

Chapter 5

TRANSLATIONS IN NETWORK CONFIGURATIONS

A Case Study of System Implementation in a Hospital

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Abstract: This paper reports from an interpretive case study in a hospital of the replacement of paper based order forms for radiology examinations with web based order forms. The aim is to contribute with a better understanding about the implementation of networked technologies in healthcare. The case shows how the implementation of network technology imposes a configuration in the actor-network and illustrates the importance of small steps and translations involving many different actors in the process leading to a new stabilized configuration.

Key words: implementation, adoption, network configuration, translation, healthcare

1. INTRODUCTION

The healthcare sector has invested large sums of money in information and communication technology (ICT), often with little satisfaction (Heeks & Davies, 1999). However, the conviction of the potential benefits of ICTs in healthcare remains strong, and is based on the knowledge and information intensive characteristics of health organizations. This tension between the potential benefits and actual outcomes is the primary motivation for this study of the implementation of a networked technology in a healthcare unit.

Lyytinen and Damsgaard (2001) have examined common conjectures when diffusion of innovation theory is applied for analyzing networked

technologies. They suggest that history helps us understand important process features and the role played by key actors. They also recognize the need for developing “multi-layered theories of diffusion that factor out mappings between layers and locales” (p. 186), and the need to “use alternative theoretical perspectives that can help extend analysis beyond questions of efficient choice” (p. 186). We acknowledge these research directions as theoretical guidelines for our study of implementation practices.

Our understanding of ICT implementation is based on Swanson’s (2001) concept of innovation processes as a story having four phases: comprehension, adoption, implementation, and assimilation. Specifically we consider the adoption and implementation phase, and focus on the latter since our story begins when the decision to adopt the new technology was already made. The adoption phase concerns decisions about “why to adopt the innovation?” and “when is the right time to do it?” The implementation phase is about “when and how is the implementation to be accomplished?”

The primary actors, managers and end-users, in these phases have different interests in the process and they are not autonomous in their choice of adopting or rejecting an innovation (Gallivan, 2001). Gallivan argues that, in organizations, the conditions for decision are defined as “contingent authority innovation decisions” in which “authorities make the initial decision to adopt and targeted users have few alternatives but to adopt the innovation and make the necessary adjustments for using it to perform their jobs” (p. 52). After this non-voluntary adoption phase (Gallivan, 2001), future users deal with the innovation as the new configuration meets current work practices. How this unfolds in organizational settings has been extensively studied from various perspectives, for example as re-invention (Rogers, 1995), care (Ciborra, 1996), sense making (Henfridsson, 1999), formative contexts (Ciborra and Lanzara, 1994), or as situated change (Orlikowski, 1996). These studies provide a rich understanding of the challenges involved in transforming organizations with networked technologies, but our knowledge about the reactions of and interactions between different stakeholders during system implementation remains limited. Also, there are no extensive case studies available from the healthcare sector about implementation of contemporary networked technologies.

Our primary aim is to contribute with a deeper understanding of implementations of networked technologies in healthcare. When a new network technology comes into the picture a certain configuration is imposed on the existing socio-technical network. We analyze how the socio-technical relations start to change in terms of small steps of negotiations and translations involving various groups of actors. We argue that this dynamics

have important consequences for how work practices sustain, are challenged, and are transformed.

The following section outlines the method adopted for data collection, and section three describes the case study. Subsequently, in section four, we review the existing literature on implementation of networked technologies in organizational settings and we introduce the theoretical lenses for the analysis. The empirical material is presented and analyzed in sections five and six. Finally, we discuss the contribution of our research in relation to the existing literature and we outline some implications of our findings.

2. METHOD

We report from an ongoing interpretive case study (Walsham, 1993; 1995) in a large Swedish hospital. The study focuses on a change process involving replacement of paper based order forms for radiology examinations with electronic order forms. We focus on the following research question:

What is the role of negotiations and translations between different groups of stakeholders when new network configurations are introduced to change current work practices?

