Identification of Benefits and Barriers for the Adoption of E-Health Information Systems Using a Socio-Technical Approach

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Abstract. Although current research reports substantial benefits of the use of e-health systems and the barriers for their implementation, there are many inconsistencies between the results reported. Aiming to unify existing views and to identify the roots of such inconsistencies, this research used a socio-technical approach to collect data from two e-health projects. The results suggest that although there are some benefits and barriers that are consistent amongst those reported, new benefits and barriers were found. The qualitative approach to this study helped to identify possible ways to overcome these barriers and to propose alternative ways to justify the implementation of e-health systems.

Keywords. E-health adoption, Information Systems, benefits, barriers.

1. Introduction: e-Health systems to support chronically ill patients

E-Health systems are generally considered as an important advantage for health institutions and organisations. The literature has reported the possibility of obtaining relevant benefits from these systems, such as:

- Access to health independently to geographically barriers. (Wootton, 2001)
- Help health organisations to reduce costs and increase cost-effectiveness (Aoki et al., 2003; Ball & Lillis, 2001; Boddy et al., 1999; Mair & Whitten, 2000)
- Deliver new and integrated services. (Williams, et al., 2003)
- Improve clinical evolution of the disease. (Ball & Lillis, 2001; Hersh et al., 2001)
- Increase patient quality of life (Ammenwerth et al., 2003; Aoki et al., 2003).
- Improve the role of patients and their families in their treatments (Jennett & Andruchuk, 2001).

Similarly, current literature also identifies a list of the barriers and challenges that need to be addressed to achieve better e-health systems, amongst the most reported ones are:

- Legal issues related with information security and responsibilities. (Ball & Lillis, 2001)
- Technical difficulties with the platform and the technology. (Ammenwerth et al., 2003; Aoki et al., 2003; Ball & Lillis, 2001)
- Time and convenience of use for health professionals. (Richards et al., 2005)
- Cost and training/familiarity in the technology. (Richards et al., 2005)
- Culture of healthcare organisations and professionals to be able to adapt their process to those new paths of care deliver. (Walker & Whetton, 2002).

Although there are many studies that report important benefits of the use of e-health systems, there are many inconsistencies in relation to: a) the diversity of the benefits/barriers reported (Barlow et al., 2005); b) the outcomes reported are preliminary data and thus need to be explored in more detail (Wootton, 2001) and c) most of the reported data is based on pilot projects or small implementations with limited amount of patients (Hebert & Korabek, 2004; Hebert et al. 2004; Barlow et al., 2003)

The diversity of opinions in this field may be due to many reasons, and one being that the implementation of telecare systems induces an important change in the way health services are delivered. It affects the way healthcare organisations are managed; and most importantly the way healthcare professionals interact among them and how the healthcare services are delivered (Berg et al. 2003). The very nature of healthcare work is interpretative, interactive and pragmatic (Aarts & Berg, 2004). Hence, the standardisation of work processes necessary to fully adopt those systems is difficult to achieve WHO (2002). In particular, this research focuses on e-health systems that are used to support chronically ill patients. WHO (2002, p.11) defines chronic conditions as “health problems
that require ongoing management over a period of years and decades”.

In this context, this research argues that a socio-technical approach to investigate the potential benefits and barriers of e-health systems could help to a) better understand the benefits and barriers of such systems b) better identify the stakeholders involved and c) to unify the views of the stakeholders involved.

2. Research context

This research has been conducted in Spain and the UK. In the UK, a pilot project based on a telemedicine system to connect residential nursing homes with health professionals and in Spain, a telecare system oriented to support chronically ill patients at home. Both health systems are of public provision of healthcare, where Governments and Health authorities set overall policies and frameworks and where services are provided mainly by public agencies or agreed private organisations. Both systems are also funded by taxes. Healthcare is free and is provided by a complex network of primary and community centres, secondary hospitals and tertiary services, regardless of whether they were publicly owned or not.

