HOW SOCIAL CAPITAL BETWEEN MEDICAL AND IT PROFESSIONALS SHAPES THE OUTCOMES OF HEALTH INFORMATION SYSTEM IMPLEMENTATION ENDEAVOURS

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HOW SOCIAL CAPITAL BETWEEN MEDICAL AND IT PROFESSIONALS SHAPES THE OUTCOMES OF HEALTH INFORMATION SYSTEM IMPLEMENTATION ENDEAVOURS

Research

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Abstract

Successful implementation of healthcare information systems (HIS) is tremendously difficult. Although few is known about the mechanisms enabling successful HIS implementation, effective learning processes and consciously implemented adaptations to HIS and medical reality are assumed to be pivotal. In this paper, we aim to gain understanding about the enablers of these processes. To that end, we conducted an in-depth case study of an HIS implementation project.

Findings demonstrate that the success of HIS initiatives is particularly dependent on the capacity of involved actors to integrate their idiosyncratic knowledge and to develop congruent and actionable understanding. Looking at the conducting paths for integrating knowledge, our findings further show that stakeholders’ social capital reflected by their opportunity, motivation and ability to capitalize on existing knowledge and experiences are critical for aligning HIS and medical reality. Taking a qualitative approach, we extend existing research by illustrating how social capital and knowledge integration outcomes coevolve.

Overall, our results highlight the importance of social capital for knowledge integration during HIS initiatives. Medical and IT professionals’ collaborative endeavours seem to produce valuable solutions that balance divergent stakeholders’ concerns when opportunity, motivation and ability to integrate their knowledge, expertise and interests are effectively managed.

Keywords: Social capital, knowledge integration, healthcare information systems, alignment


1 Introduction

Since the stakes of healthcare are life and death, healthcare delivery needs to be carefully pursued and heedfully executed (Fichman et al., 2011). Healthcare information systems (HIS) are intended to support this pursuit by, e.g. improving quality of care and enhancing patient safety. (Zheng et al., 2005; Chaudhry et al., 2006; Stead, 2007; Aron et al., 2011). However, implementing HIS is found to be exceedingly complex and difficult (Bhattacherjee and Hikmet, 2007; Goh et al., 2011). Empirical evidence is given that many HIS initiatives encounter major obstacles (Heeks, 2006), which often lead to resistance amongst healthcare professionals (Bhattacherjee and Hikmet, 2007).

Till today few research has examined the mechanisms underlying successful HIS implementation (Goh et al., 2011, p. 565). However, it is assumed that effective and continuously sustained integration of medical and technical knowledge and subsequent, consciously implemented adaptations to HIS and medical reality are key (Poon et al., 2004; Fichman et al., 2011). Even outside healthcare, few studies have addressed knowledge integration processes between the people that make IT work and those that are working with IT (van den Hooff and de Winter, 2011). Nonetheless, there are some indications that social capital between them facilitates the development of shared understanding and, ultimately, purposeful alignment of IT with business objectives and needs (van den Hooff and de Winter, 2011; Wagner et al., 2014; Weeger et al., 2015). Subsequently, social capital seems to play a critical role in implementing and adapting IT in organizations. As most of these studies are quantitative in nature, few is known about the qualitative edge of social capital and how mechanisms embraced in social structures enable aligning of HIS in practice. To contribute to the understanding of these mechanisms, we put forward the following research question: How does social capital between medical and IT stakeholders impact HIS implementation endeavours?

In order to approach this question, we conducted an in-depth case-study of an HIS implementation project at a large German hospital. Drawing on the opportunity-motivation-ability framework as proposed by Adler and Kwon (2002), we particularly focus on the nature and role of relationships between operational business and IT professionals. As to that, we examine how these characteristics facilitate knowledge integration between both domains and, eventually, enable them to consciously adjust and interrelate HIS, existing work practices and structures.

This study contributes to and complements existing literature by qualitatively disentangling the social capital architecture inherent to a HIS project. As to that, we illustrate the reciprocal effects of evolving social capital and knowledge integration, which, in turn, impacts HIS implementation outcomes. Looking at the conducting paths for knowledge exchange, our findings show that opportunity, motivation and ability to exploit idiosyncratic knowledge, experiences and interests are critical for adjusting and implementing HIS. The results of this study further encourage project manager to constantly monitor and manage the structure and nature of relationships within HIS initiatives, which, eventually, facilitate adjustments that balance divergent concerns of stakeholder and realize intended value.

The remainder of this paper is structured as follows. We start discussing the role of HIS in healthcare, the challenges related to effectively implement HIS and how social capital is expected to facilitate these processes. This section exhibits our theoretical sensitivity, which is presumed to help us giving meaning to data we collect during our in-depth case study (Strauss and Corbin, 1998). Before presenting the findings, we introduce the research setting and present our methods. Finally, we outline our findings, consider the limitations and discuss the contributions of our study.

2 Theoretical Foundations

Following the propositions of Fichman et al. (2011), we begin to lay out our theoretical foundations by reflecting the distinctive characteristics of hospitals that inform our theorizing. We then deliberate the pivotal role of knowledge integration for adjusting and interrelating HIS and medical reality and how social capital between medical and IT professionals may facilitates these processes.
2.1 The Role of HIS in Healthcare Delivery within Hospitals

The healthcare context is characterized by an evolving division of labour across organizations, professions and occupations. These, in turn, are mediated and produced by relations of power, knowledge and identity (Halford et al., 2010). In German hospitals, these characteristics notably manifest themselves in the occurrence of three distinct communities, which are organized along strict and widely disconnected hierarchical authorities, namely medicine, nursing and administration (Moers, 2003). Performed within these historically emergent and dynamic social orders (Fichman et al., 2011), healthcare delivery involves significant coordination, interdependence, and interactions among a variety of actors (Goh et al., 2011). To ensure quality and efficiency within these complexities, strong expectations are set in HIS (Goldzweig et al., 2009). HIS are particularly expected to improve information flow and coordination between the participating actors and, eventually, increase efficiency and quality of healthcare delivery.

