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Firas Masri

*University of Manchester, [firmas.masri@postgrad.mbs.ac.uk](mailto:firmas.masri@postgrad.mbs.ac.uk)*

Peter Kawalek

*University of Manchester, [peter.kawalek@manchester.ac.uk](mailto:peter.kawalek@manchester.ac.uk)*

Trevor Wood-Harper

*University of Manchester, [atwh@mbs.ac.uk](mailto:atwh@mbs.ac.uk)*

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# KNOWLEDGE MANAGEMENT SYSTEM IMPLEMENTATION AND KNOWLEDGE TRANSFER PRACTICES THROUGH SYSTEMS THINKING: A CASE STUDY IN A NHS HOSPITAL

Firas Masri<sup>1</sup>, Prof. Peter Kawalek<sup>2</sup> and Prof. A. Trevor Wood-Harper<sup>3</sup>

<sup>1</sup>Ph.D. (Knowledge Management in Health Sector), Alliance Manchester Business School, IMP and Health Division  
Manchester M15 6PB

<sup>2</sup>Professor, University of Manchester., Alliance Manchester Business School, Booth Street East Manchester M15 6PB

<sup>3</sup>Chair in Information Systems & Systemic Change, Alliance Manchester Business School Manchester M15 6PB

## **Abstract**

*The paper aims to contribute to the understanding of Knowledge Transfer (KT) through implementing a Knowledge Management System (KMS) as a case study in the field of healthcare, leading to theory extension. The concepts of system thinking were used to explore in what way a hospital practically achieves and implements a KMS. To do so, a case study was conducted as a qualitative approach, and data was collected by in depth semi-structured interviews with different stakeholders, including strategic management, technicians and end users, in addition to reviewing related documents and observation. Template analysis was also used as data analysis method. This case study provides evidence that system thinking provide benefit for KMS at both planning and implementation stages. Moreover, an emphasis on the understanding of KT would be to bring about the integration of care. Also, the findings illustrate that implementing KMS requires not only the theoretical awareness of the concept, but also requires learning through practice for a smoother implementation process. Flexibility, distributed leadership and end-user involvement are important, and communication technologies and strategies should focus strongly on the transparency, including communications tools and methods.*

**Keywords:** Knowledge Management, Knowledge Transfer, Healthcare, System Thinking, Electronic Patient Record, Implementation.

## 1.0 Introduction

Implementing KMS and making knowledge easily transferable within healthcare organisations is still perceived to be difficult, particularly in hospitals that in the last ten years, such issues of implementation have begun to be tackled in the healthcare (Chalmers R and Grangel R, 2008; Gastaldi *et al.*, 2012). There are some studies which highlight the reasons behind these issues. Hansen *et al.*, (1999) justified that by the gap between the theories of KM approaches and their empirical implementation. Maier and Remus (2003) argued that this is due to the lack of agreed methods for implanting KM. In a more recent study, Edwards (2009) claimed that the decision to do KM is not the same as actually to do it. This remains the case in 2016. According to many scholars, a Systems Thinking approach to KM and KT provides a method to understand KM system implementation (Rubenstein-Montano *et al.*, 2001; Edwards, 2003; Parent *et al.*, 2007). However, these studies have not been conducted in the healthcare field. This study aims to enhance our understanding of the KT in healthcare, by focusing on implementing KMS from a Systems Thinking perspective. The general purpose is to get better understanding on how to implement KMS in healthcare effectively. This study is also exploratory for implementing an Electronic Patient Record (EPR). Exploratory research is defined as a type of study that is attempting a new subject about which little is known (Philips and Pugh, 2000). Exploratory research attempts to gain awareness and comprehension to the subject area for more deep analysis Collis & Hussey (2013).

This study specifically explores the implementation of a KMS from different points of-view across various 'stakeholders' (i.e. strategic managers, implementers and end-users), in order to understand the Knowledge Transfer (KT) practices through implementing a Knowledge Management System (KMS) as a case study in the field of healthcare.

