UNDERSTANDING THE EFFECTIVE USE OF HEALTH INFORMATION SYSTEMS FROM MULTIPLE STAKEHOLDERS' PERSPECTIVES

Research in Progress

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Abstract

During the last three decades, health organisations started to widely adopt information system (IS) to manage healthcare limitations and challenges. Lately, the spending on health information system (HIS) has continued to increase, and there has been a significant increase in the use of mobile technology, social media, wearables and online communities. Telemedicine is a subset of telehealth, specifically the provision of clinical and medical services to patients through technology such as audio, video conferencing, and text messaging. Hence, healthcare organisations have attempted to generate the maximum value out of the system by utilising it effectively. However, we have a limited understanding of the effective use of telemedicine applications from healthcare providers' and patients' perspectives. Previous studies have focused on the implication of HIS use and its impacts on entire healthcare organisations' performances or users' satisfaction. Also, these studies have been restricted to focus on the healthcare providers' perspectives, neglecting other perspectives (such as the patients'). Therefore, this paper seeks to explore what the effective use of telemedicine applications is and what it constitutes from the healthcare providers' and patients' perspectives. This research is in progress; both qualitative and quantitative data will be analysed to conceptualise a holistic notion on the effective use of telemedicine.

Keywords: Health information system (HIS), Telemedicine application, System use, Effective use.

1 Introduction

Health information system (HIS) research has become a subdiscipline of significant interest to information system (IS) scholars (e.g., Chen et al., 2019; Davidson et al., 2018; Kohli and Tan, 2016; Palvia et al., 2017; Romanow et al., 2012). This is because the development of IS in the healthcare industry enables organisations to reduce medical errors, reduce healthcare costs, increase the quality and efficiency of patient care and facilitate information sharing across organisational boundaries (Agarwal et al., 2010; Chiasson and Davidson, 2004; Fichman et al., 2011; Garg et al., 2005; Haux, 2006; Hillestad et al., 2005). Lately, with the rapid and advanced healthcare technologies being used, healthcare organisations have attempted to generate the maximum value out of the systems by utilising them effectively (Burton-Jones and Volkoff, 2017). More importantly, one of the most significant problems healthcare organisations face today is not how much their systems are used and how faithfully features are appropriated, but how effectively their systems are used and whether the desired outcomes are achieved (Burton-Jones and Grange, 2008; Burton-Jones and Volkoff, 2017). Indeed, much of what we know on HIS is based on the implication of their use and their impact on healthcare organisations' performances (e.g., Adjerid et al., 2018; Bardhan and Thouin, 2013; Huang et al., 2018; Pinsonneault et al., 2017; Zolbanin and Delen, 2018) or users' satisfaction (Chang et al., 2012; Romanow et al., 2018). Although several studies have enriched our understanding of HIS use and how the systems impact individual and organisational outcomes, much less is known about the effective use of HIS and how patients and healthcare providers achieve the desired goals of these systems. Recently, IS scholars called for a move from use to effective use – which requires an in-depth understanding of use (in which the user, system, and task are integral elements that define the essence of system use) (Bagayogo et al., 2014; Burton-Jones and Straub, 2006; Burton-Jones and Grange, 2012). Burton-Jones and Grange (2013) defined effective use as 'using a system in a way that helps attain the goals for using the system' (p. 3). Hence, effective use is mainly concerned with the outcome that reflects the 'system use associated with goal attainment constitutes an individual benefit to the user, which when aggregated with other users, may result in benefits to the organisation as a whole' (Torres and Sidorova, 2019,p. 318). However, few studies have investigated what the effective use of HIS is, what it constitutes and how individuals and health-care organisations achieve the desired goals (Burton-Jones and Volkoff, 2017).

Moreover, these few studies (Burton-Jones and Volkoff, 2017; Serrano and Karahanna, 2016) have mainly focused on HIS use from healthcare providers' perspective, neglecting other perspectives (i.e., patients', agencies' and the government's). Yet, healthcare providers' perspective of HIS only leads to a limited view on the effective use of HIS. The conclusion based on the partial perspective (healthcare providers') used in prior studies do not reveal the full picture of what the effective use of HIS is as perceived by people in different roles and what it constitutes (LeRouge et al., 2007; Lerouge et al., 2015; Burton-Jones and Volkoff, 2017; Fallon et al., 2019). This paper, therefore, seeks to explore what the effective use of HIS involves from the perspectives of both healthcare providers and patients, assuming the dimensions of effective use may occur differently in each perspective. Hence, a collective exploration of multiple perspectives on the effective use of HIS is critically important for healthcare organisations to understand to what extent the systems are used effectively to achieve the desired goals from different perspectives (healthcare providers' and patients') (LeRouge et al., 2007; Burton-Jones and Grange, 2013; Lerouge et al., 2015).

