variable, male = 0 or female = 1.

**Data Analysis**

The analysis was performed with SPSS 18.0. Means, correlations, and standard deviations were calculated for the study variables. Missing values were handled with the expectation maximization (EM) procedure. Multiple mediation analysis was chosen as the appropriate method of data analysis because it has the ability of testing multiple indirect effects simultaneously. As described by Preacher and Hayes (2008) this has several benefits. First, it is possible to determine whether an overall effect of a set of mediators exists. Second, it is possible to examine a specific mediator’s mediating effect conditional on the other mediators in the model. Third, the probability is reduced that important mediating variables are omitted from the analysis, which might lead to parameter bias. Fourth, the relative magnitudes of the specific indirect effects can be assessed and compared, thus testing for competing theories.

The multiple mediation analysis was conducted with Preacher and Hayes’ (2008) SPSS Indirect Macro for Multiple Mediation. This macro uses a bootstrap technique to test the mediation hypotheses, which is a powerful method for testing the statistical significance of indirect effects (Mallinckrodt, Abraham, Wei, & Russell, 2006). Bootstrap analysis is a nonparametric approach, which means that it makes no assumptions about the sampling distribution of the variables or of the indirect effects. Moreover, it is not based on large-sample theory, which means that it can be applied to small and moderate samples with more confidence (Preacher & Hayes, 2004; Shrout & Bolger, 2002). Bootstrapping involves generating series of unique data sets, called bootstrap samples, by directly taking samples from the original sample and estimating the indirect effects in each resampled data set (Shrout & Bolger, 2002). The resampling process is conducted with replacement, which means that each case is put back such that every case has equal chances of being redrawn while the new samples are constructed (Hayes, 2009). This process is repeated thousands of times creating an empirically estimated sampling distribution of the indirect effects, which is then used to
derive bootstrap confidence intervals to test the statistical significance of total and specific indirect effects (Mallinckrodt, et al., 2006). An effect is considered as significant if the confidence interval does not contain zero (Preacher & Hayes, 2008).

The multiple mediation model. In this study a multiple mediation model was examined, which involves investigating “simultaneous mediation by multiple variables” (Preacher & Hayes, 2008, p. 880). The model was used to determine whether transformational leadership affects innovation implementation behavior through three proposed mediators: affective commitment to change, normative commitment to change, and perceived computer self-efficacy. Figure 1 displays the hypothesized model. The $a$ coefficients represent the effect of transformational leadership on the mediators, and the $b$ coefficients represent the effects of the mediators on innovation implementation behavior partialling out the effect of transformational leadership. The $c$ path is the total effect of transformational leadership on innovation implementation behavior. The $c'$ path is the direct effect, that is, the effect of transformational leadership on innovation implementation behavior controlled for the effect of the set of mediators. The specific indirect effect is the mediating effect of each proposed mediator, in this study represented by $a_1b_1$ (affective commitment to change), $a_2b_2$ (normative commitment to change), and $a_3b_3$ (perceived computer self-efficacy). Finally, the total indirect effect is the sum of all three specific indirect effects. Figure 1 presents the hypothesized multiple mediation model.

![Figure 1. The Hypothesized Multiple Mediation Model.](image-url)
Preacher and Hayes (2008) have recommended that testing a multiple mediation model should involve (1) an analysis of the total indirect effect, that is, the overall mediating effect of the set of mediators, and (2) an analysis of the specific indirect effect, that is, the mediating effect of each proposed mediator. Thus, the total and specific indirect effects of affective commitment to change, normative commitment to change, and perceived computer self-efficacy were tested in this study. As suggested by Hayes (2009), analyses and parameter estimates in this study are based on 5000 bootstrap samples, drawn with replacement from the original sample of 75 respondents. 95% bias-corrected and accelerated confidence intervals (BCa CIs) were used to test the significance of the total and indirect effects, as this has been shown to be performing best in terms of power and Type 1 error rates (Preacher & Hayes, 2008). If the BCa CI for the parameter estimate is different from zero, the indirect effect is statistically significant and mediation was demonstrated (Hayes, 2009).

Effect size and statistical power. Testing a multiple mediation model generally requires a larger sample size than a model that contains few variables. The statistical power and the required sample size for the analysis were therefore calculated with the analysis program G*power 3 (Faul, Erdfelder, Lang, & Buchner, (2007). Using Cohen’s (1992) effect size indexes, a large effect size was found in Choi and Price (2005) and a medium effect-size was found in Michaelis, et al. (2010) with regard to innovation implementation behavior. According to the power analysis, this study’s sample size of 75 respondents was sufficient. Furthermore, Shrout and Bolger (2002) have recommended that the bootstrap approach should be used when the sample size is small. Research has demonstrated that bootstrapping is a powerful method for testing the statistical significance of indirect effects, and that its advantages increases as either the sample size or effect size decreases (Mallinckrodt, et al., 2006). As the SPSS Indirect Macro for Multiple Mediation by Preacher and Hayes (2008) uses bootstrap analysis to test for mediation, this was an advantage for the small sample size in this study.

