8-5-2011

Applying sense-making to integrated health IT: Renal care in the UK and Sweden

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ABSTRACT

Information technology (IT) in healthcare combines opportunities for improved integrated healthcare delivery with barriers which include clinician resistance and low adoption rates. While national level initiatives are taken to promote electronic healthcare (e-health), it is at the grassroots level that their outcomes unfold. This paper employs sense-making theory to extend prior research on the implementation of health IT by investigating the introduction of IT into renal care units in the UK and Sweden. Issues such as management support, user training, usability of systems and perceived benefits of technology were found to have a direct impact on users' sense-making processes. The manner in which people make sense of imposed systems has far reaching effects, as the gap between intended results and actual outcomes is not limited to disparities between micro-level end-users alone, but spans multiple levels including higher authorities, as well as individuals at the grassroots level.

Keywords

Integrated healthcare, e-health, sense-making

INTRODUCTION

Digitalisation of health systems to consolidate patients' data is a priority in many countries (European Commission, 2009; Carter, 2008) and these efforts should be steered in the right direction to bring about positive results. The proliferation of specialists and multi-specialty centres having tailor-made records and systems (Gröne and Garcia-Barbero, 2001) highlights the need for connectivity between isolated systems and processes (Hobday *et al.,* 2005).

Despite the potential benefits of e-health (Bates *et al.,* 2003; Goldschmidt, 2005; Herzlinger, 2006) its adoption has been relatively slow (Ilie *et al*., 2009). Top-instigated measures have to contend with grassroots level dynamics as the success of any implementation depends on how users perceive and make sense of imposed changes (McNulty, 2003). We employ sense-making theory (Weick *et al*., 2005) to analyse two cases from the UK and Sweden. The clinical context is the promotion of process integration within renal care. The general trend towards population ageing (Lutz *et al*., 2008), the predominance of renal disease as a chronic ailment affecting the older population (Stengel *et al*., 2003), and the close relation between renal disease and other ailments (Zoccali *et al.,* 2009) point towards a need for quality healthcare in this area, with proper consolidation of patient data from different departments. The use of e-health technologies for digitalised records is a step towards meeting this need, as they can provide quick, easy and timely access to patient data (Alshawi *et al.,* 2003; Bates *et al*., 2003; Goldschmidt, 2005).

This paper employs a conceptual framework illustrating how sense-making affects health IT implementation at the individual user level. The next section discusses the theoretical underpinnings of this study. This is followed by our conceptual framework and research methodology. We then present the research setting, our findings, and a discussion of the same. A refined framework and insights on how this knowledge may be used to steer ongoing as well as future implementations for improved results are then provided.

THEORETICAL UNDERPINNINGS

Studies on health systems implementation and sense-making are limited and have not been extended to the level of a cross-country comparative study (Weick *et al.*, 2005; Jensen *et al*., 2009; Jensen and Aanestad, 2007; Kitzmiller *et al*., 2010). Healthcare is a dynamic field (Hunter, 1996) with conflicting ideas regarding work practices and the handling of clinical data (Ilie *et al*., 2009). Differences in the interpretations and expectations of various user groups with regard to technology use,

and how these result in deviations from expected outcomes has been highlighted by previous IS scholars (Ginzberg, 1981; Orlikowski and Gash, 1994; Davidson, 2006). This paper builds on sense-making theory to illustrate the nuances of e-health implementation, and how the emergent use of health IT amongst clinicians varies from the results envisioned by other stakeholders. We suggest that the processes and influences of sense-making are not limited to the micro stratum but span several levels and user groups, resulting in variations in expectations and results not just at a single level, but between different user groups and levels.

Health Systems Integration

The fragmented nature of healthcare and the need for safe, accessible and high quality health services have triggered increased focus on integrated e-health (European Commission, 2009; Iakovidis, 1998). The possibilities of increased interconnectivity, reduced medical errors, lower costs, standardised records and improved access to complete and consistent patient data have helped fuel this interest (Lutchens and Collins, 2005; Bates *et al*., 2003; Goldschmidt, 2005; Herzlinger, 2006; Waring and Wainwright, 2000; Ilie *et al*., 2009; Atkinson *et al*., 2002).

