Promoting Success in the Introduction of Health Information Systems

Paulo Teixeira, Instituto Politécnico do Cávado e do Ave, Portugal
Patrícia Leite Brandão, Instituto Politécnico do Cávado e do Ave, Portugal
Álvaro Rocha, Universidade Fernando Pessoa, Portugal

ABSTRACT

The significant number of publications describing unsuccessful cases in the introduction of health information systems makes it advisable to analyze the factors that may be contributing to such failures. However, the very notion of success is not equally assumed in all publications. Based on a literature review, the authors argue that the introduction of systems must be based in an eclectic combination of knowledge fields, adopting methodologies that strengthen the role of organizational culture and human resources in this project, as a whole. On the other hand, the authors argue that the introduction of systems should be oriented by a previously defined matrix of factors, against which the success can be measured.

Keywords: Health, Information Systems, Introduction of Systems, Organizational Culture, Success

1. INTRODUCTION

The success behind the Introduction of Information Systems (IIS) can be as important as the system itself. Notwithstanding its qualities, if a system is not successfully introduced it will not achieve its primary goal: enhancing the performance of a company. On the contrary, it may contribute to the degradation of operations and become a risk factor in the business field.

Several reports of unsuccessful introduction of information systems cases in the health field (Ash, Marc, & Enrico, 2004; Avison & Young, 2007; Balka, 2003; Heeks, 2006), as well as our personal knowledge of a few cases, led us to the investigation and identification of the factors that should be explored in order to promote the success of IIS in this area. This analysis will contribute to a wider investigation where we intend to develop a change management methodology for the introduction of health information systems.

Current organizational context is extremely dynamic, so the performance, the success and the very survival of organizations depend on their capacity to adapt themselves or even to take the lead in change. On the other hand, information systems assume a significant role in
supporting the organizations business processes. This reality raises several questions. Will the organizations successfully rise up to this challenge? How effective will their answers be? Have the existent theories and models revealed themselves effective for the Introduction of Information Systems in organizations? If so, can they be improved? These are some of the questions that frame this investigation.

In this investigation, the term “Introduction of Systems” does not refer only to the entry of the system but also, in a wider sense, to the complete development of an information system, with all tangible and intangible effects associated with the information system introduction or change.

In the following sections we analyze different areas that frame the development of these systems and different risk factors associated with the IIS, we highlight the role of change management in the promotion of success in information systems and the importance of human resource management in this process, we identify some of the references that should be considered in the promotion of successful IIS, we discuss the criteria that should be observed when measuring success and, finally, we list a few conclusions.

2. THE NATURE OF SYSTEMS DEVELOPMENT

The available literature reports several unsuccessful cases in the introduction of health information systems (Avison & Young, 2007; Day, 2007; Heeks, 2006). This lack of success is mainly explained by a development process lag between the final organization and the organization for which the system was developed. This lag stems primarily from social and human questions that do not receive the appropriate consideration (Brooke & Maguire, 1998).

The development of systems is generally approached as a technological question. However, the body of literature reveals another perspective, according to which information systems should be primarily regarded as social systems (Kukafka, 2003; Ryan, 2010). The influence of this interpretative perspective in practice has been growing. This work intends to follow and deepen this perspective. If information systems are more than a decision-making support tool and if the projects go beyond the applications of the system development cycle described in manuals, then technicians need to understand a whole new set of questions, mainly social and organizational questions.

Figure 1 depicts a set of fields, without assuming an exhaustive character, and reveals that the development of systems, even in a relatively static situation, is a complex area. But considering that most organizations work in dynamic environments, the degree of complexity is significantly higher.

Methodologies for the development of information systems are mainly focused in a subset of organizational problems. Stuart Maguire (2000) proposes a higher alignment between technologies and the business area of the organizations where these technologies are being introduced. The author underlines the distinction between a simple implementation, with a more technological nature, and the introduction of a system with a higher social inclination, where all organizational process-induced changes are taken into consideration. In the present article, as was previously mentioned, we will pursue the latter perspective. Historically, Information System developers tried to reduce the complexity of this organizational change, mainly focusing in the technical questions that the process involved.

The development of systems is a complex process, with numerous opportunities for things to take the wrong turn (Agrawal, 2010; Yeo, 2002). Methodologies are necessary in order to control the complexity of the process, conferring discipline to the information system development process (Maguire, 2000).

The adoption of generally accepted methodologies in the development of systems does not guarantee the successful implementation of information systems. Traditional methodologies still have weaknesses and fields in need of improvement (Koh & Maguire, 2009; Laudon & Laudon, 2010).
3. RISK FACTORS IN THE INTRODUCTION OF SYSTEMS

Many information systems are introduced believing in a premise of immediate success. This assumption leads to the neglect of risk management measures that could minimize the consequences of possible failures. Organizations seek a successful system implementation while performing their normal business activity. However, new systems are not introduced from zero, they are introduced in organizations that hold a certain degree of complexity and in that sense they imply risks that should be analyzed a priori, so that a business continuity plan can be prepared.