Results

Descriptive Statistics

Means, standard deviations, and bivariate correlations for the study variables are presented in Table 1. To ensure that there was no problem with multicollinearity due to a significant correlation between the two variables of commitment to change, collinearity diagnostics were performed in linear regression analysis. The Tolerance-level was high (.93)
and the VIF-value was low (1.07), indicating that multicollinearity was not an issue (Christophersen, 2004).
Table 1. Means, Standard Deviations, Bivariate Correlations, and Reliabilities of the Study Variables.

<table>
<thead>
<tr>
<th>No.</th>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Gender (male = 0, female = 1)</td>
<td>.28</td>
<td>.45</td>
<td></td>
<td></td>
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<td>2</td>
<td>Age</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>Independent variable</strong></td>
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<td></td>
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<td></td>
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<tr>
<td>3</td>
<td>Transformational leadership</td>
<td>4.58</td>
<td>1.34</td>
<td>-.11</td>
<td>.07</td>
<td></td>
<td>.07</td>
<td>(.95)</td>
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</tr>
<tr>
<td></td>
<td><strong>Mediators</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Affective commitment to change</td>
<td>4.80</td>
<td>1.48</td>
<td>-.14</td>
<td>-.09</td>
<td>.39**</td>
<td></td>
<td>(.92)</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>Normative commitment to change</td>
<td>5.08</td>
<td>1.37</td>
<td>-.22</td>
<td>.11</td>
<td>.43**</td>
<td>.26*</td>
<td></td>
<td>(.85)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Computer self-efficacy</td>
<td>4.23</td>
<td>1.15</td>
<td>.14</td>
<td>-.24*</td>
<td>.28**</td>
<td>.22</td>
<td>.21</td>
<td></td>
<td>(.87)</td>
</tr>
<tr>
<td></td>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Innovation implementation behaviour</td>
<td>5.60</td>
<td>.99</td>
<td>-.21</td>
<td>-.19</td>
<td>.27*</td>
<td>.19</td>
<td>.41**</td>
<td>.15</td>
<td>(.81)</td>
</tr>
</tbody>
</table>

*Note. N = 75 for all variables. Scale reliability (Cronbach’s alpha) in parentheses on the diagonal. * p < .05. ** p < .01.*
Multiple Mediation Analysis

Prior to the multiple mediation analysis, a linear regression analysis was performed to estimate the amount of variance in innovation implementation behavior that was explained by the control variables gender and age. The results showed that gender had a beta of -.20 ($p > .09$) and that age had a beta of .18 ($p > .13$), $F = 2.91$ ($p > .06$). Gender and age explained in total 7.5% of the variance in innovation implementation behavior ($R^2 = .075$). Table 2 presents the estimated regression coefficients from the multiple mediation analysis. As shown in the table, gender did not have a significant effect on innovation implementation behavior ($b = -.21, p > .39$), whereas age had a significant negative effect ($b = -.02, p < .05$). The latter finding suggests that older employees are less engaged in consistent and committed use of the particular innovation. Overall, the multiple mediation model explained 25% of the variance in innovation implementation behavior ($R^2 = .25, p < .01$).

Hypothesis 1 predicted that transformational leadership has a positive influence on innovation implementation behavior. As seen in Table 2 (path c), the results showed that transformational leadership was significantly related to innovation implementation behavior ($b = .19, p < .05$). Hypothesis 1 was therefore supported. This finding indicates that transformational leadership promotes employees’ innovation implementation behavior. However, the results also demonstrated that the direct effect (path c’) of transformational leadership on innovation implementation behavior was not significant ($b = .08, p > .39$). That is, the effect of transformational leadership on innovation implementation behavior, when controlled for the effect of the mediators, was considerably reduced and no longer significant. The fact that the influence of transformational leadership was not significant once it was adjusted for the set of mediators indicates that the mediators completely mediated the effect of transformational leadership on innovation implementation behavior (Baron & Kenny, 1986).
Table 2. *Regression Coefficients from the Multiple Mediation Analysis Predicting Innovation Implementation Behavior.*

<table>
<thead>
<tr>
<th>Control variables</th>
<th>b</th>
<th>SE</th>
<th>$R^2$</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-.21</td>
<td>.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.02*</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Path a**

| Affective commitment to change | .43*** | .12 |
| Normative commitment to change | .41*** | .11 |
| Computer self-efficacy         | .28**  | .09 |

**Path b**

| Affective commitment to change | .01  | .08 |
| Normative commitment to change | .26** | .09 |
| Computer self-efficacy         | .00  | .10 |

