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Malaysia Health Information Exchange: A systematic review

Nurul Izzatty Ismail, Nor Hazana Abdullah
Faculty of Technology Management and Business, University Tun Hussein Onn, Malaysia

corresponding e-mail: izzatty[at]uthm(dot)edu(dot)my
address: Faculty of Technology Management and Business, University Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Malaysia

Abstract:

Malaysia Health Information Exchange (MyHiX) is part of Health Transformation System, which is a national agenda to improve the healthcare service using ICT as an enabler. Its main focus is to share patients' discharge summary or clinical summary among healthcare facilities. This initiative was launched in November 2008. However, nine years after its launch, MyHiX has been successfully implemented only in eight healthcare institutions in Malaysia. Therefore, this paper presents a systematic review of the existing literatures related to Health Information Exchange or MyHiX, with the aim of exploring the empirical gaps and issues associated with its implementation. Six databases were used to locate relevant studies, namely IEEE, Proquest, Emerald, Science Direct, Google Scholar and Scopus. In total, 70 studies met the inclusion criteria. Further thematic analysis of these studies revealed that issues of MyHIX implementation could be categorized into technological, organizational, environmental and human contexts.

JEL Classifications: I10

Keywords: Health Information Exchange, Malaysia Health Information Exchange, technological, organizational, environmental, human

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1. Introduction

The healthcare sector is considered important in Malaysia as demonstrated by the government's efforts in driving various initiatives to improve the sector. For example, the Ministry of Health Malaysia (2011) formulated three Key Research Areas (KRAs) in response to the National Key Economic Areas (NKEAs), which was tabled during the 11th Malaysia Plan in 2010 as follows:

a. KRA 1: Health sector transformation towards a more efficient and effective health system in ensuring universal access to healthcare.

b. KRA 2: Health awareness and healthy lifestyle.

c. KRA 3: Empowerment of individual and community to be responsible for their health.

Health System Transformation was derived from the KRAs to improve the use of ICT in healthcare. The main agenda of Health System Transformation is to restructure national health system and provides a choice of quality health care, ensuring universal coverage for health care needs of the population based on solidarity and equity based on service delivery, organizational and financing (Shaik Allaudin, 2013). Hospital Information System and Health Information Exchange (HIE) are regarded as integral parts of the ICT in the Malaysian public healthcare as be mentioned in KRA 1.

Hospital Information System (HIS) has been implemented in stages so that the hospital staff can provide high-quality hospital services and treatments to the patients (Ismail et al., 2013). Patient data or information are integrated into another department within the

hospital by using the HIS (Ismail et al., 2010; Mohd. & Syed Mohamad, 2005; Ismail & Abdullah, 2016). HIE is a reliable and interoperable electronic information hub, which facilitates sharing of clinical information among hospital staff, other healthcare providers, and patients. The operation transcends the boundaries of healthcare institutions, health data repositories, states, and other entities, with access from one organization to other organizations that are not within a single organization or among affiliated providers (Department of Health, 2014). In addition, National Alliance for Health Information Technology (2008) defines HIE as an electronic network of health-related information movement between organizations according to nationally recognized standards. The system includes electronical processes of transmitting patient information between healthcare organizations (Acker et al., 2007). However, the implementation of HIE, which is known as MyHiX in the Malaysian context, has not received much attention. This is because, MyHiX is seen to face of financial constraints and lack of abilities in managing of data integration (Shaik Allaudin, 2013).

Data integration is defined as the use of common definitions and codes across different departments of an organization (Bos, 2006). Data integration is an important procedure that will improve communication and coordination between the subunits of an organization (Goodhue). HIS encompasses information integration within individual hospitals, whilst HIE covers information integration among hospitals (Saad & Alias, 2012; Som et al, 2010; Sugijarto et al., 2013).