Despite envisioned benefits, HIS initiatives are found to have the potential to interfere with current healthcare delivery processes. In this respect, implementing HIS frequently implies that work needs to be reorganized, new tasks are introduced and existing division of labour is subjected to change (Halford et al., 2010). Further, bureaucratic imperatives built into HIS and the necessity to use them may conflict with healthcare professionals’ primary concern: treating patients (Halford et al., 2010; Fichman et al., 2011). In addition, workflows inscribed in these systems may not provide sufficient flexibility and are often incompatible with established routines and structures (Doolin, 2004). Implementing HIS may also challenge existing social orders within healthcare. For instance, the increasing centrality of HIS systems during the ‘art of healing’ also requires new kind of knowledge, which does not originally belong to the clinical knowledge domain (e.g. knowledge about IT). Utilizing HIS, medical professionals may thus expect to become increasingly dependent on non-medical professionals. This dependency may erode the stability of evolved social structures (FitzHenry et al., 2000; Weeger and Gewald, 2015).

Since stability and reliability are pivotal in healthcare settings, HIS initiatives should carefully manage change to healthcare delivery (Fichman et al., 2011). Particularly, changes to aspects that are providing reliability such as historically evolved and familiarized social structures as well as attuned practices should be carefully considered. Concerning this matter, embedding generic HIS as “one size fits it all” seems not to be a promising approach (Poon et al., 2004; Oborn et al., 2011). Rather, both, HIS and existing workflows and structures need to be consciously adapted (Lapointe and Rivard, 2005). Subsequently, HIS implementation requires medical stakeholders and IT professionals to consciously interrelate the design and functionalities of the HIS, medical work practices and, possibly, their underlying power relations so much that they reach a sufficient degree of coherence (Goh et al., 2011). This has to be seen as an evolutionary process “that is not only dynamic—occurring over time—but which also needs to be sustained continuously throughout the life of an HIS project” (Heeks, 2006, p. 133). Moreover, enabling these processes, it is assumed that practices related to HIS design, adaptation, and implementation must not only focus on system considerations, but reflect the impact of HIS on the different users’ work behaviours and divergent rationalities of stakeholder groups (Heeks, 2006; Bhattacherjee and Hikmet, 2007). However, evidence is given that specifically hospitals experience trouble integrating those technical, managerial and medical points of views (Simon et al., 2007; DesRoches et al., 2008; Goh et al., 2011). Below, we discuss how these challenges may be explained and approached.

2.2 Challenges to Aligning HIS and Medical Practices

In order to consider technical, managerial and medical aspects that play a pivotal role for the success of HIS initiative, stakeholders must be knowledgeable of them. Acknowledging the difficulties of HIS implementation, teams considered with HIS implementation most likely have difficulties to share and relate knowledge that characterizes each stakeholder group and is, hence, “socialized, embedded and invested in practice” (Carlile, 2002, p. 442). Within hospitals, such knowledge might encompass information about routines which are at the core of daily operations and determine efficiency and quality of care (Goh et al., 2011) as well as information about the limitations of the IS that aim to facilitate and improve these routines and the opportunities they provide. General difficulties to share and integrate
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...idiosyncratic knowledge between communities may be further reinforced by a hospital’s decoupled nature and the distinctive boundaries between physicians, nurses and administrative staff (Doege and Martini, 2008). Sharing and relating knowledge may be also impeded by divergent interests and different rationalities, which might surface during cross-functional cooperation (Pinto et al., 1993). As a consequence, they may lead to diverse understandings of a similar situation such as the nature of a problem, its significance and possible solutions (Bechky, 2003; van den Hooff and de Winter, 2011).

To mitigate these effects and to capitalize on the knowledge available, stakeholders must evolve the ability to relate unfamiliar pieces of knowledge (Tiwana and McLean, 2005; Robert et al., 2008). The literature shows that explicating, sharing and relating knowledge about their fields enables stakeholders to develop congruent understandings of the rationality, objectives and feasible solutions of their joint endeavours (Newell et al., 2004; Tiwana and McLean, 2005; Vlaar et al., 2008; Hsu and Hung, 2013). Explaining such processes, the concept of knowledge integration was introduced. Knowledge integration refers to the ‘synthesis’ of information and expertise through social interactions (Okhuysen and Eisenhardt, 2002; Robert et al., 2008). It enables cross-functional teams to capitalize on their distinct knowledge and views and to develop understandings that are sufficiently related and have the same behavioural implications or, in short, that are congruent and actionable (Vlaar et al., 2008). Such understandings enable specialists to agree on the problem, critical requirements and functionalities as well as limitations and technical trade-offs that are acceptable for all stakeholders (Tiwana, 2012).

Prior studies show that knowledge integration enables actors from distinct communities to collaborate effectively. For instance, knowledge integration was found to enhance alignment between information systems and the context they are used in (Kearns and Sabherwal, 2006; Preston and Karahanna, 2009; Vermerris et al., 2014; Wagner et al., 2014). Subsequently, it can be assumed that knowledge integration also facilitates the development of congruent and actionable understandings about how HIS and medical reality can be successfully aligned (i.e. adjusted and interrelated).