The paper is organized as follows: first part will illustrate a literature review that will discuss previous studies on KM, KT and the System Thinking to KM. Also it will talk about implementing KMS with specific reference to healthcare. The second part will explain the research methodology and approach to data collection and data analysis. The third part will discuss the case study. Afterwards, this paper closes with the conclusion and recommendations.

## 2.0 Literature Review

### 2.1 Systems thinking

*Design rules! Design must be at the heart of every business... Design thinking and systems thinking are one and the same. In great design, form and function come together seamlessly. Every part contributes to the whole in a way that seems inevitable. So too in a great system. (Peters 2005, p54)*

Systems thinking could be defined as a theoretical framework for ‘*problem solving*’ which attempts to incorporate different scientific disciplines and multi-perspectives. *Problem solving* tries to reduce or fragment the system into sub-systems in order to study how each part is functioning. The term “systems” exists because of most scientific fields, and system thinking comes to discuss the notion of problems as a whole (Senge, 1990; Hall, 1999). System thinkers see their world as entities organised into or by systems and sub-systems, and the term “system” is utilized to demonstrate every entity and all entities in reality and relationships among or/and between its/their parts, entirety (Parent *et al.*, 2007).

Many theoretical frameworks that adopt systems thinking for problem-solving had been discussed in the literature. For instance, we can see Soft Systems Methodology (SSM) (Checkland, 1981; Checkland, 1991) Systems Intervention Methodology (SIM) (Hall, 1997), Value Systems Theory (VST) (Hall, 1999) and Spiral Dynamics (Beck and Cowan, 2014). Moreover, according to Miettinen, and Hämäläinen, (1997); Zandi, (1986), Life Cycle Assessment (LCA), which is a tool, built in the literature, can be used for problem-solving/systems thinking.

The premise of the system perspective of the world sustains that this universe characterizes as an imperative of incorporated complexity, all of which are interdependent and interconnected. Thus, any system and its subs cannot be understood without considering and understanding its relation to the other systems and to the environment which is surrounding it. A mechanistic view, as a static concept, tries to break parts down to understand the functionality of machines. System thinking, as a dynamic model, tries to understand the changing of the world through recovering the connections or relations that are existed between systems and their sub-systems. For Rubenstein-Montano *et al.*, (2001), “problem-solving in this way involves a pattern finding to enhance an understanding of, and responsiveness to, the problem” (2001, p. 6).

Holland (1962) formalized the concept of *adaptive systems* which could be defined as the necessity for systems to change and adapt to changes within the system’s context to better achieve their goals. Ackoff and Emery (1972) developed the concept of *purposeful systems* to support the idea that systems will exist in the context of specific goals. Then, Shakun (1981) advanced the idea of responsive systems which denote the way systems learn from past performance to enhance

functionality and efficiency. Checkland (1981) developed Soft System Methodology (SSM) through 25 years of action research, aimed to deal with “messy real-world situations”.

Rubenstein *et al.*, (2001, p. 6), stated that:

*Outcomes from systems thinking depend heavily on how a system is defined because system thinking examines relationships between the various parts of the system. Boundaries must be set to distinguish what parts of the world are contained inside the system and what parts are considered the environment of the system. The environment of the system will influence problem solving because it influences the system, but it is not part of the system.*

If we agreed to consider the strategy is implemented when all lights are green and there is no resistance, system thinking is very useful for the observer to see patterns that enable them to drive through all the green lights. This argument shows the power of KM and KT when placed in a system(s) thinking to understand the context. From this perspective, people, knowledge they have need and transfer, the culture for knowledge transfer, technological infrastructure and organisational structure, all must be understood for effective KT practice.

System thinking is needed in the healthcare to enhance KMS implementation and KT practice through its ability to understand the complexity of the environment and dynamic processes (Schlange, 1995). Thus, System thinking is important for KMS implementation and KT practice to provide an overseeing framework to insure that a robust definition of the system being referred to, along with its boundaries.