**Total effect of transformational leadership (path c)**

| .19*  | .08 |

**Direct effect of transformational leadership (path c’)**

| .08  | .09 |

**Model summary**

| .25** | 3.74** |

*Note. N = 75. b = unstandardized regression coefficient. * $p < .05$. ** $p < .01$. *** $p < .001$.**
The results in Table 2 also show that transformational leadership was significantly related to all three mediators (path $a$). As predicted by Hypothesis 2, transformational leadership had a positive influence on affective commitment to change ($b = .43, p < .001$). Hypothesis 2 was thus supported. This finding implies that transformational leadership has a positive impact on the employees’ belief that the introduced computer technology is beneficial. Hypothesis 3 predicted that transformational leadership has a positive influence on normative commitment to change. The results showed that transformational leadership did have a positive effect on normative commitment to change ($b = .41, p < .001$), supporting Hypothesis 3. This indicates that transformational leadership behavior has a positive influence on the employees’ feelings of obligation to support the introduced computer technology. Furthermore, Hypothesis 8 predicted that transformational leadership has a positive influence on perceived computer self-efficacy. The results showed that transformational leadership enhanced the employees’ perceived computer self-efficacy ($b = .28, p < .01$). Hypothesis 8 was therefore also supported. This finding suggests that transformational leadership positively influence the employees’ belief that they can competently use the introduced computer technology.

Hypothesis 4 predicted that affective commitment to change has a positive effect on innovation implementation behavior. As seen in Table 2, the results showed that affective commitment to change did not have a significant effect on innovation implementation behavior ($b = .01, p > .90$). Hypothesis 4 was therefore not supported. This suggests that the employees’ belief that the introduced computer technology is beneficial does not encourage their consistent and committed use of the particular computer technology. Hypothesis 5 predicted that normative commitment to change is positively related to innovation implementation behavior. The results demonstrated that normative commitment to change was significantly related to innovation implementation behavior ($b = .26, p < .01$), and Hypothesis 5 was therefore supported. This indicates that the employees’ feelings of obligation to support the introduced computer technology promote their consistent and committed use of it. Hypothesis 9 predicted that perceived computer self-efficacy positively influences innovation implementation behavior. However, the results showed that there was no effect of perceived computer self-efficacy on innovation implementation behavior ($b = .00, p > .99$). Consequently, Hypothesis 9 was not supported. This implies that the employees’ belief that they are able to competently use the introduced computer technology does not influence their use of the particular technology. Overall, these findings indicate that only the employees’ feelings of obligation to support the introduced computer technology promote the
employees’ consistent and committed use of the particular technology. Figure 2 provides an illustration of the estimated multiple mediation model.

Figure 2. The estimated multiple mediation model. The numbers in the figure represent unstandardized regression coefficients. * \( p < .05 \). ** \( p < .01 \). *** \( p < .001 \).

**Bootstrap Analysis**

Table 3 displays the parameter estimates and the bias-corrected and accelerated confidence intervals (BCa CIs) for the total and specific indirect effects obtained from the bootstrap analysis. The total indirect effect of the set of mediators was statistically significant, with a parameter estimate of .1135 and a BCa 95% CI of .0080 to .2217. That is, the confidence interval did not contain a zero. In agreement with the interpretation of the direct effect (path \( c' \)), this result demonstrates that the set of mediators completely mediated the effect of transformational leadership on innovation implementation behavior.

Hypothesis 6 predicted that affective commitment to change is a mediator of the effect of transformational leadership on innovation implementation behavior. An examination of the specific indirect effects in Table 3 shows that the specific indirect effect of affective commitment to change was not significant. With a parameter estimate of .0048 and a BCa 95% CI of -.1156 to .0748, the confidence interval was not different from zero. As such, affective commitment to change did not have a mediating effect, and Hypothesis 6 was
therefore not supported. The relationship between transformational leadership and affective commitment to change was significant (Hypothesis 2), but the effect of affective commitment to change on innovation implementation behavior was not (Hypothesis 4). These results suggest that transformational leadership has a positive influence on the employees’ belief that the introduced computer technology is beneficial, but that these beliefs does not encourage the employees’ consistent and committed use of the particular computer technology.

Hypothesis 7 predicted that normative commitment to change has a mediating effect on the relationship between transformational leadership and innovation implementation behavior. As shown in Table 3, the specific indirect effect of normative commitment to change was significant, thus supporting Hypothesis 7. With a parameter estimate of .1086 and a BCa 95% CI of .0279 to 2836, the confidence interval was different from zero. That is, normative commitment to change was a significant mediator of the relationship between transformational leadership and innovation implementation behavior. The direction of the relationships was as hypothesized: transformational leadership had a positive influence on normative commitment to change (Hypothesis 3), which in turn had a positive impact on innovation implementation behavior (Hypothesis 5). In other words, transformational leadership behaviors positively influence the employees’ feelings of obligation to support the introduced computer technology, and this sense of obligation promotes the employees’ consistent and committed use of the particular computer technology.