3. Research approach

This research is fundamentally qualitative and the method used has been the case study. The underlying epistemology is interpretive because the aim has been to understand the phenomenon through the social groups and individuals or stakeholders involved in the system. Our construction of reality is shaped by the interpretation of reality done by human actors (Walsham, 1995, 2006). The motivation has been to create an initial theoretical framework based on previous knowledge, namely Stakeholder theories and Social Construction of Technology (Walsham, 2002).

Case study is commonly used in IS research and fits particularly well in this context where the focus is in contemporary events and several organisations are involved (Benbasat et al., 2002). Case study is chosen because it would help to understand the process and the context as a whole. The context in which this project was conducted, healthcare systems, was as relevant as the information system itself. The system could not be understood without taking into consideration the organisations in which it exists: hospitals, primary care centres, patients’ homes, and the interaction of the different stakeholders.

4. Data collection strategy

The data of the UK and the Spanish case studies were collected using several sources: semi-structured interviews with the participants, study of document and text about the system, questionnaire to the patients, attendance to patients training sessions, attendance to patients’ home visits and direct observation of the system while being in use. The initial information collected were documents and texts about the system, the clinical protocols and the patient’s information sheets. The objective of this data was to inform about the information systems and the context in which it was going to be implemented. Moreover, general information about the diseases and the clinical protocols that would be followed, were also gathered and studied to understand the needs of the patients and the professionals. Four sessions of direct observation of the system while being used by healthcare professionals were also conducted. Additionally, three patients training sessions were attended by the researcher, in which the case managers trained the patients in how to use the system, assessed them in the difficulties they could have had while using it on their own and trained them in how to take the medication and the clinical aspect of the disease.

Semi-structured open-ended interviews with the stakeholders involved in both cases were the main source of data. The interviews were done in their premises and lasted from 45 minutes up to two hours. They were recorded using a digital recording machine and manually transcribed for data analysis. The interviewees were selected depending on their involvement in the area. A total of 46 interviews were done to 21 different groups of stakeholders, during an 8 months period.

Three visits to the patients’ residence were conducted with a specialist nurse. During those visits, the researcher observed the protocol and the reactions of patients, families and professionals. Although the initial research plan was to gather the information of the patients in semi-structured interviews, it was difficult to get this information because the difficulties of getting access to all of them (70) and most importantly trying to avoid patient’s bias. Patients usually confused researchers with healthcare professionals and their opinions
during the interview were influenced by this perception. Consequently, a questionnaire was prepared to gather their opinions and perceptions.

5. Analysis of the Results

The results are grouped into six different categories: Clinical, Economic, Organisational, Patient-related, Professional and Technical issues. These categories were derived from current literature as well as from the analysis of the data from both case studies. Clinical refers to the clinical aspects of the diseases. Professional issues are related with the themes that affect the professional healthcare work. Organisational are related with the organisational structures and the work procedures. Patient-related are those related with the patients’ condition and perception. Finally, Economic are related with costs and funding matters. The following sections summarise the benefits and barriers found in both case studies for each of these categories.

5.1. Clinical Issues

The case studies are related with chronic disease. The fact that the evolution of a chronic disease can only be mitigated but not completely cured shapes the perception of clinical benefits by all the participants in our case studies. The focus is on delaying the evolution rather than on improving the health condition. Therefore, information reported was related with improving the compliance, the emergency processes and avoiding complications.

5.1.1. Benefits

Reduce hospital admissions and hospitalisations was reported in both cases and the literature. This benefit implies an important reduction of cost, an improvement in the evolution of the disease, an enhancement of patients’ quality of life, a decrease of complications and deteriorations, and a reduction of waiting lists among others. The second benefit mentioned in both case studies was to better understand the optimum clinical model. Telecare systems allow gathering continuous data about vital signals and disease evolution. The stakeholders reported that this information can provide a better understanding about how particular diseases evolve and how different treatments affect this evolution. This benefit was not previously reported in the literature and could be used to provide ‘truly scientific outcomes’ about clinical aspects and facilitates to overcome the barrier described in section 5.1.2.

