# Electronic Health Readiness (EHR) in Indonesia: Managerial Perspectives

Vera Pujani
Management Department-
Andalas University
Limau Manis Padang,
Indonesia
+6287788076125
verapujani@eb.unand.ac.id

Hardisman
Faculty of Medicine -
Andalas University
Limau Manis Padang,
Indonesia
+6285272116900
hardisman@med.unand.ac.id

Refdinal Nazir
Electrical Engineering-
Andalas University
Limau Manis Padang,
Indonesia
+6281266558708
refdinalnazir@eng.unand.ac.id

## ABSTRACT

This paper presents the readiness factor of e-health systems in Indonesia based on hospital managers' perspectives. The need of information systems in healthcare activities in particularly to improve hospital service quality and performance is required. The objective of this study is identified the readiness factors including the core, structural, societal and engagement to measure e-health adoption. The descriptive analysis of the data obtained using a survey method on a-104 hospital managers in Indonesia is presented. Again, research respondent selected using convenience sampling. Finally, result of this study shown various indicators of readiness factors descriptively, in core, structural, societal and engagement have been identified. The core readiness was identified as highest factor in adopting e-health and the societal readiness was the lowest factors in adopting e-health in Indonesia. The further study is would be completed with empirical study toward e-health adoption in Indonesia's hospitals.

## CCS Concepts

**• Information systems→ Information Systems Applications →Enterprise Information Systems→ Enterprise Application.**

## Keywords

Readiness; Adoption; Health Information systems; Indonesia

## 1. INTRODUCTION

Nowadays, the majority of healthcare industry and hospitals has operated various information systems during the service delivery process to patients especially for health institutions which have adopted intensively e-health systems. There are various information systems worked in hospital related to electronic health record, healthcare information systems, Management Information systems, and others health services [1]. However, it has still not realized related to the optimize of e-health revolution since to numerous barriers including shortage of healthcare practitioners, limited budgets, poor infrastructures and inefficient resources uses [2]. Especially in developing country contexts, like Indonesia with 270 million population and 2820 hospitals has the problem of fragmentation and poor coordination in the national Health Information Systems [3]. Accordingly, electronic readiness (e-readiness) is a trusted concept to handle barrier in operating technology in healthcare services in particular, Health Information systems.



*ICIBE 2019*, September 27–29, 2019, Hong Kong, Hong Kong

ACM ISBN 978-1-4503-7653-2/19/09…$15.00
https://doi.org/10.1145/3364335.3364401

The readiness is identified as new concept in healthcare contexts particularly in adopting the health information systems (e-health). Despite of facts, the related study in terms of the implementation of e-health in developing countries especially in Indonesia is lack of develop [4]. The gap of e-health implementation in developing countries was identified as missing component between vision and reality in providing meaningful uses [5], technological and cultural priorities [6]. Therefore, the objective of this study is identified the readiness factors to measure the adoption of e-health in developing country especially in Indonesia contexts.

## 2. LITERATURE REVIEW

This section presents the previous study toward electronic readiness (e-readiness) in operating various health information systems (HIS) in hospitals. The conceptual and empirical study related to e-health readiness model are reviewed in following paragraph.

### 2.1 E-Readiness

This section presents the previous study toward electronic readiness (e-readiness) in operating various information systems in developing countries. The conceptual and empirical study related to e-readiness model are reviewed in following paragraph.

E-readiness is identified the usage of internet technology to increase the capability in operating organizational activities particularly to support and sustain its performance. Readiness electronically related to promptness of organization, individual/user, community and government to be able to transform working with IT-application, information systems and technical skillfulness [7].

