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The Adoption of the National Programme for Information Technology in the UK National Health Service: The Case of Lorenzo

MR.Khalid Altarawneh
MIS Dep.College of Business and Administration, Mutah UniversityPO Box 7, Mutah, Alkarak, Jordan

Abstract
The failed National Programme for Information Technology (NPfIT) undertaken by the UK National Health Service (NHS) was described as the largest IT programme ever undertaken. This paper considers the factors that influenced the implementation of one aspect of the NPfIT, Lorenzo, the Electronic Health Record system.Using grounded theory semi-structured interviews were conducted with respondents from the NHS and IT contractors to get a balanced approach on user acceptance from the client side and the supplier side. NVIVO was used to aid the analysis of the interview data and the dominant categories which emerged, Clinicians' Attributes, Organisational Factors and System Related Factors, are discussed. The implications for IS academics and practitioners are outlined before the paper concludes.
Keywords: Health Informatics, National Health Service, National Programme for Information Technology.

1. Introduction

The UK Prime Minister Tony Blair declared his ambition to modernise UK healthcare in 1998 with a stated aim of, "Giving the people of this country the best system of healthcare in the world" (Department of Health 1998). The UK government then concentrated its efforts on utilising Information and Communication Technology (ICT) as a key enabler of numerous reforms and/or modernisation plans (Beynon-Davies and Williams 2003). These plans aimed at reengineering organisational processes and services in the healthcare sector to enhance patient care (Currie and Guah 2006). The modernisation of the NHS through IT was termed the National Programme for Information Technology (NPfIT) and was described as the largest IT project ever undertaken (Brennan, 2007).

However, ICT and healthcare have always been uncomfortable bedfellows with Sauer and Willcocks (2007) detailing problems including "tensions between clinicians and managers" (p195), the sensitive political status of healthcare, the size and risk of investments and the erroneous view that investment in ICT was a panacea in itself. The NPfIT would face considerable problems and was itself abandoned in 2012 after a series of critical UK government reports.

This paper considers one aspect of the NPfIT, the implementation of Lorenzo, the care records systems, to achieve depth of analysis. The authors noted that end-user acceptance had been identified as an important theme in the NPfIT (Clegg and Shephard, 2007, Wager et al, 2005) and was thus worthy of detailed examination.

The paper presents an exploratory study from the perspective of end users and developers of Lorenzo to identify the significant factors that influenced its implementation. The broad aim of the paper is to investigate the status of Lorenzo implementation at the local level (i.e. a bottom-up approach). To achieve the broad aim, the paper focused on end users' attitudes toward the use of Lorenzo through qualitative research.

1.1 Aim and outline

The aim of the paper was to examine the barriers to the successful implementation of Lorenzo. The study makes a contribution to the IT user acceptance literature and also makes a practical contribution due to the on-going high failure rate of large IT projects.

The paper is structured as follows. Firstly, the paper reviews relevant literature. The next section outlines the key background to the NPfIT. The methodology is outlined before analysis and discussion of the results and the paper is then summarised.

2. Literature Review

Using the language of Hekkala and Urquart (2013) this was a non-committal literature review as a grounded theory approach was used later to analyse the data. The literature review focuses on successful implementation of information systems with particular relevance to the healthcare sector. In this sector, information technology (IT) has been used with the aim of improving patient service and reducing medical errors (LeRouge, Mantzana & Wilson 2007). Key principles from IS still apply, however, and human and organisational factors are seen to be as vital as technical issues.

2.1 Fit

For any technology to have a positive impact on performance, it must be utilised and have a good fit with the task it is supposed to support. Goodhue and Thompson (1995) developed the **T**ask-**T**echnology **F**it (**TTF**) framework, which stresses the importance of matching task characteristics with technology characteristics. Ammenwerth et al (2006) criticised the TFF model as it takes into account the fit between task and technology, and the fit between user and technology with no emphasis on the fit between the user and the task. Ammenwerth et al (2006) argue that the nature of the clinical environment in which IT is applied, necessitates that systems developers and decision makers focus on matching users' attributes with the task's attributes.

2.2 Socio-technical approaches

Most IT-enabled organisational change projects face resistance from users, and in some cases these projects encounter system rejection (Doherty & King 2005). The adoption of a techno-centric approach in designing IT projects is one possible factor which can contribute to the failure of IT projects because it encourages systems developers to give most of their attention to implementing IT systems, with a lack of emphasis on adapting these systems to the organisational context (Eason 2001, Doherty & King, 2005).