## **2.2 System thinking and KT model**

The environment of healthcare is complex, and function as an intensive generator of knowledge and information from different disciplines that each requires high creativity and autonomy. KM and KT models encourage system thinking to advance a basic framework and to identify the main elements required for social system(s) to produce, articulate and apply new knowledge to achieve a desired outcome (e.g. quality of care). However, KM and KT is an expansive area of study. Thus, it requires a systems thinking approach to identifying opportunities for improvement within these organizations. When the holistic approach of systems-thinking will be applied, KT would be considered as a link to the relationships between and among systems and their sub-systems and also the relations with their processes and goals. This perspective of system thinking consents a viewing KT from both what capacities the system possesses for KT to succeed (to achieve the goals), and also how knowledge gets transferred (the process). This approach should consider the restrictions within which KT typically occurs, as all systems have limits. All in all, KM and KT to use system thinking must consider the integration between organisational strategy, technology, learning and culture.

### **2.3 Knowledge management and Knowledge Transfer**

Definitions of knowledge and KT practices and KM vary from the broad conceptual to the practical. Space does not allow a full discussion here: for the purposes of this research, we regard any piece of information with a specific objective and can lead to do an action in an organisation as knowledge. “KT practices” is seen as an important approach to facilitate knowledge acquisition, knowledge sharing, and knowledge application to achieve desired outcomes (Argote, 2013). To define KM in healthcare, the Healthcare Information & Management Systems Society in the United Kingdom (HIMSS) definition is adopted. Accordingly, KM is the ‘aligning of people, processes, data and technologies to optimise information, collaboration, expertise, and experience in order to drive organisational performance and growth’.

In other words, KM is a holistic approach to associate all knowledge in the health organisations to deliver the best quality patient care. In such organisations, professional specialists, who operate in different, hierarchical arrangements across organisational units, are responsible for delivering patient care. Thus, the delivery of patient care is fragmented (Van Beveren, 2003). This unique characteristic of health organisation regarding the operational arrangement has a deep effect on the ability of these organisations to create, and transfer knowledge. According to Darr, Argote, and Epple, (1995) Knowledge transfer is considered as the most common approach discussed in organisational learning and knowledge management literature. Also, the relationship between KT and KMS was very clear when Davenport *et al.*, (1998) and Alavi & Leidner (1999)<sup>1</sup> described a KMS. In reality, they put a strong emphasis on the ability of the system to facilitate the *knowledge transfer* to support the decision making and/or to do an action. However, there are two concerns emerged from the KMS and IS literature in relation to KT. First, KMS as an approach is more than technology to facilitate knowledge sharing/transfer, but is also about considering other key factors, such as culture of the workplace. Second, imposing technology could inhabit the development and growth power of knowledge and KT practices. Therefore, the strategies for the implementation of KM, and KMS must respond to knowledge flow or what is referred to as KT.

### **2.4 Knowledge transfer and Healthcare: the main issues**

Knowledge management in general and Knowledge transfer specifically are emerging as a potential solution to encourage learning and distributing knowledge which it can encounter the barriers and challenges of the healthcare system (Mitton *et al.*, 2007, Pentland *et al.*, 2011). In healthcare, improved the quality of care in medical areas is a dominant strategy of most organisations. However, KT in healthcare is complicated due to the mobility and subjectivity of knowledge, professional boundaries, time pressure and shift work. The importance of KT in healthcare is viewed from many

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<sup>1</sup> Alavi and Leidner (1999) indicated that usually organizations are developing IS designed to facilitate the integration and sharing all types of knowledge.

directions. First, the healthcare environment is complex and knowledge based. Therefore, providing high quality healthcare requires accessibility to the right knowledge at the right time by providers in order to make the right decisions more efficiently (Lin and Chang, 2008). Second, knowledge in healthcare organisations is mobile. Providers are using knowledge which should be shared by different actors from multiple sources. This sharing of knowledge requires a specific ability, such as dissemination and absorption among professionals (Pentland *et al.*, 2011; Singh *et al.*, 2010). Third, KT between different shifts is considered as the most important aspects about healthcare organisations. These reasons are the main motivators to conduct this study.