Business impact analysis should identify revenue loss; customer loss; business credibility loss; and the capacity for recovery. The organization should consider all the options that could minimize part of the risk attached to the introduction of a new system. Organizations should be prepared to absorb the effects of an unsuccessful system introduction in their business. Risk planning should involve the identification of risk factors, the evaluation of business impacts and the provision of a business continuity plan. However, it would be wrong to assume that predicting a risk guarantees its control. Some authors consider that a successful system introduction is as important as the system itself (Kolltveit, Hennestad, & Grønhaug, 2007; Kwon & Zmud, 1987).

The introduction of systems should be based in methodologies that fit each situation. One of the downsides of adopting an external IIS support methodology is the time spent in human resource training and full comprehension of the system, and the methodology can ultimately not be appropriate to the organizational culture. Some authors describe risk management as the ability to foresee what might go wrong in a project (Hoffer, George, & Valacich, 2004). According to these authors, big projects hold higher risks than small projects. One other factor that should be considered in risk analysis is the definition of the requirements. A system where requirement compliance is easy and highly structured is less risky than a system with confusing, poorly structured and subjective requisites. The maturity of the technology supporting the project can equally condition the risk. The development of a system based in a mature technology is less risky than one based in a recent, non-standardized technology. The involvement of potential users in the system development process contributes to decrease the risk of failure.

The specific business area and organizational culture of each organization should be equally and deeply analyzed, so that the adoption of measures and methodologies fits that
The introduction of health systems has been the object of several case studies that can be used as a reference for future interventions (Ash, Chin, Sittig, & Dykstra, 2005; Phansalkar, Weir, Morris, & Warner, 2008; Waring & Wainwright, 2002).

Ward and Peppard (2002) identified six general categories (Figure 2) that frame possible risks faced by a project. The magnitude of the impact from the risks in each category depends on the nature of the developed/implemented system.

Groundbreaking approaches are considered necessary by several authors for the implementation of health Information Systems. There are several unsuccessful cases in the introduction of new systems, but very few of them are actually thoroughly studied in order to establish what went wrong. The few cases that are subjected to post-implementation audits are analyzed through a technological point of view only, when significant problems are essentially organizational and political (Waring & Wainwright, 2002). Most problems stem from insufficiencies in the new system modeling, from cultural conflicts between departments and from the interaction between internal or external project teams.

The introduction of information systems is based in the analysis of requirements that are afterwards translated into an agreement between the client and the system supplier entity. However, those requirements remain stagnated in time while the environment and the needs of the client organization evolve. The initial premise of an information system project should be the likelihood of change (Maguire, 2004). In this sense, methodologies should offer the necessary flexibility to accommodate possible changes. If there is one thing certain in the development of systems is that changes will be necessary. Whether these changes refer to a line of code or a complete system remodeling is a question of scale.

Contemplating these perspectives while introducing the systems can contribute to the process enhancement. But in all likelihood, this will remain an inaccurate science.

4. CHANGE MANAGEMENT

The line of thought concerning change management in the introduction of technologies is based in planned approaches (Teixeira & Rocha, 2009), following Kurt Lewin’s works (1951). In practice, however, this assumes a more reactive character than the one initially planned. This reactive character plays a preponderant role in what are known as the emerging change management methodologies (Cameron & Green, 2004). Generally, and despite being planned according to different stages, changes are influenced by internal and external organizational dynamics. Uncertainty and ever-changing organizational rules ultimately condition the outlined change plan and imply substantial adjustments that favor the discrepancy between the predicted plan and change operationalization.
One of the significant influences in the effectiveness of the change process is the interdependent relationship established between three dimensions (Orlikowski & Hofman, 1997): technology, organizational context (culture, structure, roles and responsibilities), and the adopted change model. The ideal interaction between these three dimensions (Figure 3) should be compatible, or at least not contradictory.

Let us consider the relationship between the change model and the adopted technology. If the technology is closed and does not allow any customization from users, the adopted change model will be relatively stiff and traditional. Similarly, if the technology is dominated and its impacts well understood, a traditionally planned change implementation will be advisable. However, if the technology is new and the experience with it very small, or if it is opened and customizable for users, a model with a higher improvisation and adaptation capacity, that offers the necessary flexibility to the organization during the adaptation and learning process, is advisable.

The relationship between the change model and the organizational context is equally significant. A flexible change model will likely be inadequate in organizations with an extremely stiff and/or bureaucratic structure. But it will possibly be advisable in organizations with a more informal character or a more cooperative culture.