The main principle of socio-technical theory is to pay equal attention to both the human and technical subsystems of the organisation. This means that employees who are meant to use the technology or supposed to be affected by the introduction of the new technology, should be involved, and participate in defining their needs, so that they can be incorporated into the design of the new IS (Mumford 2006). Adopting the socio-technical approach has a prerequisite, which is creating participative, open, and democratic communications that enable employees to convey their needs (Mumford 2006). In healthcare organisations, implementing IS projects leads to a great deal of change, which profoundly affects the organisation, its staff, and patients (Wager et al 2005).

2.3 Information Systems Development Methods (ISDMs)

Numerous building approaches have been developed to accommodate the differences in information systems (Laudon & Laudon 2005). Laudon & Laudon (2005) and Gupta (1996) identify five major IS development methods: the System Development Life Cycle (SDLC), prototyping – of which Rapid Application Development is an advanced version -, application software packages, end-user development, and outsourcing. All these methods have strengths and weaknesses; for example, SDLC is a set of highly planned sequential stages suited for developing routine and highly structured systems (Gupta 1996) but it may not be appropriate for complex problems.

2.4 Successful implementation of IT projects

There is an ambiguity around the concept of IT success or failure (Belassi & Tukel 1996). Mário & John (2003) see the concept of IS success as rather problematic because there are many ways of defining this concept. Belassi & Tukel (1996) state that different stakeholders who are involved in implementing an IT project perceive IS success or failure differently, a point made by other authors (e.g. Molla & Licker (2001)). Secondly, even though the IS literature has been generous in providing a wide array of success or failure factors, these factors seem to be either too general, or too specific to be applicable to certain types of projects.

Caldeira & Ward (2002) state that IS effectiveness is used to measure IS success. Yuthas & Eining (1995) stress that the effectiveness of an IS should be determined by its impact on the organisation's competitive advantage and its ability to achieve the organisational objectives (Caldeira & Ward 2002).

IS effectiveness encompasses three distinct constructs, which are decision performance, user satisfaction, and system usage (Yuthas & Eining 1995). When intended users show resistance to using the system, it denotes system failure (Sharma & Yetton 2003). Thus, system usage is an important measure of system success that should be considered when evaluating IS effectiveness.

2.5 The DeLone and McLean Model of IS Success

In the IS literature, **U**ser **I**nformation **S**atisfaction (UIS) and system usage, or so called end user system utilisation (Coombs 1999) are the most prominent constructs which measure IS implementation success (Sharma & Yetton 2003, Gelderman 1998, Yuthas & Eining 1995, DeLone & McLean 1992). DeLone & McLean (1992) admit the importance of UIS and system usage as surrogate measures of IS success. However, after a comprehensive review of 180 studies on IS success, DeLone & McLean (1992) found out that some IS researchers focused on studying the characteristics of the system itself (system quality), other researchers concentrated their study on the characteristics of the information generated (information quality), and others focused on investigating the impact of IS on both individual and organisational performance. In sum, DeLone & McLean (1992) synthesized six dimensions, which constitute a wider taxonomy of IS success that is still widely used by IS researchers.

Although the DeLone &McLean model has been very influential it has been subject to criticism (for

example, Seddon (1997) Rai et al. (2002) Molla & Licker (2001) have reported opponents' criticisms of the DeLone &McLean model. For instance: unclear theoretical foundation, the irrational unidirectional relationships among use, user satisfaction, individual impact, and organisational impact.

2.6 IS Failure

IS failure has become a major concern for IS researchers and practitioners. Currie & Guah (2006) state that the failure rate of large scale IT projects in the public sector is 80%. Ammenwerth et al. (2006) commenting on the high failure rate of healthcare IT projects, (which sometimes reach 60-70%,) show that it leads to tremendous loss of financial capital, and weakened confidence in IT capabilities from the user perspective.

Authors in the IS field have analysed the causes behind the IS failure phenomenon. For instance, Kijsanayotin et al. (2009) postulates that inadequate understanding of the socio-technical aspects of IT is one of the major factors leading to failure. Laudon & Laudon (2006) attribute IS failure to inaccuracy and the inconsistency of data generated, operational flaws, and a system design that does not take into account the business requirements. Sharma & Yetton (2003) and Jiang et al. (2000) stress that user resistance is the key factor responsible for failure.

There are symptoms that appear prior to failure, which may act as warning signs to which decision makers and system developers should be alerted to rescue the IT project from potential termination (Kappelman, McKeeman & Zhang 2006). Kappelman et al. (2006) pinpoint a dozen EWSs, six of them are people-oriented factors, and the rest are process-related factors

Determining whether an IT project is a success or failure is difficult because various stakeholders perceive success and failure differently, and the success/failure factors discussed in the IS literature are not tailored to the implementation of HCIS in the NHS in England. Therefore, even though IS success is a multidimensional construct, usage was the ultimate measure of success because the authors aimed to approach user issues concerned with the use of Lorenzo's from a user perspective (bottom-up).