Readiness of the organization business in adopting ICT was investigated based on e-readiness of perceived organization, perceived environment, organizational characteristics and technological contexts [8]. This study shown that technology competence, financial commitment, perceived environmental e-readiness and organizational size were influential factors in e-business adoption [9]. Based on individual users, e-readiness study had been investigated by employee readiness for e-business [Lai and Ong. 2010]. This study developed the dimension of employee readiness for e-business including technology, task and

structure. The process began from technology, task and structure, since in implementing e-business, introduction of new technology was first requires as the employee–technology readiness. Beside e-readiness based on organization and individual users, there is another perspective of e-readiness that is based on government perspectives [10]. The study included two majors, the external environment e-readiness indicators and the internal government e-readiness indicators. The external environment readiness refers to social ICT infrastructure social and human environment. The internal government readiness is composed of managerial framework, leadership, investment, workforce capability, internal IT infrastructure, information safety and legal and regulatory environment. The concept of e-readiness is not only related to with technology's usage but also with organization contexts and the subordinate level employees and expanded to top management also community or society. Therefore, there numerous studies investigated influencing factors of the e-readiness model including factor of organization, technology, systems, leaderships, IT-skill people, budget, society, government, regulations/law and others were investigated.

However, in developing countries context, various barriers IT implementations included but not limited to poverty, unemployment, diseases outbreak, lack of quality and reliable healthcare services, limited number of medical personnel, lack of access to medical information and poor IT infrastructure were identified [11]. Again, it was poor coordination of E- health integration, misalignment of the implementation processes and insufficient policies and frameworks to guide technology integration [12].

## 2.2 Electronic Health Readiness (EHR)

This research investigated the electronic readiness of Health systems adoption in numerous prior studies. There are same studies in using IT-application based healthcare services (e-health) [13]. The World Health Organization (WHO) defines e-health as 'the use of information and communication technology (ICT) for health'. Again, Electronic health readiness (EHR) was identified as the readiness of the context in terms of organizations, technologies/infrastructures, healthcare providers, engagements, society, core, government, and public/patients [4].

There are prior studies which investigated the adoption of health information systems and the extend of readiness concepts. The readiness electronically in terms of core, technological, learning, societal and policy aspects were investigated by [6], [13], [14].

*Core Readiness* – It refers to the importance of needs, planning, and accessibility such as appropriateness of technology, and integration of technology with existing services [13], as well related to the core attributes of the target population that leads to the need for change including identifying needs; dissatisfaction with status quo; awareness about e-health; comfort with technology; trust on the use of ICT; planning for e-health project; overall satisfaction and willingness; satisfaction; integration of technology [14].

*Technological/Structural Readiness* – Its refers to the availability and affordability of required ICT, and the hardware and software needed to implement a proposed program [13]. His refers to those attributes related to institutional and human resource structures [15]. The attributes include; ICT regulations and policies, work ethics and organizational culture, training and availability of resources like, speed and quality of network; hardware and software; compatibility; capability of the ICT support team; availability of the internet; reliability of the network; training of users; internet accessibility [14].

*Societal Readiness* – It refers to dealt with determinants of accessibility such as relevance of content and sociocultural factors, and addressed the issues of inequity in gender and social classes [13]. his refers to the level of preparedness of the health institution and its staff to participate in the networked world including communication and collaboration between the bigger state hospital and clinics within and outside the country (Li & Seale, 2012). Attributes include; collaboration with other health institutions; sharing of information, provision of care to patients and communities in collaboration with other healthcare institutions; socio-cultural factors among staff; *(e.g. cultural factors; social roles & circumstance);* socio-economic position and socio-cultural factors among clients and communities [14].

*Engagement Readiness* – It refers to identify assesses the healthcare providers 'engagement readiness: exposure to e-health readiness systems and willingness to participate in the Networking world which indicate with the benefit of information provided, learnability, financial benefits and resistance to change [16].

# 3. RESEARCH METHOD

This study was conducted based on managerial perspectives related to readiness in using e-health descriptively In Indonesia. The respondent of this research hospital's managers including their owners. They were asked to give the perspective on e-health adoption in their hospitals and in hospital generally. The research respondent was the national congress participant of hospital across Indonesia 2018 both public and private from different level of its hospitals. The-104 respondent collected based on an accidental sampling technique, who fulfilled self-administrated questionnaires in the face-to-face survey method. The readiness was identified as core, structural, societal and engagement readiness factors. The analysis was conducted by descriptive statistics in 5-Likerts scale to identified the tends of the readiness in adopting e-health systems.