A combination of different qualitative techniques for data collection have been used; observations of daily work, interviews, meetings and seminars, study of documents and the ICT system, and continuous informal discussions with the project managers as well as care professionals. Different professions involved in the clinical work have been considered; physicians, nurses, assistant nurses and secretaries with different responsibilities.

The data collection started in October 2001 by participating at the first project meeting for the order form system. During autumn 2001 and spring 2002, we participated in 10 project meetings, each lasting about two to three hours. In May 2002 a first version of the system was implemented at the orthopaedic clinic. During May, June and September 2002 we spent forty hours of observation of daily work at the different departments and professions at the clinic. Between February and May 2003, twelve semi-structured interviews, 30-90 minutes long, were conducted, covering questions of how the users perceived the system and its impact on their work practice.

In the analyses of the case we aim to understand the complex relations among different types of elements, e.g. information, people, work practices,

and ICT's, involved in the adoption process and to study the evolution of these relations over time. We do this by adopting relevant concepts from Actor Network Theory (ANT) (e.g. Latour, 1987) as analytical tools. There are several reasons for adopting this particular theoretical lens. Firstly, ANT has proven useful for analyzing socio-technical relations in heterogeneous networks (e.g. Aanestad, 2003; Akrich, 1992; Hanseth & Monteiro, 1997). Secondly, ANT offers concepts like network configuration, negotiation and translation that help us focus on how various actors deal with the dynamics involved in going from one set of work practices to a new set enabled by the new order form system (Law, 1999). Thirdly, ANT does not make any particular assumptions about the organizational context of the implementation process in question. This allows us to focus on different network sizes and to adopt different levels of granularity (Hanseth & Monteiro, 1997).

3. THE CASE

The implementation process unfolds in a Swedish emergency hospital, a limited corporation owned by the county council serving approximately 360,000 inhabitants. The decision to implement the new electronic order form hospital wide was made at the top level by the hospital director and managers from the different clinics. The IT unit at the hospital acted as project manager for the implementation and for the overall digitalization of the radiology department. A small external company developed the web based order form system, including the radiology information system (RIS). The picture archiving communication system (PACS) storing relevant images was purchased as a standard system.

The digitalization of the radiology department is part of an ongoing modernization process in Swedish hospitals. The process implies, in this case, the implementation of RIS and PACS within the radiology department and the adoption of the electronic order form system connecting the radiology department to all clinics. The electronic order form system is expected to benefit the hospital as a whole as well as the radiology department. Specifically, it should lead to improved access and timesaving for searching after lost and misplaced documents.

4. THEORY

Previous research in the area of implementation of network technologies in organizations points out the main challenges involved and suggests

different analytical concepts for their interpretation. Ciborra (1996) identifies three interrelated elements in an implementation process: the human organization, the system, and the context. He argues that to reach an effective implementation it is necessary that the members of the human organization express a great amount of care to incorporate the new system into their daily work life. To reach a full appropriation of the system, the involved actors should engage actively to cope with the involved uncertainties and not rely on a passive detached process of acknowledgment (Ciborra, 1996). Henfridsson (1999) proposes a sense making perspective for understanding ICT adaptation in organizations. He proposes to focus on the dynamics in the sense making process. The main assumption is that it is through people's active production and assignment of meanings to ICT that systems become useful in specific organizational contexts. Ciborra and Lanzara (1994) explore a perspective centered on human action pointing at the importance of the formative contexts. They refer to formative context as "the pre-existing institutional arrangements, cognitive frames and imageries that actors bring and routinely enact in a situation of action" (p. 70). These institutional arrangements play a crucial role in shaping the way routines are formed and given specific meanings. Orlikowski (1996) conceptualizes the ICT implementation process as a result of social actors' anticipations, expectations, and enactments of emerging patterns of use and exploitation of up-coming opportunities. Finally, Rogers (1995) explores the concept of reinvention focusing at how an ICT innovation is modified by users during implementation. He points out that implementing a new technology is not a passive process, but implies a decision to make full use of an existing idea.