Finally, let us focus on the relationship between the technology and the organizational context. The adoption of a certain technology should suit and adapt itself to the model and the organizational structure, in order to enhance the success of the organization. Thus, there should be a strong alignment in the relationship between the adopted technology and the organizational structure, so that the technology does not become a barrier to organizational processes and so that the organization can fully enjoy the technology it intends to adopt.

Despite the developments observed in Software Engineering and Project Management in the last few decades, resistance to change is still identified as one of the main causes in unsuccessful information system projects (Calvo-Manzano et al., 2010). Resistance to change is a natural human resource trait in every organizational environment. It is therefore necessary for any change process to be based in good practices, contributing to an improved success index in these projects.

5. THE ROLE OF HUMAN RESOURCE MANAGEMENT

The development of information systems was, for several decades, considered a discipline with a technological nature. Information system professionals developed systems, partially helped by users, based in project management methodologies and other technical tools. The high failure rate observed in the development of certain systems questioned the technological focus of the discipline (Kukafka, 2003; Maguire, 2007).
The impact of information systems is growing, inside and outside organizational boundaries. It is therefore important that people responsible for the introduction of systems hold communication and leadership skills, as well as management skills, in order to render these processes easier (Ryan, 2010).

According to Maguire (Maguire, 2007), despite the existence of an abundant literature concerning Human Resource Management and Information Systems, almost no studies integrate both areas.

The introduction of systems directly impacts individual responsibility and business process organization. It should therefore be preceded by an evaluation of training necessities, as well as a training plan that minimizes the impact of the transition. The execution of the training plan, and the subsequent entry of the new system, should be followed and monitored to ensure the necessary flexibility to face unexpected changes.

Information systems assume a preponderant role in organizations, helping them achieve their goals. For this reason, systems should be integrated in the organizational culture while supporting business processes (Laudon & Laudon, 2010; Luftman, Lewis, & Oldach, 1993; Wang, Archer, & Per, 2008). Otherwise, the organization may be facing a technological success and an organizational failure at the same time.

The development and the introduction of systems usually depends on different groups, from users, managers, marketers, to information system technicians and project teams, and all of them are working towards a common goal. Historically, many of the factors that contribute to the unsuccessful introduction of systems relate to human resource allocation (Abdelhamid & Madnick, 1990; Chen, Law, & Yang, 2009) or to the coordination of different groups inside the organization (Avison & Young, 2007; Day, 2007). We believe that this area would substantially benefit from the improvement of human resource management skills (Crawford & Nahmias, 2010).

6. REFERENCES TO BE CONSIDERED

Independently of the adopted options, organizations are expected to deliver the best answers to the challenges of changes, imposed by developments in information technologies, globalization or increased demands from their clients (Sims, 2002).

There is still a lot to be learned from practices and from the habit of introducing systems in organizations, considering both the upsides, improving them whenever possible, and the downsides, minimizing them (Teixeira, 2009).

Our bibliography offers many references for good practices in managing technological services (Cartlidge et al., 2007; Menken, Blokdijk, & Malone, 2009; Van Grembergen, 2009; Ward, Aggarwal, Buco, Olsson, & Weinberger, 2007). These references include public tools and norms as well as organizational and individual property knowledge (Figure 4).

Good practices are successful practices inside the industry that are formalized afterwards. However, they should not be perceived as stagnated fields, but rather fields that are enriched on a daily basis with new case studies, successful testimonies and failure reports. One of the problems identified in literature and related to the adoption of methodological references is that, although they sometimes complete or complement each other, their application is usually done in an isolated manner, which leads to the loss of their complementarity potential (Kukafka, 2003).

The hospital environment constitutes a good example of what is intended in terms of different team and different skill management, and common goal prosecution. Although it is seemingly a rigorously controlled environment, this is an environment where knowledge is constantly changing, where unpredictability

Copyright © 2012, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
reigns and where the consequences of error can be fatal.

7. EVALUATION OF SUCCESS

The evaluation of success is generally a subject whose definition is prone to confusion and controversy. The health field, and particularly the health system and technology evaluation, follows a generic rule (Ammenwerth, Gräber, Herrmann, Bürkle, & König, 2003). We know that good system development, management and implementation practices tend to increase the success of its introduction. However, the measurement of this success requires the a priori identification of the factors against which it will be measured. The approaches traditionally associated with project management based their measurements in time, costs and quantity, and all of these factors are easy to measure.

Considering the conceptual nature of success when dealing with information systems, measurement factors are not consensual and they change according to different cases. The explanation lies in the strategic nature of these factors, and these factors can also be a product of adopted implementation methods (Ojiako & Greenwood, 2007). It should be noted that the introduction of systems is only beneficial when it implies changes in the nature of the work itself or in the behavior of the people inside the organization.