2.7 Users' Acceptance of IT

An organisation may adopt and implement computer systems but lack end user acceptance. Therefore, motivating end users to use the system, and understanding the factors that affect their behaviour toward the use of IT are crucial. The importance of understanding the factors that influence users' adoption of innovations stems from the fact that adoption of innovation takes place within an organisation (Intra-organisational adoption), in conjunction with the organisational adoption. The IS adoption/diffusion literature has pinpointed the notion of the two-level adoption process (organisational and individual) (Jeyaraj, Rottman & Lacity 2006, Rogers 2003, Frambach & Schillewaert 2002, Premkumar & Roberts 1999, Agarwal & Prasad 1998).

2.8 IT Adoption/Acceptance theories

Based on what has been discussed, looking at not only how organisations adopt IT but also how individual users behave toward IT is imperative (Quaddus & Xu 2005, Frambach & Schillewaert 2002, Leonard-Barton & Deschamps 1988). The IS literature offers a plethora of theories, which explain users' acceptance of newly installed systems in terms of the factors that mostly affect their inclination to use new systems. For instance, **U**nified **T**heory of **A**cceptance and **U**se of **T**echnology (UTAUT) (Venkatesh et al. 2003), **M**odel of **PC** **U**tilization (MPCU) (Thompson & Higgins 1991), **D**iffusion **o**f **I**nnovations (DOI) (Rogers 2003), **P**erceived **C**haracteristics of **I**nnovations (PCI) (Moore & Benbasat 1991) and **T**echnology **A**cceptance **M**odel (TAM) (Davis 1989). However, little research has been conducted to utilise and adapt these theories to the healthcare sector, which causes a shortage of explanations of end users' usage of IT (Schaper & Pervan 2004).

2.9 Critical Success Factors (CSFs) of IT Implementation

There has been a considerable amount of research identifying **C**ritical **S**uccess **F**actors (CSFs) for the development, implementation, and use of IT (Yeo 2002, Mahaney & Lederer 1999, Robert & Albert 1999, Glass, 1998, Belassi & Tukel 1996, Hougham 1996). These studies have presented a wide array of success/failure factors. It is difficult for a researcher to apply a uniform set of success variables in all IS projects (Belassi & Tukel 1996). The absence of a unified set of CSFs is because the nature of the IS project (for example, its size), and the nature of the industry in which IS projects are implemented may require different factors to exist in order for the projects to succeed. Even though CSFs is a well-known factor-based technique, it suffers from drawbacks. For instance, Fortune & White (2006) claim that the CSFs approach does not take into consideration the inter-relationships between the individual factors. In addition, the CSF approach assumes that the effect of a factor is the same throughout the stages of project implementation. Thus, the CSFs approach ignores the dynamic and iterative nature of IT projects (Kucukyazici et al. 2010).

It is therefore impossible to cover all areas covered in the literature around CSFs but some key areas highlighted in the literature are now outlined.

Top Management Support: Radhakrishnan et al. (2010) state that top management support is imperative to encourage medical staff to use healthcare systems. Furthermore, Radhakrishnan et al. (2010) postulate that strong communication channels and co-operative work should be made with users for management support to achieve its intended outcome .

User Involvement: Engaging end users in the determination of information requirements is crucial because it helps to overcome the user-designer communication gap. Most researchers who tested the role of user involvement in IS development (Rondeau, Ragu-Nathan & Vonderembse 2006, Malhotra & Galletta 2004, Winston & Benjamin 2000, Choe 1998, 1996, Saleem 1996) have found that user involvement has a positive impact on IS success. However, this relationship exists under the premise that users are homogeneous in terms of their system needs.

User Support: For an organisation to benefit from IT, it should assist its intended users (Kamal 2006). User support is considered as one of the important factors for IS success (Hussein, Abdul Karim & Selamat 2007, Jeyaraj, Rottman & Lacity 2006). Assistance is given to users in terms of technical support and guidance. Radhakrishnan et al. (2010) postulate that technical support is imperative for implementing a complex system and users feel more encouraged when they are provided with technical assistance.

User Training: User training is pivotal for successful individual IS adoption (Jeyaraj, Rottman & Lacity 2006). Training programmes enable IS staff to possess the required skills and knowledge. Radhakrishnan et al. (2010) suggest that health organisations should place greater emphasis on training their system users, and be given more time to acquire the necessary skills for the use of the system. Sharma & Yetton (2003) argue that other variables may eradicate the positive effect of training on IS success. Sharma & Yetton (2003) postulate that the greater extent of technical complexity and task interdependence, the less favourable effect of training on IS success.

