

Managing Change of EHR Systems

Morten Balle Hansen¹, Iben Nørup², Kasper Trolle Elmholdt¹, Kristian Kidholm³, Christian Nøhr⁴, Thomas Schmidt⁴

¹Department of Political Science, Aalborg University, Aalborg, Denmark, mbh@dps.aau.dk

²Department of Sociology and Social Work, Aalborg University, Aalborg, Denmark

³Center for Clinical Innovative Medical Technology, University of Southern Denmark, Odense, Denmark

⁴Center for Health Informatics & Technology, University of Southern Denmark, Odense, Denmark

Abstract

This article analyzes the associations between four leadership styles, the implementation of renewed Electronic Health Record (EHR) systems in hospitals and performance. The four leadership styles are taken from the literature on change management and are: mobilize, guide, involve and adapt. The performance measure is inspired by the Technology Acceptance Model (TAM). The empirical context is the implementation of a new EHR system in a Danish multi-site hospital in 2015. We apply a mixed-method approach combining qualitative and quantitative data. Using a Structural Equation Model (SEM) combined with focus group interviews we find evidence for significant impact on performance of all four leadership styles.

Keywords

Implementation, EHR-system, Renewal, Leading Change, Hospitals, leadership style, Performance, Technology Acceptance Model (TAM), structural equation models (SEM)

1 INTRODUCTION¹

For the past decades public sector services has undergone digitization and society has entered the digital era. As a consequence, one of the most important and permanent challenges of digital era governance is how to manage the implementation of new digital systems substituting old ones.

This paper examines if general theories of managing and leading change also hold in the context of hospitals implementing large EHR Systems? Does a leadership style that lives up to well-known recommendations for change management tend to imply a higher degree of performance than a management style that does not?

Both in the hospital system and in many other places, there have been massive challenges associated with the implementation of large information and communication technology (ICT) systems. This applies internationally in both the private and public sectors [1].

There are many reasons why such implementation processes often go wrong, but it is of the utmost importance that we develop knowledge of the various reasons and what can be done to increase the chances of success.

We are living in a digital age, and the question of how to ensure better implementation processes in connection with the introduction of new ICT systems is very likely to be on the agenda for several decades to come and will involve billions of dollars.

In this study, we focus on the importance of leadership, and our case is Electronic Health Records (EHR) in hospitals.

2 THEORY AND HYPOTHESES

Reviews about the impact of EHR systems has shown that good leadership and management, infrastructure support, staff training and focus on workflows and usability is important for the outcomes of implementing EHR[2].

Hospitals are not one single organization unit with one management but consist of a large number of clinical departments each with their own management team. Often a department includes more than 200 employees and is an organizational unit with its own local management, even though all departments have a superior management in the directors of the hospital.

Studies of the implementation of quality management systems and IT systems in Denmark and other countries has shown, that the management of the individual departments are quite different and can make a huge difference to the implementation process in terms of variations in management skills, management goals, organizational tasks and responsibilities [4] [3]. A Danish case study of an EHR development process in the North Denmark Region also found differences between wards in the implementation and use of EHR systems [5]

Based on the literature on leading and implementing change, we formulated four hypotheses about the importance of leading for performance. In the study, we focused on four well-known leadership styles that are generally recommended in the literature on leading the implementation of change processes [2] [2] [4]. We have called the four styles mobilize, guide, involve and adapt. Mobilizing and involving styles may be related to notions of

¹ The article is based on research conducted and published in 2015 (see reference [8]). It elaborates further on findings previously published by two of the authors (see reference [5] [6]).

transformational leadership, while guiding and adapting styles are related to notions of situational leadership [4].

We formulated four hypotheses that were tested in the study:

2.1 Hypothesis 1 - Mobilize support before implementation.

There is a positive relationship between a management style that ensures support before the implementation process and performance after the implementation process.

2.2 Hypothesis 2 - Provide instructions, guidance and information in a timely manner.

There is a positive relationship between a leadership style that ensures that employees receive thorough instructions and guidance on using the ICT system, and performance following the implementation process.

2.3 Hypothesis 3 - Involve employees in local adaptation.

There is a positive relationship between a leadership style that involves employees in adapting the ICT system to the individual department's routines and procedures, and performance following the implementation process.

