Health-care information technologies for dispersed knowledge management

Dana Abdulla Alrahbi, Mehmood Khan, Shivam Gupta, Sachin Modgil and Charbel Jose Chiappetta Jabbour

Abstract

Purpose – *The health-care industry has multiple stakeholders, with knowledge dispersed among clinicians, experts and patients and their families. As the adoption of health-care information technologies (HITs) depends on multiple factors, this study aims to uncover the motivators for adopting them.*

Design/methodology/approach – *The study considers 391 respondents, representing the health-care sector, to evaluate the motivators for adopting HITs for better-dispersed knowledge management. The authors analyze the responses using exploratory factor analysis (EFA) to identify the actual structure of the factors, followed by confirmatory factor analysis (CFA).*

Findings – *EFA categorized the factors into four classes: quality management; information sharing; strategic governance; and available technological infrastructure. CFA revealed that the strategic governance factor is most predictive of successfully adopting HITs that model the normative pressure of Institutional theory in health-care organizations. These results indicate that, along with considerations of finances, care quality and infrastructure, effective government involvement and policy-making are important for successful HIT adoption.*

Practical implications – *Results reveal that stakeholders' motivating factors for HIT adoption in a developed economy like the United Arab Emirates are based on considering HITs as a knowledge management mechanism. These factors may help other nations in HIT implementation and drive valuable innovations in the health-care sector. This research presents the implications for health-care professionals and stakeholders in relation to adopting HITs and their role in knowledge flow for efficient care.*

Originality/value – *HITs offer an affordable and convenient platform for collaboration among diverse teams in the health-care sector. Apart from this, it helps in facilitating an interactive platform for knowledge creation and transfer for the benefit of users and providers.*

Keywords *Stakeholders, Knowledge management, Motivators, Health-care information technology*

Paper type *Research paper*

Dana Abdulla Alrahbi and Mehmood Khan are both based at Abu Dhabi University, Abu Dhabi, United Arab Emirates. Shivam Gupta is based at the Department of Information Systems, Supply Chain and Decision Making, NEOMA Business School, Reims, France. Sachin Modgil is based at International Management Institute – Kolkata, Kolkata, India. Charbel Jose Chiappetta Jabbour is based at Montpellier Business School, Montpellier, France.

1. Introduction

In the health-care sector, medical knowledge is one of the critical components. Health-care organizations are increasingly aware of the competitive environment and intangible-knowledge-based competition. In response to stakeholders' increasing expectations, health-care organizations are increasingly adopting information technologies to manage and transfer knowledge to various individuals (Epaminonda *et al.*, 2020; Fletcher-Brown *et al.*, 2020; Van Eerd, 2019). Health-care organizations are also increasingly choosing health-care information technologies (HITs) to avoid any knowledge ambiguity or "stickiness." HIT-driven knowledge management facilitates close collaboration among health-care providers, patients and involved third parties (Barros *et al.*, 2020; Butler and Murphy, 2007). The timely and accurate availability of knowledge pertaining to health-care information can lead to lower cost, higher quality, greater speed and improved dependability (Nagasubramanian *et al.*, 2020). HITs have the potential to enhance access

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to knowledge while lowering the cost of knowledge-transfer processes in health-care settings (Peng *et al.*, 2014). Apart from facilitating knowledge transfer, HITs can also enable knowledge acquisition from different sources that can be used to provide better health-care and equip patients and their families with adequate medical knowledge. Hence, HITs offer an interesting landscape for knowledge management in the modern health-care environment.

The umbrella term HIT refers to a group of technologies for the storage, sharing and analysis of information, using data in health-care systems, based on which recommendations can be made, which, thus, creates knowledge (Buntin *et al.*, 2011; Palanisamy and Thirunavukarasu, 2019). HITs represent an essential enabler of innovative care and initiatives and they have, therefore, been adopted by modern health-care facilities (Burton-Jones *et al.*, 2020; Lee *et al.*, 2013; Shetty, 2020; Soto-Acosta *et al.*, 2018). HITs are considered eminently suitable for providing better quality at affordable costs as well-coordinated HIT strategies efficiently collate key pieces of the otherwise scattered patient and other stakeholder data (Burton-Jones *et al.*, 2020). The generated knowledge, from health insurance to complexities in patients' diseases, needs appropriate direction in the process of care delivery (Ahmad and Barner-Rasmussen, 2019). Thus, health-care facilities that use HITs to increase the quality of their medical care position themselves better for long-term sustainability (Kruse and Beane, 2018). Adopting HITs offers multiple benefits, including increased staff productivity; a reduction in the number of errors; reduced cost compared to maintaining records physically; excellent quality of service; and the automation of care services (Dash *et al.*, 2019; Kaur and Singh, 2017). Most importantly, HITs help to enhance the level of satisfaction among stakeholders through the integration of dispersed knowledge (Ahmadi *et al.*, 2017, 2018; Alsadan *et al.*, 2015; Ayatollahi *et al.*, 2016; de Vasconcelos Gomes *et al.*, 2021; Ehteshami *et al.*, 2013; Oliva *et al.*, 2019; Prieto-Pastor *et al.*, 2018; Rauniar *et al.*, 2019; Wang *et al.*, 2018).

The health-care industry now uses the medical knowledge and intelligence of HITs. This combination helps in creating new knowledge through a deeper understanding of micro issues, which are otherwise difficult to comprehend (Nahar *et al.*, 2013; Yu *et al.*, 2018). HITs are not only helpful in storing information but also facilitate clinicians' significant engagement through computerized order entry and remote decision making (Jagsi *et al.*, 2018; Mohan *et al.*, 2019). HITs can also facilitate treatment selection and reduce variations in care processes (McIlvennan *et al.*, 2015). Further, home-based, patient-led and physician-led care need a primary decision support system to be successful (Kalra *et al.*, 2020; Papa *et al.*, 2020; Russell-Jones *et al.*, 2018). Artificial intelligence (AI) has already been adopted in the form of image processing through machine learning in the area of dermatology and radiology (Hosny *et al.*, 2018; Ker *et al.*, 2017). HITs can also facilitate precision medicine and influence the pathology domain due to the need to integrate test results and clinical information (Aronson and Rehm, 2015; Pauli *et al.*, 2017), enabling dispersed knowledge in different domains to be integrated and used effectively (Ahammad *et al.*, 2016; Oliva *et al.*, 2019; Sánchez-Polo *et al.*, 2019). HITs find their application in areas such as clinical decision support, patient health monitoring, electronic medical records, electronic prescription and telehealth. The technologies such as sensors and wearable technology help in collecting the data in health-care sector that further develops as a critical element of health-care knowledge. Additionally, real-time location services help hospitals to enhance their efficiency and identify the areas of improvement. Hospitals use this technology for tracking the usage of instruments, devices and other staff.