Hypothesis 10 predicted that perceived computer self-efficacy mediates the effect of transformational leadership on innovation implementation behavior. The results showed, however, that the specific indirect effect of perceived computer self-efficacy was not significant. With a parameter estimate of .0001 and a BCa 95% CI of -.0671 to .0547 the confidence interval contained zero, as shown in Table 3. Therefore, perceived computer self-efficacy did not mediate the relationship between transformational leadership and innovation implementation behavior, and Hypothesis 10 was not supported. Transformational leadership was positively related to perceived computer self-efficacy (Hypothesis 8), but perceived computer self-efficacy did not affect of innovation implementation behavior (Hypothesis 9). This result suggests that transformational leadership has a positive effect on the employees’ belief that they are able to competently use the introduced computer technology, but this belief does not promote the employees’ consistent and committed use of the particular computer technology.
Table 3. *Total Indirect Effect, Specific Indirect Effects, Contrasts, and their Corresponding Bootstrap Confidence Intervals of the Relationship Between Transformational Leadership and Innovation Implementation Behavior.*

<table>
<thead>
<tr>
<th>Mediator</th>
<th>Parameter estimate</th>
<th>SE</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>.1135</td>
<td>.05</td>
<td>.0080</td>
<td>.2217</td>
</tr>
<tr>
<td>AC2C</td>
<td>.0048</td>
<td>.04</td>
<td>-.1156</td>
<td>.0748</td>
</tr>
<tr>
<td>NC2C</td>
<td>.1086</td>
<td>.06</td>
<td>.0279</td>
<td>.2836</td>
</tr>
<tr>
<td>Computer self-efficacy</td>
<td>.0001</td>
<td>.03</td>
<td>-.0671</td>
<td>.0547</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contrasts</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>AC2Cvs. NC2C</td>
<td>-.1038</td>
<td>.09</td>
<td>-.3582</td>
<td>.0305</td>
</tr>
<tr>
<td>AC2C vs. computer self-efficacy</td>
<td>.0046</td>
<td>.05</td>
<td>-.1196</td>
<td>.0826</td>
</tr>
<tr>
<td>NC2C vs. computer self-efficacy</td>
<td>.1085</td>
<td>.07</td>
<td>.0077</td>
<td>.3222</td>
</tr>
</tbody>
</table>

*Note.* BCa CI = bias corrected and accelerated confidence intervals. Based on 5000 bootstrap samples. AC2C = affective commitment to change. NC2C = normative commitment to change.
Contrasts between the specific indirect effects. As noted above, the total indirect effect of the set of mediators was significant, while an examination of the specific indirect effects showed that only normative commitment to change was a significant mediator of the relationship between transformational leadership and innovation implementation behavior. This indicates that normative commitment to change accounted for the whole total indirect effect. Pairwise contrasts between the specific indirect effects were therefore conducted to get information about the size of the differences. Table 3 presents the results.

The specific indirect effect through normative commitment to change was significantly larger than the specific indirect effect through computer self-efficacy, as evidenced by a parameter estimate of .1085 and a BCa 95% CI of .0077 to .3222 that did not contain a zero. However, the specific indirect effects of affective commitment to change and normative commitment to change could not be distinguished in terms of magnitude, despite the fact that the specific indirect effect of normative commitment to change was significantly different from zero and that of affective commitment to change was not. With a parameter estimate of -.1038 and a BCa 95% CI of -.3582 to .0305, the confidence interval contained a zero. A reason for this paradox might be that the specific indirect effect of normative commitment to change was not sufficiently far from zero (Preacher & Hayes, 2008). The specific indirect effects of affective commitment to change and computer self-efficacy also could not be distinguished. With a parameter estimate of .0046 and a BCa 95% CI of -.1196 to .0826, the confidence interval was not different from zero.

Summary of Results

The results demonstrate that transformational leadership significantly predicted innovation implementation behavior. Hypothesis 1 was thus supported. Transformational leadership was significantly related to both affective commitment to change and normative commitment to change, supporting Hypothesis 2 and 3. Affective commitment to change did not have a significant effect on innovation implementation behavior, and Hypothesis 4 was therefore not supported. In support of Hypothesis 5, normative commitment to change had a significant effect on innovation implementation behavior. The results also show that affective commitment to change did not significantly mediate the effect of transformational leadership on innovation implementation behavior. As such, Hypothesis 6 was not supported. Normative commitment to change was, however, found to be a significant mediator of the positive relationship between transformational leadership and innovation implementation behavior, supporting Hypothesis 7. In support of Hypothesis 8, transformational leadership had a
positive impact on perceived computer self-efficacy. However, perceived computer self-efficacy was not related to innovation implementation behavior, thus Hypothesis 9 was not supported. The specific indirect effect of perceived computer self-efficacy showed that it did not mediate the effect of transformational leadership on innovation implementation behavior. Consequently, Hypothesis 10 was not supported.

