

E-Health Adoption Factors in Hospitals Based On Humans, Technology, Organizations, and Environment Aspects – A Literature Review

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ABSTRACT

As one of the public service sector, healthcare is getting more world attention. Increasing the world population and health problem complexity underlies the healthcare institutions and their effectiveness. Meanwhile, the fast-growing innovation in information technology field is applicable in all sector to improve the business process. It may be the cause of the United Nations World Health Organization issues a statement requiring the members to urge the development of health information technology as well as e-health adapting local regulation and conformance. In fact, the implementation of e-health systems is not going well in developing countries based on multiple surveys. Many factors influence healthcare provider in making decision adopting e-health. This paper addresses the problems in finding the inhibiting factors influencing the organization to adopt e-health. Three scientific databases are searched and there were 184 papers found in an initial screening. At last, 69 papers are chosen after a further screening process. It is found that there were 20 factors that influence e-health adoption in the healthcare provider. These factors are grouped into four aspects of i.e., human, technology, organization, and environment. The findings conform to the principle of three IT adoption framework model i.e, the principle of Innovation Diffusion, HOT suitability model, and TOE framework.

Keywords: Adoption of Information Technology, e-Health, Diffusion Of Innovation theory, HOT Conformity Model, TOE Framework

I. INTRODUCTION

Health is one of the major issues in the world, as the UN has established in Sustainable Development Goals (SDGs). So many developing countries are investing in ICT-Based Health Systems or Health Information Technology (HIT), because health is considered the key to development [1]. At the 2003 World Summit meeting in Geneva has been declared about the use of information and communication technology to improve health services. In the 58th WHO meeting in May 2005 stated that member countries begin to plan the development of health information technology or known as e-health

appropriate for each country [2]. This is because the application of information and communication technology (ICT) to support health services has the potential to have a positive impact on the quality of health services, improve the efficiency of health services, and enable the development of health programs, especially in developing communities in developing countries [3].

According to the World Health Organization (WHO), e-health is a cost-effective and safe use of information and communication technology (ICT) to support health and practice, including health care, health surveillance, health literature, and health, knowledge, and research. education. In developed

countries, e-health is considered by governments, healthcare providers, and service users as the primary method of improving the quality of services, security, and reducing costs associated with providing health services [4]. Many countries are trying to implement e-Health in order to support health services [1]. With e-Health, it is expected to be a medium of health information exchange on patients in all health institutions and media to promote good care and health care [5]. E-Health is a system that can improve the general health system and special health care [6]. The e-Health system is capable of generating highly useful information that can be shared among different healthcare workers from all levels of healthcare organizations [7].

Several previous studies have estimated that the advantages and benefits of e-Health may be of great interest to countries beginning to implement e-Health. However, although global e-Health adoption rate is steadily growing, e-Health adoption in developing countries are mostly far behind [8]. For example in African countries, e-health still cannot develop properly. The development is hampered by the challenges involved in clinical decisions in Africa to use e-health technology innovation [9]. In Bangladesh e-health can also be said still far behind and often face problems, but the difficulty can be overcome by the government [6]. Saudi Arabia is also a developing country in Asia that has implemented an e-health system. One of the systems used is the EHR system, which has been implemented since 1988. But until now the application of EHR in Saudi Arabia has tended to lag behind [10]. Even many hospitals in European countries whose adoption rate is still low in the use of e-health systems [11]. An example is the application of the most common e-health system, Hospital Information System (HIS). The application of HIS in some European Hospitals has not yet reached widespread implementation, especially in mid-level hospitals [12].

From the above problem, it is known that the adoption of e-health in the World is still low, especially in developing countries. Many factors

influence the hospital in adopting e-health. In response, this paper aims to provide a conceptual model of factors affecting hospitals in the application of e-health or ICT Health. This systematic method can help researchers to establish trends in the literature on e-health adoption, as well as major research gaps. In most e-health research, many e-health systems are used as objects such as Hospital Information System, Electronic Medical Record, Telemedicine and Cellular Health. In our research, this system is categorized as part of the e-health system. We extract factors and identify them into 4 main aspects: Human, Technology, Organization, and environment. The four aspects refer to three theories that are widely used in IT adoption research, namely Innovation Diffusion theory, HOF suitability model and TOE framework. This review literature method is expected to provide new research opportunities to prove the conceptual model of e-health adoption generated in this paper.