2. Malaysia Health Information Exchange (MyHiX)

Through the operation of MyHiX, a patient's discharge summary is electronically transmitted between the Hospital Information Systems (HIS) and the application systems of the Clinic Information System (CIS) (Ministry of Health, 2014). The patient's discharge summary includes records of physical examination, previous history, laboratory investigation, diagnosis and treatments. MyHiX facilitates the exchange of medical records or healthcare information of patients between government hospitals or clinics; the data flows are effected through an online virtual private network in a smooth and secure manner (Ministry of Health, 2014). This system permits physicians to access the health information of individuals and provides continual and better-quality healthcare to the people; at the same time, the Lifetime Health Records for patients are constantly updated in the government hospitals and clinics. In total, there are 139 public hospitals and 2839 public clinics in Malaysia (Ministry of Health, 2017). However, according to the Ministry of Health Malaysia Official Website (2016), at present, only eight Malaysian public healthcare institutions that have implemented MyHiX:

a. Hospital Putrajaya, Putrajaya
b. Hospital Tuanku Jaafar, Negeri Sembilan
c. Hospital Port Dickson, Negeri Sembilan
d. Hospital Bentong, Pahang
e. Hospital Sultanah Nur Zahirah, Terengganu
f. Hospital Raja Perempuan Zainab II, Kelantan
g. Institut Kanser Negara, Putrajaya
h. Klinik Kesihatan Presint 9, Putrajaya

These hospitals share records and information of patients, such as demographics and patient healthcare information (Hisan, 2012).

2.1. Benefits of Hospital Information Exchange

There are several benefits associated with the implementation of HIE. According to Zaidan et al. (2015), healthcare is safer by using HIE. This is because security errors of patients could be reduced by using HIE as declared by Kaelber & Bates (2007). A total of 18% and 70% of adverse drug events could be eliminated by using HIE (Kaelber & Bates, 2007). Furthermore, medication errors also could be reduced (Zaidan et al., 2015; Hypponen et al., 2014; Thorn et al., 2014).

Timeliness is one of the benefits of using the HIE (Zaidan, 2015). Time spent by the hospital staff in verifying information could be reduced, which includes that of medical tests, results and diagnoses of patients (Blaya et al., 2010; Payne et al., 2011; Zaidan et al., 2015; Williams et al., 2016).

Zaidan et al. (2015) also found that the costs could be reduced by using HIE; for example, reducing the duplication of tests and results as well as less usage of paper in hospitals (Yaraghi, 2015; Zaidan et al., 2015; Bailey et al., 2013; Miller & Tucker, 2014).

Access to administrative data could be increased, and more accurate administrative records can be retrieved by using HIE (Iezzoni, 1997). Accuracy of patient information is important, and this is achieved through regular updating of the information by the system (Zaidan et al., 2015; Vest & Gamm, 2010; Adler-Milstein et al., 2011; Parker & Adler-Milstein, 2016).

The datasets of administrative information can be increased by using HIE (Safran et al., 2007). This includes using specific databases to store large volume of medical data and patients' information (Zaidan et al., 2015; Nissinen et al., 2016). There are various types of databases to store patient information and hospital staff can have access to them whenever they need to (Groves et al., 2016; Miller & Tucker, 2014).

The organization will benefit from using HIE, in terms of attaining a high level of patient satisfaction (Zaidan et al., 2015; Vest & Gamm, 2010). The researchers (Friedberg et al., 2014; Byrne et al., 2014; Otte-Trojel et al., 2014; Ritten-house et al., 2017) agreed that HIE could increase patient satisfaction, especially when the medical information is accessible to them when they needed it.

TABLE 1. BENEFITS OF HIE

BENEFITS OF HIE	RESEARCHERS
Safety healthcare	(Kaelber & Bates, 2007; Hyppönen et al., 2014; Thorn et al., 2014; Zaidan et al., 2015)
Timeliness	(Blaya et al., 2010; Payne et al., 2011; Zaidan et al., 2015; Williams et al., 2016)
Assessing quality of care	(Iezzoni, 1997; Zaidan et al., 2015; Vest & Gamm, 2010; Adler-Milstein et al., 2011; Parker et al., 2016).
Research resource	(Safran et al., 2007; Nissinen et al., 2016; Groves et al., 2016; Miller & Tucker, 2014)
Organizational benefits	(Vest, 2012; Friedberg et al., 2014; Byrne et al., 2014; Otte-Trojel et al., 2014; Rittenhouse et al., 2017)
Patient perception	(Park, 2013; Hsieh, 2015; Geissbuhler, 2013)
Security and privacy	(Gritzalis & Lambrinoudakis, 2004; Ibrahim & Singhal, 2016; Kruse et al., 2014; Huang et al., 2014)
Cost reduction	(Yaraghi, 2015; Zaidan et al., 2015; Bailey et al., 2013; Miller & Tucker, 2014)

Patient perceptions of health information sharing are important as discovered by Park (2013). In this study, the respondents indicated their acceptance of the new information system or willingness to endorse HIE technology. In addition, Hsieh (2015) and Geissbuhler (2013) declared that both physicians and patients accepted the HIE as an instrument to enhance information exchange that would bring about better healthcare for their benefits.