Addressing this limitation in the literature will help in conceptualising a holistic view of the effective use notion, considering that the multiple stakeholders have different goals and different expectations, while effective use can also be seen as context-related and time-bounded. We aim at providing better understanding of the needs of the patients who use telemedicine, their desired goals, and how to potentially navigate the multi-stakeholder's organisational complexity in designing effective telemedicine. To achieve this study's objectives, an inductive grounded theory-building approach will be adopted by collecting both qualitative and quantitative data to gain a rich understanding of what the effective use involves in the context of a mobile telemedicine application in the Kingdom of Saudi Arabia (KSA). A context that is widely agreed upon to be of both theoretical and practical importance

(LeRouge et al., 2007; Serrano and Karahanna, 2016; Thapa and Sein, 2018). Currently we are at the stage of data collection.

2 Health Information System (HIS)

The review and analysis of the IS literature revealed how dominant research themes in HIS research emerged. The first theme is the adoption, diffusion and assimilation of HIS. This theme was extensively examined due to a significant U.S. government push for electronic health record (EHR) adoption via the Meaningful Use program passed in 2009 and started in 2010, which provides financial incentives to eligible hospitals and clinicians (Chen et al., 2019; Crampton et al., 2018). The other theme of HIS research is the implications of HIS use. This theme evaluated healthcare performance in terms of the quality, cost and efficiency that result from the application of HIS. In 2010, the Affordable Care Act placed a higher emphasis on utilising technology in managing health data. Furthermore, in 2010, the Health information technology for economic and clinical health (HITECH) act incentivised payouts for meaningful use. As a result, the adoption rate of HIS (Rouse, 2016), as well as the research interest in the implications of HIS use, have increased in the past few years.

Although the two HIS themes mentioned above are essential in the field of IS research and have significant gaps to be addressed, previous research has shown a growing interest in moving from the study of HIS adoption and diffusion to the study of HIS use and its impact (Romanow et al., 2012; Chen et al., 2019). Essentially, Chen et al. (2019) claimed HIS adoption, diffusion, and assimilation is a crowded topic, such that it is difficult to make any significant contribution. They clarified the need to study the HIS use process to strengthen its value and potential (Chen et al., 2019). Also, the Management Information Systems Quarterly (MISQ) publications on IS use show a significant increase in post-adoptive use studies (Burton-Jones et al., 2017). This shift is critical because most of the previous IS studies extensively examined the construct of use and its antecedents. IS use is mainly conceptualised as a dependent variable (Burton-Jones et al., 2017), not considering the narrower aspect of use (e.g., how the IS is used to achieve the desired outcome). According to Jasperson et al. (2005 cited in Burton-Jones et al., 2017), studies on IS adoption and acceptance 'motivated a switch in focus to what happens after acceptance, often called post-adoptive use' (p. 2). Post-adoptive use is where use is examined 'as part of an ongoing process with the aim of understanding how it is shaped by and in turn shapes a variety of other phenomena at multiple levels of analysis' (Burton-Jones et al., 2017, p. 2). Hence, in this paper, the focus will be on the HIS use and its impact.

3 Literature Review

3.1 Implications of HIS use

IS researchers have evaluated health-care outcomes in terms of quality, cost and efficiency that result from the application of HISs (see Table 1). This review found that a majority of the implications of HIS use studies examined HIS use and its impact on entire health-care organisations' performances (e.g., Adjerid et al., 2018; Bardhan and Thouin, 2013; Huang et al., 2018; Pinsonneault et al., 2017; Zolbanin and Delen, 2018) or users' satisfaction (Chang et al., 2012; Romanow et al., 2018). However, few studies are known about the effective use of HIS and how patients and healthcare providers achieve the desired goals of these systems. Indeed, one of the most significant problems healthcare organisations face today is not how much their systems are used and how faithfully features are appropriated but how effectively their systems are used and whether the desired outcomes are achieved (Burton-Jones and Grange, 2008; Burton-Jones and Volkoff, 2017). Recently, IS scholars called for a move from use to effective use, which requires a deep understanding of the systems' nature and purpose of use (Bagayogo et al., 2014; Boudreau and Seligman, 2005; Burton-Jones and Straub, 2006; Burton-Jones and Grange, 2012; Burton-Jones and Volkoff, 2017). They stressed that examining use only is not enough; the use must be effective (Burton-Jones and Grange, 2012; Burton-Jones and Volkoff, 2017; Eden et al., 2018a; Shachak et al., 2019). Burton-Jones and Grange (2012) proposed a conceptualisation of effective use in which the user, system, and task are integral elements that define the essence of system use. The IS literature defines effective use as 'using a system in a way that helps attain the goals for using the

system' (Burton-Jones and Grange, 2013, p. 3). The definitions are specifically not only about using the system but are more about how the system is used to achieve the desired outcomes.

