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Relevance of e-Health Needs and Usage in Indonesia

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A B S T R A C T

The eHealth application can be used for healthcare, supervision, literature, education, and research. It is a cost-efficient and secure application based on information and communication technology for the health and medical fields. The use of Information and Communication Technology (ICT) as an infrastructure or medium that connects hospitals and health centers using the eHealth electronic health application is the key problem facing the implementation of eHealth on a worldwide scale. eHealth is an ICT-based application for the healthcare industry and one of the Action Plans of the World Summit on the Information Society (WSIS) Geneva 2003. The goal of using the eHealth app is to increase patient access, medical process efficiency, effectiveness, and process quality. This covers the administration of medical services provided by hospitals, clinics, health centers, medical professionals (including therapists and doctors), laboratories, pharmacies, and insurance

1. Introduction

Because of the wide variations in geographical conditions, health workers' availability, and the availability of health facilities, there is a chance that public health services will become more unequal in different parts of Indonesia [1]. Making the most of electronic health applications is one way to get past these challenges (eHealth).

The goal of UHC (Universal Health Coverage) or some of its essential components are included in more than half of the eHealth strategies already in place in WHO Member States. Policies for managing information are increasingly commonplace in nations. When properly stated, eHealth plans need to facilitate the interoperability required to ensure universal access to centralized health care.

Based on the results of a survey given to users, the goal of this research is to describe and examine the current state of eHealth implementation in Indonesia from the viewpoint of eHealth users across a number of relevant professions. The eHealth success elements have been categorized into five categories by a recent classification, which was then updated by Ahmed et al [2]. These categories are: (1) technology and its supporting infrastructure; (2) user acceptance; (3) short- and long-term funding; (4) organizational variables; and (5) political or legislative considerations. The factors (1) and (2) that are the subject of our study may be of interest and familiarity to the eHealth users that we polled.

2. Research Method

We employed a structural equation model that captures the perspectives of frontline eHealth providers in Indonesia. In order to gather information about the obstacles to the implementation of eHealth in Indonesia, we surveyed 107 people using the Google Forms application. We then used structural equation models to analyze the collected data and ascertain the relationship between the model's constructs—such as the dependent variable and eHealth utilization.

2.1. Constructs developed for the eHealth Implementation model

The model utilized in this investigation is depicted in Figure 1. The backdrop of model design as well as the specifics of the model and hypothesis development are explained in the discussion that follows. Using the Google Forms tool, which is described in the appendix.1, a web-based questionnaire was used to conduct research based on this paradigm presented in Figure 1.

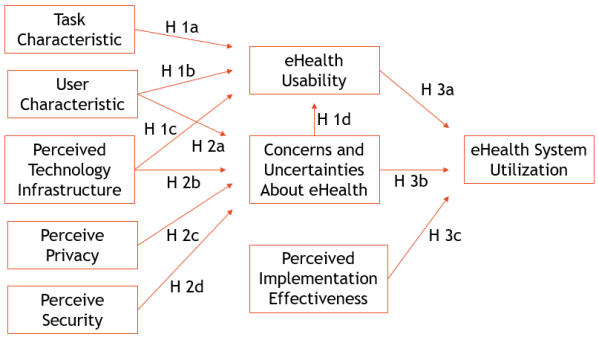

Figure 1 Structural equation model of the eHealth implementation problem in Indonesia

2.2. Task Characteristic

Task characteristics are things that the organization depends on. Organizational tasks are completed more easily because to information systems. Work is frequently characterized by factors such as task complexity, task compatibility, and work procedures or styles [3]. Studies have indicated [4] that there is a higher likelihood of system success when a system is more closely matched with user requirements. According to the fit-variability model [5], which is connected to Goodhue's task-technology fit model [4], there may be variations in how different stakeholders perceive the appropriateness and feasibility of an eHealth service, as well as between an eHealth service's organizational and individual appropriateness. The creation of the task characteristics for the questionnaire was derived using pertinent data from the study conducted by Goodhue and Thompson [4]. This leads as *Hypothesis 1a: task characteristics will positively influence eHealth usability*

2.3. User Characteristic

User characteristics are unique to each user of an information system and include attitudes, perceptions, and demographics [4]. The majority of participants in a survey conducted by [6] among 465 medical professionals working in hospitals in northwest Nigeria demonstrated a good level of literacy necessary for the implementation and operation of modern eHealth systems. They discovered that attitudes toward eHealth, perceived benefits of eHealth, expertise with eHealth and information technology, and technical infrastructure for eHealth all showed statistically significant positive relationships with intention to utilize eHealth. The study by Zayyad and Toycan [6] served as the model for the user characteristics construct used in the questionnaire. This leads to:

a. Hypothesis 1b: User characteristics will positively affect eHealth usability.

b. Hypothesis 2a: User characteristics will negatively affect concerns and uncertainties.

