Involving Clinicians in the Development of an Electronic Clinical Handover System – Thinking Systems Not Just Technology

Ming Chao WONG a, 1, Paul TURNER a and Kwang Chien YEE a, c

a School of Information Systems, University of Tasmania, Australia

Abstract While the need to ‘involve the user’ in information technology (IT) development is almost a mantra amongst information systems specialists, numerous IT projects continue to fail because of an inability to capture user insights or respond to users needs. Although there are clearly practical difficulties in addressing and responding to the heterogeneous requirements expressed by different users, marginalizing these views ultimately is to the detriment of the systems built. This paper describes the development of an electronic clinical handover system at the Department of General Internal Medicine (DGIM), Royal Hobart Hospital (RHH). More specifically, the paper aims to highlight how to engage meaningfully with clinicians in the development of a sustainable system. It is anticipated that by drawing attention to the importance of users and by outlining the practical experience of dealing with the diversity of requirements and views expressed, the paper can contribute to a stronger recognition within the domain of eHealth for a user-centred systems approach to IT development.

Keywords. Socio-cultural systems, clinical handover, information communication technology, health informatics, patient safety

Introduction

It has previously been reported that 75% of large IT projects in health care fail [1]. This astonishingly high figure is at least partially attributable to a failure on the part of developers to understand the workflow of health professionals and to meaningfully involve users in the design, development and implementation of these systems [2].

Information Systems (IS) has traditionally bridged this divide between end-users and technology developers. As a discipline it is founded on recognition of the importance of user involvement in systems design, implementation and evaluation. In recent years, a variety of approaches have been developed to support user involvement including user-centred design; participatory design; prototyping and joint application design and human factor engineering. All of these approaches have been used to improve information systems analysis, design and implementation processes [3].

1 Corresponding Author: Ming Chao Wong, School of Information Systems, University of Tasmania, Private bag 87, 7001, Hobart, Tasmania, Australia; E-mail: mewong@utas.edu.au
This paper describes the development of an electronic clinical handover system at DGIM at the RHH and describes the value of involving clinicians, particularly junior medical officers (JMOs) in all stages of system analysis and design. More specifically, the paper aims to outline the methodological approach of involving and empowering clinicians right from the start of its development. This approach aims to acquire an in-depth understanding of the clinical handover process and to ensure the enfranchisement in the development process.

1 Project Background

The RHH is Tasmania’s main tertiary referral public hospital, operating within the acute care service division of the Tasmania Department of Health and Human Services (DHHS). The RHH utilises traditional project management methodologies which advocate the use of committees involving major stakeholders in decision making processes [4]. However, the traditionally hierarchical nature of medicine often means that if any clinicians are invited to be part of a committee they are usually senior consultants rather than actual users of the proposed system [5]. Unfortunately, as in many other jurisdictions, this can result in JMOs who are often in the frontline with regard to the use of hospital IT systems rarely being asked for direct input or feedback on the system [6]. As research has revealed these approaches often lead to problems when systems are implemented as they fail to fit into existing workflow practices of JMOs. This often becomes a hindrance to clinical routine [7].

While ICT developers are often keen to build state-of-the-art systems, utilising cutting edge technologies, with multiple user interfaces, wireless accessibility and high levels of system functionality, experience suggests that the utility of these systems for clinicians’ daily practice remains debatable. Although system functionality and feature complexity is of interest to designers, it is imperative in the health domain that there is an acknowledgement that many end-users continue to have difficulty in incorporating basic information systems functionality into their activities. This suggests not only a need for training but also for user involvement at all stages of the system development life-cycle. Critically, there is a need for more practical examples of how to support this user involvement amongst clinicians.

This paper examines these issues in the context of the development of an electronic clinical handover tool and illustrates how JMOs and senior management were both actively involved in the decision-making processes. The paper argues that this approach provides significant benefits for implementation of the system.