II. REVIEW ON FACTOR AFFECTING ADOPTION E-HEALTH

The low rate of e-health adoption in Developing Countries can be known by exploring innovation adoption theory. Many previous studies have used the theory to investigate adoption factors of technological innovation and the development of IT adoption in organizations. Weerd, Mangula, & Brinkkemper (2016) in their research have mapped and there are ten studies from 2011 to 2014, which use the theory as a technological aspect of the adoption factor. In the application of e-health, Innovation Diffusion theory is also a Technological Aspect in the adoption factor of the Hospital Information System [13]. innovation Diffusion Theory consists of five factors that influence the adoption of innovation namely: complexity; compatibility; relative advantage; observability and trialability [14]. Faber, Geenhuizen, & Reuver (2017) in their research also used Rogers's theory to identify the development of e-health adoption.

Until now the technological aspects have become an important aspect of the research of Information Technology adoption in organizations. So far, technical aspects have become an important discussion in IT adoption. However, regardless of the importance of technical aspects, there is the fact that IT success is not only determined by technical issues. Many previous studies have made it clear that adopting IT is not just a technical factor to be considered. Problems encountered in implementing e-health related to government policy on Health Information Technology (HIT), organizational characteristics, or characteristics of existing technology [15]. Other aspects of organizational, managerial, social, and environmental aspects are also important factors in the adoption of e-health [16, 17, 15].

In technology adoption, organizational aspects focus on top management support, hospital size, organizational learning ability, and organizational readiness. These factors are closely related to factors of hospital owners. Hospital owners can determine the outcome of e-health adoption. As is the case in Saudi Arabia, military and private hospitals are more advanced than government hospitals [18]. This finding is also appropriate to the conditions prevailing in Bangladesh, that private hospitals in Bangladesh are more advanced in building infrastructure and using e-health systems following international standards [19]. But both findings are slightly different from e-health conditions in some areas of the Arab country, government hospitals have a lack of professional IT use, even private hospitals do not have sufficient funds to apply Health Information Technology [8].

In addition to technology and organizations, there are still other aspects that determine e-Health Adoption. Marques, et al. (2011) and Nilashi, et al. (2016) have mapped out the adoption factors into four aspects: Human, Organization, Technology, and Environment. The technological context includes tools and processes, Organizational context as size, localization and managerial structure, Human

context related to "User Engagement", and Environmental Context that combines the country's cultural environment and the influence of regulation [16]. These four aspects are derived from the Human-Organization-Technology (HOT) model and Technology-Organization-Environment (TOE) framework.

In the HOT model, the Human aspect does not address the user's perception of the acceptance of a technology, but rather the character of a user of a technology. For example, the factors included in the Human aspect are Knowledge of IS and IT Staff Competencies [13]. In addition to these factors, the Level of Education is also one of the factors adopted in the human aspect [16]. The main adopters of e-health are health professionals such as doctors and nurses. The doctor's decision may affect the adoption rate of an e-health system in the Hospital [20]. Many doctors are still unsure of e-health systems, so not a few hospitals and health agencies that only implement some e-health system according to the needs of the hospital. Some doctors in Germany and Switzerland have a negative attitude towards internet-based e-health services, they doubt the quality of information provided by the system [21]. This statement is supported by other findings that say very little use of the Electronic Health Record (EHR) in hospitals and many doctors are skeptical of using the EHR system [1]. While this skepticism can be seen as a symptom of backward thinking. Doubt Doctors can influence Hospital in adopting e-health. This is because, the doctor's opinion substantially contributes to the hospital decision-making process in adopting, both negatively and positively [21]. Previous research statements about doctors show that Humans are an important aspect to note.

The environment is the last aspect of e-health adoption. According to Marques et al. (2011), the environmental context is the arena in which the organization does business, refers to its industry, its competitors, and its affairs with the government. Factors in the environmental aspects include government support, competitor pressure and system

providers [22]. Based on this explanation, the description of the environmental aspects and the factors within it have relevance to the location of the Hospital. Young-Taek Park & Jinhyung Lee, (2014) say that hospitals in urban areas have a higher adoption rate than hospitals in rural areas. This can be caused by factors that exist in the aspect of the Environment. Thus the location of a hospital may be a confounding variable that affects the adoption of EMR. But the findings differ from those of Fulgencio (2014), that there is no difference between rural and urban areas in developing countries in terms of challenges or adoption of e-health.