2.4. Perceived Technology Infrastructure

Technology for information and communication is essential to any program using eHealth. Technology must be in place to support a database that practitioners can always immediately and readily access to input, retrieve, analyze, and exchange health records throughout patient care for an eHealth program to be successful. To enable the access and sharing of health records via a device used by healthcare professionals, infrastructure must comprise digital communication networks that are robust and dependable, as well as hardware and software. To power the infrastructure components, extremely reliable electrical power must also always be available [7], [8], [9]. The study by Zayyad and Toycan [6] provided the perceived relevant technology infrastructure constructs for the questionnaire (Appendix 1), which were modified as follows:

a. Hypothesis 1c: Perceived technology infrastructure will positively affect eHealth usability.

b. Hypothesis 2b: Perceived technology infrastructure will negatively affect concerns and uncertainties.

2.5. Perceive Privacy

According to a study on eHealth in Bangladesh, doctors' reservations about utilizing eHealth were not significantly impacted by patients' privacy issues [10]. Patients' ratings of eHealth systems as failures were explained by inadequate eHealth privacy and security issues [11]. Contrary to what has been shown, eHealth users (physicians) may feel that security and privacy are less significant when eHealth technologies offer better treatment. According to Wilkowska and Ziefle's research [12], the construct of felt privacy used in the questionnaire was as Hypothesis 2c: Perceived privacy will positively affect concerns and uncertainties.

2.6. Perceive Security

A person's right to health must be upheld. Nonetheless, delivering healthcare services necessitates substantial resources that need to be effectively managed. One information technology tool used in the health industry to enable more effective and efficient services is health information systems, or eHealth. Numerous eHealth application versions are available for usage by patients or persons as independent health condition monitors as well as by health organizations as management information systems. Health information technology (HIT), which encompasses clinical information systems (CIS) and medical devices [13], is one of the applications of eHealth that is used in clinical settings, such as hospitals, clinics, and other health centers, to provide healthcare services. Hospital Information System (HIS) is a common term used to describe CIS used in hospitals. The issue of security value in preserving health data is one of the new issues brought

forth by eHealth innovation, in addition to its benefits [14].

Implementing eHealth systems is frequently hampered by security and privacy concerns; managing privacy is hard without a secure system. The intention of professionals to adopt eHealth was investigated using a survey of professionals employed in Nigerian hospitals [6]. A security-related inquiry revealed a negligible relationship between the intention to use eHealth and this issue. Based on research by Wilkowska and Ziefle [12], the perceived security construct of the questionnaire was developed as Hypothesis 2d: Perceived security will positively affect concerns and uncertainties.

2.7. eHealth Usability

The adoption and usage of eHealth systems will be greatly impacted by a system's usability or benefits, which are crucial but sometimes disregarded. Doctors, medical technologists, nurses, administrative staff, and other users will find it extremely difficult to realize the potential benefits of eHealth systems in the absence of a useable or helpful system. Technical research on system usability has been conducted in the field of information systems, beginning with Davis groundbreaking work [15]. It is a crucial indicator of an eHealth system's effectiveness and shows how users could respond favorably to its use. Generally speaking, a system's usability will increase if it is designed to carry out particular user duties. The questionnaire's eHealth usability was constructed using a modification of Davis's research [15]. The preceding results in the subsequent as Hypothesis 3a: eHealth usability will positively affect eHealth utilization.

2.8. Concerns and Uncertainties About eHealth

The most frequently cited factor in the success of eHealth interventions, according to a review of empirical studies categorizing eHealth implementations as successes or failures [16], was healthcare quality. Despite workflow challenges being identified in the majority of the analyzed publications, this review indicated that cost was the factor most frequently cited as a contributing factor to failure. Workflow problems may cause clinicians to disagree, which will raise uncertainty and may cause the eHealth system to collapse. The following theories are the result of the worries and ambiguities surrounding the eHealth component of the questionnaire, which modify the concepts presented by Aranda-Jan et al. [17] in a systematic review of what fails in African eHealth projects. Hypothesis 1d: Concerns and uncertainties about eHealth systems will negatively affect eHealth usability as Hypothesis 3b: Concerns and uncertainties about eHealth systems will negatively affect eHealth utilization.