These contributions agree that network implementation processes are highly complex and demanding, and that the involved actors need to actively engage in and contribute to the adoption of the new system and to the transformation of current work practices. This literature also provides a rich array of interpretations of why this is the case and of the different kinds of enablers and barriers that exist to make the implementation happen. Building on these findings we adopt ANT to analyze specifically how different actors become engaged as current work practices are confronted with a new system. ANT develops from the idea that entities take their form and acquire their attributes as a result of their relations with other entities (Law, 1999). In this scheme entities have no inherent qualities as being large or small, human or non human etc, but rather as Law points out such divisions or distinctions are understood as effects or outcomes. They achieve their form as a consequence of the relations in which they are located.

We use two concepts from ANT as the key theoretical lenses in our analysis: network configuration and translation. A network configuration refers to how an actor-network is 'displayed'. Aanestad (2003) suggests

conceptualizing design work of networked technologies as *design of network configurations* pointing at the materially heterogeneous elements in networks. The work of configuring a network refers then to the alignment performed by all actors involved in the network, and calls for a detailed examination of the strategies, which enlist bodies, materials, discourses, techniques, feelings, laws, and organizations. This concept allows us to see how actors influence the configuration, and how the configuration itself is fundamentally relational.

The way an actor-network is configured is the outcome of how actors play their roles and succeed in translating their interests, or inscribing them into pieces of technologies. Callon and Latour (1981) define translation stressing the uneasiness of such process: “By translation we understand all the negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or act on behalf of another actor or force” (p. 279). Accordingly, Akrich (1992) suggests that if we want to describe the elementary mechanisms of reciprocal adjustment between the technical object and its environment” we need to find disagreement, negotiations, and the potential for breakdown” (p. 207). Too often configurations are perceived natural as if there was never a possibility that they could have been otherwise (Akrich, 1992). In line with Akrich, we believe in the importance of following each movement leading to a new stabilized configuration.

5. THE IMPLEMENTATION PROCESS

This section describes the implementation process that was initiated as a pilot project at the orthopaedic clinic. We also discuss the integration into the existing infrastructure and the management of the change process. Figure 1 provides a chronology of key events during this implementation of the new order form system at the orthopaedic clinic.

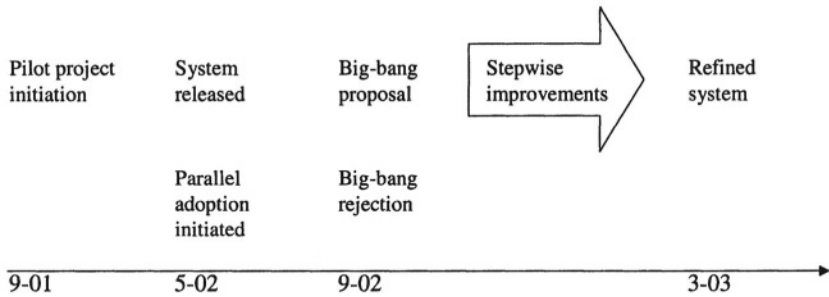


Figure 1. Key Events during System Implementation

5.1 Pilot Implementation

The order form implementation started with a ‘Pilot project initiation’ (see Figure 1) where a group of various care professionals representing the orthopaedic clinic was formed in September 2001. The group analyzed current routines and information flows and prepared the clinic for the new system. Insights from the group served as input to the detailed design of the system.

An issue that was intensively discussed in the project was whether physicians should write order forms themselves after the system was implemented. In the paper-based routines, the order form was structured with various fields to fill in and sent through a pneumatic tube system within the hospital. Traditionally, all preparations to gather relevant documents were conducted by archive personnel, secretaries, assistant nurses and nurses. Nurses or secretaries would also check that sufficient data were filled in before an order form was sent. Physicians expressed being quite happy with the existing paper based system and the pneumatic tube system. Nurses and secretaries experienced some difficulties searching for lost and misplaced documents.