The low level of e-health adoption is also influenced by the many challenges and obstacles faced by hospitals in adopting e-health. Alsulame, et al. (2015) states that the frequent challenges in e-health adoption relate to organizational and cultural issues, end-user attitudes and motivations toward health projects, and the lack of specialized human resources for implementing e-health systems. In addition, they also mentioned that in Saudi Arabia the main challenge faced is the procurement-related issues within health organizations. The issue of procurement is closely related to financial problems. According to Mohamed Khalifa (2013), human and financial are the two main categories of obstacles and challenges in the successful implementation of EHR. WHO itself has reported that there are eight (8) barriers most commonly faced by all countries adopting e-health, some of which are lack of vision, strategy and national plans; lack of information and awareness about e-health; blind to computer technology; insufficient resources; limited expertise in medical informatics; weak infrastructure of information technology and telecommunications [23]. Based on this report, it can be concluded that the existing constraints have relevance to these four aspects. In accordance with the statement of Marques et al. (2011) that the human, technological and environmental aspects of the adoption factor may be a barrier to the utilization of e-health systems. Faber, Geenhuizen, & Reuver (2017) also suggested that the

tech and environmental aspects of J.G. Anderson (2007) has proven to be a source of barriers to e-health adoption.

III. RESEARCH METHODOLOGY

We conducted a systematic literature review to identify factors affecting hospitals to adopt e-health. A review of systematic literature is a method of research undertaken by identifying, evaluating and interpreting all relevant existing research with specific research questions, or topic areas, or interest phenomena [24]. In reviewing the systematic literature there are at least five steps which must do: *Resource Searched, Search Terms, Inclusion/exclusion criteria, Study Selection Process* dan *Data Analysis* [25].

A. Resource Searched

Seven databases and a Google search engine are used to search for keywords related to e-Health Adoption. The seven databases are Science Direct, Emerald Insight, Research Gate, Google Scholar, IEEE, Springer, and Nature.

B. Search Terms

In the keyword search process, we divide into categories. The first category focuses on the adoption of e-health ("Adoption of e-health" OR "Implementation of e-health"). The second category focuses on the factors and success of e-health adoption ("e-health Adoption Factors" OR "Key Success Factors e-health Adoption" OR "Success Factors e-health Adoption"). The third category focuses on finding barrier factors and challenges in e-health adoption ("challenges adoption e-health" OR "barriers adoption e-health" OR "barriers e-health" OR "Inhibitors of e-health adoption"). In this category, we assume that challenges and obstacles can be factors affecting hospitals in adopting e-health. From these three search categories, we want to find

relevant papers that mention the factors that influence e-Health Adoption.

C. Inclusion/Exclusion Criteria

The criteria used in selecting journals are as follows: (1) International and Indonesian Journals (2) The journal used should address the adoption of e-health or some e-health system at the Hospital (3) The journal used is not about user acceptance of e-health application. And (4) The journal used should discuss the factors influencing Hospital in adopting e-health.

D. Study Selection Process

Figure 1 shows the process of stages in selecting the previous research journals applied in this study. The first stage performs a journal search using keywords on seven databases and one search engine. As a result, 184 papers were identified for initial screening. At this stage, we are looking at whether the paper contains issues of e-health adoption. Next, we do a selection of journals that have been obtained by title (52 journals did not pass the selection; $n = 132$). We read titles on each paper to make sure the papers fit our research. The third stage we read the results in the abstract based on the discussion of e-health adoption (35 journals did not pass the selection; $n = 97$). At this stage, we look at the abstract purpose of each journal and download journals that are relevant to our research. In the last stage, we analyze the results of each journal we have downloaded. We read the contents of the journal in full (28 journals did not pass the selection; $n = 69$). As a result of these steps, we have 69 relevant papers that result in various factors that influence hospitals in adopting e-health.

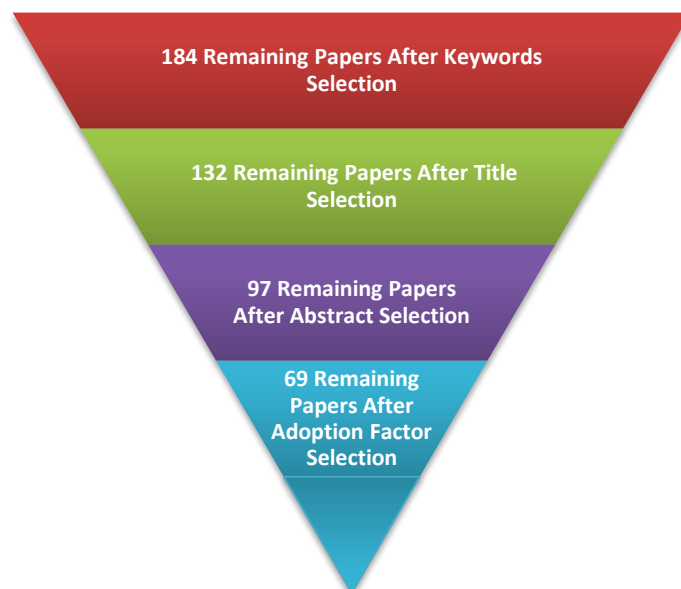


Figure 1. Stages of the study selection process

The number of papers at each stage of selection is shown in Table 1. There are 184 papers obtained in the early stages, and after the selection of titles, abstracts, content containing e-health adoption and e-health adoption factors, the number of papers used in 69 papers.