Security and privacy of health data could be improved, by allowing users to access information virtually by using HIE (Gritzalis & Lambrinoudakis, 2004; Zaidan et al., 2015; Ibrahim & Singhal, 2016; Kruse et al., 2014; Huang et al., 2014.

These various studies highlight eight major benefits of HIE: Safety Healthcare; Timeliness; Cost Reduction; Assessing Quality of Care; Research Resource, Organizational Benefits; Patient Perceptions; and Security and Privacy as shown in Table 1.

2.2. Barriers of Hospital Information Exchange (HIE)

There are several issues concerning the implementation of Health Information Exchange

(HIE). According to Ross et al. (2010) and Vest et al. (2010), HIE faces a usability issue, especially that from the perspective of patients. Vest et al. (2010), states that the system has a low access level of only 2.3% because the patients are unfamiliar with the facility, and there are time constraints in using it. One of the reasons HIE has such a low access level is technological related-issue; there is a lack of technical support for accessing the HIE (Ross et al., 2010). Data stored in HIE could go missing by using HIE (Tham et al., 2010; Rudin et al., 2011). This could happen due to human errors and system errors. Moreover, the cost of HIE implementation is high (Patel et al., 2011; Pevnick et al., 2012; Rudin et al., 2014). In addition, there are privacy and security issues since information stored in HIE could be accessed from multiple locations (Patel et al., 2011; Pevnick et al., 2012; Rudin et al., 2014; Parker & Adler-Mildstein, 2016). Rudin et al. (2014) discovered another barrier to the usage of HIE: there is a lack of a compelling business case for sustainability.

In Malaysia, MyHIX is seen to face significant budget constraints in developing the infrastructure and system; funding is required for future maintenance, replacement of obsolete parts and expanding the limited infrastructures in Malaysia (Ismail et al., 2013; Shaik Allaudin, 2016). Moreover, Zaidan et al. (2015) express that HIE does not have the desired interoperability; as a result, patient and healthcare information sharing across provider boundaries is difficult. Liu (2012) highlight a fragmentation problem in the health information exchange, which results in a lack of accountability, medical errors, wastes and duplication. One example of medical errors is related to failure of patient identification and matching by using the HIE (Adler-Mildstein et al., 2016).

TABLE 2. BARRIERS OF HIE

BARRIERS OF HIE	RESEARCHERS
Usability	(Ross et al., 2010; Vest et al., 2011)
Missing data	(Tham et al., 2010; Rudin et al., 2011)
Disruption of workflow	(Ross et al., 2010; Rudin et al., 2011; Rudin et al., 2014)
Costs	(Patel et al., 2011; Pevnick et al., 2012; Rudin et al., 2014)
Privacy and security	(Rudin et al., 2014; Parker & Adler-Mildstein, 2016)
Lack of a compelling business case for sustainability	(Rudin et al., 2014)

Table 2 shows the recurring issues across the studies that are categorized as usability, missing data, disruption of workflow, startup costs, privacy and security, and lack of compelling business case for sustainability.

As mentioned earlier, the implementation of MyHix has not been very successful, limited to several hospitals and clinics only. Such phenomenon would undermine the effectiveness of national health policy enforcement and attainment. Therefore, it is imperative to identify factors affecting HIE or MyHIX implementation so that the issues can be understood further.

3. Methodology

This research utilized systematic literature review in identifying, critically assessing and assimilating findings of all related studies in Health Information Exchange or MyHiX implementation. According to Khan et al. (2003), a strategic literature review encompasses five key activities, which are scoping, planning, identification, screening and eligibility. In this paper, the systematic literature review was done to identify factors affecting MyHIX implementation. Therefore, all relevant terms related conceptually to MyHIX were also reviewed. These are the inclusion criteria:

a. The article is published between 2010 and 2017.This is important to ensure that only the current, updated and accurate findings are obtained. The findings earlier than 2010 are considered to be outdated.

b. All types of studies on MyHIX and others related to the subject

c. This study focuses on "Health Information Exchange" and "Malaysia Health Information Exchange". However, there are several other terms involved and associated with the subject of this study; for example, "Health Information System", "Hospital Information System", "Tele-Health", "Tele-Medicine" and "Tele-Medical".

d. Articles published in six major databases:

- IEEE Explore Digital Library
- Proquest
- Emerald
- Science Direct
- Google Scholar
- Scopus

With the data and information retrieved based on the above inclusion criteria, the study gaps were analyzed. It was done by focusing on both the abstracts and full text of the articles. Hence, factors affecting MyHIX could be identified and discussed. This procedure is important so that the review is comprehensive. Relevant studies were then grouped into recurring themes and tabulated for review.