5.1.2. Barriers

The lack of uniformity in clinical protocols was mentioned in both case studies and the literature. This barrier is closely related with the difficulty of applying an Information System, which could be adapted to the variety of protocols and clinical guidelines that are normally used by each healthcare organisation. The second barrier mentioned in both case studies is about the difficulties of making truly scientific outcomes from pilot case studies. Medicine studies are evidence based. Hence, scientific outcomes are expected from any projects in order to establish evidence based on the area. However, telecare projects have not been researched with truly scientific hypothesis, but with other variables, such as cost-reduction, improving quality of life or cost-effectiveness, that might not be considered formally ‘scientific’. This different approach makes difficult to set evidence based outcomes and therefore contributes to the adoption.

5.2. Economic issues

5.2.1. Benefits

There is a clear consensus about the potential of telecare systems in cost reduction through the reduction of clinical interventions, such as hospitalisation, emergency-room visits and specialist visits. This benefit can facilitate to reinterpret the high initial cost for the initial deployment of those systems.

5.2.2. Barriers

The economic barrier related with the high initial investment was cited in the two case studies and also in the majority of the academic literature. This barrier is considered one of the most important obstacles to the adoption of telecare projects. The differences founded in Case Study I and Case Study II are more related with the differences between UK and Spain healthcare systems. NHS is funding projects in the UK whereas in Spain is not the case. Funding in Spain usually comes either from the European
Union or from the private sector, such as telecommunications or mobile device companies.

5.3. Organisational issues

5.3.1. Benefits

Three organisational benefits were mentioned by both case studies and literature sources. The first one was to improve the access to healthcare assistance to distance locations or with difficult access. This is particularly important in rural areas with low demographic index and a common telemedicine application. Secondly, the increase of access to specialist expertise was reported. It can help to improve the use of resources and improve diagnosis from primary care. The last benefit mentioned was to increase the collaboration between healthcare professionals. These systems support a model in which healthcare services are provided in an integrated way. They also support formal ways of collaboration.

5.3.2. Barriers

Two barriers were mentioned in both case studies and in the literature: the lack of training for healthcare professionals and the insufficient support from managers to this type of systems. Two of the most mentioned barriers in Case Study II, difficulties of coordination of actors and the resistance to change among professionals are likely related with the complexity of the selected case study and also due to the Spanish healthcare system in which formal collaboration is still underdeveloped. Healthcare organisations in Spain from different healthcare levels are still very independent and collaboration is limited.

5.4. Patient-related issues

5.4.1. Benefits

The consensus on patient-related benefits is more evident. Patients are the group of stakeholders, who can obtain the most important advantages. Improving quality of life and patients’ satisfaction, are generally reported as benefits. Avoiding patients transfer and commuting was also reported in Case Study II and the literature review. Finally The improvement in the social support was also mentioned. Being treated at home supports independent living and improves the social network of senior citizens.

5.4.2. Barriers

The only patient-related barrier reported was the lack of self-management skills in some patients; however, this barrier was reported by a minority of the participants.

5.5. Professional issues

5.5.1. Benefits

The possibility of giving access to specialist expertise to primary care professionals was a benefit mentioned by all three sources. Also, changing the way normal practise is conducted was reported as a benefit and as a challenge. It seems that, although resistance to change is a fact, being able to improve actual practise is perceived as a benefit. Improving relationships between healthcare professionals from different levels and improving the role of nurses was mentioned in both case studies but not in the literature.

5.5.2. Barriers

All the barriers mentioned in Case Study I were also mentioned in Case Study II. One of those barriers was the necessity of getting used to a different way of working, which is clearly connected with the resistance to change. The difficulties of supporting the pilot projects during overtime and without financial reward was also mentioned as a barrier. This connects with the need to be especially motivated about those systems. Most of the work is done by volunteers and based on personal motivation. It was also reported in both cases the need of making healthcare professionals leaders of the projects rather than technology specialist. It was reported that this could help to overcome resistance to change and improve motivation. It was also reported, however, that healthcare professionals tend to be reluctant to new technology. Moreover, the fear to miss the contact between professionals and patients was also mentioned in Case II and in the literature review.