This review found there are few studies that have not explicitly studied effective use but have done so implicitly (e.g. Findikoglu and Watson-Manheim, 2016; Strong et al., 2014; Serrano and Karahanna, 2016; Thapa and Sein, 2018). For example, Strong et al., (2014) and Findikoglu and Watson-Manheim (2016) drew on affordance theory and explored how the use of EHR systems leads to healthcare organisational change. Additionally, Serrano and Karahanna (2016) drew on task technology fit theory that examined how 'users will use a system in a way that increases task performance if the system fits the task and if the user is competent' (Burton-Jones and Grange, 2008, p. 2). Further, Romanow et al. (2018) explored how the use of appropriate computerised physician order entry features affects physician's coordination, consequently affecting patient satisfaction and health status. Romanow et al. (2018) drew upon adaptive structuration theory, which 'is closely related to effective use in that it relates to outcomes that stem from use, but it differs in that it traditionally focuses on whether or not the system is used in a manner consistent with the designer's intentions' (Burton-Jones and Grange, 2013, p. 633). Likewise, O'Connor and O'Reilly (2016) used the concept of 'infusion' and developed a conceptual model to explore the extent to which mobile health impacts the performance of healthcare practitioners in a clinical healthcare setting. Burton-Jones and Grange (2013) stated although the concept of 'infusion' examined the performance outcomes, 'it differs from effective use in that it refers to how extensively the system is integrated into the work and how fully it is used' (p. 633).

To date, this review found there are only three papers that have focused on the effective use phenomenon in the healthcare context (see Table 2). Most of the previous studies that have addressed the impact of HIS use focused more on the technology and ignored the goals, although many health organisations that invested in HIS had goals to achieve (Strong et al., 2014). However, two studies examined the antecedents of effective use (Boudreau and Seligman, 2005; Serrano and Karahanna, 2016), and only one study, which was by Burton-Jones and Volkoff (2017), examined the effective use in the context of EHR.

Research perspective/type	Paper
Healthcare provider perspective	Chang et al., (2012); Sergeeva et al., (2017); O'Connor and O' Reilly, (2016); Serrano and Karahanna, (2016); Romanow, Rai and keil, (2018); Strong, Volkoff and Johnson, (2014); Findikoglu and Watson-Manheim, (2016); Thapa and Sein, (2018); Burton-Jones and Volkoff, (2017); Mettler et al., (2017); Bardhan and Thouin, (2013); Novak et al., (2012); Ayabakan,Esting and Kirksey, (2017); Adjerid, Adler-Milstein and Angst, (2018); Pinsonneault et al., (2017)
Patient perspective	Serrano and Karahanna, (2016); Huang et al., (2018); Piri et al., (2017); Zolbanin and Delen, (2018); Bardhan et al., (2015); Lin, Chen and Brown, (2017)
Review	Weber-jahnke and Peyton, (2015); Kohli and Tan, (2016); Fichman, Kohli & Krishnan, (2011); Agarwal and Dhar, (2014); Chen and Storey, (2019); Davidson, Baird and Prince, (2018)

Table 1 Studies of the implication of the health information system (HIS) use

Moreover, this review found that despite the advantages previous studies might have, they have mainly focused on HIS use from the healthcare providers' perspective, neglecting other perspectives (i.e., patients', agencies' and the government's). LeRouge et al. (2007) emphasised the importance of understanding the effective use of HIS from multiple stakeholders' perspectives to obtain the full picture. This is because each perspective may have different insights into effective use that may not be readily apparent from the other perspectives. Hence, a collective exploration of multiple perspectives on the effective use of HIS is critically important for health-care organisations to understand to what extent the systems are used effectively to achieve the desired goals (LeRouge et al., 2007; Burton-Jones and Grange, 2013; Lerouge et al., 2015).

