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How business intelligence maturity enabling hospital agility

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ABSTRACT

Executives of information officers polled agree that rapid and accurate decision-making are essential to organizational agility and data plays an important role in decision making process. With Advanced information technologies, collecting data can be ubiquitously. However, the current volume of data accumulated in hospitals has exceeded the capacity of their medical information systems, not to mention using the data to make decisions. Hospitals started to employ business intelligence systems (BIS) to extract correct, timely, and useful information for hospital decision-makers. Most studies in the area focus on the establishment and related benefits of BIS. This research aims to evaluate the BIS maturity and its influences on decision quality to reveal the BIS impacts on hospital agility. To test the research model, opinions were collected by distributing questionnaires to clinical and administrative decision-makers who had experiences of using BIS in hospitals. The results showed that medical information quality was significantly influenced by BIS maturity. Furthermore, medical information quality exerted a significant effect on medical decision quality, BIS usage, and user satisfaction. The positive influence of user satisfaction on medical decision quality is also verified.

1. Introduction

With the adoption of advanced medical information technology, such as mobile devices or wearable connected devices to tract detailed vital signs of patients, hospitals are producing clinical and administrative "Big Data" (Brooks et al., 2015). The volume of information accumulated in hospitals has exceeded the processing capacity of their medical information systems; additionally, this information comes from different sources and in different formats, which increase the difficulty for hospital decision-makers to extract useful information (Cynthia McKinney et al., 2012). Executives of information officers polled agree that rapid and accurate decision-making are essential to organizational agility (Reid, 2015). Mach and Salem (2010) and Olszak and Batko (2012) pointed out that by employing a business intelligence systems (BIS) to process medical big data, hospital policy-makers can improve their administrative efficiency and make better decisions. Most of the related studies in the medical field have focused on the benefits and system construction of BIS, and some have paid attention to BIC level of maturity and impacts on decision quality.

After the implementation of the national healthcare insurance (NHI), only accredited hospitals would receive proper insurance reimbursements. There are 271 quality indicators regarding acute and chronic care, patient safety, and operating

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management performance suggested as the Taiwan Healthcare Indicator Series. To name a few, the clinical indicators include patients' survival rate, falls rate, and infection rate while administrating indicators include insurance reimbursement report, and service volume of in- and out-patients. Many hospitals assure their medical quality by meeting the indicators standards of accreditation. Physicians, nurses, technical staff and administrators are responsible for maintaining the indicators related to their profession which is time-consuming and requires efforts. The BIS can help them trace the indicators periodically and drill down the root causes of sentinel event.

Popovič et al. (2012) and Popovič et al. (2009) indicate that whether a BIS can provide good-quality information depends on the level of BIS maturity matters. Caniëls and Bakens (2012) concluded that good-quality information will further influence the quality of decisions made by policy-makers. The aforementioned studies are done in business area, few studies in the medical field have focused on BIC maturity and impacts. Therefore, this study constructs a research model to investigate the impacts of BIS on medical decision quality. Meanwhile, acceptance of technology is a key factor to system success, therefore this study adds users' satisfaction, and usage of BIS to further examine the influences of acceptance to technology on decision quality.

2. Theoretical background

Elbashir et al. (2008) proposed that a BIS is a specialized tool for data analysis, which can assist managerial personnel in decision-making needed in a wide range of business activities. Watson (2009) believes that business intelligence includes application, storage, process collection, techniques, interviews, and data analysis to help corporations make better decisions. In this study, BIS is regarded as a modern information technology, which extracts, integrates, and analyzes the timely and useful information internal and external to organizations, while also creating and accumulating user knowledge and insights in order to help them make accurate judgment.

Hribar Rajterič (2010) measured BIS maturity from the perspective of organizational culture which is based on management and focuses on transforming the methods of information use. BIS maturity within an organization can be defined as the capacity of an organization to provide quality information and enhance organization performance through this system. In other words, evaluating BIS maturity is evaluating the quality and level of application of a BIS within an organization (Popovič et al., 2012). Raber et al. (2013) also pointed out an direct way to measure BIS maturity is to evaluate the corresponding level or scale of the organization's that applies BIS. Lahrmann et al. (2011) summarized that different orientations of measuring BIS maturity leads to different impact orientation. In this study, Hribar Rajterič's (2010) measurement of BIS maturity is used.

Information quality has constantly been a topic discussed by scholars and experts in the information systems area. DeLone and McLean (1992) suggested that information quality represents the quality of the output from the information system in the form of reports or on-screen data and can be evaluated by the users. The most obvious benefit of implementing a BIS is improved information quality within the organization (Watson et al., 2002). Popovič et al. (2012) and Popovič et al. (2009) indicate that BIS maturity can affect the information quality of system output. Therefore, this study infers that a higher level of BIS maturity will lead to better medical information quality produced by the system.

After an information system is constructed, the benefits of the system fall into two categories: economic benefits and personal benefits (Galletta and Lederer, 1989). The economic benefit is mainly expressed as cost-savings brought by the higher operation efficacy, or better compliance, safety and security of the information system. The personal benefits focus on the users' satisfaction and system utilization. The economic benefit can be high or low only if the users accepted and used the system. Therefore, this study focused on the personal benefits. Previous studies discovered that user satisfaction is positively associated with medical information quality produced by medical information systems (Yusof et al., 2008; Park et al., 2010) and poor information output leads to user dissatisfaction with the system and further cause information system failure (Xu et al., 2003). Meanwhile, higher user satisfaction will lead to greater reliance on the information system. Therefore, this study infers that when better information quality is provided by BIS in a hospital, who use the BIS are likely to have higher levels of satisfaction and usage.

Borchers (2005) defines decision quality as a unique result of decision science of organizational values, goals, belief systems, ethics, and law. Decision quality can also be viewed as the capacity to optimize decisions, in other words, the capacity of a decision-maker to select the most appropriate solution to a problem among a variety of options (Decker, 1998). Caniëls and Bakens (2012) defined decision quality as whether the decision-maker believes that the decision quality has increased or decreased the amount of decision time needed. In addition, decision quality can be measured by the gap between the decision that has been made and the optimal decision (Gonzalez and Kasper, 1997; Jarvenpaa, 1989; Kaiser et al., 1992). In a group decision, higher decision quality is required, though this often consumes too much decision time and ignores decision efficiency. Given the impossibility of accomplishing two conflicting goals simultaneously, decision-makers often have to make a choice between "decision quality" and "decision efficiency". Therefore, executives of information officers polled agree that rapid and accurate decision-making are essential to organizational agility

3. Research methods

Based on the aforementioned literature research, the research model is shown in Diagram 1 and the associated hypotheses are developed as follows: