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FACTORS INFLUENCING USER INVOLVEMENT IN DSS PROJECT IMPLEMENTATION: SOME LESSONS FROM THE UNITED KINGDOM HEALTH SECTOR

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Abstract

This paper presents two in-depth case studies on the user involvement factors considered by a hospital in the UK in implementing their Decision Support Systems (DSS) projects. The implementation of the systems had supported in the need to monitor clinical effectiveness of drug treatments patients with mental illnesses. The case studies have illustrated that individual's eagerness had been the key factor to the success of the project despite its lack of formal project practices.

Keywords: User involvement; DSS project; DSS project implementation; Health sector.

1 INTRODUCTION

For the past two decades, the health sector in the UK had been seriously spending a great deal of time researching the question of how to better implement Decision Support Systems (DSS) in their organisations¹. This is due to the fact that it had become almost impossible to operate with no use of the system. Given the impact of user involvement in DSS project implementation, there had been a great amount of studies assessing user involvement in DSS project implementation (Kivijarvi and Zmud, 1993). A considerable amount of studies have investigated the difficulty of implementation with a view of providing guidelines for implementation success, *e.g.*, 1) to redefine implementation and inherent user involvement problems (Palvia and Chervany, 1995); 2) to characterise user involvement related factors that influence implementation success or failure (Yoon, *et al*, 1995) and 3) to suggest alternative user involvement strategies (Kwon and Zmud, 1987). Even with extensive research, they are still facing a combination of problems for which there are no effortless solutions. Several authors conclude that introducing a DSS into organisation results in profound changes that modify the role behaviours of organisational members.

1.1 The significance of user involvement in DSS project implementation studies

The challenges surrounding user involvement in DSS project implementation are problematic and complex. It is a process that involves all the individuals who make-up the organisation, from senior level executives to clerical staff. The implementation literature provides consistent evidence of user involvement in DSS project implementation. A large body of DSS project implementation studies had investigated the relationship between user-related variables and project implementation success (*e.g.*, Alavi and Joachimsthaler, 1992). The relationships between these factors and DSS project implementation are believed to be influenced by a number of contextual variables.

Alavi and Joachimsthaler (1992) further argued that user related variables include user experience, involvement, and training. User experience refers to prior exposure to DSS and to the user's work history (*e.g.*, number of years). User involvement, according to Swanson (1974) refers to the "*entanglement*" of the user in DSS related activities. Thus, a user and a DSS, two purposeful systems are "*involved*" to the extent that activities of each facilitate the attainment of the ends of the other. In this context, involvement refers to user participation in DSS project implementation. Training, in the context of DSS implementation, refers to the provision of hardware and software skills sufficient to enable effective interaction with the system under consideration.

There are many factors contributing to DSS project implementation but unfortunately, the results of these prior studies were not just mixed and inconclusive. They have also been conducted in fields other than health. Given the dramatically different nature of DSS project implementation, these results, obtained from previous studies are likely to provide at best, a partial picture of the key factors influencing DSS project implementation in practice.

1.2 The significance of user involvement in DSS project implementation studies

In reviewing the factors influencing user involvement from the vast range of DSS project implementation literature, it can be concluded that there are immense amounts of factors influencing both successful and failed DSS implementation projects. Given the array of these factors, it is

¹ It is useful to distinguish between the installation of a system and its implementation. "Installation" refers to the physical placement of a system into an organisation, while implementation is defined as a series of activities throughout the development of a DSS.

significance to re-encapsulate a thorough understanding of the user who would contribute to the better handling of the project implementation, and thus increasing the chances of its success.

The framework was proposed to encapsulate the factors influencing DSS project implementation based upon the perspective of the end users. The challenge with such guidelines is that it does not fully relate to the organisation's particular situation, nor does it itemise the possible problems that may arise during the process.