2.4 Hypothesis 4 - Adapt the implementation process to local conditions.

There is a positive relationship between a leadership style that adapts the implementation process to the specific characteristics of each department and performance after the implementation process.

3 RESEARCH DESIGN AND DATA GENERATION

We tested our hypotheses in an analysis of the implementation of a new Electronic Health Record (EHR) system. The implementation took place in 2015 at the Hospital Lillebælt, a multi-site hospital in the Southern Denmark region with several locations - in Kolding, Middelfart and Vejle .

We examined the hypotheses using a mixed methods design:

- we conducted survey studies of all approx. 4,000 affected employees before and after implementation. The surveys were conducted as a panel study where we could see exactly what the individual employee had answered before and after the implementation,
- we conducted qualitative interviews and focus group interviews during the implementation process to identify what challenges occurred along the way and how management and different groups of employees responded to these challenges.
- The time span between the pre- and post-study was approx. five months, so our findings reflect a short-term measure of performance three to four months after implementation was initiated [6].

On the basis of the quantitative data, the changes in support for the ICT innovation have been described, and four non-recursive structural equation models (SEM) have been constructed using a model build approach in order to test the overall hypothesis that local variations in the approach to

leadership during the implementation affect the perceived performance after the implementation process.

4 FINDINGS

As Figure 1 shows, there was considerable support for the new system before implementation. However, this support had dropped significantly five months later after implementation. The figure also shows that there were major differences in the employees' perception of the system. There were major challenges along the way in the implementation process - technical challenges as well as challenges related to the content and use of the EHR system.

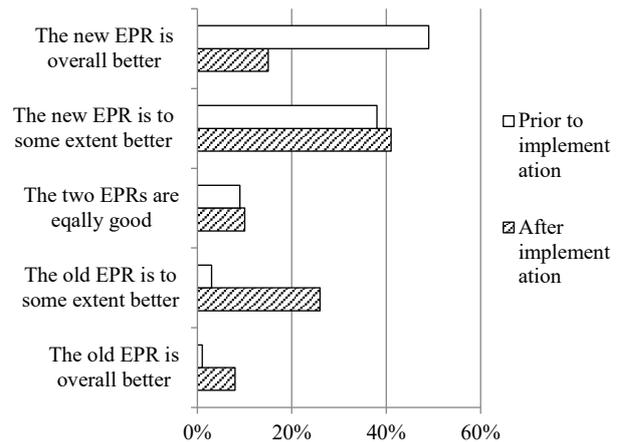


Figure 1 Overall support for the EHR system before and after the implementation (Source: Hansen & Nørup 2017, p. 856, [5]).

Furthermore, there were large differences in management style between the various departments.

The question here is whether differences in management style have a bearing on the performance of the system?

Inspired by the Technology Assessment Model [3] [2] [2], we measured performance on three dimensions:

- perceived ease of use (is it easy to use?).
- experienced usability (is it useful to use?).
- perceived impact (has services been improved?)

First, an initial model consisting only of the support for the ICT innovation before and after the implementation process has taken place is constructed. In the second model, two variables are added that measure the leadership style in relation to 1) providing sufficient information and training the employees (directive leadership) and 2) the degree of participative leadership of the local management.

In the third model, a variable is added measuring whether the management in the local hospital units has followed a locally adjusted implementation strategy or used the standardized strategy provided by the central hospital management. In the fourth model, a control for professional background is added (figure 2).

By gradually building the model, we investigate not only the direct effects of management and leadership style but also how these variables moderate the direct effects between initial support and perceived performance.