**Discussion**

This study examined the effect of transformational leadership in promoting innovation implementation behavior. Specifically, employees’ affective commitment and normative commitment to a new computer technology initiative and their perceived self-efficacy to use the particular computer technology were investigated as mediators by which transformational leadership is related to employees’ consistent and committed use of the particular innovation.

*Transformational Leadership*

The first finding in this study, as predicted by Hypothesis 1, was that transformational leadership had a positive influence on employees’ innovation implementation behavior. This indicates that transformational leadership behaviors play an important part in promoting employees’ consistent and committed use of a particular computer technology, which supports the previous finding by Michaelis, et al. (2010). However, Michaelis et al. (2010) used the Multifactor Leadership Questionnaire (MLQ) to measure transformational leadership (Bass & Avolio, 1995). The MLQ assesses five sub-dimensions of transformational leadership: idealized influence-attributed (the degree to which the leader is perceived as being confident, powerful, and focusing on higher order ideals), idealized influence-behavior (the degree to which the leader’s actions are charismatic), inspirational motivation, intellectual stimulation, and individualized consideration (Bass & Avolio, 1995; Elenkov & Manev, 2005). They averaged the items and made a sum score of transformational leadership. As such, Michaelis et al. (2010) covered all four transformational leadership dimensions in their study (Bass & Avolio, 1994). In contrast, the present study mainly covered the two transformational leadership dimensions charismatic behavior/idealized influence and individualized consideration. Also in this study the items were averaged into a sum score. Thus, the two dimensions inspirational motivation and intellectual stimulation were not covered in the present study. Therefore, while supporting the finding that transformational leadership is important in promoting employees’ consistent and committed use of a particular innovation, the results in this study specifically indicate that important transformational
leadership behaviors are that of articulating a shared vision and paying close attention to individual differences among the employees. As noted earlier, through charismatic behaviors, transformational leaders articulate a shared vision that build motivation and confidence, and receive a high degree of trust, respect, and confidence from the employees (Bass, 1990; Yukl, 1989). Furthermore, by providing individualized consideration the transformational leader demonstrates support and respect for the individual employees’ feelings, needs, and desires with regard to the introduced innovation (Bass & Avolio, 1994). These transformational leadership behaviors are thus likely to reduce employee skepticism and to increase employee support for the introduced innovation (Eisenbach, et al., 1999), and as such, to promote employees’ consistent and committed use of the particular innovation.

Hypothesis 2 and 3 predicted that transformational leadership would be positively related to employees’ affective commitment to change and normative commitment to change. As expected, transformational leadership had a positive impact on both. The finding that transformational leadership positively influences affective commitment and normative commitment corresponds with previous research (Herold, et al., 2008; Bycio, et al., 1995; Moss, et al., 2007; Korek, et al. 2009; Meyer & Parfyonova, 2010). Although some researchers have argued that affective commitment to change is most likely to be influenced by transformational leadership behaviors because it best reflects a positive attitude toward a specific change (Herold, et al., 2008), the results in this study demonstrate that employees’ who perceive their leader as transformational in nature develop both affective and normative commitment to a particular computer technology initiative. That is, transformational leadership has a positive effect on the employees’ belief that the implemented computer technology is beneficial and valuable, as well as on the employees’ feelings of obligation to support its use. Thus, it seems that by providing a vision, building motivation and confidence, stimulating individual employees, and tending to individual needs, transformational leadership behaviors increase employees’ affective and normative commitment to a specific change initiative.

Affective Commitment to Change and Normative Commitment to Change

The hypothesis that affective commitment to change would be related to innovation implementation behavior was not supported (Hypothesis 4). Furthermore, affective commitment to change did not have a significant mediating effect on the positive relationship between transformational leadership and innovation implementation behavior (Hypothesis 6). These findings indicate that transformational leadership has a positive influence on the
employees’ belief that the implemented computer technology is beneficial, but that this belief
does not affect employees’ consistent and committed use of the particular computer
technology. In contrast, normative commitment to change was significantly related to
innovation implementation behavior (Hypothesis 5). Moreover, normative commitment to
change was found to be a significant mediator of the relationship between transformational
leadership and innovation implementation behavior (Hypothesis 7). That is, transformational
leadership positively influenced normative commitment to change, and normative
commitment to change had in turn a positive effect on the employees’ innovation
implementation behavior. These results indicate that transformational leadership behaviors
contribute to the development of employees’ feelings of obligation to support the computer
technology initiative, and that this sense of obligation promotes employees’ consistent and
committed use of the particular computer technology.