The extent of knowledge that may be shared and related is dependent on the selection of project stakeholder and team members (Newell et al., 2004). Ideally, individuals from all relevant fields will be allocated to project work. This mix constitutes the existing intellectual capital of the team, defined as the “knowledge and knowing capability of the collectivity” (Nahapiet and Ghoshal, 1998, p. 245). However, aiming at the creation of new intellectual capital based on congruent and actionable understandings (i.e. adapted HIS and medical practices), the ability to capitalize on these resources is critical (Robert et al., 2008). As to that, several studies show that the ability to create new intellectual capital (i.e. congruent understandings), is inherent in a group’s social capital (Reagans and Zuckerman, 2001; Newell et al., 2004; Subramaniam and Youndt, 2005; Wang et al., 2006). For instance, examining interactions within cross-functional projects, Huang and Newell (2003) show that social capital significantly shapes the dynamics and effectiveness of knowledge integration.

2.3 How Social Capital facilitates Knowledge Integration

Despite its widespread use, the conceptualizations of social capital are not consistent in the literature (Burt, 2005). However, most research on social capital is based on the idea that the goodwill of others makes resources available (Adler and Kwon, 2002) that enable the achievement of interests “that in its absence would not be possible” (Coleman, 1988, p. 98). Such resources are located in networks “of more or less institutionalized relationships of mutual acquaintance and recognition” (Bourdieu, 1986, p. 249). In a nutshell, social capital relates to the resources that an actor or a group can mobilize through the goodwill of others (Peppard, 2007).

There are two divergent views on social capital. While Coleman (1988) argues that the strength of the relationship between actors (i.e. cohesion) is the source of social capital, Burt (1992) contends that the value of social capital may rather arise from opportunities to bridge disconnections or non-equivalencies in social structure (i.e. structural holes). Bridging structural holes makes sets of perspectives, skills, or knowledge available, while highly cohesive networks are argued to benefit from effective coordination and increased willingness to engage in knowledge exchange (Coleman, 1988; Burt, 2001; Reagans and Zuckerman, 2001). Integrating both perspectives leads to view social capital as a resource that facilitates
access to non-redundant knowledge and enables actors to effectively leverage knowledge within their social network (Nahapiet and Ghoshal, 1998). Building upon this idea, Adler and Kwon (2002) propose a framework that theorizes social capital as three-dimensional construct encompassing structural opportunities, relational motivation and a cognitive abilities to leverage resources. The opportunity dimension reflects the gestalt of the social network. The structure of the social network determines to which degree changes to leverage external resources are created (‘bridging’) and joint action is facilitated (‘bonding’). Relational motivation reflects the willingness of the actors to define and act on collective goals. Motivation is caused by shared interests, common identity and commitment to the common good. Last not least, mobilization of social relations and the knowledge embedded is contingent on actors’ ability. Particularly shared representations, interpretations, and common frames of reference enable actors to understand and utilize what is shared. Last not least, it is admitted that these dimensions are interrelated and to some degree mutually reinforcing (Nahapiet and Ghoshal, 1998).

The dimensions of social capital (i.e. structural opportunities, relational motivation and cognitive ability) are in line with the premises of knowledge integration: actor’s opportunity, their motivation and their ability to share knowledge (Wasko and Faraj, 2005). Subsequently, it is not surprising that social capital is found to be important for creating congruent understandings between actors from distinct fields. For instance, Newell et al. (2004) show that ‘bridging’ social capital within IT project teams facilitates the formation of a shared sense of purpose and congruent understanding, while ‘bonding’ facets help them to complete project objectives. Wagner et al. (2014) as well as van den Hooff and de Winter (2011) show that social capital has significant influence on learning processes between business and IT professionals. Furthermore, the study of Karahanna and Preston (2013) indicates that social capital enables the exchange of strategic knowledge, facilitates the development of congruent understandings, and thus influences the integration of business and information systems (IS) strategies. Focusing on the healthcare context, Weeger et al. (2015) recently show that social capital between IT professionals and physicians within hospitals fosters purposeful collaboration between both communities and, ultimately, drives IT business value.

Overall, we assume that IT and medical professionals need to consciously interrelate HIS and clinical reality in order to leverage the full potentials of HIS. This implies that both parties identify, negotiate and implement necessary adjustments (Poon et al., 2004; Lapointe and Rivard, 2005). Designing and implementing such reciprocal changes to HIS and clinical reality requires all stakeholders to integrate their specialized and dispersed knowledge, their expertise and their diverse expectations (Rousse and Deltour, 2012). Ultimately, these processes lead to congruent and actionable understandings about how HIS, medical work practices and structures need to be adjusted and interrelated. Constituting “the conducting paths for sharing and exchanging knowledge” (Subramaniam and Youndt, 2005, p. 452), we expect that social capital between medical stakeholders and IT professionals impacts these processes and eventually affects the outcomes of HIS implementation endeavours.

3 Methods

In order to gain understanding on how social capital between medical and IT stakeholders impacts HIS implementation, we conducted an in-depth single case study (Eisenhardt, 1989; Yin, 2009). Having explained the theoretical sensitivity for our study (Strauss and Corbin, 1998), we proceed with giving a brief introduction to the case and presenting our methods.

3.1 Research Case Context

The case of this paper is a cross-functional IT project at a large German teaching hospital aiming at the replacement of an electronic ‘patient data management system’ (PDMS), which is implemented at 15 intensive care and anesthesiology units (ICU) within the hospital. A PDMS guides and supports clinical workflows and particularly focuses on the collection, integration and visualization of patient-related data (Fretschner et al., 2001). Moreover, they are providing support for clinical decision making.
The system to be replaced (hitherto CareSysOld, CSO) was deployed approx. 20 years ago. Over time, IT and medical stakeholders invested much effort to interrelate the system’s functionalities and characteristics, medical practices and structures. According to our informants, CareSysOld was almost perfectly aligned with the operational requirements of the medical units and its users. However, the system was run out of life cycle and does not comply with the German medical product enactment (93/42/EWG, 2007/47/EG, Article 1, 2a). Further, physicians increasingly asked for advanced medical decision support functions, which are not covered by CSO.