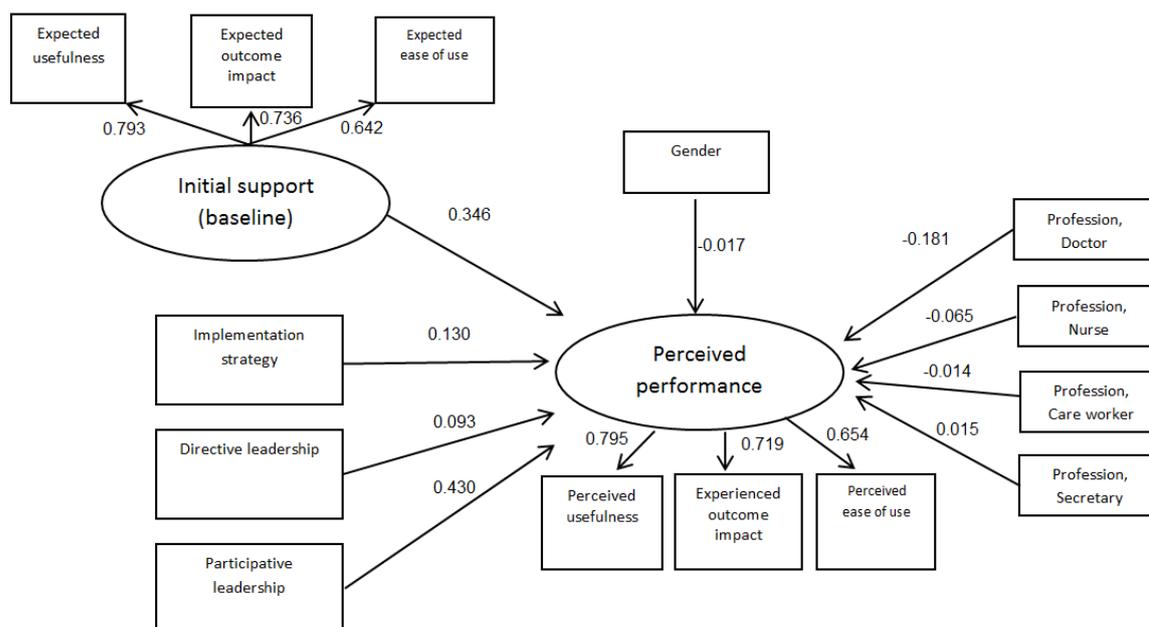


Figure 2 Model 4 – final model explaining variations in perceived performance, non-recursive SEM (Source: Hansen & Nørup 2017, page 857 [5]).

The study shows that all four leadership styles are significantly positively related to performance - all four hypotheses are supported by the empirical results, and management theory's recommendations for change management are thus confirmed by our study. The management style that has the most positive effect on perceived performance is employee involvement (Hypothesis 3). Employees at departments where the employees have been consulted to adapt the system to the department's routines experience higher levels of performance.

The management style with the second highest positive effect is support before implementation (Hypothesis 1). Employees who expected high performance before implementation tend to maintain this assessment, despite the experienced difficulties during the implementation. However, the study indicates that there is a delicate balance for management in mobilizing support before implementation. In addition to convincing that it is a good idea, it is also important to prepare employees for the difficulties that almost always arise when implementing large ICT systems.

The management style of local process adaptation (Hypothesis 4) had the third largest effect. In this case, it was a trial. Two departments were allowed to do an implementation process, where teaching and guidance were especially adapted to their department. At the other departments of the hospital, the employees received a generic introduction to the new system. Our findings indicate that the experiment was successful. The employees at these two departments experienced a higher degree of performance after implementation.

The management style of providing instructions and guidance (Hypothesis 2) had the least effect on perceived performance in this study. But there is an effect, and as expected, it is significantly positive. Employees who receive instructions and guidance when they need it experience a higher level of performance.

5 DISCUSSION AND CONCLUSION

The study has a number of implications for practice [6]:

- Prior mobilization of support for the new system among employees increases the likelihood of better results, even in the event of serious technical problems, but managers should strive for a careful balance between prior mobilization of support for ICT innovation and on the other to prepare employees for difficulties in the implementation process.
- Participative leadership involving employees in decisions on the practical implementation and adaptation of the ICT system significantly increases the likelihood of better results.
- Management that provides sufficient information and timely technical support during the implementation of the ICT system increases the likelihood of better results.
- Adapting the implementation process to the conditions in each department increases the likelihood of better results.

The findings of our study are clear and not surprising. Our study adds some nuances to theories of change management and it replicates previous studies within the field. Thereby the study contributes to a strengthening of the evidence for tested theories. Yet the above recommendations have been well known from management research for the past 15-20 years. These theories have been taught at many management education programs in Denmark during the same period.