Availability of Resources: The availability of financial resources is one of the strongest CSFs. However, financial capital is not the only resource required for developing and adopting IT (Kamal 2006). Kamal (2006) classifies IT capabilities as one of the CSFs for developing advanced IT projects in the public sector. One main component in IT facilities is the IT infrastructure. The IT infrastructure allows different organisational units to share the repository of information or knowledge. Data communication networks, workstations, and clinical repositories are examples of IT infrastructure that enable health organisations to establish a delivery system-wide network to combine various applications (Wager et al, 2005). Kamal (2006) posits that the level of IT competence or skill set has a positive impact on IT adoption in government organisations. However, Donald (1999) highlights the fact that employees working in governmental organisations often lack adequate training for using IT. Inadequate training leads to resistance to use and under-utilisation of computers.

Project champion: Rogers (2003) emphasises the pivotal role of the project champion who supports the organisational efforts in implementing technological innovations, and overcomes any resistance that new ideas may bring about in organisations. The champion is a charismatic person (Rogers 2003) who is committed to introducing an IS to the organisation (Kamal 2006).

3. Background To The Npfit In The Nhs

When the NPfIT was implemented the UK National Health Service (NHS) was organised through regional Strategic Health Authorities (SHAs) - which have since been abolished - and at a local level through local NHS organisations.

The SHAs were accountable for implementation and benefits realisation from the NPfIT, and making sure that the local NHS had the capability and resources to deliver their plans.

Successive UK governments tried, with varying success, to enhance quality and reduce the cost of providing health services. Information and Communication Technologies (ICT) in the NHS context have been perceived as a crucial element in achieving these goals, by making health information available electronically at local and national level. The introduction of IT started from the 1960s illustrated by computer systems for Patient Administration Systems (PAS), followed by laboratory and radiology systems in the 1970s. Hospital information support systems and resource management systems were introduced in 1980s. In the 1990s, the NHS developed an IT strategy that resulted in the introduction of Electronic Patient Record (EPR) and later an Electronic Record Development and Implementation Programme (ERDIP) (Currie & Guah 2007).

Modernising the NHS began in July 2000 as a 10-year reform programme and the NPfIT, announced in 2002, would become a major part of this programme. The NPfIT was a 10-year programme for creating a national and integrated IT infrastructure. The programme was centrally controlled by the NHS Connecting for Health (CfH) agency to procure various IT applications with a total expected expenditure of £12.4 billion over the ten years until 2013/2014 (House of Commons 2007). The hugely ambitious aim was that once the national systems were installed, they would connect 110,000 doctors, 390,000 nurses, and 120,000 other health professionals (The NHS Confederation 2008). Moreover, patients would have access to their personal health information.

The main objective of the NPfIT was to give health professionals access to patient-related information

safely, securely, and easily whenever and wherever it was needed. Providing health services to people entails producing massive volume of paperwork which is vulnerable to misplacement, occupies a massive amount of space, and is difficult to access. Thus, implementing the various IT applications in the NPfIT was expected to save the processing time, consume less space, and overcome other problems that had been evident in the NHS such as, lost records, delays in appointments and prescriptions (The NHS Confederation 2008).

Moreover, previously hospitals purchased and used their own IT systems without national sharing of medical records with other NHS organisations. Thus, the NPfIT aimed at linking the computer systems of NHS organisations to enable electronic sharing of information easily and securely (Eason 2006, National Audit Office 2006).

The NPfIT consisted of four main components; the first component was the NHS Care Records Service (CRS). CRS was concerned with creating a single electronic health record to which all health providers can have access to and add health-related information (The NHS Confederation 2008). To implement the CRS, England was divided into 10 Strategic Health Authorities (SHAs). Local Service Providers (LSPs) were assigned to deliver local systems and services. Six out of the 10 SHAs constituted the NME region (North, Midlands, and East of England). In the NME region, Lorenzo, the focus of this paper, designed by Computer Science Corporation (CSC), was the CRS to be installed.

The second component was the electronic booking system (Choose and Book) that enables patients to choose their appointments. The third component was Electronic Transmission of Prescriptions (ETP) for generating and transmitting prescriptions electronically. The fourth component was the NHS National Network (N3) that provides the NHS with the IT infrastructure and networking services. The NPfIT increased in scope and complexity as more IT applications were added for improved performance.

4. Methodology

A qualitative approach through an interpretivistic paradigm was adopted in order to interview end users to understand what influenced user attitudes towards Lorenzo. This was appropriate as no prior studies on Lorenzo had been found. Interaction with the user community and those responsible for assisting them from the Local Service Provider enabled the authors to gain a better understanding of the factors and other issues related to Lorenzo's implementation.