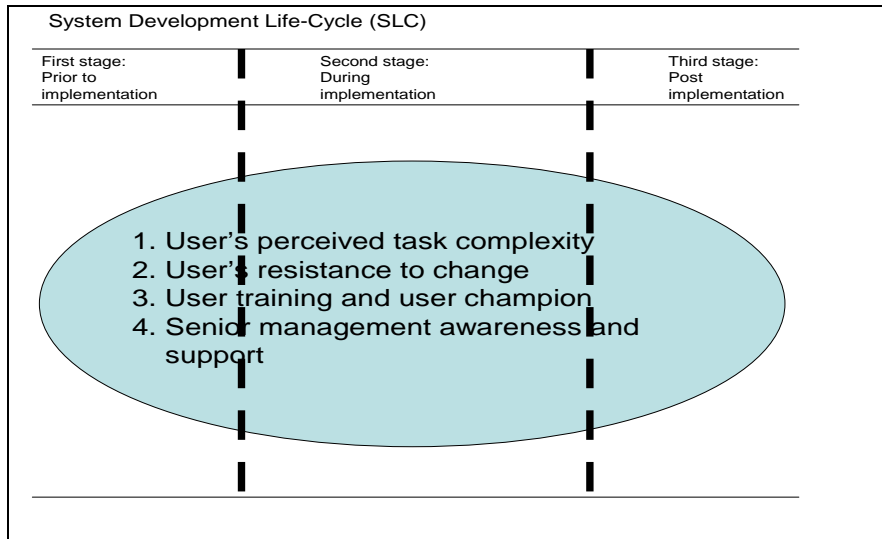


Figure 1: The proposed theoretical framework

Both the System Development Life-Cycle (SDLC) and the Lewin/Schein change process model (Keen and Scott-Morton, 1978) were merged to form the proposed theoretical framework (see Figure 1). The model offers a basis for understanding the implementation through a system development lifecycle. It involves three main stages; unfreezing, change and refreezing;

- Unfreezing, involves establishing the essential conditions for change. Many of the factors such as senior executive's support is evaluated and manipulated, during this stage.
- Change, engages those tasks normally associated with the customary strategy.
- Refreezing, explicitly confronts the problems of refreezing (after implementation or institutionalisation of a system).

Each of these stages was consisted of a number of issues requiring resolution. Some of the main factors are further explained below.

1.3 Definition of main factors

1.3.1 User's perceived task complexity

User's perceived task complexity relates to how well users can adopt to the system and navigate around it. Some studies of system diffusion suggested that the simpler the innovation is to understand, the more quickly it is adopted. For instance, a simple application may be easy to grasp. However, when the application is fully integrated into the organisation's business processes, it could become a complex operation that could affect implementation. In short, one could argue that perceived task

complexity is found to be negatively related to implementation and can greatly impact upon the user's time to learn the system.

1.3.2 User's resistance to change

The most common reaction to technological implementation in organisations is resistance to change. To people at work new technology can spell all kinds of trouble. It can mean loss of jobs, disruption to know procedures, the need to learn new skills or the further dehumanisation of the work itself. New technology means change and change can be disadvantageous and difficult. It may also bring a better quality of working life, opportunities to become more proficient etc., but the most common reaction is to expect the worst. The change approach to DSS implementation strives to create a situation in which change will be accepted through the involvement of affected users, an intensive education programme and most significantly, the assigning of project responsibility to the DSS user.

As Coch and French (1948) and Eason (1988) discovered, an implementation strategy in which there is the participation by all those affected leads to much more positive response than a process in which only a few representatives are consulted, 2) participation must be more than symbolic (it must be possible to influence issues that matter to them and to "own" the future system so that it is not perceived as a development imposed from outside) and 3) it must enable an understanding of the implications, appreciate positive opportunities, come to terms with negative aspects and plan their own coping strategies (if it was to be effective, the planning details must be done by the people who will be affected).

1.3.3 User training and project champion

User training, in the context of DSS project implementation, refers to the provision of hardware and software talents adequate to enable interaction with the system under consideration. Untrained users would not be productive or motivated, as those who are trained. They would be unable to effectively deal with change because their skills are specific and not catered for the change.