The finding that affective commitment to change was not a significant mediator of the
relationship between transformational leadership and innovation implementation behavior
contradicts the findings by Michaelis, et al. (2010). Research by Choi and Price (2005) might
provide some insight into this result. They argued that cognitive comparisons between person
and innovation determine an individual’s affective and behavioral responses to an innovation.
Whereas the behavioral response concerns innovation implementation behavior, the affective
response represents commitment to implementation, that is “an individual’s belief in the
innovation and a willingness to exert considerable effort in its implementation” (p. 85). The
latter suggests that an employees’ affective commitment to the computer technology initiative
might in fact reflect his/her affective response to that particular technology. Furthermore,
Choi and Price (2005) found in their study that the affective response was strongly related to
congruence between the goals and values that an innovation represents and the individual’s
personal values. One possible reason why affective commitment to change did not have a
mediating effect might therefore be that the values of the targeted users do not correspond
with the values that are communicated by their leader or the values that the computer
technology represents. This indicates that even though transformational leadership has a
positive influence on the employees’ belief that the computer technology initiative is valuable
(affective commitment), this in turn fails to affect the employees’ use of the technology
because they do not share the values. For example, it might be that the employees do not
agree with or do not value the proposed merits of the particular computer technology. The
issue of value discrepancy might be particularly apparent when the employees are instructed
to use an innovation that was introduced by the organizations’ top management, because such
innovations often represent an imperfect fit with organizational members’ values (Klein & Knight, 2005). This suggests that even though the results in this study contradict the findings by Michaelis et al. (2010), it can nevertheless be explained by the findings of Choi and Price (2005).

Research has shown that the organizational context might be important in affecting employee behavior and performance (Conway & Monks, 2008). Another possible reason why affective commitment to change did not have a mediating effect might be that the change recipients in this study are professionals such as physicians and nurses. Ferlie, Fitzgerald, Wood, and Hawkins (2005) argued that social and cognitive boundaries between different groups of professionals might hinder the diffusion of innovations within organizations. They furthermore argued that these boundaries are not easily influenced from the outside and that they therefore have implications on how professionals consider and react to organizational change, such as the implementation of a new computer technology. This suggests that even when the transformational leader motivates the employees to acknowledge the potential benefits of the computer technology initiative, this in itself does not necessarily promote the employees’ consistent and committed use of the particular computer technology. In contrast, all the participants in the study by Michaelis, et al. (2010) were from R&D divisions. Thus it might be that they were particularly open to innovations, that is, more affectively committed, because they work with innovation on a daily basis and have innovation-relevant knowledge.

Also, another reason why affective commitment to change did not mediate the relationship between transformational leadership and innovation implementation behavior might that organizations are a stabilizing force due to norms and routines that foster maintenance of the status quo (Klein & Knight, 2005). This means that even if the employees do recognize the benefits of a specific change initiative, they might nevertheless fail to implement a useful innovation because they for example hold on to the past or “substitute talk for action” (p. 244). Thus it might be that the employees want to adhere to the old paper-based patient record system because it is the traditional health record system at the medical centers, even though they know that the new electronic patient record system may enhance the performance and the efficiency.

Because the constructs of affective commitment and normative commitment are distinguishable, it is possible that a feeling of obligation to support a change exists even in the absence of a desire to do so (Meyer, et al., 2002). The findings in the present study indicate that the employees support the computer technology initiative because they feel an obligation to support it, and not because they believe that the particular computer technology is valuable.
and beneficial. That is, employees’ consistent and committed use of the introduced innovation is based on a sense of duty. One reason for this finding could have been that usage of the introduced computer technology was mandatory. However, the system that was introduced in the study by Michaelis, et al. (2010) was also mandatory and this is therefore probably not an adequate explanation for the contrasting findings. A plausible explanation why normative commitment to change had an important impact on the employees’ innovation implementation behavior might be that the potential consequences of implementation failure would be severe. Feelings of obligation to implement a change effectively can be especially salient to the employees if its success has direct implications for the wellbeing of others, for example colleagues or clients (Herscovitch & Meyer, 2002). In this study, the organization from which the data was collected was a medical clinic and the change was the introduction of an EPR system. Important health information about individual patients resides in this system, and if the system is not properly used this will have critical consequences for the patients as the hospital personnel will not be able to do their job. The hospital personnel therefore has to use the system in their job. Furthermore, they are dependent on each other’s use of the system. The unsuccessful use of the computer technology would therefore have implications for the quality, safety, and efficiency of the health services provided by the medical centers.

In this study the data were collected at a private organization. Another reason why normative commitment to change plays a role in promoting employees’ use of the particular computer technology, might be that rewards like wage increases and bonuses are often used more in private organizations than in public organizations. This might thus contribute to the development of normative commitment, as a means of reciprocation of the benefits received (Meyer, et al., 1993).