4. Results

A total of six major databases (IEEE, Proquest, Emerald, Science Direct Google Scholar and Scopus) were used as a medium in searching for the articles of the relevant field of study.

Table 3 shows a total of 12,300,004,519,173 studies focusing on information system in the healthcare sector all over the globe. The searching term of "Health Information

Exchange" brought in 1,820,753 articles. These articles discuss and explain the HIE from all over the globe. "Health Information System" brought in 2,795,395 articles, whereas "Hospital Information System" brought in 2,842,163 articles. "Tele-Health" and "Tele-Medicine" brought in 28,565 and 74,600 articles respectively, whilst "Tele-Medical" brought in 8,446 articles. However, only articles focusing on MyHiX, HIE and HIS were selected. Thus, only 70 articles are included in this study. These articles were selected based on relevancy of healthcare integrated system.

Out of the 70 articles, only five articles focus on MyHiX, signaling that there is dearth of studies specializing in MyHiX in Malaysia compared with 1,820,753 articles of HIE overseas. Abdulnabi et al. (2017) had proposed a distributed framework for the nationwide health information exchange using smartphone technologies. Zaidan et al. (2015) had focused on security issues faced by the health information exchange system. They had proposed a security framework for the nationwide health information exchange based on telehealth strategy. Shaik Allaudin (2013) had studied the national e-health of Malaysia update, which found MyHiX as a new system to be implemented in Malaysia. Hisan (2012) had presented the MyHiX characteristics and benefits in his study. Ministry of Health (2014) also presented MyHiX toolkit which explains the overall picture of MyHiX.

Upon further scrutiny of the articles, the issues of HIE can be divided into four contexts that influence MyHiX implementation: Technological, Organizational, Environmental and Human. These contexts were chosen based on previous articles that included the Technological, Organizational, Environmental (Ismail et al., 2016; 70; Ahmadi et al., 2015) and Human (Ahmadi et al., 2015; Sulaiman & Wickramasinghe, 2014) contexts as factors influencing the electronic healthcare system in their articles.

TABLE 3. NUMBER OF STUDIES BASED ON DATABASES

Database	HIE	Health IS	Hospital IS	Tele-Health	Tele-Medicine	Tele-Medical
IEEE	595	9,651	3,711	61	6112	170
Proquest	163,176	362,138	466,224	3,157	6,606	274
Emerald	21,426	60,747	18,732	184	427	12
Science Direct	90,656	1,059,274	627,274	3,006	10,821	638
Google Scholar	1,540,000	1,230,000	1,700,000	18,100	36,600	6,890
Scopus	4,900	73,589	26,222	4,057	14,034	462

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5. Discussion

According to the findings, the Technological, Organizational, Environmental and Human contexts were found to influence the HIE. Hereafter, the same contexts could affect the MyHiX in Malaysia. These contexts were derived from the issues of HIE based on the selected articles as depicted in Table 3.

TABLE 4. CONTEXTS OF THEMATIC AREAS

TECHNOLOGICAL	ORGANIZATIONAL	ENVIRONMENTAL	HUMAN
Perceived usefulness (PU)	Organizational size (OS)	Cost (C)	User satisfaction (US)
Perceived ease of use (PEOU)	Managerial structure (MS)	Government regulation (GR)	Skill and experience (SE)
Information quality (IQ)	Timeliness (T)		
Service quality (SQ)			
System quality (SYQ)			
Security and privacy (SP)			

Table 4 shows different contexts found to be relevant to the electronic healthcare system. By following evaluations of the selected articles, it is evident there are several issues in technological context that affect the HIE, namely Perceived Usefulness, Perceived Ease of Use, Information Quality, Service Quality, System Quality, and Security and Privacy. Therefore, several issues are seen to affect the HIE under organizational context, managerial structure and timeliness. Cost and government regulation also can affect the HIE under environmental context, whereas user satisfaction and skill and experience can influence the HIE under Human context.