Existing studies have highlighted the role of knowledge management from the resource-based view (Fletcher-Brown *et al.*, 2020) in relation to nurses' role in healthcare, while de Souza *et al.* (2020) examined knowledge management in healthcare for clinical staff. Some other studies have discussed knowledge barriers and knowledge transfer in the health-care setting (Sheng *et al.*, 2013; Van Eerd, 2019). These studies, however, represent

only one type of stakeholder (either clinical staff or nurses) in the creation and utilization of knowledge in healthcare; however, patients and their families, members of the public and experts are also key stakeholders in relation to health-care technologies. Prior studies have failed to discuss these key stakeholders in modern healthcare in the context of HITs becoming an effective knowledge-transfer platform, integrating dispersed knowledge to provide better health-care services. On the basis of these gaps in the existing literature, we adopt in the current study a multi-dimensional approach to knowledge management through HITs for the benefit of multiple stakeholders. Additionally, governments are now making considerable investments to purchase cutting-edge health-care technologies (Marques *et al.*, 2011; Polykarpou *et al.*, 2018), with leading specialists estimating that the HIT industry would create global revenue of US$185bn in 2018–2019 (Cresswell and Sheikh, 2015). However, some governments have not yet responded appropriately, which raises an important concern and leads to the following research question:

RQ1. Why are HITs being increasingly preferred as knowledge management platforms?

Our study aims to contribute to the utilization of HITs through the lens of the institutional theory that translates into quality in health-care services, the provision of better health-care-related information and the provision of strategic governance to the health-care ecosystem and that acts as a robust technological infrastructure to facilitate quick and efficient services. By studying the motivations of several stakeholder groups, this study aims to offer direction for the improved adoption of modern technologies. The remainder of this paper is organized as follows. We present the existing literature on the motivating factors for HIT adoption, the role of stakeholders and the current state of play in the United Arab Emirates (UAE) in Section 2. The research design is described in Section 3, while Section 4 presents and analyzes the results. The results are further discussed, including implications both for research and practice, as well as limitations and scope for future research, in Section 5. The conclusions are presented in Section 6.

2. Literature review

This section addresses three HIT key aspects: motivators for HIT adoption; the role of stakeholders; and the current state of HITs in the UAE.

2.1 Key motivators for health-care information technology adoption

Motivators for using technology can be extrinsic or intrinsic (Alrahbi *et al.*, 2019; Davis *et al.*, 1992; Deci and Ryan, 1980), with several influences and paths (Petty and Cacioppo, 1986). Several motivators for the adoption of technology listed in the literature include cultural influences, social influences, facilitating conditions, effort expectancy, performance expectancy, meaningful use and proactive leadership behaviors (Aljohani *et al.*, 2018; Arefin *et al.*, 2020; Fisher and Clayton, 2012; Hoque and Bao, 2015; Ingebrigtsen *et al.*, 2014; Ruivo *et al.*, 2012; Slight *et al.*, 2015; Thackeray *et al.*, 2013; Tortorella and Fries, 2015). Regarding health-related technologies specifically, as might be expected, a major motivator for HIT adoption, particularly for health-care providers, is the financial impact. Numerous scholars have articulated the role of HIT in improving profitability and organizational performance (McLeod *et al.*, 2008; Mello *et al.*, 2010). As indicated by Robertson (2011), financial motivators for entering the electronic health-care records world for various stakeholders center around costs and improved efficiency. Electronic healthcare helps to improve process quality, leading to improved financial outcomes (Li and Collier, 2000; Polykarpou *et al.*, 2018). Thus, we can hypothesize *H1*.

H1. Technology adoption has a significant relationship with quality management.

In addition to considering outcome-based motivators such as financial impact, whole-hearted HIT adoption must also consider stakeholder motivations such as ease of use

(Del Giudice *et al.*, 2017; Law *et al.*, 2017). HITs do not only help in communicating information but also facilitate the integration of widespread knowledge in the health-care sector and the provision of adequate information (Oliva *et al.*, 2019). The inter-organizational and individual factors that are critical in technology acceptance encompass thematic interconnectivity, equipment and workflow to successfully assimilate the multi-directional knowledge (Del Giudice and Maggioni, 2014). This leads to health-care professionals being comfortable in using the technologies, provided they are effectively implemented (Wei and Clegg, 2014). The technology acceptance model suggests that perceived usefulness is a direct indicator of nurses' intention to use HITs (Chen *et al.*, 2008). This intention could further be enhanced with internet access, computer skills and ease of use (Aggelidis and Chatzoglou, 2009). However, the unified theory of acceptance and use of technology model points out several other factors that dictate this intention to use such as social influence and facilitating parameters (Kijsanayotin *et al.*, 2009).

Various external factors may also play a role in the intention to use such as leaders' innovativeness, knowledge management capabilities and government pressure (Alkraiji *et al.*, 2011; Del Giudice *et al.*, 2017; Orlando *et al.*, 2020; Spender *et al.*, 2017). Despite the many motivations for HIT adoption (and the value in doing so), there are significant deterrents and challenges related to technological elements and how easy they would be to implement and use (Oliva, 2014). Cresswell and Sheikh (2013) confirmed many of the previously mentioned motivations for HIT adoption but also found that the challenges of its implementation are related to how it interacts with other technical, social and organizational motivators. They pointed out some gaps requiring further research, namely, environmental factors and the interplay between adopters and organizational characteristics. This suggests that effective HIT adoption needs to target both motivating people to use it and breaking down the barriers that de-motivate them (Oliva, 2014).

In summary, the current literature is replete with studies that have identified numerous factors in various domains that affect HIT adoption. However, the literature lacks a detailed study on the motivators from the perspective of various health-care stakeholder groups such as institutions, physicians, nurses and patients. Thus, there is a need to identify the adoption determinants across these stakeholder categories to identify the most universally important and appealing factors.

2.2 Dispersed knowledge in health-care sector

Health-care services heavily rely on the knowledge and evidence-based practices. In health-care delivery, the knowledge is dispersed among different specializations ranging from cardiology, gynecology and neurology to orthopedics among others. Even the teams in healthcare are geographically dispersed and collaborate through HITs for better health-care services (Mors and Waguespack, 2021; Zhang *et al.*, 2019). Medicines are one of the key facilitators in the health-care sector that are sourced from pharmaceutical and biotech companies (Sharma and Goswami, 2009). The research and development (R&D) department have a different level of knowledge than a purchase or marketing executive in the organization, however, they are working for the common objective of the organization (Mazzucchelli *et al.*, 2019). In healthcare, the knowledge is dispersed right from labs where usually tests for vitals are conducted to the pharmacies of hospitals where patient purchases the medicines during the treatment. Similarly, the knowledge utilization, level of practice and cases handled by different clinicians and nurses pose the field for dispersed knowledge among stakeholders those not only belong to the core health-care sector but also outside the core such as insurance companies and banks. Even clinicians absorb and share the knowledge from different specializations in healthcare that becomes useful in offering health-care services (Raab *et al.*, 2014). The induction of emerging and smart technologies in health-care sector can help in integrating and presenting it at the common platform that further facilitates health-care organizations toward better services (Zhang *et al.*, 2019).

The knowledge about patient vitals coming from diverse departments to a common platform helps health-care managers to refine and redefine the services offered. The dispersed knowledge integration through technologies also leads to developing innovative solutions to the problems (Mazzucchelli *et al.*, 2019). A structured mechanism/algorithm helps in addressing the challenges for dispersed knowledge in healthcare. The HITs offer mechanism that facilitate creating, assimilating and sharing the health-care knowledge among various stakeholders (Raab *et al.*, 2014). The dispersed knowledge has huge potential in developing new abilities, services and skills that can enhance the performance of a health-care system (Zhang *et al.*, 2019). The knowledge is dispersed around the organizational and stakeholders activities that can be further used not only from a consumer view but also from a strategic view, asset management and assimilating knowledge in innovative ways (Mazzucchelli *et al.*, 2019). Dispersed knowledge also facilitates multi-stakeholder organizations in the areas such as organizational learning (Prieto-Pastor *et al.*, 2018). In this manner, dispersed knowledge in health-care organizations and its organizations helps in advancing medical science and training. Apart from health-care organizations dispersed knowledge has been highlighted in other domains (Table 1), that indicate the potential of integration and using it through various means for the betterment of organizations and ecosystems. Thus, we hypothesize *H2*.

H2. Technology adoption has a significant relationship with information sharing.

2.3 Role of stakeholders

Stakeholders, defined as "any person, group or organization that can place a claim on an organization's attention, resources or output or is affected by that output" (Bryson, 1995, p. 27), are key to a company's very existence (Storr *et al.*, 2021). Stakeholders' views and opinions play a critical role in an organization's success (Pellizzoni *et al.*, 2020). Stakeholder theory asserts that an enterprise should set its targets based on how they can meet the needs of their stakeholders and the normative version of this model investigates the behavior both of managers and stakeholders (Friedman and Miles, 2006). The notion of stakeholders has been widely adopted in seeking to understand knowledge management in the inter-organizational context, encompassing strategic management, business planning, project and environmental management and information systems (Agostini *et al.*, 2020). The literature has mostly focused on electronic government and electronic commerce (Balta *et al.*, 2015; Mishra and Dwivedi, 2012). Thus, we hypothesize *H3*.

H3. Technology adoption has a significant relationship with strategic governance.

At the core of this study is the assumption that health-care facilities can improve their service delivery through modern technology by fostering an understanding of the benefits among stakeholders. It is widely accepted that stakeholders need to embrace innovative models based on HITs in healthcare (Del Giudice and Della Peruta, 2016; Kotabe and Kothari, 2016; Orlando *et al.*, 2020). To obtain a comprehensive assessment of technology acceptance motivators, we identified four major stakeholder groups within the system: health-care professionals; patients (and their families); members of the public; and foresight experts. Given their expertise in and understanding of, how current and past patterns have been appropriate to organizational targets, foresight experts assist organizations in navigating changes via the early evaluation of potential opportunities and/or obstacles. Thus, by combining and considering the views of experts and users, policymakers and health-care professionals can gain valuable insights regarding how to address the current issues in modern healthcare, from the rising costs of care to major demographic shifts, to continue providing quality care. Thus, we hypothesize *H4*.

H4. Technology adoption has a significant relationship with technology infrastructure.

Table 1 Key literature on dispersed knowledge management

S. no.	Author(s) and year	Objective	Approach	Tools	Respondents	Major findings
1	de Vasconcelos Gomes *et al.* (2021)	Investigation of how firms manage the dispersed knowledge in ecosystem those are heterogeneous and autonomous	Interview	Case study and thematic coding	43 respondents from 12 projects and 6 firms	Dispersed knowledge needs to be integrated through strategies that facilitate transfer, modularity and circularity in ecosystems and organization
2	Mors and Waguespack (2021)	Investigate the effects of dispersion in research teams and their efficiency outcomes	Literature	Content analysis	5,250 teams from different geographies	Geographically or organizationally dispersed research teams are reaching faster to success and fail slowly as compared to non-dispersed teams due to their different level of knowledge. The dispersed teams also choose the projects those have high potential leading to have low chances of failure
3	Storr *et al.* (2021)	Examining the knowledge problems connected with designating specific goods and services as "essential" during Covid-19	Conceptual	Content analysis	–	Essentialness is usually subjective and primarily depends upon dispersed local knowledge that changes over time. Due to dispersed knowledge, policymakers do not possess the capability to meet the requirements of all people. This knowledge gap further hampers the allocation and reallocation of scarce resources effectively
4	Przybyła-Kasperek (2020)	Simplifying the process of reducing the size of local decision tables that maintains the quality of decisions	Simulation	Experiment	–	Experiment indicates that using generalized objects considerably decreases the number of items in local tables. Additionally, the generalized objects having a greater number of attributes offer comparable quality classification
5	Mazzucchelli *et al.* (2019)	Investigate the role of social capital and information technologies in augmenting sharing of knowledge and innovation capabilities with reference to globally dispersed R&D teams	Survey	Structural equation modeling and fuzzy set qualitative analysis	265 R&D managers from Italy and other locations	In geographically dispersed R&D teams social capital structure and information technologies play a critical role in advancing manufacturing in small and medium enterprises
6	Zhang *et al.* (2019)	Identify the key mechanisms linked with a global knowledge of multinational corporations	Qualitative	Content analysis	US patent data from electrical equipment companies	The absorption of new knowledge by one multinational plant and the flow of newly absorbed knowledge to other global units influence the innovative performance of multinationals. The flow of newly absorbed knowledge is more prevalent from parent to subsidiaries as compared to among subsidiaries when it comes to MNCs innovation performance

(*continued*)

Table 1

S. no.	Author(s) and year	Objective	Approach	Tools	Respondents	Major findings
7	Rauniar *et al.* (2019)	Recognizing the antecedents and their relationship for knowledge integration that represents the joint mission of a project, trust and mutual influence	Survey	Structural equation modeling	191 respondents from the US manufacturing industry	Shared project mission, trust, knowledge integration and mutual influence are found to have a substantial positive association. Additionally, the measures of project success and product success are positively influenced by knowledge integration
8	Prieto-Pastor *et al.* (2018)	Investigating the diverse dimensions of project members that facilitate the knowledge integration	Survey	Structural equation modeling	129 R&D executives from Spain	Knowledge integration leads to exploratory and exploitive learning in R&D organizations leading to ambidextrous knowledge management. Out of three dimensions of social capital (cognitive, affective and relational), the cognitive dimension has a noteworthy impact on knowledge integration
9	Raab *et al.* (2014)	Analyzing factors influencing the effectiveness of knowledge sharing among geographically dispersed expert groups	Survey	Regression analysis	Respondents from a large software company (Accenture)	Managerial involvement moderates the relationship of group expert's dispersion and the acts of them in social integration process for effective knowledge sharing. Management can put appropriate controls to cultural barriers in knowledge sharing. No effect among trust and perceived knowledge sharing was observed
10	Sharma and Goswami (2009)	Propose a dynamic model for R&D to ease the transfer of knowledge across the organization	Conceptual	Literature review and case studies	Case studies from Indian companies	Outsourcing helps in developing new knowledge that can be further used as knowledge identity across the organization. Active research collaboration among global subsidiaries helps in knowledge flow and assimilation of knowledge
11	Becker (2001)	Analyzing the organizational problems and response to dispersed knowledge	Conceptual	Content analysis	–	Dispersed knowledge lead to a large number of opinion, asymmetric information and uncertainty. Strategies should be used selectively and the knowledge replacement with partly recreation skills helps in certain situations. Additionally, decentralization leads to self-reinforcing influence

To our knowledge, this is one of the very few studies to explore the various stakeholder groups to provide a more comprehensive perspective on what motivates the adoption of modern health-care technologies, especially in the UAE. In addition, the inclusion of foresight experts is new to academic research in HIT adoption motivation and represents an important contribution to the literature. This novel combination of factors and their interplay is presented in Figure 1. Table 2 describes the list of stakeholders used in this study. Institutional theory appropriately addresses the need and capabilities of the different systems impacting the HITs adoption (Dubey *et al.*, 2015).

2.4 Institutional theory

Perceived from the view of institutional theory of organizations, the effective adoption and implementation of HITs can influence the normative, coercive and mimetic systems across the organizations. Institutional theory guide the behavior of an organization. Institutional theory considers that it is impacted by the outside environment, activities, norms and expectations of stakeholders (Bhakoo and Choi, 2013; Dubey *et al.*, 2015). The knowledge especially is dispersed and collected through external environments such as insurance organizations, specific laboratories and other third-party services in health-care sector (Gopalakrishna-Remani *et al.*, 2016). The coercive system is exerted by external stakeholders to create and collect the dispersed knowledge to follow certain standards in health-care delivery (Bhakoo and Choi, 2013). The coercive system is developed by the stakeholders such as the government (e.g. require the data for certain diseases), patients (e.g. monitoring of patient condition in hospital from home) and suppliers (e.g. close coordination with health-care facility for supplies) (Gopalakrishna-Remani *et al.*, 2019). The normative system influence comes from the associations, media and other social entities (Dubey *et al.*, 2015). The normative system develops the pressure on health-care organizations to be responsible for representing the right kind of information developed from the different forms of dispersed knowledge which is quick and easy through HITs (Gopalakrishna-Remani *et al.*, 2016). The normative system helps in ensuring that health-care organizations are operating in social complaint mode by integrating the dispersed

Figure 1 Theoretical framework

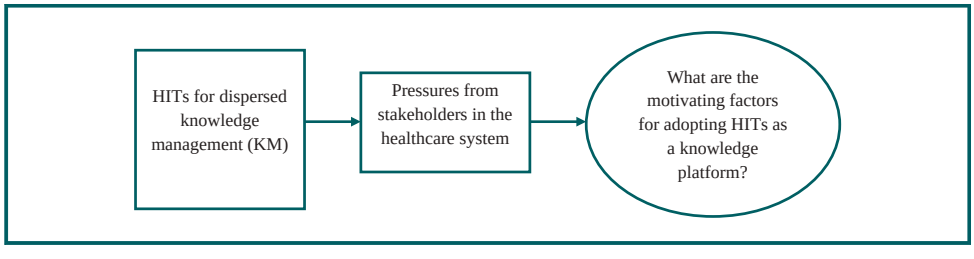


Table 2 Stakeholder categories and definitions

Stakeholder group	*Description*
Employee	Individuals working in health-care sector (administrators, nurses, doctors, etc.) with no limit to their years of experience
Patient	Any individual, male or female, has received the services provided by the health-care sector. Patients under 18 were assisted by their guardians
UAE citizen or resident	Residents of the country in the age group; 18–65
Foresight expert	These are trainees with foresight training. Foresight experts are aware of changes in the external environment and in what way these affect the organization. They help companies in analyzing the obstacles and opportunities

knowledge and presenting it to stakeholders timely (Hsia *et al.*, 2019). Mimetic system emerges when organizations engage in competing mindsets pursuing superior performance (Bhakoo and Choi, 2013). The adoption of HITs can be really helpful for health-care organizations achieving higher performance addressing the issue of dispersed knowledge among different stakholders.

2.5 Health-care information technology in the UAE

The UAE in particular and the Arab world in general, has witnessed dramatic changes over the past 10 years. Healthcare in the UAE is a private-public mixed system, mostly funded and governed by the health authority (Alsadan *et al.*, 2015). The health-care system is aiming for a revolutionary transformation to cope up with the ever-increasing demands and is searching for a more classical, privately funded, care paradigm. The UAE government's vision is to become a global health-care destination by 2021.

This transition in the health-care system is not an easy task and various obstacles must be overcome before the UAE's ambitious vision can become a reality. The common challenges that policymakers must address include the increasing rates of chronic diseases such as heart problems and cancers. People are increasingly affluent and a lazy lifestyle necessitates state-of-the-art medical facilities governed by knowledge-driven HITs (Kotabe and Murray, 2018; Technavio, 2015).

The UAE began a key initiative in 2008 named *Wareed*. This electronic system links the health-care facilities of Dubai and all the other Northern Emirates. This centralized system stores patients' data and allows doctors remote access to patients' medical history and other information (McLeod *et al.*, 2008; Turulja *et al.*, 2020). The advanced features of *Wareed* are quite extensive and include a decision support system that moderates errors and system use, as well as preventing duplication in prescriptions and improving health efficiency. A similar initiative was offered by the company NMC Health using blockchain technology to allow the storage and sharing of electronic medical records. These strategic partnerships for adopting modern HITs can offer enhanced security and reliability to efficiently facilitate knowledge management among the providers and receivers of care. Further, HIT adoption provides seamless access that motivates new knowledge generation (Alrahbi *et al.*, 2019).

Some of the recent preventive care measures in Abu Dhabi include the *Weqaya* Program (a public service program) and a Telemedicine Center (Constantinides and Barrett, 2006; Fletcher-Brown *et al.*, 2020). Similarly, promoting preventative care through building good health habits, the Dubai Health Authority (DHA) recently undertook an initiative focused on connecting people via smartphone applications and encouraging children and teenagers to drink more water and brush their teeth more often. The DHA has also been working to promote professional development for health-care providers with the help of smart applications (Gebre-Mariam and Bygstad, 2019; Spender *et al.*, 2017). This ecosystem can help the UAE achieve its vision of being a top global health-care destination, a vision that cannot be realized without the successful adoption and implementation of HITs (Turulja *et al.*, 2020).

The UAE is at the heart of reshaping the Middle East and is taking the lead in the Arab world in technology adoption (Alsadan *et al.*, 2015). Being strategically positioned, we chose the UAE as a suitable study location in which to explore the motivations for HIT adoption. Moreover, public institutions are characterized by low IT usage, while private companies encounter major financial constraints to adopting various forms of HIT, e.g. eHealth, electronic health records and telemedicine. Hence, there is a need to find viable ways to overcome all types of de-motivators for HIT adoption if the advantages of this technology are to be gained. A clear understanding of these advantages has made the UAE successful in adopting valuable health-care technologies. Thus, this study aims to understand the

views and motivations of various stakeholders in the UAE toward adopting HIT. It is essential to understand how to better equip other health-care systems to start seeing some of the innovative and much-needed technological progress that the UAE health-care sector has seen.

3. Research design

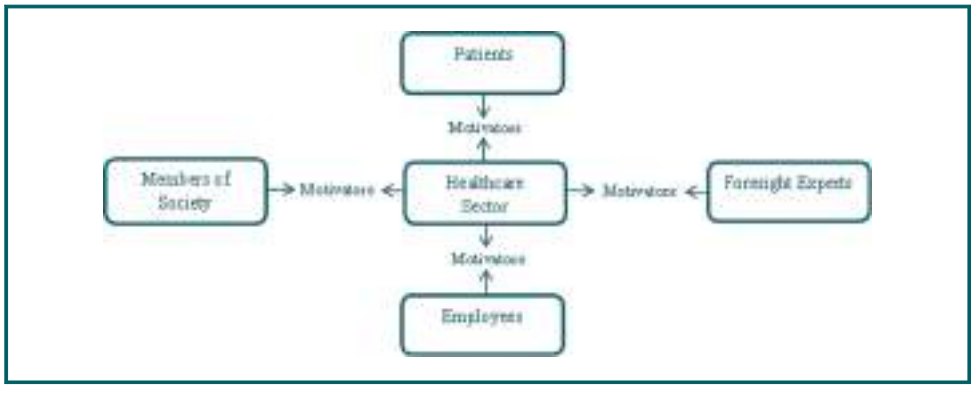
3.1 Instrument development

In this study, we initially considered 44 key questions in relation to the critical motivators in HIT adoption (Alrahbi *et al.*, 2019; Sheng *et al.*, 2013). As it is important to refine a questionnaire with the help of academics and professionals (Johnston *et al.*, 2003), these questions underwent refinement in several stages. First, we discussed the questions related to HITs with four academicians and they suggested the removal of five questions due to their inapplicability in the UAE context. In the second round, we discussed the questions with a group comprising employees, patients and foresight experts, who suggested the deletion of six questions, hence leaving 33 questions. In the final round, we discussed the questions with the top management of five hospitals in the conference and they indicated the further elimination of five questions, leaving a total of 28 questions (areas) for investigation. The design of the questionnaire was developed in three phases. It comprises two main parts: the first is related to respondents' demographic information and the second comprises the 28 finalized questions. Figure 2 presents the theoretical framework used in the study, based on which stakeholders were surveyed regarding their motivation in adopting HITs for integrating, sharing and transferring knowledge and how HIT facilitates knowledge management in health-care organizations (Wang *et al.*, 2018).

3.2 Data collection

Four types of respondents were considered for the survey in this study. The first category comprises employees working in health-care facilities, including clinicians, lab technicians, nurses and administrators. Most employees in the UAE health-care sector are expats (Harrison and Michailova, 2012), so their opinion on HITs may help provide a different perspective as they have studied and practiced in other countries (Heizmann *et al.*, 2018). The second category comprises patients who are either experiencing or have experienced HITs. As it was also important to understand the views of the public, we included members of the public in the UAE as a third category to understand their views on HITs and their effect on them, both now and in the future (Aceto *et al.*, 2018). The fourth category comprises foresight experts. With the intention of receiving a holistic view of the motivating factors for HIT adoption, we sent the questionnaire to approximately 650 respondents.

Figure 2 Stakeholders involved in the adoption of health-care information technology



These respondents were identified from five hospitals, including clinicians, nurses, technicians, patients and their families and members of the public. We targeted around 253 employees from the health-care sector, 79 patients using health-care services, 297 members of the public and 21 foresight experts. After three reminders, each after 15 days, we collected 398 responses. After a critical examination of each questionnaire, we found 7 to be incomplete, leaving 391 for further analysis (a response rate of 60.15%). Category-wise, the highest response rate was from employees (61.66%) and the lowest was from foresight experts (42.86%).

3.3 Measures

We operationalized the motivators of HIT adoption through a questionnaire designed in three phases. These questions included areas related to the cost, quality and delivery of health-care services, including safety standards followed during care (Sheng *et al.*, 2013; Van Eerd, 2019). Additionally, items were included related to the role of HITs in integrating, identifying and transferring adequate knowledge, online access and the public's association with local medical schools and their culture (Fletcher-Brown *et al.*, 2020; de Souza *et al.*, 2020). HITs play an important role in overcoming knowledge "stickiness," which can be attributed both to the knowledge itself and the characteristics of the receiver (Szulanski *et al.*, 2016). Hence, HITs represent the best medium through which to transfer knowledge among stakeholders, which could otherwise be a costly and complex process (Sheng *et al.*, 2013). The adoption of HITs also helps address some of the United Nations (UN) Sustainable Development Goals, enabling health-care facilities to achieve sustainable healthcare through strategic governance. The roadmap in the UAE for health-care facilities in adopting HITs and promoting medical tourism highlights their contribution to economic development. Notably, HIT adoption needs the support of strong technology infrastructure and the physical infrastructure of buildings (Beladi *et al.*, 2015). HITs' success will lead to the interoperability of different types of data and inferences, helping clinicians and other stakeholders in their decision-making processes (Turulja *et al.*, 2020).

3.4 Non-response bias test

In empirical research, non-response bias is a common issue. To check for non-response bias, we compared two sets of data (195 and 196 responses) collected in two phases (Armstrong and Overton, 1977; Dubey *et al.*, 2015). The *t*-statistics indicated no significant difference (p = 0.11) between the two data groups; hence, non-response bias is not a potential issue in this study.

3.5 Profile of respondents

We received 391 responses representing a wide spectrum of stakeholder categories. The respondents were invited to participate in the electronic survey, indicating that it would take around 20 to 25 min to gauge their orientation toward HIT adoption. Each respondent was approached individually to collect their responses to the questionnaire. We provided the background and objective of the study before respondents answered the questions. Once respondents agreed electronically, we made a phone call to each respondent to verify that they understood the objective of the study clearly. Around 30% of the respondents had less than five years' experience in the health-care sector. A detailed demographic breakdown of the sample population, including how many there are in each stakeholder category, is presented in Table 3.