2 Methodology

2.1 Stakeholder endorsement

This project commenced by acquiring endorsement from all stakeholders involved to ensure support at all levels. More specifically, this meant endorsements from DGIM of RHH, School of Medicine and School of Information Systems, University of Tasmania, as well as DHHS, Tasmania State Government.
At a practical level, this involved researchers interacting closely with all levels of clinicians at the hospital from interns to consultants via observations, interviews and focus groups in an iterative manner. All levels of clinicians were invited to participate in the early stages of the project regardless of their clinical seniority. While the focus was on JMOs as the primary end-users, comments, insights and experiences were also captured from senior clinicians. These processes ensured that user requirements were identified and that system functionality could be trialled and tested directly with users.

The information systems (IS) researchers were not medically trained and initially had to deal with resistance from some clinicians who initially perceived the project as an effort to introduce technology for ‘policing’ their clinical practice. There were also some concerns expressed that an IS researcher would not understand clinician practice due to a lack of medical knowledge. As a consequence of this initial resistance there was a need for time and energy to be expended in building rapport with many of the JMOs through informal chats and attending informal gatherings and social activities. This resulted in building trust between clinicians and the research team – a critical factor in ensuring that user requirements could be captured accurately.

2.2 Familiarisation with Clinical handover

The research team utilized two main data collection techniques in the process of familiarisation with the actual practice of clinical handover. Firstly, 30 observation sessions were carried out during the morning handover and night handover over three extended holiday periods where staff numbers were down to their minimum and adequate handover was extremely important for patient care. Field notes were obtained and typed into the computer at the end of the observation sessions independently by an information systems researcher and a clinician. Secondly, semi-structured interviews were conducted individually with four groups of clinicians: experienced interns, inexperienced interns, registrars, and consultants.

The interviews were audio-recorded and transcribed. Analysis of the transcripts was conducted using open, axial and selective coding drawing on the principles of grounded theory [8]. The data from the observations and interviews were then reconciled to obtain an in-depth understanding of the clinical handover process. This in-depth understanding was then again discussed with clinicians at the hospital.

2.3 Systems Development

The first step in determining the requirements for systems development involved an analysis of 50 handwritten clinical handover messages provided by the clinical handover leader. This was done to identify the minimal field data set required for effective clinical handover.

A series of 6 workshops drawing on the principles of participatory design [9] were then conducted to work through the minimal data set and IT specifications. The workshops involved clinicians of all levels but were aimed primarily at JMOs as they were to be the main users of the system. Clinical examples were used and opinions from participants regarding the data requirements, presentation and delivery were documented. The documented opinions from the clinicians were then analysed and a simple template drawn up which was representative of the final IT system. This template was then distributed to end-users in both electronic form and printed form for comments and further discussion and analysis.
3 Results and Discussion

3.1 “Mythical” vs Actual clinical handover process

The analysis of the data collected through observations and semi-structured interviews revealed that there was a significant difference between what was thought to be the handover process and what actually happened at handover. Interviews conducted with consultants revealed that clinical handover was an efficient process with a well formulated structure facilitating adequate information exchange and was attended by all involved and at times included an education component for JMOs. Observations sessions however, revealed that there were multiple factors, including cultural, environmental, human and other factors that determine the structure, attendance and efficiency of the clinical handover process. Furthermore, apart from the primary function of information exchange, there were other functions embedded within the clinical handover process eg. Seeking a second opinion, a reminder to check test results, seeking supervision and debriefing of difficult and stressful situations.

Our experience of identifying a “mythical” and an actual clinical handover process closely mirrored the description of the problem explained by Norman [5]. Domain experts have little insight into their own work and they are often divorced from actual use [5]. Our study has validated Norman’s argument in the clinical handover setting that observations by trained professionals are important in understanding workflow.

3.2 Building the electronic clinical handover system

Given the difference between the “mythical” handover process and the actual handover process, a decision had to be made as to whether the system was built to address the needs of the “mythical” handover or the actual handover process. A decision to build an IT system to support the “mythical” handover process would risk failure because it would not fit in with what was actually done at handover. A decision to build an IT system to support the actual handover process would risk failure because some clinicians might feel that their opinion was not taken into consideration.

Following further discussion, it was agreed that a system be built to support the actual work processes as this had the strongest support and the best likelihood of adoption by JMOs. The IT project team understood fully the different approaches utilized in clinical handover by different clinicians in actual workflow. The formalisation of the clinical handover process through IT program implementation trajectory will only be productive if this is aligned with the organizational change trajectory [2]. Therefore, during the implementation process, educational and leadership program for clinical handover will be implemented simultaneously.