While decisions and regulations may originate from higher authorities, micro level actors play a significant role in determining their impact (McNulty, 2003). IT implementation requires convergence of visions not only between different user groups at different levels of society, but also between individuals at the same organisational level.

Challenges to health systems integration include data accuracy, consistency and integrity (Goodhue *et al*., 1992; Alshawi *et al*., 2003; Kisilowska, 2006). There may also be social and cultural resistance due to existing (paper based) practices for health information exchange (Atkinson *et* al., 2002; Hartswood *et al.*, 2003). Management support and user training help ease the transition by familiarising users with new systems (Watson and Haley, 1998; Shaw, 2001). This also combats the lack of exploitation of technology due to users being unaware of all the functionalities available (Shaw, 2001). Unfamiliar user interfaces and lack of IT skills are other reasons why clinicians resist technology (Hier *et al*., 2005), often resulting in the use of both paper as well as electronic records in hospitals. Such dual use of paper and electronic records is however unadvisable (Shaw, 2001).

Though technology may be a driver for change, it can also be a barrier to further technological change as stakeholders may be oblivious to the benefits of new systems due to their preference for other applications (Herzlinger, 2006; Atkinson *et al*., 2002). The cumulative effect of multiple interpretations and interactions between stakeholders could have an influence on future directions, as conflicts may arise, subside or lead to compromises (Atkinson *et al*., 2005). Further, the success of technology implementation varies across locations, contexts and stakeholders (Dixon, 2007). Clearly, technology is a carrier, not just of change, but of meaning as well, with diverse user groups relating to it differently.

Sense-making with IT in healthcare

People embark on the sense-making process when attempting to construct meanings out of their situations, especially when there is an element of uncertainty or ambiguity involved (Weick, 1995). This human element becomes more prominent at the grassroots level where the dynamics of sense-making are clearly evident (McNulty, 2003). Extending this to an IS context, the socio-cognitive nature of interaction with technology means that people's perceptions of technology affect the way they use systems. Their efforts to make sense of technology result in 'technological frames' which can act as either enablers or barriers to effective implementation depending on the congruency between frames formed by different user groups (Orlikowski and Gash, 1994).

The episodic nature of mediation of technology use (Davidson and Chiasson, 2005) determines whether systems are *adopted* or *adapted* by workers (Orlikowski, 2000; Barley, 1986). This is linked to users' ongoing sense-making process wherein they select cues from past experiences to gain a retrospective understanding of events (Weick *et al*., 2005). The isolation and bracketing of cues by different users (Jensen *et al.*, 2009; Weick *et al*., 2005) reiterate the context-dependant nature of technology implementation. Mismatches between user expectations and reality result in ambiguity, causing users to interpret their experiences, thus stimulating technology mediation and sense-making (Davidson and Chiasson, 2005; Weick *et al*., 2005).

Whether e-health necessarily leads to improved healthcare is debatable since its success is highly dependent on factors such as user acceptance and appropriate use of technology. While some welcome the use of healthcare IT due to its possible benefits (Bates *et al.,* 2003; Goldschmidt, 2005; Herzlinger, 2006), others fear it is a control mechanism which interferes with their accustomed work processes (Jensen and Aanestad, 2007). At a higher level, there have been efforts by the World Health Organisation (WHO) and the European Commission to promote e-health to facilitate cross-border healthcare. However, the

visions and expectations held by such entities have not seen complete fruition. Expectations vary across levels, and there are differences in the way people make sense of e-health technologies, resulting in different targets, expectations and outcomes.

Technology by itself is representative of the *intended* goals of the organisation, as it is configured to address work tasks in the ideal or optimal manner of execution (Orlikowski and Robey, 1991). It is *symbolic* of an organisation's vision which may be a far cry from actual emergent practice (Eason, 2001; Orlikowski, 2000). This chasm between targets and outcomes may be partly explained by the complex sense-making process which occurs at micro levels, as the combined effect of multiple perspectives and actions causes deviations from originally intended goals (Jensen *et al*., 2009; Jensen and Aanestad, 2007; Weick *et al*., 2005).