E. Section Headings

Figure 2 illustrates the process undertaken to achieve the objectives of this study. According to the description and factors contained in the literature, at least 24 factors affect the hospital in adopting e-health. At this stage, we reread every journal containing the word e-health adoption. We look deeper at issues affecting hospitals to adopt e-health. These findings will be categorized into e-health adoption factors. For example, "the success of e-health adoption depends on the physician's knowledge of e-health technology" [26]. The next finding is "the lack of employee knowledge becomes a factor that affects the adoption of Hospital Information Systems" [13]. These two findings have the same intent as we combine these two findings into the Employees IT Knowledge Factor.

Furthermore, of the 24 factors that have been found, cone-shaped into 20 factors. This is because there are factors that can be combined into one factor. For example, finance is a hospital problem in

the implementation of e-health [27] and inadequate infrastructure can be an obstacle to the implementation of e-health [28]. These two factors, according to Faber, Geenhuizen, & Reuver (2017) are included in the organizational readiness factor. In the organization's readiness factors include technological readiness and financial readiness. Technology readiness includes IT infrastructure, IT governance, IT human resources, IT security [11]. Another example is privacy. Until now privacy is a constraint in the implementation of e-health in hospitals [29]. While Privacy is one aspect of information security. So we categorize privacy into the information security factor.

TABLE I
NUMBER OF PAPERS IN DIFFERENT STAGES OF STUDY SELECTION PROCESS

Database	Keywords	Title	Abstract	Adoption Factor
Emerald	16	10	4	1
Insight				
ScienceDirect	49	36	28	16
Researchgate	5	4	4	4
Google Scholar	12	11	9	8
IEEE	14	13	10	9
Springer	10	9	9	8
Nature	2	2	2	2
Google Search Engine	76	48	32	21
Total	184	132	97	69

The next step, we aim to categorize the 20 factors into meaningful categories to produce a more comprehensive conceptual model. We categorize these factors into 4 aspects: Human, Technology, Organization and Environment. These four aspects refer to the Human-Organization-Technology and Technology-Organization-Environment Model. We use both theories because they are the most widely used theories in IT adoption research in the Organization. In addition, we also added the theory

of Innovation Diffusion in technological aspects, such as research conducted by Marques, et al. (2011) and Ahmadi, et al. (2016). In this categorization, we look deeper than the reviews contained in each paper. Furthermore each factor that has been found will be labeled in accordance with the aspects that have been determined. For example "many doctors are hesitant and reluctant to use the e-health system" [21]. This statement can be categorized into a health professional behavioral factor that belongs to the Human aspect. Another example is "the successful implementation of Electronic Medical Record (EMR) systems relies on hospital support for physicians" [31]. While EMR is one of the most widely implemented e-health system in the hospital. Hospital support can be interpreted as a top management support factor. Top management support is a factor in the organizational aspect. After labeling, the mapping process is done in accordance with predetermined aspects. The final process is to form a conceptual model based on the aspects and factors of adoption that have been found. We have 4 aspects and 20 factors. To know these factors have been illustrated in Fig. 5.