The study was inductive in nature; the authors started with the data, which was obtained from the participants (empirical observations). Then, the authors interpreted participants' views to reach patterns or more generalisable inferences (Darlington & Scott 2002).

Grounded theory (GT) was used to collect and analyse the data for this research project. GT was originally developed by Glaser and Strauss (1967) with the aim of "generating theory from data", although Glaser and Strauss later diverged on what the term actually meant.

Tan (2010) identified three common cases in which GT can be applied, the latter two of which are relevant in this analysis of Lorenzo. The first case is when researchers aim to create a theory about issues of importance in people's lives. The second case where researchers can use GT is in the study of new socio-technical phenomena (Fernández 2004). The third situation where researchers can use GT is when the area of interest is new and developing. Generating theory was part of a wider research project the authors were involved in.

4.1Case Study Design

The current research uses a single case, which was the process of designing and implementing Lorenzo in the NHS. Applying this programme in the NHS entailed organisational changes and decisions to be made, which profoundly influenced the success of Lorenzo.

4.2 Sampling

To achieve a balanced approach three participants were recruited from the NHS who could represent the user perspective and three participants from the Local Service Provider. Although the current study's participants were in senior positions, they also had significant medical experience and were actively involved in implementation.

The selection criterion of the sample subject was that the participants, from either the NHS or the LSP side, should possess the required knowledge and expertise in Lorenzo's implementation.

The research team used theoretical sampling, an integral aspect of grounded theory, through a snowball process (Karp, cited in Bryant and Charmaz (2010). Theoretical sampling was conducted iteratively where the researchers collected data and conducted analysis until it was felt saturation was reached, i.e. an extra interview added no fresh insights. At the start of the primary research process the research team thus made contact with a medical academic with many years of experience of Information Systems in the NHS. He referred the team on to an NHS clinician deeply involved in the Lorenzo project, Respondent 1 below. In turn each

respondent was asked for a further referral until it was felt no more were required, i.e. after Respondent 6 was interviewed and the data analysed. It is recognised that this method is not statistically significant (Karp, cited in Bryant and Charmaz (2010) which could be seen as a limitation of this study.

The respondents are described as follows, with details intentionally left vague to maintain anonymity.

Respondent 1 was a senior clinician in a large NHS Trust with many years experience of Information Systems in the NHS. He had been seconded to work with a Local Service Provider during part of the duration of the NPfIT before returning to the Trust.

Respondent 2 was a senior member of staff with a Local Service Provider. This respondent had previously spent many years working in senior roles within the NHS and was responsible for user aspects of Lorenzo implementation.

Respondent 3 was a senior employee with extensive prior clinical experience, focussed on Information Systems within an NHS Trust with responsibilities for the implementation of Lorenzo.

Respondent 4 was also a senior employee in Information Systems within the same NHS Trust as Respondent 3 with responsibilities for the implementation of Lorenzo.

Respondent 5 was a senior member of staff in a Local Service Provider with deep involvement in the implementation of Lorenzo.

Respondent 6 was also a senior member of staff in a Local Service Provider with responsibilities for implementation of Lorenzo.

4.3 Interviews

The interviews were conducted in 2008 and 2009 and ranged from 1 hour and 9 minutes to 1 hour and 32 minutes. An interview guide with some general questions was used for each interview, however, there were not many specific questions used for two main reasons. Firstly, the authors wanted to explore the participants' views and to learn, from their perspectives, the crucial aspects that influence the implementation of Lorenzo. Some of the issues raised by participants were absent from the authors' original thinking, this is because the participants had significant experience in dealing with Information Systems in Healthcare in general and Lorenzo in particular.

Secondly, GT techniques and principles requires that research should start with an open mind. Although the authors included a set of questions or ideas to be discussed with the participants, the order and format of the questions were changed according to the participants' responses. Flexibility, as one of the salient features of qualitative interviewing (Holloway 2005), allowed such a change in the order and format of the questions. Due to this change, new topics and/or questions emerged spontaneously during the interviews, which were necessary to clarify and probe thoroughly some of the participants' ideas.

Questions were modified for each interview according to the resulting analysis of the previous interviews, the nature of the participants' work, and the roles and responsibilities they performed. Changing the questions according to the analysis of the previous interviews enabled the authors to create theoretical concepts grounded in the data collected and again, this symbolises the emergence principle of grounded theory.

All interviews were transcribed and sent to the respective respondents for them to remove any confidential data. All respondents agreed that the information they provided could be used in the research and made available in public domain.

