

Implementation of Hospital Information System in Indonesia: A Review

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ABSTRACT

Objective: The government of Indonesia has mandated the use of the Hospital Information System (HIS) since 2013. Previous research has revealed the various factors of success and failure of HIS implementation in Indonesia. This variation is due to the uniqueness and characteristics of each hospital. Therefore, this review aims to provide a clearer picture of Indonesia's HIS implementation's main factors.

Methods: This review included literature in the area of interest. i.e., the HIS implementation in Indonesia, which was published from 2009 to 2019. The literature was searched within the Indonesian and international databases through their websites. The article selection was conducted by two researchers independently, using these two inclusion criteria, i.e., 1) original and peer-reviewed research, 2) research investigating HIS's implementation involving a case study at a hospital in Indonesia, 3) articles are in the national language (Bahasa Indonesia) and English, 4) full-text versions are accessible by the researchers. The selection process from the two researchers resulted in a Kappa value of 0.882. The content approach was used to review the literature searched. The Hot-fit (Human-Organization-Technolo-

gy) concept was applied as a theoretical framework of the review process.

Results: Fifty-two articles were identified. Through the selection process, 33 articles fitted the criteria for review. The findings show more success stories than failure factors in the HIS implementation in Indonesia. An essential lesson that can be learned from this review is that the organization's role is crucial in assuring HIS implementation's success by conducting adequate planning, monitoring, and evaluating the HIS implementation.

Conclusion: The provision of technology and the organization's support that meets the user's demands and expectations is crucial to assure HIS's implementation benefit.

Keywords: Hospital Information System (HIS), Success factors, Failure factors

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INTRODUCTION

The rapid growth of Information and Communication Technology (ICT) has forced the modernization of the health information system. The World Health Organization has demanded the country members, especially in developing countries, to facilitate the ICT's infrastructure to develop the nation's health care information system (WHO, 2016). Electronic health platforms, known as e-health, have been advanced to enhance health care services; for example, Computerized Provider Entry Order (CPEO), electronic medical records, and clinical data repository system (Mehdipour Y and Zerehkafi H, 2013). The use of ICT in hospitals has been inevitable since the hospital is a complex organization that requires reliable integration of information produced by many units to deal with the patients' needs (Lammintakanen J, *et al.*, 2010). Most developed countries apply an integrated Hospital Information System (HIS), while those in developing countries mostly adopt parts of the system. Indeed, the implementation of new technology in hospitals in developing countries remains a problem regarding the infrastructure provision and the organizational behavior issue (Ahmed Z, *et al.*, 2016; Ebnehoseini Z, *et al.*, 2019).

Hospital produces many complex clinical and administrative data that health care professional, non-health professionals, and patient's access (Lippeveld T, *et al.*, 2000; Demirel D, 2017). Hospital Information System (HIS) implementation reduces the complexity of stakeholders' interaction within the hospital organization. Moreover, HIS also plays a pivotal role in the documentation processes, closely linking the services' quality assurance (Mehdipour Y and Zerehkafi H, 2013; Ismail NI, *et al.*, 2015). However, organizational behavior contributes to the success of HIS implementation, besides infrastructure provisions (Ismail NI, *et al.*, 2015; Sadoughi F, *et al.*, 2013). Hospital personnel who retain their old

habit and hardly adopt new technology could prevent HIS's benefits (Khalifa M and Alswailem O, 2015).

In Indonesia, since 2013, regulation has mandated the hospitals to implement a Hospital Information System (HIS), which is named "Sistem Informasi Manajemen Rumah Sakit"/"SIMRS" in the Indonesian language (Kemenkes RI, 2013). However, its implementation faces many challenges. Indonesia had 2.831 hospitals in 2017. The private sector manages 64% of all hospitals, and the government operates only one-third. This situation creates a discrepancy in terms of infrastructure provision. Since applying HMIS requires technology investing and an organization's behavior change, its implementation is not easy for some hospitals. The main barriers to HIS implementation include facilities and personnel behavior change. While the hospitals tend to accommodate the facilities and the HIS developers improve their products and services, the hospital personnel's acceptance or resistance could delay the HIS operationalization (Kuo KM, *et al.*, 2018; Farzandipur M, *et al.*, 2016). Therefore, this review aims to describe the success and failure factors of HIS implementation in Indonesia.