Therefore, this study aims to gain a deeper understanding of the HIS use outcomes by exploring what is HIS effective use and what it constitutes within the context of a mobile telemedicine application. Also, because there is a lack of research on effective use that considers multiple perspectives, especially those of the patients, this study will focus on the effective use of mobile telemedicine applications for both healthcare providers and patients, the relationship between the effective use of these two stakeholders and how to achieve the organisational goals as a whole.

Paper	Level of analysis	Type of system	Definition	Theory	Dimensions	Drivers
LeRouge, Hevner and Collins (2007)	Group	Telemedicine	Intelligent effort by direct users (medical staff) during the medical video conferencing encounter, with the effect that the effort facilitates desired outcomes (p.1291)	IS success model		Technological aptitude and ability, communication skills, orchestration
Burton-Jones and Volkoff (2017)	Organization	EHR	Type of use that helps users attain desired goals, i.e., "using a system in a way that helps attain the goals for using the system" (Burton-Jones & Grange 2013, p. 633)	Affordances	Reflection-in-action, accuracy, and consistency	
Serrano and Karahanna (2016)	Individual	Telemedicine	Effective system use, which is comprised of "three elements… the competencies and motivations of users, the nature and purpose of systems, and the characteristics of tasks" (Burton-Jones & Grange,2013, p. 634)	Task–technology fit		User abilities and technology capabilities

Table 2 HIS studies in effective use

To achieve that research aim, the following research questions will be addressed:

- What are the components of effective use as perceived by the telemedicine healthcare providers and patients?
- Do their perspectives of effective use differ? If they do, why? Where do these perspectives converge and diverge?

4 The Research Methodology

In this paper, we aim to perform an in-depth exploration of what the effective use of a specific HIS is from different perspectives (healthcare providers and patients) in the context of a mobile telemedicine application in the Kingdom of Saudi Arabia (KSA). Recently, the Ministry of Health (MOH) implemented the e-health initiative to address many challenges that it faces as part of its 40 initiatives within the 2020 National Transformation Program. The MOH aims to enhance healthcare effectively

and efficiently through adopting and using IT and digital transformation. Sehha was one of the MOH e-health initiatives launched in March 2018. Sehha (https://apps.apple.com/sa/app/sehha-صحة/id1205814003) is an online medical consultation application that aims to provide patients throughout KSA free, efficient and quick health consultations. It is designed to enable patients perform audio and video communication from 8 a.m. to 12 a.m. during the workdays, as well as from 4 p.m. to 12 a.m. on the weekends. Accordingly, users can login into the application, communicate directly with a specialist and have their cases diagnosed through the application. The medical specialist answers users' enquiries and then provides the needed medical consultation and the necessary medical procedure. The MOH has great expectations for this new application. It is expected to reduce medical and diagnostic errors, as well as their incurred side effects. Also, this app is expected to enhance online medical education.

This context was chosen for this study because it has interesting implications for research on the effective use of HIS. Although there is widespread interest in utilising telemedicine applications as a strategic solution that provides anytime–anywhere patient monitoring and remote consultation (Zhang et al., 2016), little research has been conducted on mobile applications for telemedicine (Fallon et al., 2019; Mikesell et al., 2018; Zhang et al., 2016). Indeed, several studies that enriched our understanding of the effective use mainly focused on EHR (Burton-Jones and Volkoff, 2017; Eden et al., 2018b; Eden et al., 2019). Drawing from the extant literature on the effective use, and more specifically on HIS, we built an argument that a HIS is a collection of systems, and therefore, studying the effective use of all the systems might entail a different set of dimensions. While there is already a sufficiently large literature base to orientate on, the uniqueness of telemedicine application, i.e. it supports bi-directional communication between patients and healthcare providers, requires a new study without any premeditated dimensions or constructs. Discovering what the effective use of telemedicine applications involves in is essential to understand to what extent this application is used effectively by the patients and healthcare providers to achieve their desired goals.

This study will adopt the inductive grounded theory (GT)-building approach by employing mixed-method design (qualitative and quantitative) (Glaser and Strauss, 1967). GT is a qualitative research method that seeks to develop theory that is grounded in data systematically gathered and analyzed (Urquhart, Lehmann, and Myers, 2010). Over the past decades, GT has become increasingly used in information System (IS) studies (Urquhart, Lehmann, and Myers, 2010) where it has been proved to be extremely useful in developing context-based, process-oriented descriptions and explanations of information systems phenomena (Goulielmos, 2004). Indeed, GT help researcher to develop new theories of information systems phenomena which are firmly grounded in empirical phenomena (Urquhart, Lehmann, and Myers, 2010).