CONCEPTUAL FRAMEWORK

Figure 1 depicts sense-making amongst system users. This dynamic process determines whether expectations are fulfilled or not, as the cumulative and diachronic interactions of multiple stakeholders mould actual outcomes with their intertwined perceptions and actions.

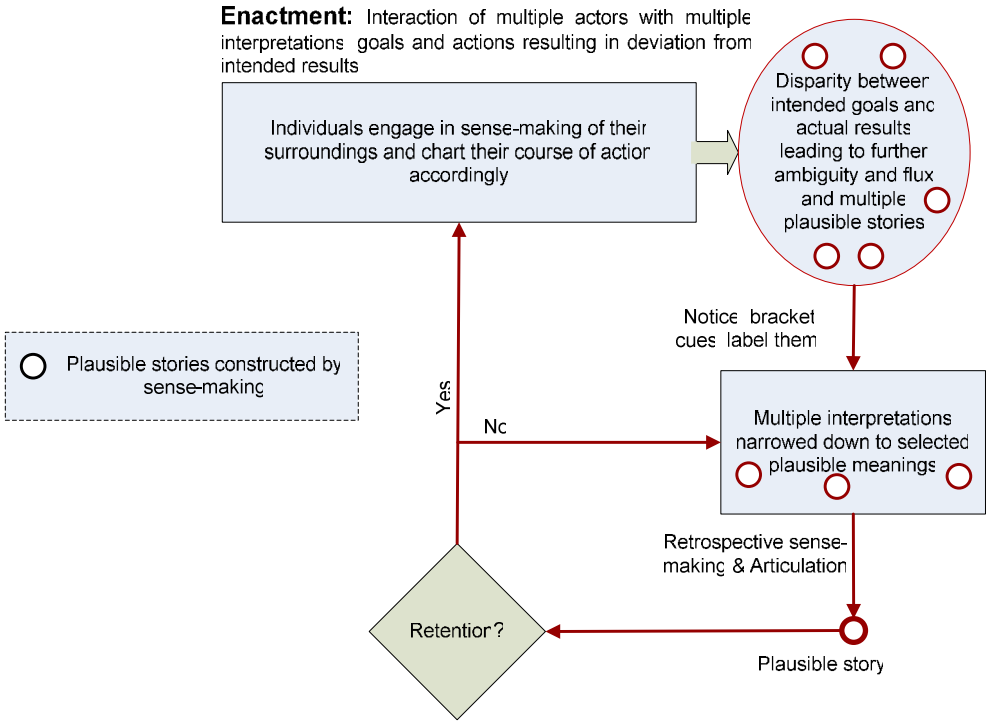

Figure 1 Conceptual framework for health IT implementation in the context of sense-making theory

When trying to understand newly implemented systems, users have to develop new skills, and gauge how these changes fit in with their work needs and expectations. The different aims of user groups are a challenge in IT implementations, as systems need to cater to these diverse requirements, and there is often a gap between expectations and delivered functionalities. This prompts users to try and 'make sense' of their newly prescribed practices. They form their own interpretations of their environment, and chose the most plausible and feasible course of action. Whether they retain this choice depends on if it affects their work; if it hinders their accustomed practices, they may re-embark on the sense-making process and find workarounds. Once they settle on a plausible understanding of their new systems, the manner in which they engage with these technologies is not isolated from their work setting. The manner in which an individual interacts with his environment is likely to affect how others make sense of their environment too, as users' perceptions are formed by observing their peers and surroundings. Our conceptual framework illustrates these points, and can be used to explain how the iterative sense-making process influences the implementation of health IT.