3.3 Data field determination

Once the decision is made to build a web-based IT system to support clinical handover, data fields needed to be determined. In moving forward with the development, the written clinical handovers notes were analysed. This provided the project team with the following minimal data fields for clinical handover program: 1. Patient unique
identifier number, 2. Patient’s demographic details, 3. Location and treating team, 4. Background issues and 5. Action required.

Minimal data fields for clinical handover had been published by others recently [10], [11]. Bernau et al provided an expert opinion on the minimal field requirement [11], while Cheah et al identified minimal data fields for surgical handover but did not mention the method utilised to identify these data [10]. We found that more data fields were required to provide adequate clinical handover compared to those expressed by Bernau et al [11]. We further identified background issues and actions required as separate fields while Cheah et al. grouped them into free-text [10]. In our opinion, the separation of issues and actions required is important and we see the implementation of the electronic handover system as a good opportunity to drive the changes to separate the two data fields to improve the effectiveness of clinical handover.

A series of workshops, with emphasis on the primary users – JMOs were then conducted. These workshops not only reconfirmed the minimal field data, but also addressed the issues of delivery, information presentation, resource requirements as well as additional features – automated display of pathology results, to support the workload of junior staff. While we acknowledge that having greater clinician participation might not help [2], we believe that having the right clinician participation, i.e. the primary users of the system will help not only with the design, but also with the feeling of ownership of the program.

3.4 Safety feature design

In order to improve the clinical handover process and to improve patient safety, we added a few in-built safety features with the electronic system. These safety features have been described elsewhere [12]. The emphasis on safety is essential. More importantly, we believe that a clear communication of the safety features of the system is important to improve sustainability. Clinicians are intrinsically driven by the virtue of “saving lives”. By aligning the strategic aims of the electronic clinical handover to both organization change trajectory and personal intrinsic desire of clinicians, we believe that it forms a force of empowerment that will drive sustainability.

3.5 Create motivation and sustainability

While the researchers acquired numerous comments, insights and recommendations from the JMOs regarding the features they wanted out of the electronic clinical handover system, it was noticeable that these were very different as compared with those acquired from senior clinicians about the system. JMOs emerged as eager to utilize the system and believed that the system would provide genuine benefits. They also indicated their preferences for complicated technologies, such as bar-coding for user identification and wireless mobile technologies. On the flip side, most senior clinicians indicated their preference for forms that could be printed out so that they can make their own hand-written notes on them. That internal conflict is balanced out by taking a middle ground by the research team, communicating clearly that a plan for version management is in place if the uptake of the program is encouraging. We believe that this approach creates an incentive for sustainability.

The research team also identified proponents and opponents for system changes and considered this clear dichotomy of views regarding the IT system and the value of process improvement. The research team included both these perspectives into the
design phase and opened up discussions on these issues to acquire further feedback. Noticeably, it was revealed that opponents of the process improvement actually provided some of the most valuable input into the design specification.

The researchers utilized the opportunistic reflective learning as a method to empower clinicians and to create an environment of readiness for change. By providing clinical examples in the workshop, clinicians could better relate to the need to improve the process and the potential benefits of this IT project. Additionally incentives for clinicians to use the system were also included. These incentives were identified through interviews and observations and built into the IT design. We believe that the above methods of education and training, listening through group workshops, obtaining feedback and good communication, version management and utilization of self-reflective learning will empower clinicians for IT sustainability in healthcare.

4 Conclusion

This paper has outlined the mechanisms used by IS developers to involve clinicians in the process of developing an electronic clinical handover system. It has examined the practical decisions that have been made in dealing with heterogeneous inputs from the interactions with a diverse range of perspectives and attitudes towards the system to be developed. The paper reveals that in working towards the development of a sustainable system it is important to engage all stakeholders, obtain first hand data (i.e observations), involve clinicians throughout in the development phase, align the IT project trajectory to organisation change trajectory and provide clinicians with opportunity for self-reflection and self-actualisation.

References