5.1. Measuring technological Issues

Technology is defined as internal and external technologies that include equipment and processes (Tornatzky & Fleischer, 1990). Therefore, the foremost technology used is equated with measuring Information System (IS). Many studies (n = 18) explained the

technological aspects in evaluating the IS (Mohd. Yusof, 2015; Sukums et al., 2015; Muhamad Yunus, 2013; Yucel et al., 2012; Ross et al., 2010; Safran et al., 2007; Li et al., et al., 2015; Tham et al., 2010; Rudin et al., 2011; Borges et al., 2010; Ismail et al., 2010; Zaidan et al., 2015; Nissinen et al., 2016; Gritalis, 2004; Ibrahim & Singhal, 2016; Kruse et al., 2014; Huang et al., 2014; Ross et al., 2010).

Perceived Usefulness is an important element for evaluating the technological issues of any electronic healthcare system, including the HIE. Perceived Usefulness is defined as the degree to which a person believes that using a particular system would enhance his/her job performance (Davis, 1989). Previous literatures (n = 4) found that Perceived Usefulness had influenced the information systems in hospitals (Mohd. Yusof, 2015; Sukums et al., 2015; Mohamad Yunus. 2013; Yucel et al., 2012). In their studies, they revealed that the users agreed that the electronic system could enhance their work performances. In their studies, they revealed that the users agreed that the electronic systems could enhance their work performance. However, a lack of usability of a system could be a barrier to implementing the system (Ross et al., 2010; Vest & Gamm, 2010).

Perceived Ease of Use is also an important element for evaluating the technological issues of HIE. It is defined as the degree to which a person believes that using a particular system would be free from effort (Davis, 1989). Several studies (n = 3) found that Perceived Ease of Use had affected the information systems in hospitals (Sukums et al., 2015; Mohamad Yunus et al., 2013; Yucel et al., 2012). The literatures proved that users agreed that electronic system sped up their work, and it was convenient to use it.

Information Quality is another variable that can be used to evaluate the technological issues of HIE. It is defined as the desirable characteristics of the system outputs. Few studies (n = 4) found that Information Quality had become an important factor leading to successful information system in the hospital (Li et al., 2015; Mohd. Yusof, 2015; Tham et al., 2010; Rudin et al., 2011). The quality of patient information could decrease when a lot of data or information are missing (Tham et al., 2010; Rudin et al., 2011) while using the system.

Service Quality is also an important element for evaluating the technological issues of HIE. It refers to the entire support delivered by a new organizational unit (DeLone & McLean, 1992). Only one study (n = 1) highlighted the importance of service quality of information systems in hospitals (Borges et al., 2010). In their studies, SERVQUAL-Card was adopted to measure service quality by using the electronic healthcare system to provide services to the patients.

System Quality is an important aspect that can be used to evaluate the technological issues of HIE. It is defined as desirable characteristics of an information system (Petter et al., 2008). Several studies (n = 3) highlighted the system quality of the electronic healthcare system (Ismail et al., 2010; Zaidan et al., 2015; Nissinen et al., 2016). Ismail et al. (2010) describe that system quality encompasses system development, support system and hardware. In addition, integration of patient information into other institutions could improve the performance, as suggested by Zaidan et al. (2015). Moreover, the quality of system includes large databases to store large volume of data (Nissinen et al., 2016).

According to several studies (n = 6), security and privacy are also important elements for evaluating the technological issues of HIE (Gritzalis & Lambrinoudakis, 2004; Ibrahim & Singhal, 2016; Kruse et al., 2014; Huang et al., 2014; Zaidan et al., 2015; Rudin et al., 2011; Ismail et al., 2010). Thereafter, Zaidan et al. (2015) suggested that the security and privacy of information exchange in healthcare should be improved to protect the patient information.

According to literatures, perceived usefulness, perceived ease of use, system quality, information quality, service quality, and privacy and security could influence MyHiX implementation as shown in Table 5.