RESEARCH METHODOLOGY

This qualitative study employs sense-making theory to analyse health systems integration in renal care in the UK and Sweden. Secondary sources including government publications, WHO reports and academic literature were used to study the e-health situation in both countries. Our investigation of the two renal units spanned three years (2006-2009) with multiple visits to each location. 20 interviewees from multiple levels were identified and interviewed during our visits, giving a total of 40 episodic interviews. The spacing of our data collection allowed us to analyse whether emergent use of systems was in line with initial expectations as changes due to a newly implemented system may become visible only after a certain period of time (Hinings, 1997).

The interviews adopted a semi-structured style with open-ended questions rather than objective or leading questions (Silverman, 2006; Yin, 1984). Our encouragement of narrative discourses by interviewees was in agreement with our approach of episodic interviewing (Flick, 2000), which acknowledges the contextual nature of knowledge. This gave us insights as to how they actually made sense of new technology at their work place. Where possible, interviews were recorded with respondents' informed consent. These were then transcribed and analysed by identifying themes which were used to link the data to our underlying theoretical concepts.

INTEGRATED HEALTH IT IN RENAL CARE IN THE UK AND SWEDEN

There have been active efforts by EU-level authorities to promote the digitalisation of healthcare (European Commission, 2009). Our high level documentary analysis confirms the superior quality of health systems and the involvement of the governments in promoting e-health in the UK and Sweden. Both countries are acknowledged e-health leaders with high ratings for e-health indicators when compared to most other EU-27 countries (Dobrev *et al*., 2008).

To study health IT implementation in deeper detail, two renal units in the UK and Sweden were investigated. One study is based on a hospital in Birmingham (Hospital A), and the second, on a hospital in Orebro county in Sweden (Hospital B).

Research Setting in the UK

The UK government has shown significant initiatives in promoting the use of technology in the healthcare sector. The government invested huge amounts in the National Programme for IT (NPfIT) which aimed to promote the use of IT for integrated healthcare in the UK following a top-down approach. This was however recently reconfigured to adopt a more devolved approach, to empower clinicians in making decisions in this area.

Hospital A provides dialysis services for a population of approximately 1.7 million in England's West Midlands, and has the largest renal transplant programme in the UK. Its use of multiple data systems results in data silos. These systems include the Lorenzo system for patient registration and the Prescribing Investigation Communication System (PICS) for medical and medication data storage. In spite of the availability of such systems, handwritten notes are still used. Employees prefer using their home made documenting system, Renal Commons. Information is frequently shared verbally and using handover documents.

Research Setting in Sweden

Unlike the UK's nation-wide attempts to incorporate IT in healthcare, Sweden has focused first on more localised solutions, followed by an increased alignment of IT infrastructure between its various regions. There have been recent efforts towards a national patient summary record in its National Patient Overview (NPO) venture, but this is still in progress.

Hospital B has developed a joint database to share data with two other dialysis units, in an attempt towards localised systems integration. It uses an integration application, Melior Journal (MJ), which is manufactured by Siemens. A patient administration system, InfoMedix is also used. There are two national databases for renal replacement therapy purposes in Sweden. These are used to compare incident results nationally. A web portal, Klinisk Portal, provides a read-only overview of these technical databases, but there is no linkage and information sharing between the systems.

FINDINGS

While both countries are well-developed and recognised forerunners in e-health, they have different approaches to integrated healthcare. The UK's NPfIT project adopted a centralised approach to healthcare, and has now recently announced intentions to revert to a more decentralised approach. Sweden however has a more fragmented health system, which has had barriers to patient data exchange as each county lays down regulations independently (eHealthEurope, 2009). Sweden's adoption of a formal e-health strategy in 2006 was relatively late compared to the UK. With this brief prelude to the health system in both

countries, we shall go into the details of the main object of this study, i.e., the practices of end-users in the renal units under investigation.

Hospital A (United Kingdom)

Significant inertia was faced in the adoption of new systems in Hospital A's renal unit. There was a wish for increased management support. Senior management expected the Lorenzo system to meet auditing requirements, but did not anticipate clinicians' needs for improving patients' care through integrated care records. Limited training was provided on the PICS and Lorenzo systems, with trained staff available only during normal office hours and not over weekends. Consequently, paper records were still in use. Manual entries made over weekends had to be re-entered into the system by trained workers during the week. Workers acknowledged that the use of hand-written records caused delays at times as well. The old home-made document system, Renal Commons, was still in use as people liked the flexibility it gave them.