4. Results and analysis

The key underlying (i.e. latent) motivators that enable the implementation of modern technologies in the health-care sector were identified using exploratory factor analysis

Table 3 Demographic details of the respondents

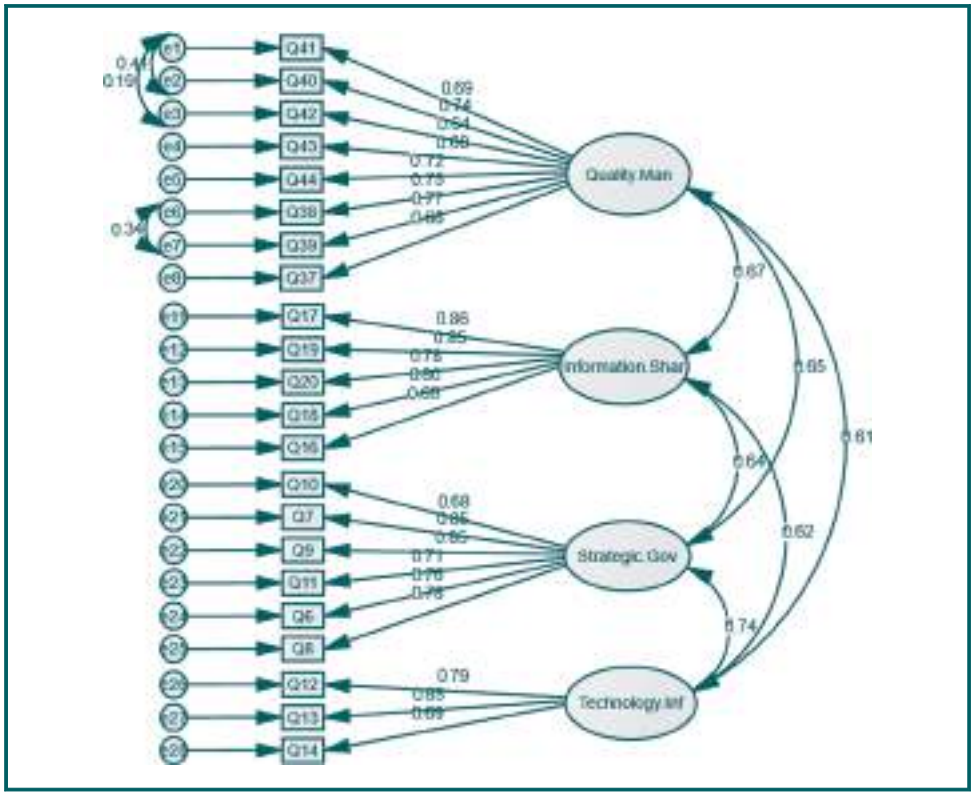
Demographics	*Category*	*Count*	*(%)*
Status	Employee in the health-care sector	156	39.9
	Patient using the health-care services	46	11.8
	Society member	180	46.0
	Future foresight expert	9	2.3
Gender	Male	95	24.3
	Female	296	75.7
Age	18 to 24	44	11.3
	25 to 34	134	34.3
	35 to 44	138	35.3
	45 to 54	62	15.9
	55 to 64	12	3.1
	65 to 74	1	0.3
Years of experience	Less than 5	118	30.2
	5 to 10	83	21.2
	10 to 15	83	21.2
	15 to 20	53	13.6
	20 to 25	28	7.2
	25 to 30	15	3.8
	More than 30	11	2.8
Level of education	High school degree holders	58	14.8
	Diploma holders	38	9.7
	Higher diploma holders	26	6.6
	Graduates with BS	192	49.1
	Graduates with MS	69	17.6
	Graduates with PhD	8	2.0

(EFA). Out of 391 responses, we used 195 for EFA and 196 for confirmatory factor analysis (CFA) to develop a measurement and a structural model (Figure 3) to ascertain to what extent each latent variable can predict HIT adoption.

The rationale for using CFA is three-fold. First, it allows for the grouping of variables into theoretically grounded constructs, which enables the testing of theory-based hypotheses. Second, unlike most available multivariate procedures, it provides relatively precise approximations for measurement errors (Byrne, 2001). This further helps in avoiding inaccuracies, especially when errors are substantial. Third, CFA focuses on observed and unobserved factors, unlike multivariate analyzes (Schumacker and Lomax, 2010). CFA helps in determining the effect of latent motivator variables (unobserved) on HIT adoption (observed). In the present study, before proceeding with EFA, we met two conditions: the Kaiser–Meyer–Olkin measure of sampling adequacy (KMO = 0.951); and Bartlett's test of sphericity ($p < 0.001$) (Treiblmaier and Filzmoser, 2010; Worthington and Whittaker, 2006). We excluded eight items for which the loading was below 0.3 (Matsunaga, 2010). The EFA results indicated four factors with an eigen value greater than one, while the combined total variance explained was 63.05%. Table 4 presents the pattern, average variance extracted (AVE) and item loadings, as well as Cronbach's alpha as an indicator of internal consistency.

To understand the relationships between the latent factors, a measurement model was developed based on the data, using only the following four identified factors: information sharing (IS); quality management (QM); strategic governance (SG); and technology infrastructure (TI). In the measurement model, the reliability of the observed variables was influenced by random measurement error, representing the associated errors in the model. Furthermore, in

Figure 3 Measurement model



accordance with the concepts of structural modeling, observed variables were regressed onto their respective factors and correlated with each other.

We conducted the chi-square test to evaluate the overall goodness of fit (GOF). We also measured the absolute and incremental fitness indexes (Hu and Bentler, 1999). Absolute fit indices, including the goodness of fit index (GFI) and root mean square error of approximation (RMSEA), indicate whether the *a priori* model represents the sample data (Hu and Bentler, 1999). Incremental fit indices, including normed fit index (NFI), comparative fit index (CFI) and Tucker–Lewis index (TLI), relate the explicit model to the basic structural equation model (Worthington and Whittaker, 2006). Table 5 presents KMO indices for sample adequacy, where Table 6 indicates the fitness of the measurement model.

We also evaluated the construct validity (convergent and discriminant) presented in Table 7. The AVE and composite reliability (CR) indicates decent convergent validity (Hair *et al.*, 2010; MacKenzie *et al.*, 2011). The maximum shared variance (MSV) and the square root of AVE (on the diagonal) determine the discriminant validity (Hair *et al.*, 2010).

Next, a structural model was developed to examine how the key factors related to the motivation for technology adoption (Figure 3). This analysis revealed a significant and strong coefficient for the paths of all four factors on the higher-order construct of technology adoption, with SG being the strongest and QM and IS being the weakest. The path coefficients also indicate that the four hypotheses mentioned in the literature, are true and significant. Figure 4 depicts this model, while GOF indices are outlined in Table 8. As with the measurement model, these measures indicate that the model is a good fit for the data.