It is recognised that there are limitations in the approach taken. The small sample size means that the research cannot claim to be generalizable. There are also, of course, issues around the role of the interviewer and the interpretation of the respondents' views. However, a systematic approach to coding the interviews, explained below, was undertaken to deal wioth such possible concerns.

4.4 Data analysis

Coding: Glaser divided the coding process into two levels, substantive and theoretical coding (discussed in Tan 2010, Heath & Cowley 2004). Whereas, Strauss and Corbin (1998, 1990) mentioned three types of coding; open, axial and selective coding. The authors used a mix of coding levels which Heath and Cowley (2004) advise can be done with caution and used Nvivo in the analysis of the data.

Open (initial) Coding: The lead author started analysing the data with open coding to identify "*concepts…..their properties and dimensions"* (Strauss & Corbin 1998: 101). After each interview, the author carefully read the transcript to extract relevant concepts. Analysis started using two types of codes; the **"in vivo"** and **"researcher-constructed"** codes (Douglas 2003). "In vivo" codes represent the actual phrases used by the participants, whereas, "researcher-constructed" codes represent the author's own description of the idea or event mentioned in the text. The other authors checked the codes with differences resolved through discussion. Strauss and Corbin (1998) claimed that once concepts emerge from the open coding phase, the researcher should group these concepts into categories. Following Bryman and Bell's advice the author grouped two or more concepts, which represent the same theme, into a single category.

Focused coding: This entails using the most frequent (repeated) earlier codes to sift through a large amount of data (Charmaz 2006: 57). As open coding of the entire transcripts finished, a richer and broader understanding was attained and concepts found earlier were edited, amended and merged.

5. Findings

Each interview was set up as a project in Nvivio. Whilst Nvivo was used it is simply a tool to store the documents and aid analysis and coding requires judgment from researchers. The lead author coded the interview transcripts by marking the texts that belong to the same conceptual theme and then each piece of the marked text (called "reference" in NVivo) was kept in the node. Creating free nodes (concepts) in NVivo is equivalent to the Open (Initial) coding in grounded theory (Charmaz 2006). Memos were used as an analytical tool, for specifying potential linkages between categories and subcategories that can be utilised for conducting theoretical coding.

To facilitate the analysis of data and capture all the relationships between the categories, it was decided to combine the six NVivo projects. One point to bear in mind is that the authors double checked that the same categories were combined to form a comprehensive hierarchical category.

From the individual projects the authors decided to include three major (core) categories. These were "Clinicians' Attributes", "Organisational Factors" and "System Related Factors". These were included because they were evident in the majority of projects, i.e. 4 or more.

5.1 Clinicians Attributes

The first category is *"**Clinicians Attributes**"* which highlights how end users' traits influence and/or explain their acceptance of/resistance to using LORENZO. This category occurred in four projects [R1, R2, R3, R5], i.e. these projects had 2 or more concepts present. The concepts which occurred most in this category were Generational Gap, Lack of End Users' Informatics Experience and Busy Clinicians (Lack of Time) which are now explained.

Generational gap: This concept was mentioned by four of the respondents as a barrier to LORENZO's implementation. R1 made the link to seniority which has further implications for the support LORENZO received, with a similar comment made by R3.

R1 "There is also the generational gap within the hospital sector you know the more senior people doctor, nurses…etc perhaps not intuitively geared toward technology"

R2 had a slightly different slant on things referring to nurses in general commenting.

"They are in the 45+ age range? So it doesn't take much to really compute that they're going to find that a little bit more challenging because they weren't brought up with computers they may not even use a computer, they might. But they may very well not do"

The literature review discussed, in general, the characteristics of users leading to resistance to using information systems. The Jiang et al (2000) paper, briefly mentioned in the literature review, also goes on to specifically mention resistance created by the users' internal characteristics such as age and gender (Meade, Buckley & Boland 2009) and their varying backgrounds, values and beliefs that affect users' attitudes toward using IT. This suggests greater emphasis should have been placed on the needs of the users of the NPfIT and how to best encourage them to become enthusiastic in their take-up of the system.

Lack of End Users' Informatics Experience: R1, R3, and R5 stressed that most clinicians lacked an understanding of technology. This negatively influenced LORENZO implementation as people were required to deal with advanced IT-based medical solutions. To quote these respondents.

R1 "There is another tension and the tension was to do with the implementation side with people's ability and understanding of the technology"

R3 "I think is where many other trusts, they just don't have clinicians who have the informatics experience, some do, but not many and I think that, I think that's holding a lot of these trusts back"

R5 "In terms of clinicians, clinicians are trained to do clinical work and a lot of them say "We're not trained to work with computers"

This emphasises the importance of training which was covered in the literature review. However, both R1 and R5 noted that IT medical systems had been used by clinicians for many years meaning the situation was not completely straightforward and that perhaps resistance was an issue, a point noted in the literature review by Sharma & Yetton (2003) and Jiang et al (2000) noted above. Avoiding user resistance is also a central part of the socio-technical approach detailed in the literature review.