On the other hand, Glover, *et al*, (1992) found a lack of project champions to be the most frequent cause of a DSS project implementation failure. These champions have to be forceful so that important decisions about the project can be taken. They also have a vital part to play in helping to derive user need analyses (become lively promoters of the system amongst their peers), and could be seen as a user who could greatly play a significant role in the implementation process.

1.3.4 Senior executive awareness and support

Securing senior executive awareness and support are central to DSS project implementation. It can substantially influence the outcomes of the project initiative (Pinto, 1993). To win the "*heart and minds*" of these decision-makers is often mentioned as one of the essential prerequisites of implementing any DSS projects. These studies provide evidence for the supportive relationships between executive support, user attitudes and perceptions. The results suggest that forced use of a poor quality system may lead to the development of unfavourable attitudes.

There is also the contention supporting the relationship between decision style and implementation success. The results also show that the non-reference users are more likely to use the system if their reference group leader had favourable attitudes toward the system. It appears that the actions of the subordinate group in the case are fully consistent with the attitudes of reference of group leaders. The clearest finding that emerges from these studies confirms the existing predictions that the older and less educated member of the organisation is most likely to resist a DSS.

2 RESEARCH METHODOLOGY

Based upon the literature review, it was noted that there is an enormous array of DSS project implementation factors described in the literature. A case study research employed as the research design to allow the encapsulation of the implementation phenomenon. A pharmacy department was approached for the purpose of the primary data collection. The foundation used in selecting the informants for this study was based upon Glaser and Straus's concept of theoretical sampling (Crook and Kumar, 1998).

The data collected were analysed across the informants to detect similarities and variations. With each informant, the iterative approach to collecting and analysing of data was open-ended and generative, in which the focus was on the development of the core and sub-categories. The data was then categorised through content analysis into recurring concepts and sub-concepts (i.e., themes). These themes then became essential candidates for a set of common categories that linked with a number of related concepts. The iterative re-analyses have subsequently yielded a set of core and sub-categories that described the salient conditions, events, and consequences associated with the implementation. These initial sets of categories guided the subsequent interviews with other informants, allowing the process of collecting and analysing the data to be much more refined. This approach was empirically valid because it had uniquely accounted for the data of each case and generalises patterns across the informants (Eisenhardt, 1989). Emerging concepts were then checked for representativeness by examining them across informants. Verification of the case study data was accomplished by crosschecking the data collected. It was crosschecked by re-interviewing other informants using the data that had been gathered from interviews conducted earlier in the same organisation. Essential contents of the interviews were thoroughly reviewed by re-asking the questions.

3 CASE DESCRIPTION

3.1 Brief organisational background

ABC Hospital is situated in the midlands, England. It provides highly secured National Health Services (NHS) to several regions of the country for both male and female patients with severe mental illnesses and personality disorders. Secured care was provided through multi-disciplinary teams comprising of a selection of consulting psychiatrists, psychologists, occupational therapists, social workers and nurses. Like any other UK hospitals, the pharmacy department was facing increased demand for computerisation. The need for computerisation can be attributed in part to the regulatory and modernisation pressures introduced by the government. The Pharmacy Department consisted of five pharmacists. Day-to-day tasks include supervising and analysing patient's drug treatments. Conventional procedures have resulted in continuous disappointment in assessing patient's suitable treatment, i.e., to establish whether they were benefiting from the drugs. As one of the pharmacists noted, *"A lot of the time we were asked whether these complex psychiatric drugs were working or not. It was always difficult to measure progress, especially in psychiatry, because so many of the outcomes were soft as opposed to treating something like an infection"*. Manually paper-processed Drug Prescription Chart, drug formulation, manual data retrieval, and hand graph were too consuming for the pharmacists, as it was hard to see what treatments were being co-prescribed.