METHODS

This literature review was conducted to describe HIS implementation in Indonesia. The literature was searched mainly from Google scholar (in Bahasa Indonesia: Google cendikia) and an Indonesian database named Garba Rujukan Digital (<http://garuda.ristekbrin.go.id>). We also used several methods to find Indonesian articles in the area of interest, such as: browsing the reference lists, searching relevant internet resources, and citation searching. The literature searching used a different combination of search words in Bahasa Indonesia [the National Language of the Republic of Indonesia], i.e., SIMRS,

Sistem Informasi Manajemen Rumah Sakit, and English, i.e., Hospital Information System, HIS. The year of publication limitation was ten years, i.e., 2009-2019.

The selected articles' inclusion criteria were as follows:

- 1) Original and peer-reviewed research
- 2) Research investigating HIS's implementation involving a case study at a hospital in Indonesia,
- 3) Articles are in the national language (Bahasa Indonesia) and English
- 4) Full-text versions are accessible by the researchers.

The literature selection decision process was conducted through two steps: Selecting the searched literature based on the title and abstract to meet the inclusion criteria and obtaining the full paper of the articles chosen for the detailed assessment. Two authors (PDC and YW) conducted the selection process independently. The process was first piloted to assess the inter-rater reliability using the Kappa-statistic for assessor agreement. The Kappa value's pilot test result was 0.882, meaning that the selection process meets an excellent agreement (McHugh ML, 2012).

Two authors (TSH and AW) conducted the data extraction process independently using a specific form containing the information set up from the review questions. The form was piloted to assure the appropriateness of the collected information. The two authors discussed any disagreements that occurred during the extraction process to formulate a consensus.

The extracted data were then analyzed using a content approach based on the two review questions:

- What are the HIS implementation's success factors?
- What are the HIS implementation's failure factors?

The DeLone and McLean concept, namely the Hot-fit model, was applied to guide the analysis. The Hot-fit model consists of three do-

mains, i.e., Human or People, Organization, and Technology (Urbach N and Müller B, 2012). The analysis was conducted as follows: coding the data, grouping the codes, constructing points based on the grouped codes.

The following approaches assured the review process. Firstly, the article selection was conducted by two researchers independently. Secondly, data extraction was also conducted by two researchers severally. These two approaches assured the results' conformability. Thirdly, discussions between the researchers regarding the suggested codes in achieving raters' agreement regarding the narrative points ensured the results' trustworthiness (Korstjens I and Moser A, 2018).

RESULTS

The literature search generated 52 articles. The article selection process resulted in a total of 33 articles for the review. The selection process excluded the articles mostly because the articles focused on information technology or computer science problems instead of implementing them. The flowchart of the article selection is presented in (Figure 1). The characteristics of the articles reviewed are shown in (Table 1) (Bayu A and Muhimmah I, 2013; Daerina SR, et al., 2018; Sukma C and Budi I, 2017, Putra DSH, 2019, Radliya NR, et al., 2015, Sidiq M, 2018; Supriyatin, et al., 2019; Hariana E, et al., 2013; Putra DSH and Siswanto M, 2016; Puspitasari N, et al., 2013; Saputra E. 2015; Saputra AB, 2016; Sari MM, et al., 2016; Supriyati and Cholil M, 2017; Abda'u PD, et al., 2018; Adam A, 2016; Maria RA, 2017; Martiana E, 2018; Mutmainah H, 2018; Sudiarti T, et al., 2019; Suyanto S, et al., 2015; Wahyuni V, Maita I, 2015; Handiwidjojo W, 2010; Harsono A, 2015; Maya Odellia E, 2018; Khairani T, et al., 2013; Setyawan D, 2016; Darmawanti, et al., 2019; Sevtyyani I, et al., 2018; Husni M and Putra DM, 2019; Puspitasari TD, et al., 2017; Muryanti T, et al., 2018). The review results found more success factors than failure factors in HIS implementation in the Indonesian context. Details of the success and failure factors are displayed in (Table 2).

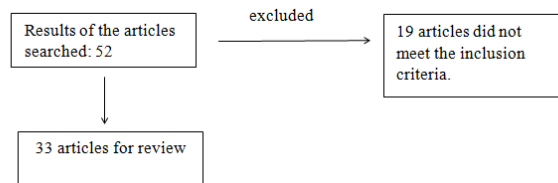


Figure 1: Flowchart of the article's selection process

Table 1: The characteristics of the articles reviewed (n=33)