TABLE 5. ISSUES OF TECHNOLOGICAL CONTEXT

RESEARCHERS	TECHNOLOGICAL CONTEXT					
	PU	PEOU	IQ	SQ	SYQ	SP
Sukums et al. (2015)	PU	PEOU				
Mohd Yunus et al. (2013)	PU	PEOU				
Yucel et al. (2012)	PU	PEOU				
Ross et al. (2010)	PU					
Vest et al. (2011)	PU					
Li et al. (2015)			IQ			
Tham et al. (2010)			IQ			
Rudin et al. (2011)			IQ			
Borges et al. (2010)				SQ		
Ismail et al. (2010)					SYQ	
Zaidan et al., 2015)					SYQ	
Nissinen et al. (2016)					SYQ	
Gritzalis & Lamb-Rinoudakis (2004)						SP
Ibrahim & Singhal (2016)						SP
Kruse et al. (2014)						SP
Huang et al. (2014)						SP
Rudin et al. (2014)						SP

5.2. Measuring organizational issues

The organizational issues are crucial for evaluating the IS, including the HIE. Organizational factors are defined as characteristics and resources in organization (Tornatzky & Fleischer, 1990). It could be explained by Organization Size and Managerial Structure. Several studies (n = 14) found that organizational issues could affect the electronic healthcare system, including the HIE (Ahmadi et al., 2015; Goo & Huan, 2015; Sulaiman & Wickramasinghe, 2014; Yucel et al., 2012; Ismail & Abdullah, 2016; Mohd. Yusof, 2015; Abdullah, 2012; Ross et al., 2010; Rudin et al., 2011; Rudin et al., 2014; 24; 25; Zaidan et al., 2015; Williams et al., 2016).

Organizational size is an important element for evaluating the HIE. Several studies (n = 7) found that organization size had influenced the information systems implemented or adopted in hospitals (Ahmadi et al., 2015; Goo & Huan, 2015; Sulaiman & Wickramasinghe, 2014; Yucel et al., 2012; Mohd. Yusof, 2015; Abdullah, 2012). Ismail & Abdullah (2016) agreed that the bigger-size organizations require a systematic electronic or automated system to help the staff in running the business; for example, the healthcare sector that has a complex environment.

Managerial structure is also an important element for evaluating the organizational issues of HIE. Several studies (n = 7) found that managerial structure including organizational planning, trainings and related activities in organizations required the assistance of information systems in hospitals (Ahmadi et al., 2015; Yucel et al., 2012, Mohd. Yusof, 2015; Abdullah, 2012; Ross et al., 2010; Rudin et al., 2011; Rudin et al., 2014; Sulaiman & Wickramasinghe, 2014). Clearly, disruption of workflow in organizations could cause hiccups with the electronic health system (Ross et al., 2010; Rudin et al., 2011; Rudin et al., 2014) agreed with the issues.

Timeliness is an important element for evaluating the organizational issues of HIE. Several studies (n = 4) found that time could be reduced to perform tasks in the workplace (Blaya et al., 2010; Payne et al., 2011; Zaidan et al., 2015; Williams et al., 2016). This is

because patient data and information are assessable through the system and shareable with systems of other locations (Williams et al., 2016). According to literatures, organizational size, managerial structure and timeliness could influence MyHiX implementation as shown in Table 6.

TABLE 6. ISSUES IN ORGANIZATIONAL CONTEXT

RESEARCHERS	ORGANIZATIONAL CONTEXT		
	ORGANIZATIONAL SIZE	MANAGERIAL STRUCTURE	TIMELINESS
Ahmadi et al. (2015)	OS		
Goo et al. (2015)	OS		
Sulaiman & Wickramasinghe (2013)	OS		
Yucel et al. (2012)	OS		
Mohd. Yusof (2015)		MS	
Mohd. Yusof (2015)		MS	
Abdullah (2012)		MS	
Ross et al. (2010)		MS	
Rudin al. (2011)		MS	
Rudin al. (2014)		MS	
Blaya et al. (2010)			T
Payne et al. (2011)			T
Zaidan et al., 2015)			T
Williams et al. (2016)			T
Ismail & Abdullah, 2016			MS

5.3. Measuring environmental issues

The environmental issues are an important element for evaluating IS, including the HIE. Environmental factor is defined as the size and structure of the industry (Tornatzky & Fleischer, 1990). Several studies (n = 11) found that environmental issues influenced the electronic healthcare system (Ahmadi et al., 2015; Kuperman et al., 2013; Frisse et al, 2012; Hung et al., 2010; Ismail et al., 2015; Patel et al., 2011; 53; Rudin et al., 2014; Lian et al., 2014; Sulaiman & Wickramasinghe, 2014; Ismail & Abdullah, 2016).