3.2 Case 1: Pharmacy Information System (PIS)

The Pharmacy Information System (PIS) was implemented to monitor and analyse drug treatment effectiveness. This helps to improve the "conventional" inadequacies of the services provided by the department. For instance, reviews of drug treatments were done manually by hand. These processes

have proved to be so time consuming and ineffective. Presenting drug histories in a graphical format helps to address the following difficulties:

- Changes in treatment strategy and long-term trends were difficult to assess from prescription alone
- Many patients with severe mental illnesses were treated with imperfect drugs. The effects of these drugs were often slight and difficult to detect.
- Treatment changes were sometimes made based upon pre-matured data (“knee jerk” reactions) as it was difficult to see the wider or longer-term view of the data.

It was believed that the proposed PIS would modernise conventional assessment of patient’s drug treatment. The system was developed to assist the department in assessing patient’s prescribed treatment and their progresses. It was seen as an extension of the clinical role that pharmacists were being asked to perform. To the hospital’s advantage, PIS was also seen as an excellent facility to demonstrate clinical governance being applied to medicine, prescribed by NHS. The system was initiated by the Head of Department through a business case presented to senior executives. The case was rejected due to lack of funds. However, sufficient amount of funding was eventually secured as a result of change in management direction. Through a thorough iterative project implementation process, a bespoke-programme was developed to accommodate the application. The process took place quickly as members within the department were introduced to the application (whilst the prototype was still being tested with real data).

The preliminary stage of the implementation began with detailed meetings with the software developer to discuss the requirements of the system. The meetings were productive due to inputs provided by the Head of Department’s extensive experience on the problems of the treatments, familiarity of the database and the pharmacists’ computing skills. Through continuous responses, adjustments were made until the PIS were created. The system was then refined. As a result, a timeline had been produced showing whether a patient was getting a better (or not) and what combinations of the drug treatment were successful. The adjustments made provided meaningful information both to the pharmacists and patients. The immediate benefits began to take place, once the system was operational. This had a positive impact on the role of the pharmacist in psychiatry. They have become more acknowledged than other professions in the hospital. As this was the first computerised system the department had encountered, there were some problems such as the amount of time it took to input all the data required.

3.2.1 User’s perceived task complexity and resistance to change

The PIS was not so advanced at the time when the system was implemented. It comprised of basic form-filling capabilities. The system, however, had successfully been upgraded and the opportunity was taken to create a far more advanced graphical user interface. For instance, a connection to a graphics application that could create advanced graphs and navigability (these updates were hard to implement because of the complexity of the system).

The PIS project implementation caused change in the practice for the users involved and a significant impact on the future treatment of patients. The user’s resistance to the new system came from the staff having little or no experience with computers. The resistance was overcome by the convenience of the PIS in replacing conventional tasks that would result in changes to the practice for the better. As the Head of the Department described, “*Basically the motivation was, if you put in this effort, what you will get out of it, is nice, smart drug charts that gives you an awful lot more influence in multi-disciplinary meetings. You can then go to the doctors or clinical team and give a better presentation*”.

3.2.2 *User responses and training, and project implementation champion*

There was not any official feedback meeting held to assess how well the users were adapting to the new system. Any user responses were taken informally. This was due to the size of the department and the small number of users using the system. The advantage of this informal communication (i.e., between the users) meant that if there were any faults or issues with the system then it could be solved rapidly. At the department, little emphasis was placed on the training. As the department did not have the resources to conduct the training sessions (neither did the organisation), there was no proper training offered to the users in the department. This was a setback as the users have missed the opportunity to gain the critical computing skills. Untrained users were generally not as productive, or motivated as those who had been trained. They were unable to deal with the change process because their existing skills were specific to the existing work system. The head of department was made aware of these dissatisfactions. As a consequence, a lot of emphasis was placed on explaining the benefits of the innovative ideas and how it could impact upon the workforce.