## **2.5 Implementation**

In early work in KM, Tenkasi & Boland argued that ‘the current tradition of information systems lacks a strong basis of what it is to integrate differentiated knowledge and expertise and facilitate mutual learning’ (Tenkasi & Boland, 1996 p. 80). Recently, in the field of Operations Management, Setia & Patel (2013), demonstrate that the issues which are between IT support and KM are still open for discussion. It is essential to keep in our mind with the emphasis on integration of the new technologies that the implementation of KMS cannot be treated as just as an information system, but should also be studied in relation with KT practices (Kwon., and Zmud., 1987; Galliers, and Leidner., 2014). To the propose of this study, the EPR system could be defined as ‘an IT system which makes knowledge available to clinicians at the point of care in order to enhance the communication and decision making processes’ (HoCLHC, 2007, p. 22) and thus is a KMS by all the descriptions cited before. The characterisation of knowledge integration as perspective taking in this research is exactly relevant to consider an EPR as a decision support system than the traditional information system.

In general, there are many studies from different disciplines conducted by looking at the enactment of KMS as a technology-based. Chalmers & Grangel (2008), as an example, arguably create a model to assist an implementation of KMS in any type of organisation. Capturing the tacit knowledge was included as one of the goals of their model by applying technology based approach. However, they conclude that this approach seems unlikely to achieve this.

The uniqueness of healthcare organisations in which they are structured, imposes that it is difficult to apply these methodologies. There are many researchers were studying KMS in health; for instance, Ghosh & Scott (2007) examined KM practises and organisational factors and associated with effective KMS within clinical nursing societies. Also, Fahey & Burbridge (2008) used the implementation and development of a KMS in a hospital to explain the transmission of modernization practices and to understand how/why the implementations of KMS initiatives fail. In addition, there are earlier researches of technology-based KMS in health include: Pedersen & Larsen (2001), Mc-Nulty (2002), and Davenport and Glaser (2002). Specifically, none of these researches took system thinking, nor do

any of them look at an EPR system, despite the fact that EPRs are becoming the backbone of all active systems in the hospitals.

Figure 1 shows a representation of a KMS, where the elements people, processes and technology are linked and interact in a reciprocal relationship with one another.

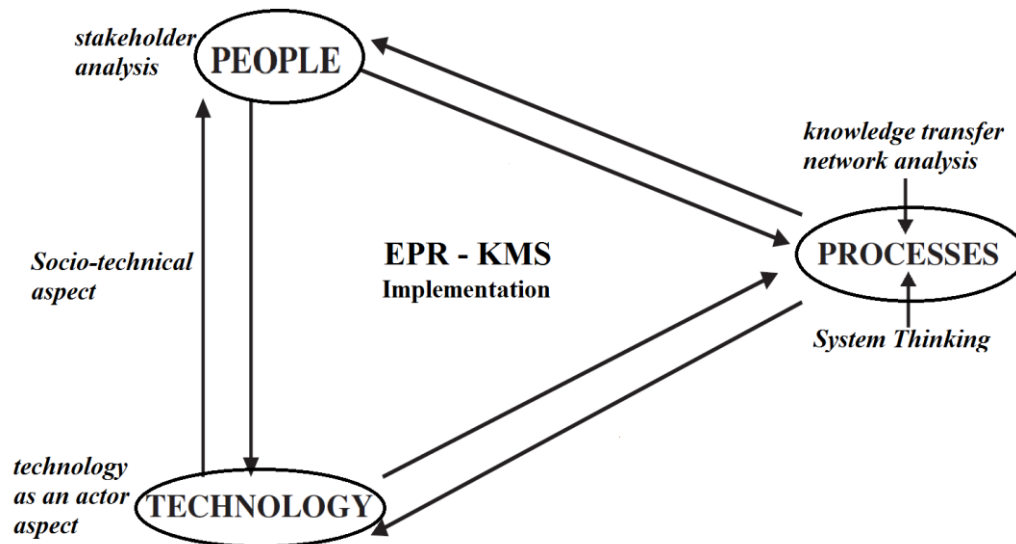


Figure 1 theoretical framework.