# 4. RESULTS

The result presents the profile of research respondent and Readiness measurement. The profile is related to individual information including gender, age, education, working period, and Job Position, in the meantime, hospital information are number of beds and IT budget of budget total. In following paragraph are its explanation in detail.

## 4.1 Respondent Profiles

Based on data obtained, Table 1. Respondent Profile provided in the following section.

In Table 1, the majority of research respondent was female and only 28.6 percent male respondents and 90 percent was respondent with age range between 30 and 60-year-old. The education level of respondent was degree and above (88.6%) with working period was more than 81 percent is 6 -30 years' work experiences with job position as department managers was 65.4 percent. In the meantime, the hospital profile was the majority of respondent was hospital with 51-399 beds (85%) which was identified as the hospital with types as class D (24.1%), class C (31%), class B (29.9 %) and class A (12.7%). Regarding to budget allocation for IT facilities, 75 percent of respondent have the range IT budget between 10 percent of budget total in their hospitals

**Table 1. Respondent Profile**

| Item | Description | Per (%) |
|---|---|---|
| Gender | Female | 71.4 |
| | Male | 28.6 |
| | Total | 100 |
| Age Range | < 30 | 6.3 |
| | 30-40 | 32.6 |
| | 41-50 | 33.7 |
| | 51-60 | 24.2 |
| | > 60 | 3.2 |
| | Total | 100 |
| Education Level | Degree and above | 88.6 |
| | Diploma and below | 11.4 |
| | Total | 100 |
| Working Period | < 5 years | 15.8 |
| | 6 – 10 years | 24.8 |
| | 11 – 20 years | 35.6 |
| | 21 – 30 years | 20.8 |
| | > 30 years | 3.0 |
| | Total | 100 |
| Position | General Manager | 21.1 |
| | Department Manager | 65.4 |
| | IT Manager | 2.9 |
| | IT Operator | 10.6 |
| | Total | 100 |
| No. Beds | < 50 | 2.3 |
| | 51 - 99 | 24.1 |
| | 100 - 299 | 31 |
| | 300 - 399 | 29.9 |
| | 400 and more | 12.7 |
| | Total | 100 |
| IT Budget | < 5 % | 36.2 |
| | 5 – 10 % | 39.7 |
| | 11 – 15 % | 12.1 |
| | 16 - 20 % | 3.4 |
| | > 20 % | 8.6 |
| | Total | 100 |

## 4.2 Readiness Factors

There was four readiness factor measurement in this study including core, structural, societal and engagement readiness. In detail regarding the indicator of each readiness factor is presented in next paragraph. Every factor of readiness in adopting e-health in hospital across Indonesia. The 5-Liksert scale was used in this investigated.

***Core Readiness*** - It refers to the need of information systems related to current conditions. In this factor, there are consist of 8 item to measure the core readiness in adopting e-health. In table 2, it shown all of indicator almost have same scores in range 4.3 – 4.7. The item toward dissatisfaction with old system has a lowest score in this factors. In brief, the majority of respondent belief that the core readiness is important factor in adopting e-health in their hospitals.

***Structural Readiness*** **–** It refers to basic structures in implementation e-health related to human, technical, training and funding. In Table 3, there are 9 items used in this factors, with highest score are 4.7 in terms of the most important of structural readiness in adopting e-health. The respondent concern toward speedy and network quality, hardware/software provides and training for users. In the meantime, the lowest score refers to not really concerns about code of ethics and organizational culture in adopting e-health in their hospitals.