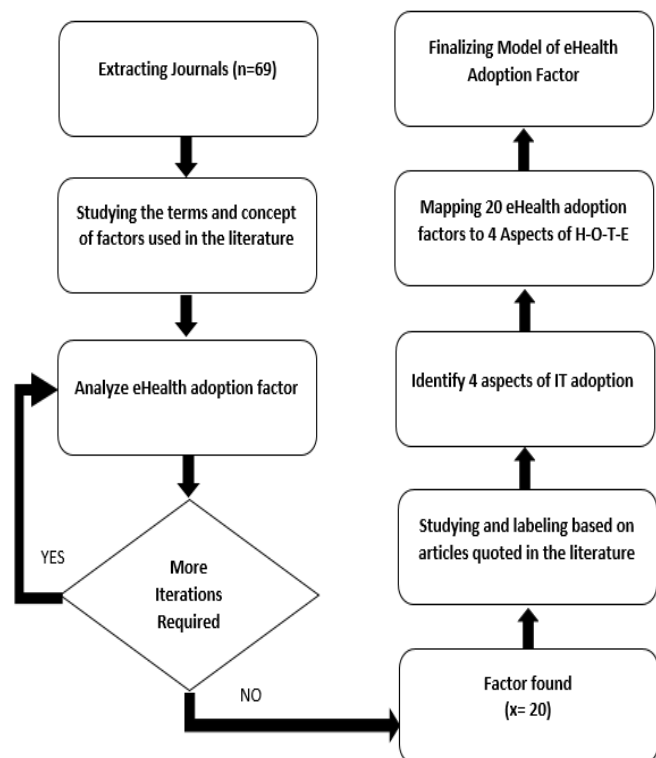


Figure 2. Study selection process

IV. RESULTS

This paper aims to determine the factors that affect the hospital in adopting e-health. This section provides readers with knowledge of the literature trends in e-health Adoption Factors. Previous research has made it clear that the success of e-health adoption is not only influenced by technical factors but also human, organizational and environmental factors. Figure 3 presents the distribution of research used year by year. When viewed on the diagram, the number of studies increased significantly after 2009, despite a decline in 2011 that eventually increased again in 2012 to 2016. This suggests that the problem of e-health adoption has attracted the attention of researchers and practitioners as a major concern in the health sector. There are only three papers in 2017, but our research was only done in April and May of that year, so the data needed is incomplete.

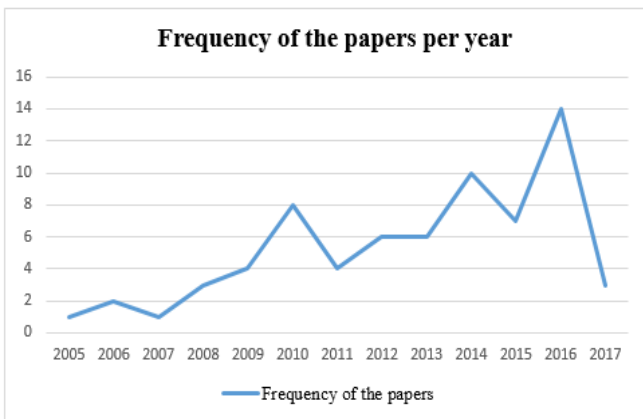


Figure 3. Frequency of the papers per year

Figure 4 gives details of the frequency of research written on different continents. According to geographical regions, Asia and Europe are the most productive continents, with (33%) for research in countries located in Asia and (29%) for research in countries located in continental Europe. Next followed by America (22%) divided into North America and South America, Africa (9%), and Oceania (7%). Although affiliation with universities does not necessarily mean that research is conducted in the country concerned, the affiliate produces information about the adoption of e-health in various countries.

For example, the implementation of e-health appears to be growing in Asian countries.

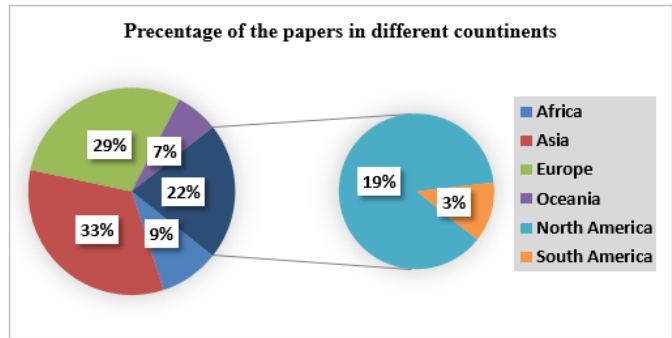


Figure 4. Frequency of the papers per continent

Our systematic review categorized factors affecting hospitals in adopting e-health. There are 20 factors that influence the adoption of e-health, which is further divided into 4 aspects: Human; Technology; Organization and Environment. Our results are illustrated in Figure 5.