It raises the question of why the recommendations are not being followed to a greater extent. We have not examined the implementation of the health platform in the metropolitan area and the Region Zealand, but according to media coverage and a recent government report, several of the above recommendations have not been followed - at least not sufficiently.

The paradox is well known and the problem is widespread. It is referred to in the international literature as the "knowing-doing gap" [6]. There is often a gap between what you do and what you know - between what people in organizations know and what they actually implement in practice. Thus, the study raises the question of how we increase the likelihood that the results of our and others' studies will have greater implications for practice.

The study does however have some limitations, which should be recognized, and its findings should be extended and tested in future research .

Perhaps the most important limitation is the short time horizon of the post-test measures. At the time of the post-implementation survey, the ICT innovation was not fully routinized and integrated in the organization. A research design including medium and long-term post-implementation measures would have been preferable, but was not possible due to lack of resources and access. Thus, our findings should be interpreted as especially relevant to the first stages of an implementation process.

The measure of performance is a subjective one as it measures perceived performance by the employees on multiple dimensions. How this performance measure may be associated with, for instance, actually delivered services, increasing errors in medical treatments or an increasing number of readmissions, has not been uncovered in the present study. On the other hand, from the point of view of management, the employees' perceptions of performance are crucially important to public service organizations.

6 REFERENCES

- [1] Davis, F. D. (1989), 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', *Mis Quarterly*, 13 (3), 319-40.
- [2] Dwivedi, Yogesh K, et al. (2015), 'Research on information systems failures and successes: Status update and future directions', *Information Systems Frontiers*, 17 (1), 143-57.
- [3] Fernandez, S. and Rainey, H. G. (2006), 'Managing successful organizational change in the public sector', *Public Administration Review*, 66 (2), 168-76.
- [4] Hansen, M. B. and Norup, I. (2017), 'Leading the Implementation of ICT Innovations', *Public Administration Review*, 77 (6), 851-60.
- [5] Hansen, Morten Balle and Nørup, Iben (2018), 'Fire anbefalinger til ledelsen ved implementeringen af store IKT-systemer', *Politologisk aarbog 2018* (København).
- [6] Hansen, Morten Balle, et al. (2019), 'Model for evaluating the implementation of a third generation EHR system', *Context Sensitive Health Informatics (CSHI 2019)* (Lille, France: the IOS Press proceedings).
- [7] Kotter, John. P. (1995), 'Leading Change - Why Transformation Efforts Fail', *Harvard Business Review*, 73 (2), 59-67.
- [8] Nørup, Iben and Hansen, Morten Balle (2015), 'Udfordringer ved implementering af større IKT projekter. Evaluering af COSMIC EPJ-projektet på Sygehus Lillebælt', (Aalborg: Aalborg Universitet).
- [9] Pedersen, Kjeld Møller (2017), 'Commentary: Electronic Patient Records: Confronting the Implementation Challenge', *Public Administration Review*, 77 (6), 861-62.
- [10] Priestman, Ward, et al. (2018), 'What to expect from electronic patient record system implementation; lessons learned from published evidence', *Journal of Innovation in Health Informatics*, 25 (2), 92-104.
- [11] Rigsrevisionen (2018), 'Rigsrevisionens beretning om Sundhedsplatformen afgivet til Folketinget med Statsrevisorernes bemærkninger', in Rigsrevisionen (ed.), (Copenhagen: Statsrevisorerne).
- [12] Van Wart, Montgomery (2013), 'Lessons from leadership theory and the contemporary challenges of leaders', *Public Administration Review*, 73 (4), 553-65.
- [13] Venkatesh, V. and Davis, F. D. (2000), 'A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies', *Management Science*, 46 (2), 186-204.
- [14] Venkatesh, V. and Bala, H. (2008), 'Technology Acceptance Model 3 and a Research Agenda on Interventions', *Decision Sciences*, 39 (2), 273-315.
- [15] Yukl, Gary (2013), 'Change Leadership', in G. Yukl (ed.), *Leadership in Organizations* (8 edn.; Upper Saddle River, New Jersey: Pearson Prentice Hall), 87-113.

7 ACKNOWLEDGEMENT

The authors would like to thank Aalborg University and the Region of Southern Denmark for support for the research.