Characteristics	Frequency	Percentage	References
Language			
Bahasa Indonesia (the national language of the Republic of Indonesia)	33	100	-
Methods applied			
Quantitative approach	15	45.4	(17-31)
Qualitative approach	16	48.5	(22,32-46)
Mixed-methods	2	6.1	(47,48)
The theoretical framework used			
None (not mentioned)	15	45.5	(22,24,28,32,33,35,36,39-46)
Hot-fit model	9	27.3	(17,19,20,22,23,25,29,31,47)
TAM (Technology Acceptance Model)	3	9	(18,27,30)
UTAUT (Unified Theory of Acceptance and Usage of Technology)	2	6.1	(26,38)
COBIT	2	6.1	(21,48)
Others	1	3	(37)
TTF (Task Technology Fit)	1	3	(34)

Table 2: Success and failure factors of HIS implementation in Indonesia

Domains of hot-fit model	Success factors	Failure factors
Human/People	a) Perceived usefulness	a) Less acceptance b) Pragmatism
	b) Positive attitude towards the HIS	
	c) Adequate skills	
	d) User's satisfaction	
	e) Discipline	
	f) Social influence	
Technology	a) A high-quality system, data, service	a) Technical errors
	b) Adequate maintenance	b) Inappropriate of the system
Organization	a) Facility provision	a) Unqualified human resources b) Inadequate planning, monitoring, and evaluation
	b) IT unit availability	
	c) Policy, i.e., reward and punishment	
	d) Quality assurance, i.e., standard operating procedure	
	e) Strong partnership	

DISCUSSION

The reviewed articles' characteristics indicate the variety of methods and theoretical frameworks used by researchers in revealing problems related to HIS implementation. This feature is probably because HIS's implementation indicates problems that must be addressed in more depth, which a more appropriate approach is a qualitative approach, for example, the interview method. HIS implementation issues are more likely to lead to behavioral problems, both in users and management (Sadoughi F, *et al.*, 2013). Questions related to HIS use behavior are more suitable for a qualitative method to explore the underlying factors. The theoretical framework used in the reviewed articles varies, although most articles do not mention the theoretical framework used or do not even use the theoretical framework. The Hot-fit model is the preferable theoretical framework that is applied in the articles reviewed. The theoretical framework helps identify the factors enclosing the implementation of new technologies, including HIS. Apart from the fact that the most used in the articles reviewed is the Hot-fit model, other theoretical frameworks, such as TAM and UTAUT, are also very helpful in deciphering HIS implementation problems.

HIS implementation problems have shifted from technical problems regarding computer science and information technology to user and organizational behavior (Sadoughi F, *et al.*, 2013). The findings in this literature review also prove the same concern in the Indonesian context. This literature review emphasizes more problems in the human and organizational area than in the field of technology. These findings show that the implementation of new technology is not only about the sophistication of the technology itself. An important aspect is how users prepare themselves to use the latest technology properly and how the organization performs its functions through the quality assurance process of implementing the new technology.

The factors enclosing the user's domain can be intrapersonal or interpersonal (Conner M and Norman P, 2017). In these findings, intrapersonal factors include acceptance, attitudes, skills, and behaviors related to HIS implementation in the institution. Interpersonal factors are factors that include an individual's relationship with his/her social environment. In the findings of this literature review, social influence becomes a factor in HIS implementation's success. Social impact can be in the form of what colleagues do in the workplace, whether verbally that can be absorbed and then becomes stimulation, or non-verbally that can be seen and then duplicated.

On the other hand, pragmatism is commonly present in the dynamics

of interaction in an organization. Pragmatism will usually be placed as a barrier. However, pragmatism can be processed into a driving force for system improvement (Farjoun M, *et al.*, 2015).

The organization, which is hospital management, plays a pivotal role in HIS's successful implementation. Based on this literature review results, the provision of facilities by management is no longer a significant problem. However, it is still necessary to provide human resources matching their qualifications; for example, the availability of an IT unit that takes on the role of a critical team to solve technical problems related to the HIS system's hardware and software. Another element that is also significant is the need for management to conduct the planning, monitoring, and evaluation cycle related to HIS implementation in their institutions. When the planning, monitoring, and evaluation cycle can be handled correctly, the technology domain's failure factor can be minimized while improving its quality through adequate maintenance.

Furthermore, hospital organizations must develop collaborative relationships with external parties to improve HIS in their institutions. HIS is a dynamic system in line with the rapid development of clinical and non-clinical data that it operates. Good collaboration with the system developer will make it easier for the hospital management to update its HIS system to fulfill user needs in providing services to patients (Gallivan MJ and Keil M, 2003).

CONCLUSION

This review has elaborated success and failure factors on HIS implementation in Indonesia. Technology and management or organization's policies that meet the user's needs and expectation is the key for element HIS's implementation success.

AUTHORS' CONTRIBUTIONS

All authors have made an equal contribution to this study. All authors had approved the final version of this manuscript.

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