The first physician representative in the project was relatively uncommitted to the project group and did not always show up. In general the representatives expressed difficulties to find time to participate in the project, and others also missed meetings occasionally.

A second physician was invited to the project group to increase participation from his professional group. The physicians’ interest was mostly focused on sustaining the existing support they had from the other professional groups. They expressed worries about spending time to do what

nurses or secretaries were now doing. They also pointed to quality concerns in relation to patients, as their time for visits would decrease.

The nurses' interest was favourable to the transfer of tasks to physicians. They regarded those tasks as being the physicians' responsibilities: according to hospital regulations a radiology examination needed to be requested and signed by a physician. However, in the paper based routines this was often delegated to nurses. The nurses' expressed that sometimes the situation really required them to support the physician, but sometimes it was more of a matter issue. Therefore, the nurses wanted to clarify responsibilities. The secretaries expressed their concern to maintain the responsibility to write order forms from dictations. In the final design of the system, only physicians were authorized to write an order form in the system, while other professionals were authorized to read.

5.2 Integrating into existing infrastructure

The existing infrastructure at the hospital included shared systems concerning the safety system utilizing a personal key infrastructure (PKI), the operating system Windows NT4, the existing Electronic Patient Record system (EPR) Melior by Siemens, plus a number of different local systems at the different clinics. The system was implemented (see 'System released' Figure 1) at the pilot clinic in May 2002. The relationships between key network components and organizational units are illustrated in Figure 2. The system was set up with access via the EPR requiring the user to logon to the network, the EPR and then start the web-based order form.

The management's arguments for implementing the order form system into the existing information infrastructure with access via the EPR was related to safety issues, and the intention to make the user perceive the EPR and the order form system as one system.

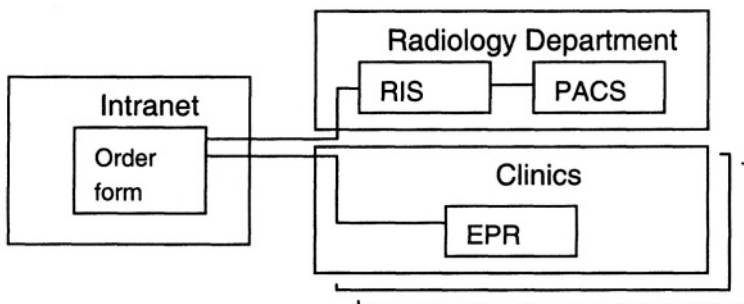


Figure 2. The Relationships between Key Network Components and Organizational Units

A 'Parallel adoption' strategy was initiated (see Figure 1) where the existing paper-based and new electronic order systems were in use at the same time. In relation to the 'System release' (see Figure 1), another physician became involved at his own initiative. That physician was an enthusiast, and started actively to engage in the project group providing viewpoints and constructive comments on how to improve and further develop the new system. The order form system required the user to fill in the form according to fixed rules, e.g. certain fields are compulsory to fill in; and certain fields are compulsory to fill in by choosing from a list of possible examinations, aiming to generate more accurate order forms. The physicians did not particularly like to use the new system, and tried to sustain the paper-based routine. The assistant nurses and nurses therefore removed the paper forms in order to make the physicians use the system.

The physicians perceived the system as being unsatisfactory, mainly due to stability and performance problems. They were also concerned with the exclusion of secretaries and nurses authorization to write a request that made their tasks so unacceptably time consuming. The enthusiast physician gathered the collective experiences among the colleagues and acted to gain support from the nurses and secretaries.

5.3 Management of the change process

Even though the order form system was a hospital concern, decided by the board of the hospital, it was conducted as part of the larger digitalization project of the radiology department. Project management experienced a lack of commitment from the hospital management in informing the involved stakeholders about the project. Most users consequently perceived the project as a radiology concern rather than a hospital wide concern. During the process, the project managers realized it would have been better to separate the order form project to clarify that it was a concern for the hospital as a whole.