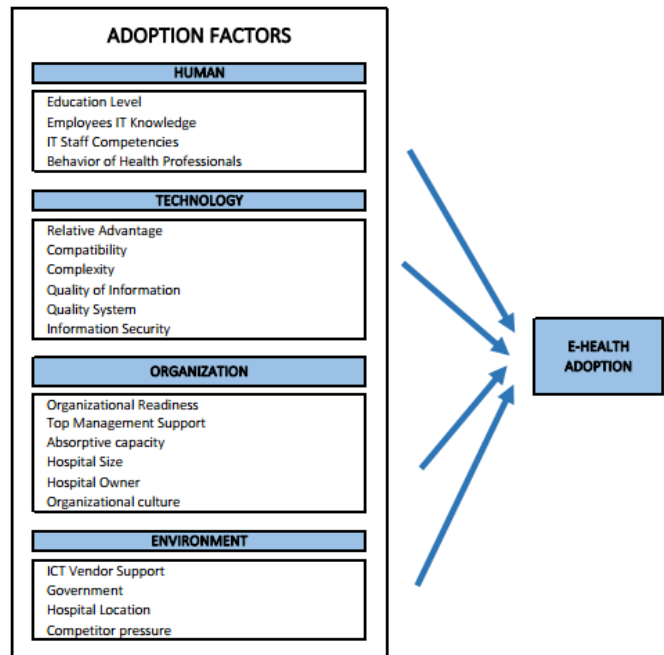


Figure 5. Frequency of the papers per continent

A. Human Aspect

This aspect consists of factors affecting hospitals to adopt e-health from the human aspect. The human aspect of this research leads to the character of the actors involved in the business process in Hospital. There are five factors included in this aspect. The first is Education level [32, 33, 34, 16]. Basically, IT implementation requires adaptation for its users. The successful implementation of e-health depends on

the knowledge and education of each Human Resources owned [16]. The next factor is IT Employee Knowledge [32, 29, 34, 13, 35]. The success of hospitals that implement e-health depends on IT knowledge and capabilities from its human resources [13]. Next is the Competence of IT Staff [36, 13, 37, 38]. Competent IT staff can support Hospitals in the application of IT, as IT staff can provide a good understanding of IT needed by the Hospital [13]. The last factor is the behavior of health professionals. This factor becomes one of the hospital considerations in the application of e-health. Previous research has shown that doctors often behave negatively and thereby impede the application of e-health [21]. The causes of many doctors and health workers behave negatively because of a lack of awareness of the importance of IT.

B. Technological Aspect

The second aspect is technology. There are seven factors that influence the hospital in adopting e-health when viewed from this aspect. These three factors are the characteristics of innovation derived from the Infusion Diffusion theory [14], namely: compatibility, relative excellence, and complexity. Nilashi, et al. (2016) says that a study conducted by Tornatzky et al. (1982) and Jeyaraj, et al. (2006) found that relative advantage, compatibility, and complexity are the characteristics of innovation that are important factors in IS adoption research. The relative advantage associated with hospital attitude in checking and ensuring that by adopting e-health there are many benefits to be gained [13]. Compatibility is defined as the feasibility of innovation for organizational conditions. Hospitals will apply e-health if they feel that e-health adoption is aligned with the organization's values, needs, and experiences [13]. And complexity is defined as the difficulty level of a system that must be understood and used. Hospitals regard this factor as a barrier to the adoption of e-health, as the rise of e-health systems results in a higher level of complexity, thus

demanding higher knowledge of medical practitioners [13]. In addition to these three characteristics of innovation, there are other factors that are part of the technological aspects. First is the quality of information. This factor is defined as the superior level of information generated by the software or system, which is related to the timeliness, accuracy, relevance, and format of information generated by the system [41]. A large amount of data and information managed, making the hospital decide to adopt e-health. Besides the quality of information, there is a system quality factor. Quality of the system into hospital considerations in adopting e-health. Good system quality will provide added value for hospitals related to health services such as helping hospital employees in completing their work on time [41]. The last factor is information security. Information security is the most important factor for e-health adoption. Because health data requires a safer environment to store and retrieve data. Therefore, security issues are a major obstacle to adoption decisions [41].

C. Organizational Aspect

The third aspect is the organization. In this aspect, it contains factors derived from the internal condition of the hospital. There are six factors that have been identified in this aspect. First is the readiness of the organization. It is believed that the readiness of a mature organization will affect IT's success. Therefore many organizations delay IT adoption and tend to wait to implement it until they have the resources they need [22]. This factor is an assessment of hospital readiness to implement e-health system. Such assessments include Technology Readiness and Financial Readiness of Hospitals. Technology readiness consists of the readiness of IT infrastructure, IT human resources, IT governance, and IT security [11]. The next factor is top management support [13, 11, 22, 41, 42, 43, 35, 44]. This factor is important in e-health adoption because top management has the power to convince the entire organization of the importance of innovation, and influence them to

participate in the adoption process [41]. The third is Absorption Capacity, this factor refers to "the dynamic capabilities of an organization associated with the creation and utilization of knowledge to enhance an organization's ability to acquire and sustain a competitive advantage" [11]. The fourth factor is Hospital Size. This factor affects the implementation of e-health because the size of the hospital is associated with adequate human and financial resources [16]. In addition to hospital size, hospital owners are also factors of e-health adoption. Hospital owners can guide the organization's strategy of implementing e-health, based on the mission and value of the organization [16]. The last factor in this aspect is organizational culture [15, 23, 45, 46]. Culture can influence Hospitals in decision-making adoption of Electronic Medical Record (EMR) [18]. In addition, organizational culture may also prevent the adoption of EMR systems [20].