**Table 2. Core Readiness of E-health Adoption**

| Indicators | Mean |
|---|---|
| Identification of needs | 4.7 |
| Dissatisfaction with old Systems | 4.3 |
| Awareness | 4.6 |
| Comfort with technology | 4.7 |
| Trust | 4.6 |
| E-health planning | 4.7 |
| Integration of technology | 4.7 |
| Overall satisfaction | 4.7 |

**Table 3. Structural Readiness**

| Item | Mean |
|---|---|
| Speedy and network quality | 4.7 |
| Service and support ICT | 4.6 |
| Ability of hardware and software | 4.6 |
| Reliability of networks | 4.6 |
| Internet accessibility | 4.6 |
| Suitable hardware and software | 4.7 |
| Training for users | 4.7 |
| Technology use regulations and policies | 4.6 |
| Code of ethics and organizational culture | 4.5 |

**Table 4. Societal Readiness**

| Item | Mean |
|---|---|
| Collaborate with health institutions | 4.4 |
| Sharing information with other institutions | 4.3 |
| Social Culture between staff | 4.2 |
| Position of Social economics community | 4.2 |
| Social culture with community | 4.3 |
| Service provided with collaborations | 2.3 |

***Societal Readiness*** **–** It refers to collaborations, interactions, intra-group and inter-group dynamics across the health institutions. In Table 4 consist of six items of societal readiness. The highest score is 4.4 score where the respondent belief collaborations with other health institutions is important in using e-health. On contrary, the lowest score is 2.3 score regarding to service provided with collaborations. In brief, the good relationship and sharing information with related institution, social culture with community.

***Engagement Readiness*** **–** It refers to the involvement of active users using e-health systems. There are five items to measure engagement readiness during operating e-health systems. The respondent is concern to usefulness and benefits financially in

using e-health systems and is followed by learning continuously and ability. Therefore, the majority of respondent the tend to use e-health with its benefits and learning process.

In summary, four readiness factors have been processed descriptively (Table 6). There is a simple illustration regarding the readiness level of adoption factors. In Table 6 shown that mean score was highest is core readiness and followed by structural and engagement readiness. In the meantime, societal readiness was the lowest in score.

**Table 5. Engagement Readiness**

| Items | Mean |
|---|---|
| Usefulness | 4.6 |
| Financial Benefits | 4.6 |
| Reluctance to change | 4.1 |
| Continuing learning | 4.5 |
| Ability to learn | 4.5 |

**Table 6. Summary of Readiness Factors**

| Factor | Mean |
|---|---|
| Core Readiness | 4.63 |
| Structural Readiness | 4.62 |
| Engagement readiness | 4.46 |
| Societal Readiness | 3.95 |

# 5. DISCUSSION AND CONCLUSION

This study has shown descriptive illustration of e-health adoption in Indonesian hospitals based on managerial perspectives. In first result, there are numerous respondent profile based on individual data and hospital characteristics. The second results, there are four readiness factor measured including core, structural, societal and engagement readiness. The two of results is analyzed by descriptive statistics to give information related to e-health adoption characteristics.

The first result presents toward characteristics of the -105 e-health users refers to hospital managers in Indonesia. The majority of respondent is female who is age range between 30-50-year-old with educational qualification as degree and above. In addition, they have been worked around 11- 20 years with position as a department managers. The hospital characteristics related the number of beds is hospital type C and B, in the meantime IT budget around 10 % from total hospital budget.

The second results of this study present toward the measurement of readiness factors in adopting e-health in their hospitals. Four readiness factors have been identified in detail of every factor. There is the core, structural, societal and engagement readiness which is measured on its every indicator. The mean of every indicator has been determined and find that majority score is tend to 4 of 5-Likert scale. It illustrates that all indicator of readiness factor important to consider in adopting e-health by hospital in Indonesia. In brief, all factor of the readiness had been analyzed and find that the highest readiness was *core readiness* which illustrated that main purpose to adopt e-health was identified as first priority. On contrary, societal readiness was identified as lowest score, it illustrated that in adopting e-health, collaboration and joint programs were not really necessary since the majority of respondents/hospital in Indonesia has the electronic collaboration with the national health insurance only.