Behavioral sciences have increased the value attached to the notion of success, and to the factors that can promote this success in the introduction of systems (Kukafka, 2003). The criteria for the measurement of success differ according to the different points of view through which they can be analyzed. In 1992, the model developed by DeLone and McLean, updated in 2003 (Delone & McLean, 2003), offered the first systematization of the measuring categories for the evaluation of success in information systems. But this approach did not include the notion that different stakeholders could legitimately hold different success measurements and perceptions concerning the same system. This was added by Seldon, Staples, Patnayakuni, and Bowtell (1999) in his appreciation of the DeLone model.

The health field congregates different and well defined professional groups, whose perceptions of success evaluation in information systems can significantly vary (Connell & Young, 2007), according to the evaluation parameters of each group.

In addition to the generic models and tools for the evaluation of success in information systems, the available publications also propose specific tools and models for the health field (Kushniruk, 2002; Ojiako & Greenwood, 2007; Talmon et al., 2009; Topacan, Basoglu, & Daim, 2008; Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008). Each proposal is based
in different evaluation parameters. Sometimes these parameters, divided in categories and subcategories, approach the same problem but they end up adding another perspective to the evaluation: the methodological perspective, whose results can be different for the same evaluation.

The diversity of perspectives concerning the success in the introduction of health systems brings some authors to contend that success, in that context, is a definition matter (Talmon et al., 2009). A definition whose criteria should be defined a priori, based on a multidimensional model.

8. CONCLUSION

There are no guarantees of success in the IIS; there are, however, tools and methodologies that enhance its probability.

The technological perspective that is traditionally associated to the development of systems does not satisfy the demands of modern organizations anymore. The complexity, dynamism and uncertainty attached to health organizations render the consideration of non-technological factors mandatory in the introduction of systems. The methodologies applied in the development of systems must be enhanced, conferring a higher synergy between internal capacities, external relationships, organizational culture and human resources. The development of systems can mainly be performed with little to no intervention from final users, but the success of its introduction depends on the participation of those who will benefit from it.

Risk management is a critical factor for success in the introduction of systems. Identifying potential risks is essential, and the adopted methodologies should include a degree of flexibility that is necessary to manage all the variables involved, in other words, a successful change management.

Change management should promote an alignment between the change model, the technology and the organization. Human resources play an essential role in this alignment, occupying the main link between all three factors. The management of technological services counts with a wide range of methodological references, and managers must base their practices in these references in order to guarantee a successful introduction of systems.

Success is a goal, but there is no agreement in its definition, however. We believe that the introduction of systems must be based in a previously defined matrix of factors, and success should be measured against those factors. This way, the entire process of change management in the introduction of systems should be oriented according to those factors.

Organizations need to incorporate guidelines from several sources and fields of knowledge, in order to minimize the risk associated to IIS. We can thus conclude that the IIS should be sustained by an eclectic combination of knowledge fields, and not by a single technological perspective of the problem.

The process behind the development of systems includes a series of circumstances that can condition their future success. A universal checklist, contemplating all the success factors involved in the life cycle of information systems, is virtually impossible, considering the diversity of available alternatives. However, we believe that the introduction of systems is the most critical point in the development cycle, and we will continue to focus our investigation on this stage in order to propose a change management methodology for the introduction of health information systems.

REFERENCES


Paulo Teixeira is a doctoral student and research collaborator at GIMED (Medical Informatics Research Group) at University Fernando Pessoa. He is Assistant Professor at the School of Technology of the Polytechnic Institute of Câvado and Ave (IPCA) in Portugal. He holds a MSc in Information Management from University of Aveiro received in 2005. His research interests are in Health Information Systems, Information Management and Change Management. He has played several positions of academic management, namely coordination of department and promotion and management of graduations.

Patrícia Leite Brandão is a doctoral student and research collaborator at GIMED (Medical Informatics Research Group) at University Fernando Pessoa. She is Lecture at the School of Technology of the Polytechnic Institute of Câvado and Ave (IPCA) in Portugal. She holds a MSc in Management Information Systems from University of Minho received in 2005. She’s research interests are in Health Information Systems and Quality of Health Web Sites.

Álvaro Rocha has a PhD in Information Systems and Technologies, specialization in Engineering and Management of Information Systems, from University of Minho, Portugal, received in 2001. He is Associate Professor at University Fernando Pessoa – Porto. He is teaching and researching subjects on Software Engineering, Management Information Systems and Healthcare Information Systems. He is co-founder and member of GIMED (Medical Informatics Research Group) at University Fernando Pessoa and co-founder and President of AISTI (Iberian Association for Information Systems and Technologies).