In accordance with all occupational groups, hospital management finally decided to initiate a project that involves both IT-professionals and health personnel. Primary project goal was the implementation of a PDMS that complies with the regulatory requirements and fits to the existing IT. Initially, the project team encompassed four IT-consultants and was complemented by representatives of the other occupational groups, which were involved when necessary and then exempt from their daily responsibilities. In addition, an external project manager was employed.

<table>
<thead>
<tr>
<th>ID</th>
<th>Role (Department)</th>
<th>Profession/background</th>
<th>Gender</th>
<th>Formal interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT1</td>
<td>Steering committee (IT)</td>
<td>Chief Executive Officer</td>
<td>Male</td>
<td>2 (60 min)</td>
</tr>
<tr>
<td>IT2</td>
<td>Project team, core (IT)</td>
<td>IT consultant, medical background (nursing)</td>
<td>Male</td>
<td>1 (120 min)</td>
</tr>
<tr>
<td>IT3</td>
<td>Project team, core (IT)</td>
<td>IT consultant, medical background (nursing)</td>
<td>Male</td>
<td>2 (105 min)</td>
</tr>
<tr>
<td>IT4</td>
<td>Stakeholder (IT)</td>
<td>IT consultant, medical background (physician)</td>
<td>Male</td>
<td>2 (70 min)</td>
</tr>
<tr>
<td>ITPM</td>
<td>Project manager (IT, external)</td>
<td>IT consultant</td>
<td>Male</td>
<td>1 (70 min)</td>
</tr>
<tr>
<td>NU1</td>
<td>Project team, extended (ICU1)</td>
<td>Nursing management</td>
<td>Male</td>
<td>2 (80 min)</td>
</tr>
<tr>
<td>NU2</td>
<td>Project team, extended (ICU1)</td>
<td>Care assistant</td>
<td>Male</td>
<td>1 (30 min)</td>
</tr>
<tr>
<td>NU3</td>
<td>Project team, extended (ICU2)</td>
<td>Care assistant</td>
<td>Female</td>
<td>1 (60 min)</td>
</tr>
<tr>
<td>NU4</td>
<td>Project team, extended (ICU2)</td>
<td>Care assistant</td>
<td>Male</td>
<td>1 (40 min)</td>
</tr>
<tr>
<td>PH1</td>
<td>Steering committee (ICU2)</td>
<td>Assistant medical director</td>
<td>Male</td>
<td>1 (40 min)</td>
</tr>
<tr>
<td>PH2</td>
<td>Project team, extended (ICU3)</td>
<td>Assistant medical director</td>
<td>Male</td>
<td>1 (65 min)</td>
</tr>
<tr>
<td>PH3</td>
<td>Stakeholder/user (ICU2)</td>
<td>Ward physician</td>
<td>Male</td>
<td>1 (40 min)</td>
</tr>
</tbody>
</table>

Table 1. Primary informants (interviewees)

3.2 Data Collection

To ensure the reliability and credibility of the data collected, we applied multiple methods and informants. Specifically, we collected data through semi-structured interviews, observations (particularly of the IS in use), and casual conversations with stakeholders and users from three ICUs shortly before and after the roll-out of the successor system CareSysNew (hitherto CSN) in these ICUs took place (November 2014 till February 2015). Most of our informants were members of the extended project team, either from one of the three intensive care units or from IT. We developed a semi-structured interview guideline encompassed questions about each project phase that guided formal interviews with 12 of our informants (see Table 1). Each interview lasted between 30 and 120 minutes. Almost all interviews were recorded (approx. 700 min audio recording) and transcribed (approx. 55,000 words). Only three interviewees felt not comfortable with voice recording. We got back to almost all of our interviewees to address further queries that emerged during other interviews and/or data analysis. These mostly informal conversations were immediately written up in a research diary. The same applies to those formal interviews that could not be recorded and the observations.

To get a more complete picture and to account for the limitations of retro-perspective data collection, we also collected an array of project related documents such as project scope and vision document, documentation of system selection, minutes of project team meetings, user meetings and steering committee meetings, requirements document (worksheets) and the catalogue of open issues (worksheet).

1 The interview-guideline is available at https://goo.gl/54FeGp
The formal interviews helped us to identify if and how stakeholders were able to develop congruent and actionable understandings during the process-phases. Moreover, they enhanced our understanding about social capital characteristics that impact these processes. The observations and casual conversations helped us to increase confidence in the internal validity of our observations and emerging explanations. Data collection ceased once the data reached so-called ‘theoretical saturation’ (Birks et al., 2013).

3.3 Data Analysis

We intend to derive novel theoretical insights (i.e. interrelation of social capital and knowledge integration) by ‘observing’ (i.e. collecting empirical data using multiple methods) and ‘analysing’ (i.e. making sense of observations by means of constant comparison and theoretical sampling) (Strauss and Corbin, 1998; Suddaby, 2006, p. 633). Data analysis, therefore, follows the tradition of grounded theory as proposed by Strauss and Corbin (1998). This method allows us to become familiar with the relevant literature and develop so-called theoretical sensitivity, that is, “the attribute of having insight, the ability to give meaning to data, the capacity to understand, and capability to separate the pertinent from that which isn’t” (Strauss and Corbin, 1998, p. 42). We employed two analysis cycles to approach this objective.