However, GT main purpose is to build theory with any type of data not just with qualitative method (Glaser and Strauss, 1967). Glaser and Strauss (1967) have long advocated the use of grounded theory with both quantitative and qualitative data separately or together. Therefore, when developing a GT, it is important to consider not only qualitative data, but also quantitative data in order to help elaborate the theory (Walsh, 2015). This research will combine qualitative and quantitative data in a mixed-methods grounded theory-building approach (Walsh, 2014, 2015). A mixed-method design 'includes different quantitative and/or qualitative methods, which combine with and supplement each other within a single project' (Walsh, 2014, p. 5). IS researchers have called for mixed-methods studies to develop meaningful insights into complex IS problems (Venkatesh et al., 2013, p. 2). Mixed methods provide the possibility of theory development within a developmental purpose (Venkatesh et al. 2013)This approach was selected for this study to perform an in-depth exploration of what the effective use of HIS is and what it constitutes from different yet interrelated perspectives (healthcare providers and patients) in the context of a mobile telemedicine application. Besides, Burton-Jones and Volkoff (2017) confirmed the need to study the effective use through a mixed-methods approach, where healthcare studies have begun examining effective use only through inductive case studies (Burton-Jones and Volkoff 2017; Eden et al., 2018b).

Therefore, this study will collect qualitative and quantitative data (see Table 3). The qualitative data will be collected from healthcare providers and patients through semi-structured face-to-face interviews. The interview data will help this study gain an in-depth and accurate understanding of users' experiences and perceptions of what constitutes effective use in this study of context. In contrast, the quantitative data will be collected from the logs file of the mobile telemedicine application. Each entry of the logs file constitutes one telemedicine consultation. At the end of each consultation, the caller/patient will rate how satisfy they are with the consultation. We will use this rating as a proxy of effective use in addition to other possible proxies as we will identify from the qualitative data. In this study, the interviews will be analyzed using content analysis, while the log files will be analysed using descriptive analysis. Both qualitative and quantitative data will inform and enrich each other towards an in-depth understanding of effective telemedicine application use.

Stakeholders	Data collection method
Patients	1 Qualitative Approach – Interviews The Semi-structured interview will be conducted to collect data from patients to gain an in-depth and accurate understanding of their system use. 2 Telemedicine applications data analysis (log file) to assess the pattern of systems use
Healthcare providers	1 Qualitative Approach – Interviews The Semi-structured interview will be conducted to collect data from physicians to gain an in-depth and accurate understanding of their system use. 2 Telemedicine applications data analysis (log file) to assess the pattern of systems use

Table 3 Data collection method

5 Expected contributions

As we are still in the data collection stage, at this time we are unable to provide any preliminary insights of the findings. Nevertheless, we expect our study to make at least three important contributions to HIS research. First, we expect to contribute to HIS use research in general, as well as effective use literature in particular, by examining what effective use involves and what it constitutes from different stakeholders' perspectives in the context of a telemedicine application. We argue the different perspectives of effective use help to get a holistic understanding of the extent to which a specific HIS is used effectively to achieve organisational goals as a whole. The understanding of how the components of effective use as perceived by the different stakeholders could complement or be in conflict with each other will enrich the extant research on effective HIS use. Second, we expect to contribute to HIS research involving telemedicine applications. Although mobile applications can potentially revolutionize telemedicine with anytime–anywhere patient monitoring and remote consultation (Zhang et al., 2016), there is a notable lack of research on mobile applications for telemedicine services. Most of the studies on telemedicine services focused on the use of videoconferencing or desktop/laptop telemedicine application within a hospital or a clinic setting (Zhang et al., 2016). Previous studies that enriched our understanding of effective use mainly focused on EHR (Burton-Jones and Volkoff, 2017; Eden et al., 2018b; Eden et al., 2019), lacking the understanding of effective use from the patients' perspective which is an essential perspective for telemedicine applications. This research will build a picture of what effective use actually is regarding a mobile telemedicine application, an artefact that may entail new dimensions of effective use that may not have been explored in other healthcare artefacts. Third, we expect to contribute to HIS effective use literature from the methodological aspect. This research will examine effective use through both qualitative and quantitative data. To the best of our knowledge, there is no IS study that have attempted to understand effective use through a mixed-methods approach in the healthcare/telemedicine context. For practitioners, the results of this research are expected to help the MOH to generate more value from telemedicine application. Findings of this research may guide the MOH on what they could do to increase the effective use of the telemedicine application, what kind of interventions they could design, and how they should educate the healthcare providers and patients to achieve the desired goals.

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