**Perceived Computer Self-Efficacy**

The hypothesis that transformational leadership would be positively related to perceived computer self-efficacy was supported (Hypothesis 8). This implies that transformational leadership behaviors enhance the employees’ belief that they are able to competently use the introduced computer technology, which supports previous studies that have shown that transformational leadership increases employee self-efficacy (Pillai & Williams, 2003). However, perceived computer self-efficacy was not related to innovation implementation behavior (Hypothesis 9), and it did not mediate the relationship between transformational leadership and innovation implementation behavior (Hypothesis 10). This indicates that the employees’ consistent and committed use of the introduced computer technology does not
depend on their competency beliefs. One reason for this result might be that usage of the particular technology is mandatory for all targeted users. That is, the employees use the computer technology independently of their competency beliefs because they have to use it. Also, as noted earlier with regard to the influence of normative commitment to change, the fact that the potential consequences of not using the computer technology would be severe might be another reason why the employees’ competency beliefs were not related to their use of it. However, results from the bivariate correlation analysis showed that age was significantly negatively related to perceived computer self-efficacy. Thus it appears that the older the employee is the lower perceived computer self-efficacy he/she has.

In sum, normative commitment to change was found to be the sole significant mediator of the positive relationship between transformational leadership and innovation implementation behavior. Taken together this indicates that the employees’ feelings of obligation to support the computer technology initiative is more important than their belief in the inherent benefits of the computer technology or their perceived competency beliefs, when promoting employees’ consistent and committed use of the particular computer technology.

Limitations and Suggestions for Future Research

The results of this study should be interpreted in terms of its limitations. One of the main limitations of this study is that the response rate was very low (17%), which might lead to self-selection bias (Whitehead, 1991). For example, it might be that the employees who participated in the study are either very high or very low on commitment to change. As noted earlier, one probable reason for the low response rate is that most of the EPR users are health personnel who spend a lot of their day treating patients, and therefore do not spend all their working time in front of a computer. Thus, it might also be that the employees did not have the time or capacity to respond to the questionnaire during work hours. Also, the medical centers had finished another survey shortly before this study, which might have contributed to the low response rate. For future research it is suggested that the data is collected in a way that ensures a larger response rate. For example, to increase legitimacy the researchers could be more visible to the employees. Incentives could be provided to elicit responses and to ensure participation. To avoid parallel surveys and to obtain larger quantities of data, a questionnaire could be administered as a part of an ongoing survey in the organization. Due to practical limitations these suggestions were not applicable in this study.

Another limitation of this study is the small sample size ($N = 75$), which is partly caused by the low response rate. The suggestions that were made as to how to increase the
response rate therefore also apply to sample size. The small sample size was an issue especially because this study tested a multiple mediation model. Generally, testing a model that contains many variables requires a larger sample size than a model that with few variables. However, according to the power analysis that was performed to calculate the statistical power and required sample size for the analysis, this study’s sample size was sufficient. Also, the analysis was conducted with Preacher and Hayes’ (2008) macro that uses bootstrapping to test for mediation, which compensated for the small sample size (Mallinckrodt, et al., 2006). Shrout and Bolger (2002) have recommended that bootstrapping should be used when the sample size is small.

The data was collected in a Norwegian private medical clinic. The results might therefore not be representative for other sectors, cultural contexts, or settings such as more technology-intensive industrial settings. However, generalizability of the results might not always be the primary goal. Instead, the fact that the data was collected in only one organization gives the opportunity of examining in depth that particular organization. Such a focus might give valuable information and a deeper understanding of important practices, structures, and processes that might otherwise get less priority, be disregarded, or overlooked.

This study used self-report data, which appears to be the appropriate method for measuring psychological phenomena such as commitment to change and perceived self-efficacy. However, since the same individuals answered the study variables and there were no objective measures to compare the results with, the results might have been influenced by common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Future research should therefore use data from multiple sources, for example managers, to assess employees’ innovation implementation behavior. Moreover, the leaders could assess their own leadership behavior, which then would be compared to the employees’ assessments of the leaders.

The EPR system was implemented 17 months preceding this study. Thus, the full-scale operation of the system should have been attained by the time of the survey and the employees have probably gotten accustomed to the system. When assessing innovation implementation behavior it is useful that the employees have gained some proficiency in using the particular innovation. The results might have been different, however, had the study been done at a different point of time. It might for example be that the employees were more or less committed to innovation implementation behavior at an earlier stage of implementation. A longitudinal study could therefore provide more information about changes in the employees’ innovation implementation behavior over time. As such, the same questionnaire could be administered three times. The questionnaire could first be administered
before the implementation of the innovation, then shortly after the implementation, and finally, it could be administered one or two years after the implementation.

**Theoretical Implications**

This study contributes to a rather limited field of research. While there exists quite a lot of research on development and adoption of innovations, there is less research on innovation implementation and implementation behavior by individuals (Klein & Sorra, 1996; Klein & Knight, 2005; Noble & Mokwa, 1999). Moreover, this is one of very few studies that have empirically tested the mediating effect of commitment to change in relation to innovation implementation, as well as the influence of transformational leadership in promoting employees’ innovation implementation behavior (Michaelis, et al., 2010).