The first cycle of data analysis occurs in parallel to data collection. This enabled us to continually adjust our guidelines used during interviews and informal conversations and thus to resolve inconsistencies and gaps that emerged during analysis. Following the guidelines of Miles and Huberman (1994) and Wynn and Williams (2012), two researchers constantly coded the data and compared, analysed and interpreted their results. Furthermore, emerging findings were constantly discussed within the research team. Coding primarily focused on decomposing social capital configurations (i.e. finding evidence for opportunities, motivation and ability of the actors to integrate their knowledge and views), but was open to identify other causal structures. In a second cycle, we analysed the resulting codes and tried to identify how social capital reflected by actors’ opportunity, motivation and ability impacts knowledge integration outcomes such as shared understandings (i.e. pattern coding). Last not least, we tried to verify the explanatory power of the identified mechanism by checking them against alternative explanations. To address coding bias and to improve the internal validity of our findings, the emerging code-structure and potential causal mechanisms were constantly discussed within the research team.

4 Analysis and Findings

To structure our analysis, we temporally sequence the project into pre-implementation, implementation, and refinement phases. Within each phase, we discuss the characteristics of the social capital and its impact. Utilizing the opportunity-motivation-ability framework, we try to unveil the nature and structure of the relationship (i.e. their opportunity, motivation and ability to integrate their knowledge and develop common understandings) and how it may have shaped the outcomes of each phase.

4.1 Pre-Implementation Phase

In order to select an adequate successor of CSO, the project team developed high-level requirements. These requirements were developed against functionalities inscribed in CSO, project objectives, and budget-restrictions. In developing these requirements, the IT consultants basically draw on the input of the clinicians that were part of the extended project team. Since all IT consultants have a professional background as healthcare assistants, they also considered their prior experiences and practical knowledge. As a consequence, the high-level specifications predominantly focused on functionalities and workflow-specifics that were addressed by the involved physicians or derived from the knowledge and prior healthcare experiences of the IT consultants.

The project team shortlisted the bidders against these requirements. Thereafter, three vendors were asked to prepare a half-day-long product demo based on exemplary use cases. The use cases were developed by the project team and considered aspects of all end-users they were aware of. Subsequent to the demos, members of the extended project team were asked to evaluate the systems by means of a structured survey as prepared by the project team. Based on the unambiguous results of this survey, the project team concordantly agreed upon CSN as successor PDMS.
The project team adopted various measures to ensure clinical stakeholders’ involvement, create opportunities to interact. As to that, the pre-implementation phase was characterized by a significant volume of meetings, workshops and project roadshows. During these meetings, the project state was reviewed and vendors’ responses to key requirements were discussed with clinical stakeholders. In addition, the roadshows were aimed to keep end-users beyond the extended project team up to date and to prepare them for the upcoming system change. Overall, the project team reported that users’ “involvement was impressive” (IT3), that “several hundred people” (IT4) attended the road shows. Furthermore, most medical stakeholders attended the product demonstrations and engaged in the evaluation survey.

Considering the relational motivation dimension of social capital, data analysis reveals that, though the stimuli were quite different, a robust general commitment to replace CSO unified physicians and the project team. Notwithstanding physicians’ high workload, their strong involvement reflects their willingness to act on this common goal. Furthermore, the project team was able to sufficiently mobilize physicians’ knowledge and experiences. In this respect, we found that physicians were able to understand and deal with the technical and formalized language and hence to collaborate with the IT consultants on the requirements document.

In contrast, data analysis shows that nurses’ ability to contribute requirements was rather limited. They had difficulties to transform their experiences and knowledge into formal requirements. Instead of engaging in discussions, renegotiating and translating nurses’ needs, the IT consultants decided to capitalize on their own knowledge and experiences. We found that mutual trust and a common identity between the IT professionals and the nurses motivated them to define requirements on behalf of their former colleagues. Their limited ability to contribute knowledge and experience is particularly evident in two events. First, the project team distributed the selection criteria to all medical departments involved and requested feedback and improvements. However, none of the nurses provided feedback. In this regard, our informants admit that they had problems to understand the language used to specify the requirements (NU1). Second, nurses reported that they were not able to sufficiently evaluate the shortlist candidates during the system selection process. They emphasized the need to interact with the systems, but “using or testing it was not possible” (NU3). In contrast, physicians (PH1, PH3) stated that they have not faced any difficulties in specify requirements, asses the systems and, eventually engage in developing common understandings with the IT professionals.

Considering evolving understandings and their consequences, we found that involved stakeholders were not aware about major inconsistencies within their understandings about how the new PDMS can and will be integrated within their medical practices. Physicians expected to get a system that addresses the weaknesses of CSO and enables them to make better decisions faster. Although nurses are responsible for entering and maintaining most data, they did not recognize that they have to bear much of the costs of physicians’ requests. In contrast, they envisaged a system that simply replaces the existing PDMS and advances their documentation duties (e.g., due to higher usability and improved integration of medical devices), but does not subject existing workflows to change. Third, IT consultant’s focus was to replace the system with a successor that meets regulatory and architectural needs. Data indicates that physicians capitalized on their opportunities to influence the system selection process, while nurses’ willingness and ability to defend their interests was limited. Nurses relied on the experience and goodwill of their prior colleagues instead of assessing the impacts of existing requirements on their work practices and contributing their knowledge. Consequently, stakeholders failed to negotiate those system characteristics that ensure alignment with the needs of nursing. Particularly, the complexity of CSO, the role of nurses as primary users and the effort required to align the PDMS and existing practices has been underestimated.

The consequences of the outcomes of these mechanisms did not surface initially. If anything, all stakeholder agreed that CSN was superior to its competitors in almost every aspect. The unambiguous decision to implement CSN further gave the impression that IT, physicians and nurses acted in concert towards a common goal.
4.2 Implementation Phase

The objective of the implementation phase was to customize CSN and to introduce it at the ICU departments. Initially, stakeholders had to determine how CSN must be adapted to meet the requirements of the ICUs. Hereto, several interdisciplinary workshops with representatives of all professional groups and hierarchical levels concerned were conducted. During these workshops customizations such as general parameter settings as well as the sequence, content and structure of forms were fixed. In addition, several subsequent meetings have been assigned to discuss department-specific adaptations. The project team documented those requirements the stakeholders agreed on by means of worksheets and PowerPoint slides. To ensure transparency for all stakeholders and to communicate the progress made, roadshows and multiplier-events were arranged.