D. Environmental Aspect

The last aspect is the environment, where this aspect contains factors that come from the environmental conditions of the hospital are located. It can be said that this aspect contains external factors. There are four factors included in this aspect. First is Competitor's Pressure [34, 47, 13, 16, 22]. The intensity of competition can be seen as motivation for a hospital to adopt e-health. This is because Hospitals are applying IT as a health service to maintain the superiority of its competitors [16]. The second factor is Vendor Support [37, 13, 21, 34]. This factor is defined in terms of the ability of external vendors to provide support by developing more affordable health care applications that can influence hospitals to use IT in health care services. [13]. The third factor is the location of the hospital. The location of the hospital may be a confounding variable that affects the adoption of EMR. In Korea Hospitals located in urban areas have higher rates of adoption of EMR than hospitals in rural areas. [48]. The last factor is the Government. The government plays a role in policy making and providing an

infrastructure that affects the implementation of e-health in hospitals. Government funds are factors that can affect hospitals in adopting e-health [16]. Marques et al. (2011) state that in Europe the healthcare industry is still heavily dependent on public funds derived from the government. Hospitals in rural areas have more abundant financial resources and are more likely to receive support for high-cost services and technologies such as Medical Record System (MRS).

V. DISCUSSION

We have conducted a systematic literature review to categorize the factors that affect hospitals in adopting e-health. From a total of 69 research papers, we identified 20 adoption factors into four aspects. Figure 6 shows the percentage of the frequency distribution of factors affecting the adoption of e-health based on four aspects. The percentage of papers related to each aspect is as follows: human aspect, 18%; aspects of technology, 30%; organizational aspect, 35%; environmental aspect, 17%.

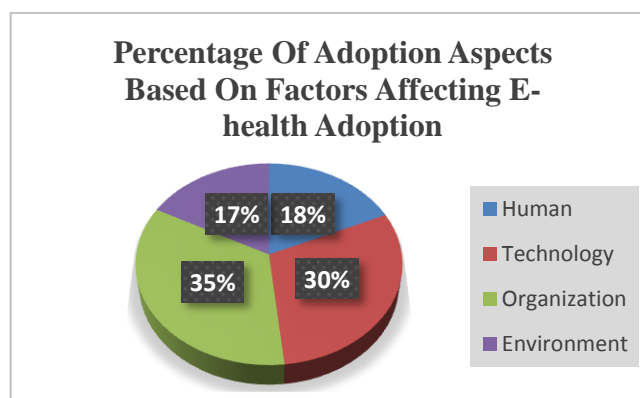


Figure 6. Percentage Of Adoption Aspects Based On Factors Affecting E-health Adoption

Based on Figure 6 it can be seen that the Organization is the aspect that has the largest percentage compared to other aspects. These results suggest that organizational aspects have a major impact on the successful adoption of e-health. In addition, the figures also show that factors in organizational aspects are a much-mentioned factor in e-health adoption research. This suggests that

many internal factors must be considered by the hospital before adopting e-health. The second aspect that has the largest percentage is Technology. In this aspect shows that the Hospital decides to adopt e-health that is influenced by technological characteristics. For example, Hospitals apply e-Health because e-health can produce much-needed information accurately, consistently, and real-time. Next is the Human aspect. Human Aspects are related to organizational aspects. Management support becomes an important key in dealing with issues arising from the Human aspect. For example, doctors who do not believe in the implementation of an e-health system can be overcome with Peak Management involvement in motivating and explaining the importance of e-health. The aspect with the lowest percentage is Environment. Based on our findings, the environmental aspect has three factors mentioned by many previous researchers. Figure 7 shows the frequency of e-health adoption factors based on the papers we obtained.

crucial in implementing e-health, as well as national policies that make hospitals feel safe in using e-health systems. The next factor is top management support. This factor is related to organizational readiness factor. Organizational readiness depends on the extent to which top management of hospitals supports hospital readiness in implementing e-health. As mentioned earlier that organizational readiness includes the readiness of IT infrastructure, IT human resources, IT governance, IT security, and financial readiness. Therefore it takes top management aware of the importance of IT so that the hospital can meet the criteria of organizational readiness. The last factor is the behavior of health professionals. This factor determines the success of the e-health system that has been adopted by the Hospital. This is because users of e-health systems are doctors and medical personnel. Their rejection will hinder the implementation of e-health.