### 3.0 Methodology

This research aims (a) to understand better how to implement KMS effectively in a complex system such as healthcare by applying system thinking. In particular, the study aims to apply systems thinking analysis of KMS implementation to provide an in-depth understanding of how EPR could be developed in hospitals. An exploratory and qualitative inductive approach was chosen in this study. This exploratory qualitative case study draws on stakeholder analysis of KMS implementation and KT practice in one British hospital (Blackpool). This method facilitated to explore and examine relationships and concepts, including our assumptions (Eisenhardt, 1989). All NHS hospitals have a certain similarity which is due to the nature and structure of the U.K. National Health Service (NHS). For example, according to the modernisation in the NHS, all hospitals need to meet the target of being (arguably) paperless in 2018. So, all hospitals are expected to implement EPR, as many of them have already done. The case chosen to represent a large NHS Foundation Trust with reasonable experience of implanting EPR which took more than 5 years up to now. According to Yin (2009), a single case study provides an opportunity to obtain a comprehensive understanding of the empirical data, when the case is about a real life phenomenon, such as system development and implementation. The new EPR was to be integrated with the existing information systems. For instance, the new system was trying to be integrated with the Patient Administration System (PAS), pathology order system, Electronic Document Management System (EDMS), GP system, theatre information system, and A&E system. Development and implementation stages were supervised by an administrative board



and operational board in which were included a mix of senior managers, technicians and clinical consultants.

### **3.1 Data collection**

This study employs an in-depth semi-structured interview as a main method for the data collection. This method is adopted in order to enable the exploration of an underpinning issues and under-researched social phenomenon (Alvesson and Ashcraft, 2012). The interviews were conducted with a sample of seventeen participants who represented different views of the stakeholders from the hospital side (e.g. Managers, IT professionals and End-users).

The focus of the interviews was on the view of the participants and their experiences of EPR implementation and development in the hospital, and their interactions with others in shaping KT practices. We asked questions about their role in the EPR implementation and KT practices, their views of using materials as tools, the context of healthcare, stakeholders and role of structures and leadership. An hour and half, the interviews were lasted on average. Also, the interviews were fully recorded and fully transcribed.

### **3.2 Data analysis**

Analysis of qualitative data can be planned in many stages as described by Easterby-Smith *et al.*, (2012). So, we produced interview protocol and also we used field notes. Moreover we used inductive approach, and templet analysis of the data which is considered as a meddle approach between matrix approach and grounded theory (King and Horrocks 2010). The detailed close reading of the field-notes and interview transcripts led to assigning codes that were categorised as first-order, second-order and third-order. This process was completed using interviews transcripts and field notes. We categorized our themes in first-order, second order and third order which was similar to the analytic approach of Strauss and Corbin (1998). These thematic procedures included open themes, axial themes and selective themes (Seale, 2004). The first order was leaded by the open coding which helps to catch the response to emerged themes. The second-order themes were generated by an axial them which refers to exploring the interconnections of thematic categories. The third-order themes were generated by a selective coding which is the stage where core categories are identified. Through this analysis, recurring views, issues, explanations, regularities, and relationships between them were identified, gradually elaborating a small set of emerging themes discerned in the data collected.

The final stage of data analysis and reporting involved the interpretation of the findings. Interpretation is the stage at which 'the researcher transcends data and cautious analyses and begins to probe into what is to be made of them' (Wolcott, 1994: 36). Interpretation is attained through a process of inference and inductive reasoning with reference to analytical frameworks used, literature reviewed,

peer-group checks, member checks and the researcher's personal experience (Lincoln and Guba, 1985; Wolcott, 1994; Patton, 2002).

A system thinking of practice, as the analytical framework in theorising for the socio-technical nature of the strategizing process in healthcare has been applied in this study. Therefore, the following section of the paper reports findings from the study as structured by analytical instruments of systems thinking for KMS implementation.