In conclusion, based on characteristics of hospitals and readiness factors, there are variety indicators which should been considered in adopting e-health by hospitals. The furher study is would be completed with empirical study toward e-health adoption in Indonesian hospitals.

# 6. ACKNOWLEDGMENTS

Our thanks to Indonesian Minister of Research Technology and Higher Education (MenristekDikti-DP2M) giving the financial support of this research in the Grant of Basic Research 2019.

# 7. REFERENCES

[1] Gholamhosseini, L. and Ayatollahi, H. 2017. The design and application of an e-health readiness assessment tool. *Health Information Management Journal*. 46,1, 32-41. DOI=10.1177/1833358316661065.

[2] Ilorah, A.I, Ditsa, G.E.M, Mokwena, S.N, 2017.

[3] Jorn Braa, et al., 2017. Health Information Systems in Indonesia: Understanding and Addressing Complexity. 14th *IFIP WG 9.4 International Conference on Social Implications of Computers in Developing Countries, ICT4D 2017.* Yogyakarta, Indonesia, May 22–24, 2017

[4] Mauco, K.L. Ecott, R.E. Mars, M. 2016. Critical analysis of e-health readiness assessment framework: suitability for application in developing countries. *Journal of Telemedicine and Telecare*. 0 (0). 1-8. DOI= 10.1177/1357633X16686548.

[5] Gregory, M., and Tembo, S. 2017. Implementation of e-health in developing countries challenges and opportunities: a case of Zambia. *Science and Technology*. 7 (2). 41-53. DOI=10.5923/j.scit.20170702.02.

[6] Durrani, H., Khoja, S., Naseem, A., Scott, R.E, Gul, A. and Jan, R. 2012. *Eastern Mediterranean Health Journal*. 18 (6). 663-670.

[7] Qureshi, Q.A. *et al.* 2014. E-readiness: A critical factor for successful implementation of ehealth projects in developing countries like Pakistan. *Gomal University Journal of Research.* 30 (2), 77-86.7

[8] Molla, A. and Licker, P. 2005, Perceived E-Readiness Factors in E-Commerce Adoption: An Empirical Investigation in a Developing Country. *International Journal of Electronic Commerce* 10(1):83-110

[9] Molla, A., Penszynski, K., Pittayachawan, S. 2010, The use of E-business in Agribusiness: Investigating the influence of e- readiness and OTE Factors, *Journal of Global Information Technology Management*, 13 (1). 56-78.

[10] Zheng, L. and Jiang, Y. 2011. Assessing e-government readiness of local governments in China: Developing a bottom-up approach. Proceeding ICEGOV2011, 26-28 September 2011. 91-96.

[11] Anwar, F., Shamim, A., and Khan S. 2012. Barriers in Adoption of Health Information Technology in Developing Societies. *International Journal of Advanced Computer Science*, 2 (1), 18-23.

[12] Odit, M. C. A, Rwashana, A. S. and Kituyi, G. M. 2014. Antecedents and Dynamics for Strategic Alignment of Health Information Systems in Uganda. *The Electronic Journal of Information Systems in Developing Countries*, 64 (6), 1-20.

[13] Khoja, et al., 2007. e-Health readiness assesment tools for healthcare institution in developing countries. 13 (4). 425-431.

[14] Kalema, B.M. and Kgasi, M. R. 2014. Leveraging e-health for future-oriented healthcare system in developing countries. *The Electronic Journal of Information Systems in Developing Countries (EJISDC*). 65 (8). 1-11.

[15] Ojo, I. Popoola, S. 2015. Some correlates of electronic heaalth information management system success in Nigerian teaching hospitals. *Biomedical Informatics in insights*, 23(1): 60-66.

[16] Kgasi, M.R, and Kalema, B.M. 2014. Leveraging e-Health for future-oriented healthcare systems in developing countries. *Journal of Industrial and Intelligent Information*2 (2). 131-135. pp. 131-135