The perception of the implemented system varied among the users, but there was a shared opinion that the system was too slow and unstable in the current state. The project managers knew that there were problems with both performance and stability, and they were continuously working with improvements. However, they were not aware of the magnitude of the perceived shortcomings and planned to perform a hospital wide implementation during the autumn of 2002 (see 'Big-bang proposal' in Figure 1). In September 2002, when this became clear among the users they reacted strongly with a requests to stop other implementation efforts until the system had been sufficiently improved (see 'Big-bang rejection' in Figure 1). As a result, the hospital wide implementation was postponed. Meanwhile,

the pilot clinic carried on using the system, although in parallel with the old paper based system as a back up when necessary.

Three main problem areas were identified in relation to performance and stability of the system and efforts were made to improve these (see 'Stepwise improvements' in Figure 1). One problem identified was related to an oracle database in RIS, which needed to be replaced with another version. Another problem had to do with the standard system PACS. This problem was solved when the supplier launched a new version. A third problem was related to programming improvements in terms of data manipulation in various lists and logical issues in the algorithms of the order form system. In addition, changes were made to the user interface based on user viewpoints. Due to the perceived cumbersome and time-consuming sequence of actions to access the order form, the users acted for an alternative access. This was made available directly to the system from the hospital intranet. In March 2003 a more 'Refined system' (see Figure 1) was in use.

6. UNFOLDING CONFIGURATIONS

In this section we analyze the dynamics involved in the transformation of the network configuration at the orthopaedic clinic. In particular we emphasize the translations enacted by the key stakeholders to understand better how the emerging work practices were negotiated in a step-by-step fashion.

6.1 The Partial Network

Even though the paper-based form was highly structured, the use of pen and paper provided a certain degree of flexibility. The form itself had no embedded inscriptions limiting the process; it was the human actors in the actor-network that would be translators of the agreed rules. The paper form provided unlimited access to the actor-network allowing the physicians to often rely on assistance to perform their task.

When this established configuration was confronted with the new actor, the order form system, performances were restricted to stronger predetermined rules. The embedded inscriptions in the new system required the user to fill in the form according to fixed rules. Further, only physicians were enabled to write a request. The inscriptions mediated the imposition of this new network configuration. In the previous configuration the actors could perform the task of ordering an examination in an 'ad hoc' manner as a result of the specific interpretations and negotiations between the actors involved in a given situation. This traditional work practice was now

translated into a configuration with a more constrained relation between the physician and the order form system. As a result, the physicians perceived their work situation as more difficult. They now had to perform the task single-handed.

The imposed socio-technical network configuration was the result of a translation that occurred as a result of tensions between the roles of nurses and physicians. In the translation process, the nurses made an active effort to embed their interest and concerns in the design of the system. The original flexibility of the established cooperative pattern was now constrained by the embedded inscriptions in the new system.

The physicians were initially rather passively observing the implementation process but later they complained in several ways and with increasing force that their work tasks were becoming unacceptably time consuming. Due to their strong reaction, the hospital wide implementation of the system was postponed. Moreover, the embedded inscriptions in the system and the routines were changed to reintroduce a certain degree of flexibility. Thus, both nurses and secretaries were enabled to write requests (on delegation) in order to assist physicians in certain situations.

We have summarized the key negotiations and translations enacted by the different groups of users in the orthopaedic clinic during systems implementation in Table 1. The table highlights the dynamics involved as the users deal with the challenges involved in transforming their work practices.

Table 1 Key Negotiations and Translations in the Orthopaedic Clinic

Physicians	Nurses	Others
Traditionally assisted by secretaries, assistant nurses and nurses Initially disinterested in project Exercise increasing influence to avoid emerging configuration Regain assistance from secretaries, assistant nurses and nurses	Traditionally executing physicians' responsibilities Active during project initiation Successfully transfer responsibilities to physicians Eventually assist physicians in executing responsibilities	Traditionally responsible for writing down dictations Active during project initiation Eventually sustain the responsibility to write from dictations

6.2 The Extended Network

We then zoom out from the work practices and the changes by the new system. Instead we consider the system as an actor in a larger actor network to understand how these higher level dynamics also influenced the resulting

network configuration. The system was part of a larger infrastructure with other elements that need to be taken into consideration.