"Since it is a home-made documenting system we can decide ourselves what we want to put in, which is perhaps good and bad." – Staff Nurse

"We have some staff who have developed their own systems… to make life easier."- Staff Nurse

Users were not familiar using the new handover document and found it more convenient to use their own hand-made documents as they had control over what information they included.

"The Trust has made a handover sheet that they want us to use but we haven't had proper training in it… Our hand-made one is more user-friendly. We can also delete and add new stuff on the one we have made ourselves." - Staff Nurse

Hospital B (Sweden)

Hospital B developed a joint database for data sharing with two other dialysis units, in a venture towards localised systems integration. Though workers here were more receptive to the new systems when compared to workers in Hospital A, there were still issues in the take up of these systems. Management support was in question as managers were not available outside working hours.

The MJ system was used for recording medical notes which were regularly printed and shared between staff. When the MJ system was first introduced, training was provided by the provider. Later, training was conducted by in-house personnel.

"Siemens Nixdorf used to train the staff, but now we train new staff ourselves. Siemens still updates the system but have nothing to do with the training."

"When we first start we are shadowing a senior nurse and that nurse will show us how it works." – Staff Nurse

Users were able to see the benefits of entering data electronically, as it eliminated redundant work and enabled quicker access to information by using keyword searches. However, the system was not utilised to its full potential as functionalities such as e-prescriptions were not made use of.

"Melior Journal does have a medication prescription facility but we don't use it."- Staff Nurse

DISCUSSION AND ANALYSIS

The high e-health rankings of UK and Sweden, and their 'forerunner' label (Dobrev *et al*., 2008) may raise expectations, when in reality there are inherent problems in implementations at the end-user level. Investigating selected healthcare environments provides a glimpse into the actual situation in terms of e-health adoption. Both countries have clearly defined e-health strategies, and have taken steps towards the effective use of technology in healthcare (Ministry of Health and Social Affairs, 2009; Wanless, 2002). Though this reflects a favorable image at the national level, the underlying grassroots level mechanisms are not evocative of such flawless conditions.

Though sense-making is most active at the individual level, we suggest that it occurs at the organisational levels as well. Unlike micro level sense-making, sense-making which emerges at the organisational level is the result of collective understanding by influential people who represent their organisations as a whole. Our refined framework (Figure 2) builds on Figure 1 by detailing the different expectations which emerge when several user groups venture into the sense-making process together. It illustrates the multiple perspectives and expectations held by micro as well as macro level entities, and how these influence each other to result in a deviant outcome. The actions taken by higher level authorities has a direct impact on micro level actors such as clinicians, technology workers and nurses, and causes a flux of events which triggers the

sense-making process amongst these user groups at the grassroots level. The framework also highlights key concerns like management support, training and ease of use of systems, which impacted the sense-making process in both cases.

Sense-making theory suggests that users may perform actions with specific intentions in mind. However these actions have to contend with simultaneous actions performed by others at the same time, directed towards different aims (Weick *et al.*, 2005). The occasional overlap of individuals' ideas and approaches explains the existence of some basic commonalities in the midst of disparities, represented by the intersections of the circles (Figure 2). The net effect however varies from the intended result.