5.6. Technical issues

5.6.1. Benefits

Technical benefits are not especially relevant, apart from the one mentioned by the literature review, which only applied to those systems that are already in the hospital regular services. This stage was not yet reached in both case studies.
5.6.2. Barriers

The technical barriers were significantly mentioned in both case studies with clear agreement about the most relevant ones. The immaturity of the systems, the need to have accurate systems and the fear to technology failures were mentioned by the three sources. It was also mentioned the need of paying especial attention to usability issues. Target patients have often little experience with technology, thus implying alternative ways of capturing data with this type of users. The lack of standards and the immaturity of mobile communication were also mentioned. It was reported that there is a need to agree in standards for data codification for all the professionals involved. Similarly, it was reported the need of having reliable and 24 hours working communications. Finally, in Case Study II, was reported the need of integration between systems and between the different organisations involved.

6. Discussion and conclusions

The potential of telecare systems for improving patients’ care, treatment and follow-up is one of the most significant benefits, mentioned by both case studies. To demonstrate this benefit, however, is difficult. There are limited objective indicators to assess the improvement in the follow-up or in the treatment. It seems that quality of life or other non-clinical variables cannot be strong enough to be considered as evidence. The findings from both case studies, though, reported that an important contribution for the adoption of such systems is to have access to continuous data about the patients’ vital signals, and to improve the understanding of the optimum clinical model (reported by hospital researchers and healthcare authorities). These benefits can facilitate new areas of epidemiological, clinical and technology research, providing new evidence to objectively measure the expected benefits.

E-health adoption implies a change in the way medical practise is conducted. Virtual interaction between patients and professionals is a challenge for professionals, who fear to misunderstand the symptoms, and who lose some of the information that comes from the context, the informal interaction, the touch, sound and body language of the patient. This lost information need to be gathered in a different way and with a stronger collaboration of the patient. New research is needed focused on how to capture this information that is missed in a virtual consultation and their importance in the diagnosis.

Economic issues are of especial relevance according to the findings of both case studies and the literature review. The cost to set up a new telecare service for a geographic area was reported as a relevant barrier by the majority of participants of both case studies and the literature review. A relevant number of stakeholders, however, have reported the potential of e-Health systems for saving costs through reduction in clinical intervention, in particular: hospitalisation and emergency room visits. Ideally, this potential savings can compensate the initial investment. However, the cost-effectiveness is still not clearly proven, making difficult to justify the investment. Moreover, stakeholders with managerial responsibilities (e.g. hospital manager, medical director, IS manager, Healthcare authorities and ERP manager) mentioned that savings at hospital level implies the redistribution of new resources over primary care. Reducing hospitalisation could imply the need of more healthcare resources in primary care to treat patients at home. Consequently, new investments could be needed in new areas. More in depth cost-effectiveness studies are needed in which all the areas involved are analysed. As a hospital manager reported “We have numerous necessities and a restricted budget for new investments. We need to buy washing machines, before buying videos”.

Another economical issue of importance is the necessity to establish reimbursement policies. Actual public healthcare systems have no fees policies for virtual consultation or virtual care. Consequently, those services are actually provided for free. These new types of services need to be reimbursed, especially for possible services provided by private healthcare companies. This issue implies to establish a new economic model that could also pay for virtual services, such as virtual consultation or virtual vigilance of health status of patients.

Organisational issues are of great importance for the majority of stakeholders, especially for those with managerial responsibilities. Although the organisational model proposed by WHO for integrated care of chronically ill patient is desirable; it needs to be adapted to fit into the actual organisational structures. Healthcare organisations are large, complex and slow in their changes. Decision-making process in healthcare area involves many different
multidisciplinary stakeholders with different interests and necessities, which makes the changing process complicated and slow. Moreover, healthcare organisations and healthcare professionals are not used to work in collaboration. Their organisational model is often based on individualistic working practices. This barrier is also strongly related with professional resistance to change.

References