To separate the constraints perceived by the information infrastructure as a whole and the order form system is difficult. There was an apparent relation between the perceived use of the system and the logon process to the network for the users. The information infrastructure (PKI, Windows NT4, and access via the EPR) created a sequence of activities to access the order form that were perceived as cumbersome and time consuming, which naturally influenced the overall perception of the order form system.

The configuration of the information infrastructure exemplifies a translation of overarching interests that influenced the configuration for the partial network at the orthopaedic clinic. The implementation of the order form system into the existing information infrastructure illustrates how overarching or specific interests were translated to the semi-autonomous orthopaedic clinic. Due to the perceived cumbersome and time-consuming sequence of actions to access the order form these interactions meant that an alternative access was eventually made available directly to the system from the hospital intranet.

We have summarized the key negotiations and translations enacted by key stakeholders on this level in Table 2. The table highlights the dynamics involved as these groups negotiated and renegotiated the ways in which the new system should be configured and integrated with existing work practices and infrastructures.

Table 2 Key Negotiations and Translations in the Wider Context

Project management	Hospital management	Orthopaedic clinic
Focused on getting the system implemented and used	Focused on safety issues	Promoted functional issues
Focused on progress and on maintaining the system	Wanted network components to be perceived as one system	Required improvements
		Stopped hospital wide implementation
		Required alternative access point to the system

7. DISCUSSION AND CONCLUDING REMARKS

Our research contributes to the literature on ICT implementation in organizational contexts. Previous research has pointed out that it is difficult to transfer technology from one context and culture to another and that there is a need for small steps and translations in such processes (Akrich, 1992). Our case study shows that this also applies to contexts that are not far apart, i.e. within the same hospital.

The case confirms the necessity for the involved actors to exercise a great amount of care to incorporate the new system into their daily work life, as argued by Ciborra (1996). However, our study points to difficulties involved in making this happen due to differences amongst stakeholder. The care expressed by the physicians, the nurses and the secretaries to incorporate the new system into their daily life appeared as a series of negotiations as the new system met work practices. Similarly, there were negotiations and translations going on between the different management levels of the hospital, the project, and the orthopaedic clinic.

The sense making perspective (Henfridsson, 1999) also applies to this case, but the way in which different actors made sense of the new system varied depending on their interests, the negotiations with other stakeholders, as well as the underlying formative context of the implementation process (Ciborra & Lanzara, 1994). The case shows how routines are shaped and reshaped as the involved actors develop specific meanings of the emerging network configuration.

The considered literature (Ciborra, 1996; Henfridsson, 1999; Ciborra & Lanzara, 1994; Rogers, 1995; Orlikowski, 1996) points out the complexity and dynamics of network implementation processes. It emphasizes in particular the need for actors to be actively engaged in the transformation of current work practices. Our study confirms this with a particular emphasis on the intricacy of reactions and interactions between different stakeholders during system implementation. The analysis of the case shows how the processes of configuring and reconfiguring a socio-technical network can be studied and understood well by focusing on the negotiations and translations between different key actors and stakeholders. This issue needs to be further elaborated in future research to provide a deeper understanding of the challenges involved in the implementation of network technologies.

Our research also contributes to improving the use of ICT within healthcare. Healthcare plays an increasingly important role in contemporary society. The gap between espoused beliefs in the benefits of using ICT and the difficulties faced in many particular situations suggests, however, that we need to know more about information and change management in this particular context. Our study suggests that managers in hospitals need to pay particular attention to the complex relationships between stakeholders when networked technologies are introduced. Healthcare managers are advised to proactively design implementation initiatives that allow for the necessary negotiations and translations to take place. Future studies could involve action research and experiments to explore more specifically how the notions of negotiation and translation could support tactics and strategies for successful implementation of ICT based networks within healthcare.

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