On the other hand, the project implementation champion (Head of the Pharmacy Department) had tirelessly pursued the implementation initiative by selling it to senior executives and anyone who was willing to pay attention. He initiated embracing the system as a result of the ideas that arisen from the requests made to pharmacists about the helpfulness of the medicines and treatments prescribed to patients.

3.2.3 *Senior executives' awareness and support*

The department had a flat organisational structure dissimilar to other NHSs that were sophisticatedly tall, mechanistic organisational structure. Maximum number of layers within this type of organisation had provided significant blockades to efficient communication and had hindered the funding application process for the proposed system. In terms of support, the project was rejected due to the red tape blocking its way. It was not until a government official took an interest and persuaded senior management that they should go ahead with the funding. From the senior executives' point of view, the project resulted in improved pharmacy service that enhanced its reputation.

The lack of support also became apparent when upgrading the system. The difficulty arose in obtaining senior executive commitment to recognise the importance in the upgrades. Their attentions were focused upon other more critical systems. As a result, PIS was not operational for about a year and a half although the department continued to record data into the databases. When the senior executives granted the funding, the system was upgraded with improved applications. During the development stage, the following issues were brought to light:

- The lack of attention (at the initial stage) from senior executives had led to a lack of resources that hindered the progression of the system.
- The PIS was not directed towards meeting user needs, as they were not involved in the planning and developing processes.

3.3 **Case 2: Stock Control System (SCS)**

Tremendous pressures from senior executives have led to the development of the second project - Stock Control System (SCS). These systems replaced the existing dispensing and stock control system by adding more features to the regulation of medicine purchase and dispense. Users were manually monitoring drug stock levels by physically counting them. The SCS had consolidated the functions of the previous PIS by:

- Automatically managing live stock control (which will lead to increased automation and management of the procurement processes). For instance, a wide range of standard management reports for further analyses (*i.e.*, Top 50 most expensive drugs) were generated.
- Regularly updating of drugs and related information within the system (This reduces the management of drug portfolios and gives guidance on appropriate drug dosing.
- Providing the capability to develop drug estimates to specific wards.

The request for Stock Control System (SCS) was initiated by the hospital's senior executives. With the support of both senior and middle management, the system was eventually implemented within the required budget and time limit. A pre-packaged system had been purchased as a consequence of the planning process.

3.3.1 User's perceived task complexity

User's perceived that SCS was difficult to operate (as it was pre-packaged and had restrictions on the amount of modification that could be carried out). They had to alternate between using a mouse and basic form-filling commands and only a little consistency was found in user's keystrokes to navigate around the system. As most of the tasks were repetitive, graphical user interface did in fact cause problems and in many cases, the words on the screen bore no relation to what the users were trying to do. As a result, the system was only marginally employed. As one of the users' argued, *"To create a new order, we would have to select "amend order". This too was not an obvious way of creating an order"*.

3.3.2 User training and responses, implementation planning and database development

In contrast to the PIS, user training was made available to everyone. However, one of the problems was to find the right time for the training to be conducted. If users were trained too early then the danger was that they could forget what they had learned. It was also difficult in finding a date when all the users were available. There was a considerable lack of data to demonstrate the system making it impossible to practice the skills learned during the time leading-up to the implementation. On the other hand, there were no official feedback channels to assess how well the users were adapting to SCS. Responses were obtained informally due to the size of the department and the small number of users using the system.

On the other hand, the SCS project implementation planning consisted of the following stakeholders: a project sponsor, a representative from the Finance Office, a system developer from the Information Technology Department and suppliers. A project manager was brought-in to oversee the general running of the project, ensuring that all the tasks were carried out within the time frame. In terms of the database development, the existing databases were developed to suit the new databases. Some problems were found in entering the data, as the data-entry supervisor was not informed by system developers on how to properly format the data.

4 CASE DISCUSSION

It was apparent that much unseen user involvement related factors have resulted from the analysis of these two case studies (see Table 1).