The results indicate SG is playing a normative pressure that is a driving factor in adopting the HITs for dispersed knowledge management. This may be possible, where an

Table 4 Rotated-component-matrix of items on key four factors

Item	*Label*	*QM*	*IS*	*SG*	*TI*
Q41	Less-legal-medical-cases	0.93			
Q40	Less-medical-errors	0.88			
Q42	JCI-accreditation	0.77			
Q43	Cost of services	0.71			
Q44	Quality awards	0.71			
Q38	Quick recovery	0.51			
Q39	Quality services	0.49			
Q37	Safety standards	0.48			
Q34	Control over contagious illnesses	0.44			
Q33	Mortality	0.42			
Q17	Support from teaching hospitals		0.87		
Q19	Organizational culture in hospitals		0.86		
Q20	Easy transfer of knowledge		0.82		
Q18	Support from career development centers		0.80		
Q16	Online access		0.67		
Q15	Existence of local medical schools		0.55		
Q28	Market trends		0.49		
Q25	Competition		0.46		
Q10	International trade			0.86	
Q7	Strategic support			0.72	
Q9	Future foresight			0.68	
Q11	Medical legislation			0.67	
Q6	2030-vision			0.64	
Q8	Financial-support			0.62	
Q12	Infrastructure-of-buildings				0.82
Q13	Information-infrastructure				0.82
Q14	Centralized-access-with-emirates-ID				0.67
Q35	Smart/new technologies				0.49
	Variance explained (%)	43.41	7.06	5.43	3.92
	Cronbach's alpha	0.90	0.91	0.90	0.82

Table 5 KMO and Bartlett's test

Kaiser-Meyer-Olkin-measure-of-sampling-adequacy		0.951
Bartlett's-test-of-sphericity	Approx.-Chi-square	7,891.687
	df	496
	Sig.	0.000

Table 6 Fitness indices for the measurement model

Model	*Obtained value*	*Recommended values*
χ^2/df	2.18	<3
GFI	0.91	0.90–1.0 (Hoyle, 2000; Kline, 2005)
SRMR	0.04	<0.1, ideally < 0.06 (Kline, 2011)
RMSEA	0.06	<0.08 (Hu and Bentler, 1999)
NFI	0.92	0.95–1.0 (Miles, 2007; Thompson, 2004)
TLI	0.95	0.95–1.0 (Miles, 2007; Thompson, 2004)
CFI	0.96	>0.90 (Kline, 2011)

Notes: χ2/df = normed-chi-square-statistic; GFI = goodness-of-fit index; RMR = root-mean-square-residual; RMSEA = root-mean-square-error of approximation; NFI = normed-fit-index; TLI = Tucker-Lewis-index; CFI = comparative-fit-index

Table 7 Validity and reliability of the four constructs

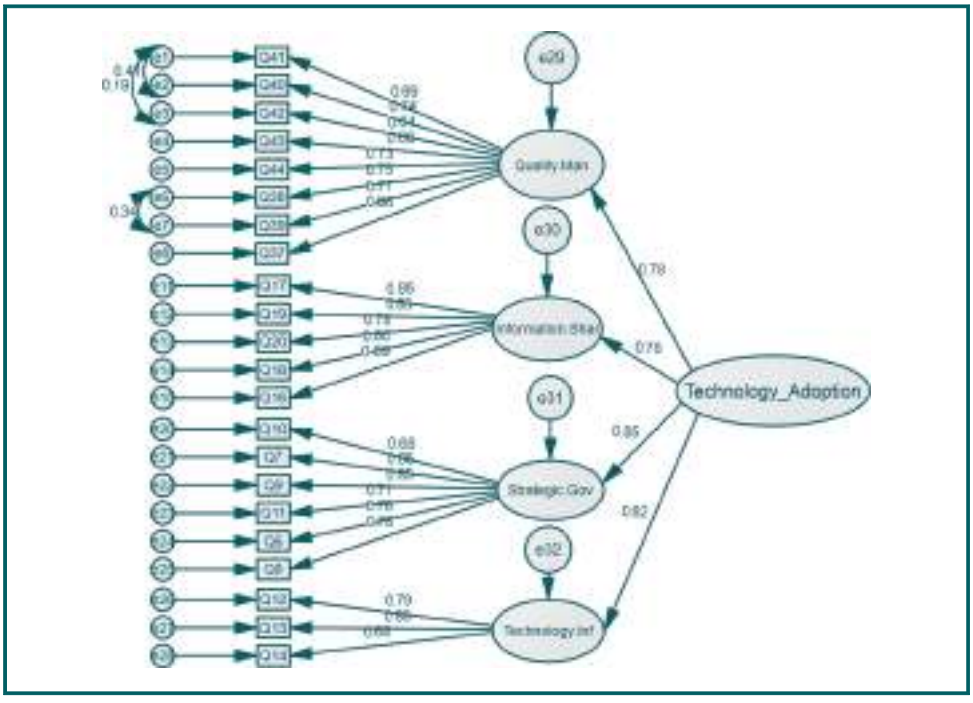
Factor	*CR*	*AVE*	*MSV*	*SG*	*QM*	*IS*	*TI*
SG	0.90	0.60	0.55	***0.77***			
QM	0.89	0.50	0.44	0.65	***0.77***		
IS	0.90	0.64	0.44	0.64	0.66	***0.80***	
TI	0.82	0.61	0.55	0.74	0.61	0.62	***0.78***

Notes: CR = composite-reliability; AVE = average-variance-extracted; MSV = maximum-shared-variance; SG = strategic-governance; QM = quality-management; IS = information-sharing; TI = technology-infrastructure

Table 8 Fitness indices for structural model

Model	*Obtained value*	*Recommended value*
χ^2/df	2.21	<3
GFI	0.90	0.90–1.0; Hoyle (2000) and Kline (2005)
SRMR	0.04	<0.1, recommended < 0.06; Kline (2011)
RMSEA	0.06	<0.08; Hu and Bentler (1999)
NFI	0.92	0.95–1.0; Miles (2007) and Thompson (2004)
TLI	0.95	0.95–1.0; Thompson (2004) and Miles (2007)
CFI	0.95	>0.90; Kline (2011)

Figure 4 Structural model



organization like Emirates Medical Association pushes the health-care organizations to improve their delivery standards. The association monitors the performance of health-care organizations and encourages medical tourism, which is solely driven by customer satisfaction. Today the customer satisfaction in health-care sector primarily depends upon,

how well the family or patient is treated and what facilities apart from basic operations in hospitals are provided. In the past two decades, technology has advanced healthcare to a significant extent. The technology platform benchmarking and strategic push by the government helps in integrating the dispersed knowledge from different stakeholders ranging from insurance providers to nurses monitoring the patient status on daily basis to after services condition of the patients.

5. Discussion

The findings indicate that, apart from legal concerns, many policy-related items loaded highly onto SG. Their significance is clearly depicted by the structural model, suggesting the crucial role of government policies in implementing newer technologies. This ultimately helps to overcome the myriad challenges in meeting the ever-increasing demands in healthcare. The implementation of health-care technologies makes the UAE, in light of its Vision 2021, a model for other countries in the region and for organizations and nations all over the globe as to how to effectively increase HIT adoption and develop a knowledge-management-oriented platform. The Philips' Future Health Index 2017 highlights the efforts of different stakeholders in different countries in adopting innovative technologies in healthcare (Wang *et al.*, 2018).

