



Internal factors that favor the adoption of technological innovation defined by information systems: a study of the electronic health record

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Abstract

Research into the adoption of technological innovations often evaluates the features that users engage with when using these innovations (Loyal and Albertin, 2015; Perez, 2006; Perez and Zwicker, 2010). In this research, we identified the internal factors affecting the adoption of a technological innovation, as defined by information systems (IS) in healthcare, the electronic health record, and evaluated the results of adoption for individuals and groups using this system. We opted for a study in a hospital in Porto Alegre-Rio Grande do Sul, with mother and child specialties. Quantitative techniques were selected, questionnaires with users of the electronic health record, physicians, administrators, nurses, and technicians. We used a multivariate statistical technique of structural equation modeling, using the statistical software SmartPLS®. The survey results indicated that some internal variables to the health sector, such as communication, the participatory process and the form of decision for innovation can contribute effectively to the adoption of technological innovations. The proposed model also served to evaluate the results achieved with the adoption of this IS, which is realized through the following: the introduction of new processes; improvement of the existing ones; easier access to patient information, and creating new solutions for customers. Before the system, these were not possible to implement.

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Keywords: Information systems; Adoption of innovation; Health area

Introduction

The search for process improvement and the increase in the supply of new products and services in various market sectors has led to different sizes of organizations and in different sectors, including healthcare, to invest increasing amounts in the acquisition of information systems (IS) and information and communication technologies (ICT). However, as advocated by Perez and Zwicker (2010) as important as investing, is managing IS/ICT resources.

In the case of modern IS, its use has become increasingly intense and it has taken different work groups to work

collaboratively toward a common goal, which was hardly possible to achieve in centralized systems (Larsen and McGuire, 1998). Health is a typical example of this situation, since professionals, such as doctors, nurses, laboratory technicians, and social workers, can use the IS for information or to provide the IS with the central point that their mission is to save lives.

Healthcare has adopted several innovations introduced by IS, among which stands out the electronic health record (EHR), or electronic medical records, or the electronic patient record, which is the target of this study in innovation. This system provides a substantial number of benefits, which include better patient care, the centralization of information and the reduction in costs (Bowman, 2013).

Most studies about the EHR discuss the dimensions of the quality of the data provided by the system, such as completeness, accuracy, consistency, and plausibility (Weiskopf & Weng, 2013), or the possibility of obtaining gains with the implementation of this type of system (Bowman, 2013). However, the deployment and adoption of this type of system should take into

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account, in addition to the factors related to the system itself, the various factors related to the internal structure of the organization. Beyond the question of the integration of its various users and teams, healthcare also benefits from the EHR in improving operational and strategic results (Perez & Zwicker, 2010).

Rogers (2003) argues that the adoption of technological innovations, as in the case of the EHR, is associated with the assessment, on the part of users, of aspects that show its contribution to the work process or to the organization, as well as internal organizational factors. However, these internal organizational factors, as well as the results obtained with the adoption of a technological innovation, have not been prevalent in studies on the adoption of innovation, which focus more on the perception of users (Perez, 2006; Rogers, 2003), including in the area of health.

There are few studies on the adoption of innovations, as defined by the adoption of IS in the health area in Brazil. A contribution of this study to the advancement of knowledge about the adoption of technologies is the possibility of evaluating an organization's internal variables that favor the adoption of an innovation, which could pave the way for the proposal of other variables, beyond those indicated by Rogers (2003), contributing to the adoption of innovations of a technological nature in health and other areas.

Considering this argument, this study formulated the following research question: which internal factors favor the adoption of the EHR in a healthcare organization? The overall objective of the study was to identify the key internal factors that favor the adoption of EHR as a technological innovation in healthcare. Specific objectives were to identify the results achieved by the adoption of the EHR in terms of improvements of processes, products and services, and to validate a structural model to assess the adoption of the EHR.

Theoretical framework

ICT and knowledge management are relatively recent, emerging in Brazil in the 1970s in computer and telecommunications users and in the mid-1980s at the business schools of Brazil (Albertin & Albertin, 2005). According to these authors, it is regarded as one of the most important components of the current business environment, at both the strategic and operational levels.

To Laurindo (2002), the concept is more comprehensive than the concepts of data processing, IS, software engineering, information technology, and the set of hardware and software. It also involves human, administrative and organizational aspects. Generally speaking, a collection of computer systems used by the organization is called information technology, or IT (Turban, Volonino, & Wood, 2013).

To Turban et al. (2013), an IS is a system able to collect, process, store, analyze, and disseminate information to suit a particular purpose. Like any system, an IS includes entries (data and instructions) and outputs, such as reports and calculations (O'Brien & Marakas, 2013) and also encompasses people, procedures and physical facilities, and operates in a particular environment (Turban et al., 2013).

Table 1
The six components of an information system.

Component	Description
Hardware	Set of physical devices, such as CPU, monitor, keyboard and printer. Together, they receive information, process it and present it.
Software	Set of programs that instruct the hardware how to process the data.
Network	Connection system that enables the sharing of resources between the different computers. Can be a wireless network.
Database	Collection of related files, tables, relations, which store data and associations between them.
Procedures	Set of instructions on how to combine the components above, for the purpose of processing the information and generating the desired output.
People	Individuals/users, who work with the system, communicate with it or use its outputs.

Source: Adapted from Turban et al. (2013).

Although an IS is not necessarily an operation based on computers, many of the IS found in a modern organization are computer-based (Turban et al., 2013). The authors present an IS of six components (Table 1), with the caveat that not all IS include all of these components and that an IS has a purpose and a social context.

Laudon and Laudon (2013) argue that, from the perspective of a company, an IS is an organizational and administrative solution that takes ICT to face the challenges proposed by the environment, such that the manager needs to know the broader dimensions of organization, administration and information technology systems and their ability to provide solutions to the challenges and problems in the field.

Use of systems and information technology in healthcare

Shortliffe and Blois (2014) indicate that medical informatics or biomedical informatics is a fast-developing scientific field that deals with storage, retrieval and use of information, data and biomedical knowledge for problem solving and decision-making. The main areas of medical informatics are: health IS; electronic patient records; telemedicine; decision support systems; biological signal processing; medical image processing; internet in health, and the standardization of health information.

According to Raitoharju and Laine (2006), the acceptance of IS/ICT is one of the critical success factors for the achievement of the expected benefits from the investments made in this type of technology. These authors emphasize that, despite several studies on the acceptance of IS/ICT, very little is known about the factors which affect the process of adoption by health professionals of this type of technological innovation. The effective implementation and use of this type of technology in healthcare require multi-professional cooperation, as well as the involvement of doctors, nurses, social workers, and other professionals.

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