Methodologically this study contributes to the field of research by adopting a multiple mediation approach to the investigation of innovation implementation behavior, whereas previous studies have commonly utilized regression analyses or structural equation modeling (Michaelis, et al., 2009, 2010; Choi & Price, 2005). Multiple mediation analysis has the ability of testing multiple indirect effects simultaneously. This means that the mediating effects of several proposed mediators can be determined and compared. One of its several benefits is therefore theory comparison, which is a good scientific practice (Preacher & Hayes, 2008). This study is so far the only study on innovation implementation behavior that has applied a multiple mediation approach.

Because research has shown that correlations between normative commitment and affective commitment are generally quite high and that they share many of the same antecedents and behavioral implications, the distinctive value of normative commitment has been questioned (Meyer, et al., 2002; Meyer & Parfyonova, 2010). However, this study demonstrated that normative commitment to change was a significant mediator of the relationship between transformational leadership and innovation implementation behavior, whereas affective commitment to change was not. This indicates that normative commitment does in fact have a distinctive value and that it explains workplace behavior beyond that of affective commitment. This study therefore also contributes to the research field of commitment.

**Practical Implications**

The results in this study suggest that organizations need to pay close attention to the leadership style when an innovation is implemented. Organizations should therefore consider
whether the employees perceive the leader who will be implementing the change as transformational in nature. If so, it is likely that the leader will be able to gain employees’ commitment to the change initiative and their consistent and committed use of the particular innovation. If the employees’ do not view the leader as transformational, the organization might consider another more transformational figure that could be the leader of the specific change. Organizations may also want to consider investing in leadership training in advance of innovation implementation such that the change implementers can learn transformational leadership skills and how to be more effective implementers of change. Research has shown that training can enhance transformational leadership (Bass, 1990; Kelloway, Barling, Helleur, 2000). Such investments, which might be both expensive and time-consuming, are compensated by the fact that the benefits of successful innovation implementation are great.

By demonstrating that normative commitment to change is a mediator of the effect of transformational leadership on innovation implementation behavior, this indicates that leaders should also be aware of how they influence employees’ innovation use. That is, the psychological mechanisms by which they promote the employees’ consistent and committed use of an innovation. However, although normative commitment, as demonstrated in this study, positively influences workplace behavior such as innovation implementation behavior, it should be a goal for organizations to gain employees’ affective commitment to innovation use as well, because this might lead to higher levels of innovation implementation behavior. Employees that support a change because they believe in its inherent benefits, and not just because they see it as a part of their duty, are valuable to the organization. For instance, individuals who are affectively committed often do little extras and work hard to make the change initiative work (Meyer & Herscovitch, 2001). In contrast, normatively committed employees support a change initiative only if they see it as a part of their obligation or as a means of reciprocation for benefits received (Herscovitch & Meyer, 2002). Organizations might therefore benefit from looking beyond implementation policies and practices that are intended to facilitate innovation use, and consider the extent to which the targeted users perceive the innovation as congruent with their personal values. Including employees more in the implementation process, for example through participation and by establishing routines for communication, might be beneficial. Furthermore, the organization might provide opportunities for the employees to participate in the adoption process itself, as this increases the probability that the chosen innovation will fit with the employees’ values or that their values will change in the process and become more congruent with the innovation (Klein & Sorra, 1996). This also indicates that managers should have a long-term time orientation and
that the change initiative is not to be hastened, because it might be at the expense of employees’ affective commitment to support the change initiative.

**Conclusion**

This study is the first to use a multiple mediation approach in the investigation of innovation implementation behavior. The results demonstrate that transformational leadership positively influences innovation implementation behavior. The results also show that employees’ feelings of obligation to use the implemented computer technology (normative commitment to change) had a significant mediating effect on this relationship. Contrary to what was expected, the employees’ belief that the computer technology is beneficial (affective commitment to change) and their belief about their abilities to competently use the computer technology (perceived computer self-efficacy) were not found to have significant mediating effects on the relationship between transformational leadership and innovation implementation behavior. The results highlight the importance of transformational leadership in promoting employees’ consistent and committed use of an innovation, and suggest that employees’ feelings of obligation is a significant psychological mechanism of this relationship. The findings indicate that organizations need to pay close attention to leadership style when an innovation is implemented. Consequently, organizations may want to consider investing in leadership training such that the leaders can learn how to be effective implementers of change. Furthermore, leaders need to be aware of the psychological mechanisms by which they promote employees’ consistent and committed use of a particular innovation. For instance, leaders might benefit from providing the employees with opportunities to participate in the adoption and implementation of an innovation. This might lead to higher levels of innovation implementation behavior, which increases the likelihood of successful implementation.
References