#### **4.0 Empirical Assessment of the Electronic Patient Record (EPR) System in the Blackpool Hospital (Case Study)**

All NHS hospitals have a certain similarity which is due to the nature and structure of the U.K. National Health Service (NHS). For example, according to the modernisation in the NHS all hospitals need to meet the target of being (arguably) paperless in 2018. So, all hospitals are expected to implement EPR, as many of them have already done. The case had chosen (Blackpool Trust) to represent a large NHS Foundation Trust with reasonable experience of implanting EPR which took more than 5 years up to now. According to Yin (2009), a single case study provides an opportunity to obtain a comprehensive understanding of the empirical data, when the research is about the phenomenon in a real life context, such as system implementation. The aim was to integrate the new EPR system with the hospital's existing information systems. For instance, the new system was trying to be integrated with the Patient Administration System (PAS), pathology order come system, Electronic Document Management System (EDMS), GP system, theatre information system, and A&E system. Development and implementation were overseen by administrative and operational board which included a mix of senior managers, IT professionals and clinical consultants. As mentioned above; KM and KT utilize system thinking in order to consider the integration between organisational strategy, technology, learning and culture. Therefore, we break down these elements into four themes as following.

##### **4.1 Initial implementation issues**

In 2009, the management board of the hospital decided to begin modernising the patient administration system (PAS) through a two-year EPR implementation that was as a response to the NHS's modernisation strategy. The hospital board prepared a business case and started to get tenders to choose one. They chose ALERT Life Sciences Computing which is a Portuguese company. In November 2010, they went live that they decided to start as a *Phased Approach*. The system went live first in the A&E department in which 10 places were associated with different conditions. The system in the beginning struggled, since it was designed to be more suitable for the Portuguese healthcare system. The manager of the Alert Company and the clinical consultant decided to undergo a major

change in Alert. They decided to simulate the work in the A&E department and then to reflect the result within the system.

*What we developed was: we designed the system, and we felt that will work. We actually setup a false A&E department, if you like and brought imaginary patients in. So we could see that things people do that the system could do and it handle it. And we had about five hours that was me and another consultant we setup cases and hazel them to the nurses and doctors staff. They had to do all the processes that patient would have to using only EPR to make it do what we could do on paper .... So what we said was that we are not ready to put the product in use until these will be fixe (Informatics determent manager).*

The clinical team had seen that the system does not fit the purpose of the department.

*When they came with the product they were intending to deliver something that was going to be the final package. What we said that what you designed is very clever and very useful, but I said too much. I said you have a lot of stuff in here that we will not use, and I actually what we need to do is to develop a system that only has only one pigeon holes I said you gave me actually something that has three thousand pigeon holes, but I need only six. Why you provide a stuff which I do not need, just you designed us what I do not have access. (Clinical team manager).*

They decided to do “tracking” which is the ability to locate patients and to look at them in a specific area. The “tracking” needs to tell the staff essential information such as:

- Who is in the department?
- Where are they?
- How long had they been there? Who is seeing them?
- What are they waiting for?
- What results are available?
- What investigations had been requested?

So, the primary focus was about getting the tracking system right, and before the hospital used Alert, they used to have several systems, such as Marxism for tracking, other systems for blood results, and another system for X-rays. The main aim of the new system is to have all of these systems centralised.

Alert started to implement these requirements by adjusting the main product. This adjustment took almost 12 moths to be developed in the A&E alone, and time was running out, since the remaining systems still had to be implemented in other departments with the little time the company had. The company then started to rush the implementation which caused many resistances. And then after four years, Trust decided to finish the contract with Alert.

## **4.2 Facilitating the movement of the Knowledge**

EPR in the hospitals tends to be task-based and neglect the other aspects of KT practice. However, Alert had been designed to address how the work flows could have happened without consideration of contextual factors that influence KT activities. EPR could be considered as a prescriptive system and without feedback loop.

*“We agreed to implement EPR division by division, and then we started from A&E department .... It took us up to 12 months to restructure the system around our practice just in A&E... we did not do the same with rest of the Trust that time was running out”*

## **4.3 Culture, conflict and Staff involvement**

EPR in NHS is considered as a transformational project that most of the reporting is happening manually with paper based systems. From a managerial perspective, managers had to change the skills of staff through training and practice and at the same time forget about the old system. Also, they strongly emphasised on the importance of de-learning and forgetting old habits. From a user perspective, the credibility of the electronic system is very low that what they had learnt from old experience with different systems. Also, they support their view by providing some examples where the system was failed and how paper based alternative was very helpful.