Busy clinicians (lack of time): The research suggested that clinical staff in the front line were hindered from participating in Lorenzo's development due to lack of time and that th staff who were involved were likely to have lost touch with day-to-day operations.

R3 "Three extra clicks means a lot to a busy clinician… The problem is the doctors are so busy…"

R6 "You're there because you've got time to go away from your work and do some of that stuff but by its very

nature you are at one removed from the operational process. So it's impossible for an organization like this to get to the operational process"

5.2 Organisational Factors

This category was mentioned in four projects, R2, R4, R5, and R6. The most frequent concepts are discussed below.

Lack of NHS Trusts Involvement: Lack of NHS Trusts' Involvement was evident in R2, R4, R5, and R6. This concept indicates that there is a lack of engagement and involvement by users, who are situated on the front line or the local NHS organisations. This was illustrated by comments from R6.

R6 To be in that level where you're going to get invited to discuss requirements you're not going to be your ordinary Ward Sister or your ordinary Ward Nurse or your ordinary Radiographer or your ordinary IT, you're going to be somebody who is already in a senior management level

Lorenzo was intended to be an IT based medical solution, which is supposed to drive change in the way NHS runs its services as was described by R5. However, in order for change to occur end users should be participating in redesigning clinical processes as was suggested by R5.

R5 The only people who really know the truth are the ones that are doing it, aren't they? They're the only ones who know the truth of what you really do. So I always encourage the change leads and the organisations to go out there to make face to face visits with the district nurses, the ward staff, whoever they are, make sure that they actually get the real process

Lack of Clinical Input: Analysis of the data also showed that the lack of clinical input took place within the organisational context.

R2 *the amount of engagement and involvement clinicians have within the national programme generally. And I would say probably the amount of involvement and engagement we have on either side… is probably not enough, at all*

This did not mean that there were no initiatives aimed at engaging clinicians in the determination of system's specifications, but given the scale of the NHS they were not large enough.

R4 - *There was clinical involvement from the core clinical group that Connecting for Health employed, and that numbered around about 80 clinicians across the country, and I think that was woefully inadequate for the complexity of the sorts of systems that were being designed*

Both the concepts above can be related to user involvement, covered in the literature review. However, in such a large and diverse organisation successfully gaining user involvement was a hugely challenging task with a wide variety of specialist medical staff to deal with. R4 mentioned the lack of resources dedicated to gaining clinical input in the context of such an ambitious and wide ranging project and the sheer number of people involved.

Lack of Top Management (NHS) Support: This concept occurred in 3 projects, R2, R4, and R5 as illustrated by the following quotes.

R2 I do not think that the NHS actually put in as much support as they should be doing into the deployment

R4 The senior responsible officers need to really engage in the programme to encourage local organisations to do that piece of work and once that piece of work is done to actually encourage those organisations to think seriously about how they are going to deploy it

R5 I feel that the strategic health authorities probably have got a role in trying to get that sorted out really, to engage with very senior people, chief executives to help them to understand that these systems are there to support the business

Top management support is considered as a key issue in deploying new IT systems (Jeyaraj, Rottman & Lacity 2006, Kim & Bretschneider 2004) as we saw in the literature review. It is something which can be seen as even more important with the complexity of management, noted below, and the scale of the project as we have discussed.

Stakeholders and Communications Management: This concept occurred in projects 2, 5 and 6, interestingly all of whom work for the LSP of Lorenzo. R5 noted that end users were not involved from the early stages of the programme as communications were initiated first with the highest levels of the NHS, and end users were engaged only as the programme moved on.

The NPfIT also had a complex governance structure as R6 explained which inevitably impacted on communications.

R6 - *We are in a very strange world because the contract is written in a tripartite fashion, so you've got ourselves and our commercial relationship with the client, which is Connecting for Health, but our customer is the NHS and they themselves have a strange relationship with the client. So it's a very uneasy triangle and it doesn't serve us very well. It doesn't serve the NHS particularly well and I don't actually think it serves CfH, but it's what we have got at the moment*

This support is again connected to the role of top management as communicators - in terms of encouragement, sponsorship, or engagement in the system being deployed by informing the lower organisational layers about the

expected benefits of the programme through communications. However, the complexity of the management of the project, noted by R6, added further difficulties to an already challenging environment.