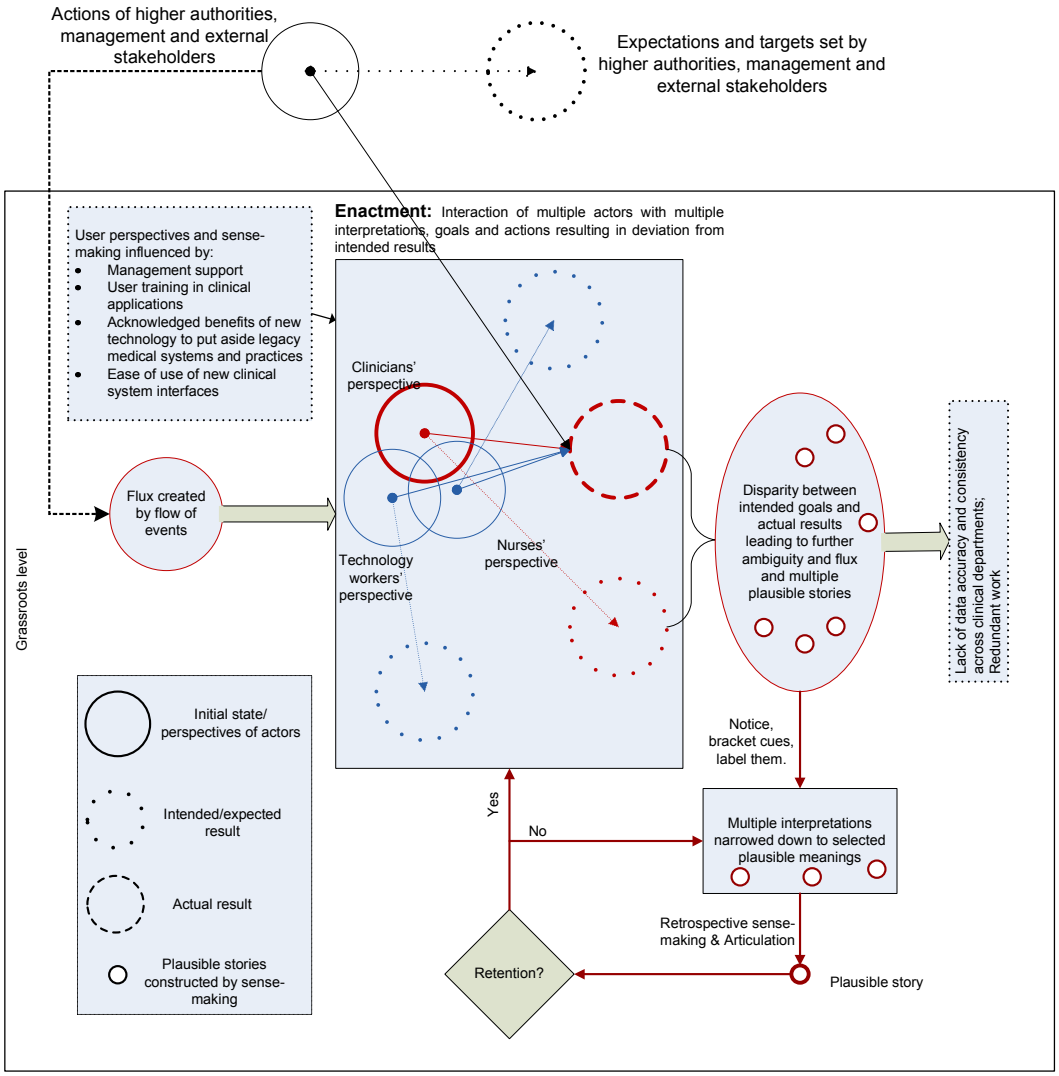

Figure 2 Refined conceptual framework incorporating external stakeholders in the sense-making process

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Ginzberg (1981) identified unrealistic unmet expectations as one of the causes for systems implementation failures. Motivations, visions and perspectives vary between levels and individuals. Their identities are coupled with expectations that represent the needs and views of their respective user groups. This is seen by the differences in the aims and expectations of management level workers and actual users of the systems in both hospitals. While the introduction of PICS, Lorenzo and MJ were intended to reap clear benefits in the quality of healthcare, this need was not understood by end-users as they rooted themselves in legacy systems and practices.

Hospital A's management, in focusing on their auditing requirements, did not consider clinicians' needs for improving patient care, with the result that paper records were retained by staff for data entry purposes. There is a need to understand micro level identities and needs prior to implementation; else systems can go under-utilised without noticeable return on investment. The dual use of handwritten records as well as IT systems (Renal Commons) implied multiple data entries and increased risks of transcription errors and data inconsistencies (Shaw, 2001).