After the requirements have been specified and approved, the vendor staff and IT consultants began to customize CSN. Utilizing the worksheets, customization progress and evolving issues were discussed during follow-up meetings. Since the volume of requirements exceeded the project teams’ capacity, also priorities were set within these meetings. During the customization process, all members of the extended project team were able to interact with and review the latest version of CSN. Once key requirements have been implemented, users were trained and user acceptance tests were conducted. Afterwards, CSN was rolled-out gradually (i.e. data of patients already set up in CSO were maintained there, while new patients were administered in CSN only).

At least initially, this phase was characterized by a vast number of cross-functional workshops and meetings. Although there have been many opportunities to contribute to the customized version of CSN, nurses gradually downscaled their involvement and interactions with the project team. Data shows that nurses have been significantly less involved than physicians, the project team has not consciously reduced interactions with nurses (ITPM). However, the IT consultants acknowledged that “it was more pleasant to work with physicians” (IT2). As a consequence, the project team was found to deal more closely with physicians and their requirements. In this regard, analysis reveals that nurses’ ability to actively contribute to the customization of CSN was limited. Although, the project manager prepared a dictionary, which listed important technical terms and outlined their meaning, nurses admit that they had difficulties to understand discussions during the meetings. For instance, NU1 stated that he “could not make out a single word”. NU2 complemented that he did not comprehend what they have talked about and hence “could not participate”. Moreover, data reveals that nurses were not able to effectively cope with the requirement worksheets. Although these worksheets improved communication and knowledge integration between the physicians and the project team, we found nurses to be unable to imagine how these requirements will materialize and impact their work practices. Specifically, nurses were found to have problems to conceive the differences between CSO and CSN in abstract discussions and representations, particularly its abilities and limitations. Subsequently, it was difficult for them to identify and formulate necessities for adjustments sufficiently precise. As to that, IT2 stated that physicians contributed “good inputs and complex answers, which are very valuable for our work”, while nursing personnel returns “rather imprecise answers and general input”. Here, IT consultants failed to act as a knowledge broker between experts of CSN (i.e. vendor’s staff) and CSO (i.e. nurses). Instead, IT consultants continued to pursue the strategy to formulate nurses’ requirements. However, the lack of shared systems of meaning between vendor, IT consultants and nurses facilitated misinterpretation of nurses’ actual needs, particularly regarding stability in their processes.

As customization of CSN advanced, nurses’ willingness to contribute their knowledge continually decreased. Trust and identification with the project team and hence nurses’ motivation was particularly debilitated by their perception that the project team preferred working with physicians and that both vendor’s employees and the IT consultants are either not able or not willing to recognize and implement their critical requirements. For instance, although approved, many of nurses’ requirements could not or only partially realized as they expected. With regard to the project team, NU2 stated that I “should only promise things that I can keep”. Moreover, NU3 added that the requirements of “Mr. Professor are more important than those of a healthcare assistant”, which indicates that medical needs have been prioritized.
During roll-out of CSN, system failures, issues related to the integration of medical devices and misalignment with nurses’ workflows caused several critical disruptions within the healthcare delivery process. Moreover, nurses realized that using CSN requires them to increase their documentation effort by approx. 30 minutes per patient. As a consequence, the volume of complaints, incident reports and change requests brought in by nurses massively increased. Though, the roll-outs in other departments limited the project team to address and resolve emerging issues at short notice. Instead, they asked for detailed documentation of system failures and misalignments. As a consequence, nurses’ perception that the project team “did not take us seriously” (NU3) reinforced and their willingness to participate constructively in resolving the issues declined. Ultimately, both parties were unable to engage in purposeful discussions over possible solutions to resolve the issues.

Although nurses had considerable chances to ensure alignment of CSN with their needs, data analysis revealed that a viscous cycle of missing abilities, decreasing motivation and passed opportunities obstructed knowledge integration between the project team, physicians and nurses. The structure and character of relations and interactions within the extended project team inhibited processes of negotiating expectations and interests. Subsequently, developing congruent understandings of critical requirements was rendered difficult. Instead, inconsistencies in the understandings of the potentials and limitations of CSN and the consequences of physicians’ extended requirements on nurses’ workflow solidified. Furthermore, many of the requirements did not fit with the inherent structure and logic of CSN. Subsequently, the resulting customization of CSN was found to be highly complex and misaligned with nurses’ operations (e.g., cluttered data entry forms).

Extended project team members, particularly nurses hardly interacted with the development versions of CSN. Considering nurses, data indicates that this can be primarily attributed to their decreased commitment to the project. As a consequence, the misalignment of CSN with nurses’ expectations and practices emerged not until the user acceptance tests. In contrast to the physicians, who were satisfied with the adaptations (PH1: CSN “meets critical requirements and it is usable for daily routines”), nurses were deeply disappointed. Functionalities and workflows implemented in CSN and, more importantly, its complexity turned out to complicate their attuned practices. As to that, CSN did not reflect their ideas of an improved successor. During roll-out, even IT consultants and physicians realized that nurses are required “to work more” (ITPM).

However, interventions and complaints during roll-out did not lead to significant improvements. Rather, a lack of goodwill between the project team and medical stakeholder obstructed knowledge integration. Hereeto, capacity constraints and reinforced distrust between nurses limited opportunities to resolve strongly divergent assessments about the severity and roots of system failures and misalignments that contradicted stability requirements of healthcare delivery. As a consequence, issues have been escalated to the steering committee, where nurses argued to bring CSO back to operation.