5.3 System Related Factors

The System Related Factors category was repeated in five projects, R1, R2, R3, R4, and R5. The main concepts are discussed below.

Changing (Creeping) Requirements: This concept evident in R1, R2 and R3 refers to the notion that the NPfIT in general was an emerging programme, which started with a limited number of systems and then increased as the system moved on.

R1 The project NPfIT programme itself is changing. It started with very clear ideas that … the infrastructure issues like email and N3 and electronic transmission of transcription and electronic patient record PACS started coming later on

R2 *The implementation of this will never stop because there will be constant refinement, both in the way in which they use it because they will be saying "Well that is a really--, actually let's do it this way. Let's use that bit of software*

Whilst flexibility can be a good thing in adjusting to user requirements uncertainty can also be a hindrance especially with such a complex project. Although not covered in the literature review creeping requirements are a common problem in the Information Systems literature noted by Gupta (1996) in the context of SLDC.

The Technological Nature of the Programme: Three interviewees – R1, R2 and R6 - asserted that there was a confusion about, or an unclear picture of the nature of, the NPfIT, whether it was just an IT project, or a tool to implement the NHS reform plans to improve the quality of health services provided to patients.

R1 "From the early beginning, there was all these discussions whether it was about IT or about clinical services and what the role of clinicians"

R2 "It has been sold really as a technology programme and I think that switches a lot of people off. We haven't even got past base camp really"

R6 "A substantial reservoir of opinion in the NHS that sees IT as that and one of the things we spend a lot of time in this organisation doing is that this isn't an IT system, this is a clinical system that's got IT as it is underpinning infrastructure"

This clearly emphasises the importance of socio-technical approaches to Information Systems. From the above statements the NPfIT, whatever its supporters may have intended, was seen as a technology project, which then discourages clinicians from becoming involved even if they felt inclined to, which could exacerbate the problem to include, for example, lack of clinical input.

6. Implications

A number of key lessons came from this research which focused around barriers to successful implementation.

6.1 Internal and external characteristics of end users

Clinicians did not feel they had sufficient time to devote to meetings and discussion on the development of Lorenzo. They lacked the required IT skills due to inappropriate training programmes, and the anxiety clinicians held about the use of the system hindered their participation in the development and deployment of LORENZO. The end result of clinicians' attributes led to fewer practising clinicians involved in developing and deploying LORENZO, either on the LSP side or the NHS side.

6.2 Fragmented departmental systems

Despite the importance of understanding how clinicians' attributes affect their tendency to use Lorenzo, the analysis reveal the crucial point that departmental factors need to be considered because systems requirements are determined and negotiated at a departmental level. However, the nature of the working environment in NHS organisations makes it difficult for the NHS users to reach consensus on these requirements.

6.3 Lack of top management support and championship

Because senior management people lack medical expertise and did not have enough awareness and understanding of the NPfIT overall, they were unable to provide support to the end users. Therefore, the NHS needs to have top level seniors who can support end users and champion the project towards a successful implementation.

6.4 Lack of end users' involvement in the implementation of Lorenzo

Participation and involvement in the implementation of Lorenzo was confined to the upper levels of NHS organisations. That caused separation in the definition of system requirements, which were identified by senior level management, and the implementation of these requirements by end users (i.e. bottom level). There are two

reasons, based on analysis of the data, for the lack of users' involvement; firstly, stakeholders and communications management influenced users' involvement. This effect is rooted in the NHS organisational culture and structure that restricts and confines bottom level roles to merely implement what comes from the upper managerial levels. This is because most NHS organisations have a top-down hierarchical structures that restricts the free flow of information between the upper and the lower managerial levels. Secondly, clinicians' attributes prevented end users from being involved in the implementation of Lorenzo.

6.5 Lack of technical support provided to end users

One of the prominent barriers facing the implementation of Lorenzo was the limited technical support provided to end users by the LSP, which was only 45 days. This denotes the fact that the LSP did not have enough interaction with the end users, and the LSP did not have enough influence to facilitate the system usage.

The contractual arrangements that managed the relationship between the NHS and the LSP, is based, perhaps inevitably, more on a commercial basis, rather than a clinical basis. This contributed to the limited support provided. In addition, the commercial nature of the contract hindered the secondment of staff to LSPs which could have improved communication between the two sides.

7. Conclusion

The NPfIT was a major disaster, even within the context of failed UK public sector IT projects. This makes it important that key lessons are learnt from the experience. A number of key lessons emerge from the failure to involve users in the project and the unrealistic nature of the project itself. However, most of the problems are found within the IS literature showing the importance of learning from such experiences the next time such an ambitious project is attempted. For the sake of public finances and the public services one only hopes that the lessons are learnt and heeded.

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