In this study, we adopted a systematic approach to developing a scale representing the motivating factors for driving knowledge across health-care organizations through HITs. We covered various stakeholders (employees, patients and their families, members of the public and foresight experts) to understand their aspirations for the quick and easy flow of dispersed knowledge through HITs across the health-care ecosystem. Moreover, aiming to facilitate the integration of dispersed knowledge and support the adequate flow of information, our study also attempted to integrate the literature from healthcare, information systems and strategic management. Our study indicates that HIT adoption facilitates quick service recovery and lowers the cost of services provided to patients as a result of strategic governance. HITs also help in developing, managing and evaluating policies related to international standards and leveraging the dispersed data to develop the knowledge required to facilitate continuous improvement. Our study offers several interesting implications for theory and for the administrators of health-care systems, we well as other stakeholders. Prior research has highlighted the role of technology in service provision and customer satisfaction in the health-care setting in terms of facilitating knowledge management in the industry (Li and Collier, 2000). The literature highlights how clinicians and patients can exchange and generate knowledge through HITs and how the internal and external environment can impact the quality of care (Turulja *et al.*, 2020). Therefore, we conceptualize institutional theory as a research lens in this study. Following the institutional theory, our study depicts the investigated factors that influence the adoption of health-care technologies.

5.1 Implications for theory

Our study represents an initial and important contribution to knowledge management research. First, the study has developed an instrument measuring the orientation of different stakeholders in adopting HITs in relation to dispersed knowledge integration and their role in quickly allowing the adequate flow of knowledge to clinicians, nurses and patients within and between facilities in the health-care setting (Prieto-Pastor *et al.*, 2018). The study's findings contribute to uncovering the reasons and motives behind HIT adoption by health-care organizations, which is arguably one of the most interesting and pertinent questions in facilitating dispersed knowledge management through modern technologies today (Epaminonda *et al.*, 2020; Holsapple, 2005; Sheffield, 2008; Tanriverdi, 2005). The first-hand findings of our study in relation to this question are consistent with the findings of Fletcher-Brown *et al.* (2020), who stated that modern technologies linked with mobile

applications can act as a form of resource-based knowledge management for health-care nurses and develop a normative system in health-care organizations. The sharing and assimilating of the dispersed knowledge toward stakeholders is directly proportional to the perceived quality of care. Further, HITs offer deeper patient engagement in health-tracking through smart devices (Papa *et al.*, 2020). Second, given the paucity of studies considering HITs in terms of knowledge identification, creation and sharing among health-care stakeholders, our study contributes by revealing the structure of the motivating factors for HIT adoption, which helps to ensure quality in health-care services, facilitate information sharing and maintain strategic governance by presenting a robust technological infrastructure that supports knowledge flow across the verticals in the health-care setting (Bardhan and Thouin, 2013). Our study views HIT adoption through the lens of institutional theory, which highlights the importance of a normative system that emphasizes professional ethics in healthcare. Using institutional theory as a foundation, our study offers a synergetic classification of the factors explored and the importance of a normative system to manage the dispersed knowledge. Existing research indicates the need for and difficulty in, classifying the factors motivating HIT adoption. Our study has addressed these challenges by presenting a validated scale through CFA. In summary, the findings of the study help in identifying the motivating factors for HIT adoption from the perspective of different stakeholders.

5.2 Implications for practice

With the growing importance of and expectations for, service levels in healthcare, along with the importance of adequate and quick knowledge-transfer requirements (Peng *et al.*, 2014), our study offers important implications for practice. First, the study suggests that maintaining the continuous availability of knowledge among stakeholders, especially patients and their families, is facilitated by HITs. The results indicate that HITs sharing a knowledge platform facilitate electronic health information exchange among doctors, pharmacists and nurses. The appropriate usage of HITs further facilitates speed, quality, safety and reduced cost in patient care. HITs help in integrating the dispersed knowledge, from family history to lab reports, to provide error-free care services. HITs play a major role in transferring the knowledge created from multiple analyzes and discussions among patients and experts related to a particular case. Therefore, administrators and managers in health-care organizations can identify, design and develop HITs around these needs in the health-care setting.

Further, the findings of our study emphasize that, with help of HITs as a knowledge platform, health-care organizations can succeed in attracting patients from different parts of the world and connect with them to provide post-care services and consultation. This helps health-care organizations to be strategically positioned. Managers and providers of healthcare can also use HITs for compliance with local-, state- and federal-level requirements. In modern healthcare, HITs provide a strong foundation for multi-directional knowledge management for the benefit of society, patients and health-care organizations. Health-care practitioners can also view HITs as a medium for storing and integrating the information flowing from pharmaceutical companies in the form of products offered and combine this information with the knowledge of clinicians to provide the best care (Sharma and Goswami, 2009). Practitioners can view the adoption of HITs as enhancing the knowledge- and information-processing capabilities of organizations. Hence, our study provides empirical support to managers concerning the motivations of and benefits for, multiple stakeholders in healthcare via HITs.

5.3 Limitations and scope for further research

As we have explored the motivating factors for HIT adoption in the UAE only, future studies could assess whether our findings can be generalized to neighboring countries in the wake

of technological innovations. The present study details the motivating factors that can reform a sector such as healthcare.

Similar studies are also needed to address the generalizability concerns around the world, particularly in those countries making pioneering efforts in implementing HITs. Further, the present study did not separate the stakeholder categories to compare how motivations differ (or not) among them. Future research can specify which motivators are strongest for which stakeholder group to specifically target interventions that will lead to the most widespread adoption of HITs. For instance, the motivating factors from the perspective of the provider may be different from those of the receiver. Moreover, the scope of HITs may also be perceived differently by other stakeholders such as medical insurance companies. This calls for more detailed research in this nascent field. It is also necessary to explore the wide range of barriers in the field of HIT (Cresswell and Sheikh, 2013). Future studies can consider HITs as a resource to create a knowledge-based platform in the health-care sector.

6. Conclusion

In this study, we have examined the structure of the motivating factors for HIT adoption from the perspective of four key stakeholder groups to ensure rapid knowledge integration and transfer to users such as clinicians and patients (and their family members). On the basis of institutional theory, we have examined stakeholders' motivations for preferring HITs that facilitate knowledge flow and the integration of dispersed knowledge. Our study assumes the existence of a basic information technology infrastructure to enable a knowledge-driven platform via HITs. Our study represents an attempt to overcome the common failure to see the potential benefits of HITs from a multi-stakeholder perspective. We argue that the findings of our study go beyond those of prior studies by suggesting that a multi-stakeholder view is critical in defining the benefits associated with HIT adoption and knowledge-driven platforms. The knowledge management perspective of HITs has not been well studied in the literature. In summary, the findings of our study offer a theory-based understanding of scale development, while also simultaneously: considering the elements of the classified factors such as quality in care service provision; presenting a technological infrastructure; providing a strategic advantage to health-care firms; and enhancing the information-sharing and -processing capabilities of organizations. In brief, this study explores and confirms the underlying factors that motivate HIT adoption in modern healthcare.

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Corresponding author

Charbel Jose Chiappetta Jabbour can be contacted at: cchiappettajabbour@lincoln.ac.uk