Major factors	<i>Pharmacy Information Systems (PIS)</i>	<i>Stock Control System (SCS)</i>
<i>Nature of the system</i>	Implemented to digitally monitor and analyse drug treatment effectiveness (A migration from conventional to computerised PIS)	Off-the-shelf package, and was implemented with added features on the regulation of medicine purchase and dispense
<i>Forces influencing implementation</i>	Internal forces: Many patients with severe mental illnesses were treated with imperfect drugs External forces: The Pharmacy Department was facing increased demand for computerisation by the government	Internal forces: Prolonged disappointment with the existing SCS ability
<i>User's perceived task complexity and resistance to change</i>	User's perceived PIS as difficult (initially) User's resistance to change came from those having little or no experience with computers. The resistance was overcome by the systems user-friendliness that had resulted in changes to the practice	User's perceived SCS as difficult (as it was a pre-packaged system) User's resistance to change was evident during the initial phase of the implementation
<i>User responses and training</i>	No channel established to attain some feedback from the users Little emphasis was placed on training the users Untrained users were not as productive or motivated as those who had been trained	Training was made available to all the users No channel established to attain some feedback from the users
<i>Project implementation champion</i>	The role was played by the project manager	No obvious championing actions had been evident
<i>Senior executives' awareness and support</i>	The awareness and support levels were marginal (as the project was first disapproved by the senior executives due to lack of awareness)	Senior executive's support was only indirectly evident, i.e., through the training provided
<i>Implementation planning and database development</i>	The planning was solely done by the project manager. There was no user participation.	Multiple stakeholders were involved in implementing the project. A project manager was brought-in to oversee the general running of the project

Table 1: Contextual differences between the user involvement factors influencing DSS project implementation in the ABC hospital

The PIS was much sought after since it had improved everyday working practices of the department. Users were more motivated as the system was being created to benefit them. However, the setback of solely relying upon a user champion was apparent. This isolation and lack of co-worker involvement had led to mistrust towards the champion. As the project manager noted, "They might think that they don't know what I am doing and so just leave me to it and they might disconnect, and not be enthusiastic". It was perceived as difficult, as users with good ideas were pressed to work on their own rather than in teams. As a result, some of the users were disappointed.

In terms of the user training, the PIS was much more complicated as the users were less exposed to computers. However, these difficulties faced did not hinder the implementation, as the champion was able to motivate the users and ensure that their needs were understood. As the project manager argued, "We had clear objectives and specific requirements so the application could not be bought off the shelf".

In terms of the user's resistance to change, it is significant to note that involvement of this kind gives users considerable influence over the decisions that affect them personally, and it is this kind of example which most successfully encounters feelings of external threat. If resistance to change was to be avoided, it was necessary to involve all potential users in the process, not merely a selected few.

5 CONCLUSION

The area of user involvement in DSS project implementation is extremely problematic and complex. It is a process that involves all the individuals who make-up the organisation, from senior level executives to clerical staff. ABC Hospital had successfully created a PIS, which had revolutionised the day-to-day and strategic operations of their pharmacy department. Thorough communications between the stakeholders was one of the factors influencing its successful implementation. Users of the PIS were fortunate in that the system was created to suit their specified requirements. On the other hand, SCS users were not committed to the pre-packaged system, as it did not directly benefit the users in making noticeable changes to their working practices (SCS only added additional analytical features for senior executives). However, the use of formal practices and adequate level of resources compensated for this lack of enthusiasm and enabled the project to succeed.

Although the framework considered for this study determines the major activities of an implementation, it still cannot trace difficulties, constraints or even risks for which they are unrefined for. A sound understanding of the factors of DSS project implementation success requires a consideration of all activities involved as the system is expected to benefit user activities at operational and strategic level of the organisation. Still, those who had already adopted the technology, experience varying degrees of success in implementing the system. Finally, considerable opportunity exists for others to expand on and otherwise improve these initial efforts in understanding the phenomenon of DSS project implementation.

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