4.3 Refinement Phase

As laid out above, the implementation process and the emerging results hampered the cross-functional collaboration between nurses and the project team seriously (i.e. loss of trust, respect, and identification). However, top management team made clear that there is no way back to CSO. Instead, the project team was asked to fix the most critical issues and transfer CSN into normal operation. Since the previous project manager was not available any more, the steering committee assigned one of the IT consultants with healthcare background as project manager. Moreover, the project team was extended by an IT-savvy nurse in order to compensate the capacity-downscaling by the vendor of CSN. The primary objective of the newly blended team was to identify the most critical issues and to modify CSN as to that healthcare delivery, particularly nurses’ workflows stabilize.

During the refinement phase, nurses’ motivation to actively contribute to the improvement of CSN significantly increased. As a consequence, user meetings have been reinstalled. They created opportunities to jointly discuss emerging issues, share and integrate knowledge about the possibilities and limitations of the system and develop strategies about how to adapt CSN. Furthermore, the project team increased
its presence at the ICUs, particularly through the newly assigned project member. The new project members did not only contribute to re-build trust but also had the ability to capitalize on their shared language with nurses and their practical experiences with CSN. To this end, they enabled the project team and medical stakeholders to develop shared interpretations about the actual deficiencies of CSN, opportunities for improvement and limitations.

The modifications the social structure (i.e. replacing and adding members to the project team) facilitated the development of congruent understandings about the significance of the issues reported and limitations of CSN. Furthermore, nurses and the project team gained understanding about each other’s workload and the need to prioritize issues. Ultimately, social capital inherent in the adapted structure of relations enabled IT and medical professionals to jointly identify and solve the most critical issues. Furthermore, stakeholders were able to align their requirements with CSN’s capabilities and, where necessary, to adapt their workflows to the structure and logic inscribed in CSN. Most stakeholder agree that stability in healthcare delivery could have been largely restored during this phase. As to that, understandings of the IT consultants and nurses were found to become compatible to a sufficient extent, and enabled them to perform behaviours that were aligned with others’ expectations.

Although not all requirements could have been addressed, CSN could be transferred to standard operations. In course of regular change management processes, still existing misalignments will be gradually resolved. Furthermore, data indicates that collaboration during the refinement-phase enabled medical stakeholders to solve some problems on their own.

5 Discussion

Prior to discussing our findings, we acknowledge the limitations of our study. First, we are focusing on a single, but rather complex HIS implementation project. Consequently, any conceptual insights will need to be verified through subsequent research. Second, we were able to retrospectively collect case study data on early phases of the project only. By providing ‘empirical corroboration’ (Wynn and Williams, 2012), further research employing multiple longitudinal case studies may increase the confidence in the causative mechanisms identified here. Considering these limitations, we outline and discuss below the contributions and implications of our study.

5.1 The Significance of Congruent and Actionable Understandings

Our study provides empirical evidence for the notion that conscious adaptions are key for the success of IS initiatives in healthcare (Poon et al., 2004; Fichman et al., 2011). In line with recent research (van den Hooff and de Winter, 2011; Wagner et al., 2014), we demonstrate that integrating operational application domain and IT knowledge is critical to align HIS and medical reality. However, recent research particularly emphasizes the significance of IT professionals’ application domain knowledge. Though our study confirms these findings, we argue that both IT and medical professionals must engage in iterative processes of consensus building. By explicating, sharing and relating their knowledge and expertise, they are eventually able to develop congruent and actionable understandings about how to adapt HIS and medical practices. Hereof, we show that social structure must enable medical stakeholders to gain sufficient understanding about the complexities, possibilities and limitations of IT.

Furthermore, this study highlights that divergent and historically decoupled professional occupations need to continuously negotiate and interrelate their viewpoints and expectations on HIS initiatives. As to that, we show that, physicians’ ambition to exhaust all technical possibilities in order to enhance variability of medical treatment (e.g., decision support and advanced analyses) may induce requirements on HIS that counteract the needs and objectives of nurses. A lack of congruent understandings amongst all stakeholder thus obstructs alignment of HIS with medical reality in the aggregate. Subsequently, project managers need to take into account existing power relationships and horizontal specialization. To this end, they are well advised to establish measures that ensure that project activities sufficiently reflect differentiation so as to all occupational groups perceive benefits as outweighing the challenges they will face (Lapointe and Rivard, 2007).
Tiwana (2012) argues that greater IT knowledge of none-IT-professionals is critical for projects dealing with the adoption of new systems, processes, and tools with which IT professionals lack experience. Since medical professionals’ knowledge about the possibilities and limitations of the system was found to be critical for purposeful adapting CSN, balancing complexity and usability, and interrelating it with existing medical practices, our findings provide stark support for this argument. Thus, we argue that practitioners should put a particular focus medical professionals’ awareness for the complexities, chances and limitations of HIS as well as for the characteristics of implementation and customization processes (i.e. IT knowledge).

5.2 How Social Capital Facilitates Aligning HIS

Recent studies revealed that social capital positively impacts knowledge integration between business and IT (van den Hooff and de Winter, 2011; Wagner et al., 2014) and the extent to which IT professionals are able to align HIS and medical practice (Weeger et al., 2015). The contribution of our study is a deeper understanding about how social capital facilitates knowledge integration within HIS implementation projects and how social capital and knowledge integration coevolve.

Our analysis indicates that, although particularly necessary in ‘decoupled’ organizational contexts, creating opportunities to interact does not constitute a sufficient condition for creating congruent understanding. Rather, there is evidence that it is not the volume of meetings, but the qualitative characteristics of social relations that facilitate evolutionary processes of aligning medical realities and HIS over time. Particularly, the goodwill of project stakeholders caused by shared interests and a common identity enables a project team to mobilize necessary resources. To this end, prior findings in healthcare suggest that opportunities for social interactions strengthen commitment of IT professionals and medical stakeholders to a common goal (Weeger et al., 2015). We found some evidence for a similar effect. Declining structural capital negatively impacted motivation to contribute. Moreover, analysis indicates that both effects are mutually reinforcing. Qualitative research that goes beyond a single case study may investigate how opportunity and motivation mutually influence each other.