*The problem it is in the locating and organizing the system, and also Alert was developed for different kind of healthcare system which is Portuguese, and I believe that they only looked at it in a very ideal situation, a small hospital, or building the hospital around the system.... Because we have Alert from different country which means they have to have a development team, they will have to have a training team, so obviously you will get logistics and language barrier. For instance, Alert is a Portuguese system so we have to get people from Portugal to Britten to develop and teach. So, you have to host them and obviously the language (laboratories direct manager).*

Moreover, Trust was straggling to get the staff that is considered as the main users, to adopt the EPR that they had been ignored during the procurement and implementation stage.

*.... but I want the end-user to be involved. I think this is the main and major problem from my point view. I think this issue is not isolated, but it is very linked to the structure of the organization, the policy of the organization, to the environment and the atmosphere, to the culture (internal and external culture), and sometimes to the governmental direction. So, there are political and social issues as well (laboratories direct manager).*

The system was accepted by some users, but only after significant changes that were made due to how it was being used in practice. Moreover, the main conflict was between the management board and

end-user perspectives. The first one was trying to find a system which can save money, but the second group was looking forward to working with a friendly and beautiful system which can make their life easier.

*And I think the mistake that they made when they go around procuring this piece of the product; they were looking over to save cash. "Oh we got an electronic record system, let's look making 70-80 medical secretary redundant."*

*We are going to save a lot of money, but we actually should spend more time looking at what users needed, how it is going to impact on the business and how this piece of software is going to work when we admit the patient. How is going actually type the stuff in real time that I have impression that the EPR would be in the real time, you would not do it retrospectively (Senior user).*

#### **4.4 Flexibility and Distributed Leadership Is Required.**

This approach is aimed to understand how the leadership in a complex environment takes place among people (Bolden, 2011). This issue was very clear by many participants, and one of them said directly:

*I do not think previously our managers went down to the operational level. They went to the manager level rather than actual operators, and the people supervising the operational areas. I think our previous leaders generalized and it is not. And I don't believe they UNDERSTOOD how complex the organization is (laboratories direct manager).*

#### **5.0 Conclusion and Recommendations**

In conclusion, awareness of KT practices can strongly influence the integration of care delivery. Implementing KMS calls for theoretical awareness and also practical awareness in order to ease the implementation process. In addition, the findings unravel the significance of flexibility, distributed leadership and end-user involvement, as well as the importance of communication technologies and strategies having a strong focus on transparency, including both structured and unstructured communications tools and methods. In terms of healthcare, it was found that hospitals are required to implement their own KMS, such as EPR to support their existing information systems that required upgrading. In the case of the Blackpool hospital, the new EPR was integrated with existing systems, such as Patient Administration System (PAS), Electronic Document Management System (EDMS), GP system, and A&E system for efficiency and to save cost. Not only that, this system aimed to centralise all of the existing systems at the hospital for convenience sake. Through observing the EPR systems, these systems are often task-based and disregard aspects of KT practice.

Despite the new EPR system intending to help hospitals save money, as well to encourage the existing hospital staff to work with a more user-friendly and efficient system which could make their life easier, it seems, however, that the new system causes more problems than solutions. This stems from the hospital having to retrain staff to become familiar with the new system, whilst forgetting the traditional routines of the old system. Not only that, the credibility of the electronic system was very low among users. Some users even gave some of their own personal accounts of how these systems can fail at any time. It was concluded that based on the above points, gaining the trust of hospital users of the new system proved challenging. In addition, some users did embrace the system, but significant modifications were needed because of the current way it was being used in practice.

Moreover, improving user awareness of the EPR system is vital so that they can learn to embrace it and not reject it. Awareness programs could be held to boost user awareness of the system and the use of such systems in the healthcare field, as well as educate them on the potential benefits of the system. It would also be recommended for the hospital to hire highly skilful IS instructors to further raise users' awareness of the system, provide additional training and of course educate them on the use of such systems in the healthcare context.

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