A. Implications for Researchers

The proposed conceptual model is a good starting point for researchers interested in issues in e-health adoption. E-health adoption factor that we present comes from various problems of e-health adoption in various countries.

Although e-health is an important issue right now, there is little research on specific e-health adoption factors. Many previous papers discussed the barriers or challenges of e-health adoption. In addition, many e-health systems have made researchers previously only research the issues of one of the e-health systems. For example, Hospital information systems [37, 13, 41], Electronic Medical Record [18, 48], Telemedicine [7, 9, 49] and mHealth [50, 51, 52, 53].

This paper can help researchers in explaining the factors that affect the hospital in adopting e-health in various countries. The conceptual model generated in this paper includes adoption factors based on four aspects: Human, Technology, Organization, and Environment. However, from 20 factors found, further research is needed to ensure the conceptual

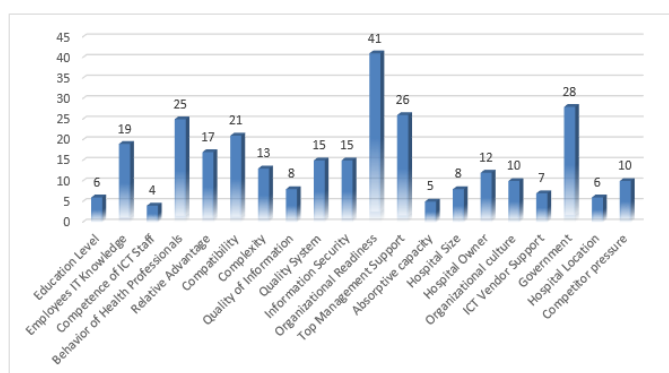


Figure 7. Frequency of factors impacting e-health adoption based on publication

Figure 7 shows that there are four most common factors mentioned in the paper. Organizational readiness is the first factor most frequently mentioned in the paper. This suggests that the greatest influence in successful e-health adoption depends on organizational factors. The Government factor is the second most frequently mentioned factor in the paper. The government has an important role in the implementation of e-health in hospitals. Infrastructure and funding support is

modeling we have developed. Therefore, we hope that future research can prove the model we produce from this paper. In addition, further research is also expected to use different categories of case studies. These categories include categories of hospital owners, hospital location categories, and hospital size categories. This test is done to prove whether the model we developed can be generalized.

B. Implications for Practice

From a practical point of view, there are various implications for such as healthcare providers, government, IT professionals, and e-health system developers.

For healthcare providers, this paper can be used as a consideration in the application of eHealth. Human factors and organizational problems can help top management of hospitals in making decisions in eHealth implementation. So hospitals can create strategies that are appropriate for the successful implementation of eHealth in their Hospitals.

Second, for the government, the conceptual model that has been created can be used as a basis for determining national policy in the application of eHealth in a country. Governments can consider the various factors and constraints that have been identified to determine the right strategy for eHealth conditions in a country. For example, the government as a regulator should also support eHealth implementation in hospitals by providing adequate infrastructure, so eHealth is expected to be well realized.

Furthermore, for IT professionals and eHealth system developers, the model generated from this paper can be used as a consideration in creating eHealth systems. Human problems and technological characteristics can be their consideration in determining the success of the systems they create

VI. CONCLUSION

Despite the fact that research has shown that e-health has a positive role in health care, some

arguments show that e-health has not been adopted according to initial expectations. In this study, based on a review of the systematic literature of 69 papers, there are 20 factors affecting hospitals in adopting e-health that is divided into 4 aspects of adoption: human, technology, organization, and environment. Organizations are the aspects that have the highest percentage of e-health adoption. Organizational readiness factors and top management support are important factors in influencing e-health adoption. Furthermore, on the technical aspects, there is a factor of compatibility and relative advantages that the hospital considerations in applying e-health. In the human aspect, employee knowledge about IT and the behavior of health professionals can determine the success of the hospital in implementing e-health. The environment is the aspect that has the lowest percentage, but in this aspect, the government becomes a factor that plays a role in the implementation of e-health in the Hospital. The role of government in policymaking and infrastructure provision can affect the implementation of e-health in hospitals. This paper has contributed to a better understanding of e-health research on different continents. For example, we found that Asia is the most dominant continent in e-health development. Finally, the proposed conceptual model can be used as a guide for researchers and practitioners such as healthcare providers, policy makers, IT professionals, and e-health system developers.

VII. REFERENCES

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