Though Hospital B workers were more open to electronic entry of patient data, users were indifferent to some of the functionalities of their MJ system. While this might have been due to lack of sufficient training (Shaw, 2001), it could also have been due to people's expectations not being geared up to how powerful health IT could actually be. Clinicians did not *expect* the e-prescription function in the MJ system to bring much benefit, and overlooked this functionality. This lack of exploitation of available functionalities may have frustrated those who actually developed the system, and *intended* e-prescriptions to be used. The experiences and expectations of different user groups were very different, and exerted conflicting influences on each other, resulting in deflections from intended outcomes.

These incongruities could have been resolved by proper *articulation* which is an essential aspect of the sense-making process (Weick *et al.*, 2005). Repeated iterations through the process of singling out plausible explanations help individuals refine perceptions. Communication by articulation of understandings and expectations would have eliminated issues such as unmet expectations, or ignorance of available services.

In both cases workers' technology usage and data entry practices were influenced by how they perceived the systems. This in turn potentially affected their understanding of patients' conditions, shifting the object of their sense-making from the technological artifact to the conditions of their patients. The verbal exchange of handover information made knowledge transfer highly dependent on how previous shifts' workers made sense of patients' conditions. The secondary nature of such articulation across a number of shifts, coupled with the dual use of electronic and paper records, gives rise to increased possibilities of plausibility rather than accuracy. It would be advisable to document handover information electronically to maintain a clear track of patients' health with no ambiguity between different workers' interpretations.

Sense-making does not end with a single individual; as mentioned earlier, a worker's understandings can affect others' practices as well. A significant part of workplace learning is done by shadowing experienced users, as in Hospital B. Unless the knowledge imparted by the key users are valid and in-depth, the skills disseminated may not be adequate, as new users may absorb a relatively diluted version of what their mentors have demonstrated and articulated. While Hospital B provided workers with on-the-job training empowering them to use the MJ system, Hospital A workers had minimal training in the Lorenzo and PICS systems. The poor quality and short duration of the training resulted in patchy knowledge amongst users. Consequently, Hospital A workers were not as familiar with the systems as they should have been

In both hospitals, users were limited by their self constructed webs of understanding which they formed in the process of sense-making. Hospital A workers found workarounds by anchoring themselves to legacy data entry practices. Hospital B users had pre-conceived expectations of the system and did not explore new functionalities in the system.

Minimal management support was observed in both cases, albeit more approachable at Hospital B in comparison to Hospital A. Senior management support is essential as it helps lower the innate tendency to resist imposed changes (Watson and Haley, 1998) and such alignment of visions is needed to minimise deviations from expectations. The variations in the sense-making process across user groups and individual actors make it essential that each group of workers be aware of information possessed and processed by other workers.

CONCLUDING REMARKS

This study investigates the IT implementation in two renal units in the UK and Sweden, using sense-making theory as the theoretical lens. We expand on Weick *et al.*'s (2005) discussion of disparities between micro level actions and intended results by highlighting that such differences exist not only within organisations, but also between organisational actors, their management and higher authorities. Sense-making, though most active at the individual user level, has an impact on the outcomes of higher level visions and targets.

Our framework explains the iterative and retrospective process of sense-making linked to key needs such as management support and end user training. The formation of multiple plausible stories makes us question the feasibility of intended project outcomes, as interpretations emerge, linger and may or may not be finally discarded. The healthcare field is an example, with higher authorities promoting the boons of e-health, while individuals at the grassroots level toy with multiple perspectives and intentions, which ultimately deviate from original targets. The failure to achieve these original aims gives rise to the need to examine whether initial visions were reasonable.

Higher level support and managerial direction are required to steer health workers' sense-making processes in the right direction. Training reduces the inevitable gap which emerges due to divergent sense-making processes. This would facilitate a more engaged and open attitude to change, which will help individuals make sense of their environments more effectively. By clearer guidance and transparency in objectives, micro level health professionals will be able to comprehend their responsibilities and embark on a more meaningful cycle of sense-making which is conducive to successful IT implementation.

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