In addition, unilateral motivation during negotiation of objectives and critical requirements, was found to cover cognitive gaps between stakeholders. Thus it inhibits them to integrate their idiosyncratic knowledge as well as to disclose and negotiate their interests. During implementation phase, on the other hand, our findings indicate that without sufficient relational motivation, effective adaptation of HIS is not feasible. Comparing physician-IT relationships to nurses-IT relationships, results provides support for the notion that weaker relational motivation in early stages could foster knowledge exploration, while strong ties facilitate exploitation (Eriksson, 2013). As such, findings indicate that benefits and risks of social capital are task-dependent (Adler and Kwon, 2002). Further research may focus on potential risks of strong bonding social capital within IT project teams and related indicators.

This study also provides evidence for the notion that the relationship between social capital and knowledge integration is not unidirectional (Rousse and Deltour, 2012). As to that, we show that social capital affects knowledge integration, and in turn, the outcomes of knowledge integration (i.e. understandings) impact project team’s social capital. We contribute to literature by showing that failures in developing congruent and actionable understandings yield to misaligned project deliverables that, in turn, may significantly impact actors’ goodwill to contribute critical knowledge. Without heedful interventions, these effects mutually reinforce each other and hence obstruct conscious adaption and interrelation of HIS and medical practices.

Last not least, we show that the ability of actors to mobilize social relations and the resources available through these relations is particular contingent on actors’ ability to integrate knowledge, expertise and interests. Although actors may be highly motivated and there are sufficient opportunities for social capital transactions, without shared representations, interpretations and systems of meanings, effective adaptation of HIS and medical reality is hardly to achieve. Supporting prior evidence on the significance of the cognitive dimension for purposeful collaboration between medical and IT professionals (Weeger et al., 2015), we discuss how such ability is influenced in practice in the following section.
Considering managerial implications, our study illustrates the practical value of social capital analysis using the opportunity-motivation-ability framework. Utilizing this common framework to assess and monitor the social capital within HIS implementation projects may enable practitioner to more effectively govern knowledge integration surrounding HIS initiatives. To that end, practitioners are well advised to monitor and balance social capital reflected by opportunities, motivation and ability in order to effectively mobilize and integrate knowledge and expertise available.

5.3 How Artefacts Impact Cognitive Ability

In view of actors’ ability to integrate their idiosyncratic knowledge, our findings highlight the importance of the artefacts employed within social interactions. Findings indicate that these artefacts have the capacity to enable or obstruct actors to mobilize the resources available within social relations. Hereof, we revealed that physicians were able to explicate, share and relate their knowledge during all project phases, regardless which tools have been used. They had not difficulties to form a solid opinion about the candidate systems based on PowerPoint slides, to contribute and discuss high-level requirements captured in a word document and to engage in discussions about customizations and parameter settings represented in abstract worksheets. Subsequently, evidence is given that the artefacts employed enabled physicians and IT consultants to transfer, translate, and transform critical knowledge embedded and invested in their practices. In contrast, data reveals that, interacting with IT consultants and physicians, nurses had major problems sharing, reflecting, and utilizing these artefacts.

Prior research shows that issues to knowledge integration can be resolved by an investment of time in the discussion over objects with sufficient capacity (Carlile, 2004). Such objects must be flexible enough to adapt to local needs and constraints of all parties involved and yet not robust enough to maintain a common identity between these (Star and Griesemer, 1989). Effectively used, such objects facilitate knowledge integration and build shared understanding across the boundaries of occupational communities (Levina and Vaast, 2005; Levina and Vaast, 2006; Rosenkranz et al., 2014). However, the objects employed in this case are found to be unable facilitating knowledge integration between nurses, IT consultants and physicians. As to that, our findings emphasizes employed artefacts’ potential to reinforce or mitigate the social capital embedded within the network of relationships. Further research may explicitly investigate how social capital and boundary objects evolve, particularly how social capital enable artefacts to become boundary objects-in-use (Levina and Vaast, 2005).

In this study, we found nurses to identify misalignments and precisely formulate their requirements as they begun to use CSN in practice. Hence, we conclude that the system itself became a boundary object-in-use. By this point, nurses were able to effectively engage in discussions about characteristics and functionality that are critical and to negotiate acceptable limitations and trade-offs. We therefore strengthen Heeks (2006) notion that traditional, structured development methodologies seem to be inadequate for healthcare. Thus, we recommend practitioners to deploy iterative methods and to put users in touch with design at the earliest opportunity.

6 Conclusion

This research was aimed to gain understanding about the mechanisms that enable successful HIS implementation in hospitals. As to that we contribute to theory and practice in several ways. We demonstrate that the success of HIS initiatives is particularly dependent on the capacity of involved actors to integrate their idiosyncratic knowledge and to develop congruent and actionable understandings. Looking at the conducting paths for integrating knowledge, our findings further show that stakeholders’ opportunity, motivation and ability to capitalize on existing knowledge and experiences are critical for aligning HIS and medical reality. Taking a qualitative approach, we extend existing research by illustrating how social capital and knowledge integration outcomes coevolve. Overall, our results highlight the importance of social capital for knowledge integration during HIS initiatives. Medical and IT professionals’ collaborative endeavours seem to produce valuable solutions that balance divergent stakeholders’ concerns when opportunity, motivation and ability to integrate their knowledge, expertise and interests are effectively managed.
References