Cost is one of the important variables for evaluating the environmental issues of HIE. The previous studies (n = 8) discovered that financial resources had influenced the information systems adopted in hospitals (Ahmadi et al., 2015; Kuperman et al., 2013; Frisse et al, 2012; Hung et al., 2010). This is because implementation costs for an electronic system in the healthcare sector are high (Ismail et al., 2015; Patel et al., 2011; 53; Rudin et al., 2014). This situation could occur or was reflected in the electronic information system implementation.

Government Regulation is a crucial element for evaluating the environmental issues of HIE. The previous studies (n = 4) discovered that the Government Regulation had influenced the information systems adopted in hospitals (Ahmadi et al., 2015; Lian et al., 2014; Sulaiman & Wickramasinghe, 2014; Ismail & Abdullah, 2016). The researchers revealed that the Ministry of Health Malaysia has the power in giving directives and official orders to all the public healthcare institutions in Malaysia. According to the literatures, costs and government regulations could influence MyHiX implementation as shown in Table 7.

TABLE 7. ISSUES OF ENVIRONMENTAL CONTEXT

RESEARCHERS	ENVIRONMENTAL CONTEXT	
	COST	GOVERNMENT REGULATION
Ahmadi et al. (2015)	C	
Kuperman et al. (2015)	C	
Frisse et al. (2012)	C	
Ismail et al. (2015)	C	
Patel et al. (2011)	C	
Pevnick et al. (2012)	C	
Abdullah (2012)	C	
Rudin et al. (2014)	C	
Lian et al. (2014)		GR
Sulaiman & Wickramasinghe (2013)		GR
Ismail & Abdullah (2016)		GR
Hung et al. (2010)		C

5.4. Measuring human issues

Human issues are an important element for evaluating IS, including the HIE. The previous studies ($n = 4$) found that Human is an important factor to explain the electronic healthcare system (Sulaiman & Wickramasinghe, 2014; Ismail & Abdullah, 2016; Ahmadi et al., 2015; Hassan, 2012).

User satisfaction is an important element for evaluating human context (Ismail & Abdullah, 2016; Ahmadi et al., 2015; Sulaiman & Wickramasinghe, 2014). It refers to satisfaction with specific functions; for example, overall satisfaction, software satisfaction and enjoyment (Sulaiman & Wickramasinghe, 2014). In previous literatures, (Ahmadi et al., 2015; Sulaiman & Wickramasinghe, 2014; Hassan, 2012) revealed that user satisfaction is important when the information systems are adopted in hospitals.

Skills and experience are also crucial elements for evaluating the Human issues. It could affect the success rate of the information systems adopted (Ismail & Abdullah, 2016; 79). Hence, the issues in the human context had been proven to influence MyHiX implementation as shown in Table 8.

TABLE 8. ISSUES OF HUMAN CONTEXT

RESEARCHERS	HUMAN CONTEXT	
	USER SATISFACTION	SKILLS AND EXPERIENCE
Ahmadi et al. (2015)	US	
Sulaiman & Wickramasinghe (2013)	US	
Ismail & Abdullah (2016)	US	SE
Hassan (2012)		SE

6. Conclusion

Premised on the arguments of these literatures, MyHiX has improved the functional efficiency of the previous HIS; the data and information stored in HIS are limited and could not be shared with the systems of different hospitals. Clearly, the implementation of MyHiX is beneficial to the public healthcare sector in Malaysia. However, the MyHiX

implementation is saddled with several issues. According to previous articles from various researchers all over the globe, the findings can be divided into four contexts: Technological, Organizational, Environmental and Human.

From the systematic reviews, this study indicates the different issues faced in different contexts of HIE as depicted in Table 4. Besides that, it shows privacy and security of HIE are the major factors that could influence or affect the implementation. Thereafter, Zaidan et al. (2015) proposed a security framework for HIE based on a telehealth strategy; this new feature would strengthen the security and privacy of patient data and information stored in HIE in Malaysia. It shows that the security and privacy of HIE could be improved further in Malaysia. Besides that, the studies on MyHiX and HIE could be important to improve the system in healthcare institutions in Malaysia.

This systematic review concentrated on issues of MyHiX in Malaysia. A significant gap is observed as none of the studies were undertaken empirically in the eight healthcare institutions that had implemented MyHiX. Therefore, the findings of this study could be utilized to provide future direction for research in exploring and testing the implementation issues of MyHiX in Malaysia's healthcare organizations.

This systematic review has its limitations due to the small number of studies on MyHiX in Malaysia. Most of the studies focus only on overview and characteristics of MyHiX.

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