2.9. Perceived Implementation Effectiveness

The perceived usefulness, confidence, willingness, and attitude of healthcare professionals are the underlying variables influencing their decision to use eHealth technology applications in LRCs [6]. These variables are indirectly reflected in our study through user survey responses from those who have decided to integrate eHealth into their job. One of the main elements that determines whether a technology is implemented successfully is its technological capacity in an eHealth system [9]. User interface design, interoperability, and functional and nonfunctional criteria are important components of technology success. The economic, social, and organizational sustainability of the system in which the technology is integrated determines the system's long-term viability. The concepts presented by Rezai-Rad et al. [18] served as the foundation for the development of the questionnaire's construct of perceived eHealth implementation efficacy as Hypothesis 3c: Perceived implementation effectiveness will positively affect eHealth utilization.

2.10 eHealth System Utilization

The extent to which an eHealth system is used by users indicates both the system's popularity and whether its use is long-term viable and worthwhile of the associated operating expenses. This is quantified in our eHealth system utilization study. An overview of the reference materials listed above that were used to develop the eHealth implementation model is provided in Table 1.

Table 1. Summary of eHealth implementation model constructs

Hypothesis	Construct	tipe	Study
Task Characteristic	Validated	Reflective	(Goodhue, & Thompson, 1995)
User Characteristic	New	Reflective	(Zayyad, & Toycan, 2018)
TechnologyInfrastructure	New	Reflective	(Zayyad, & Toycan, 2018)
Privacy	Validated	Reflective	(Wilkowska, & Ziefle, 2012)
Security	Validated	Reflective	(Wilkowska, & Ziefle, 2012)
eHealth Usability	Validated	Reflective	(Davis, 1989)
Concerns and Uncertainties About eHealth	New	Reflective	(Aranda-Jan, *et al.,* 2014)
Implementation Effectiveness	New	Reflective	(Rezai-Rad *et al.,* 2012)
eHealth System Utilization	New	Reflective	(Archer et al., 2021)

The construct model and questionnaire in this study continue the research of Archer et al [9], we try to implement the construct model in Indonesia.

3. Implementation

Survey participants are health workers with a variety of professions working in hospitals or health service facilities engaged in the government and private sectors in Indonesia. The survey questionnaire is distributed to potential respondents via the WhatsApp application in the form of a link that is connected to the list of questions on the Google Form application. In order to receive responses from every professional member in the health sector, the questionnaire link was also distributed to a number of professional organizations. In total, 107 survey respondents from 12 Indonesian provinces took part in the study. The following table has the demographics of the respondents linked.

Table 2. Provincial Origin of Respondents

No	Province	Total	Percentage (%)
1	Aceh	1	0.93
2	Banten	2	1.87
3	DIY	1	0.93
4	DKI	46	42.99
5	Jabar	38	35.51
6	Jateng	8	7.48
7	Kepri	1	0.93
8	NTB	4	3.74
9	Riau	1	0.93
10	Sulsel	1	0.93
11	Sumut	3	2.80
12	Sumbar	1	0.93
		107	

Table 3. Profession of The Respondent

Description	Pharmacist	Doctor	Nurse	Other	Total
Amount	4	41	54	8	107
Percentage (%)	3.74	38.32	50.47	7.47	100

Tabel 4. Experience of Using eHealth

Description	>1 years	1 years	2 years	3 years	>3 years	Total
Amount	21	9	10	5	62	107
Percentage (%)	19.63	8.41	9.35	4.67	57.94	100

Table 5. Respondent's Sector

Description	Public	Private	Total
Amount	87	20	107
Percentage (%)	81.31	18.69	100

The results of testing the data of 107 respondents using the smart PLS 3 application obtained the information in Tabel 6. shows the results calculated from the model structure equation, which was run by bootstrapping using 1,000 subsamples.

Table 6. Path Coefficient Calculation Results

Hypothesis	Relationship	Path Coefficie
H1a	**Task Characteristic -> eHealth Usability**	**0.366**
H1b	User Characteristic -> eHealth Usability	0.080
H2a	User Characteristica -> Concerns and Uncertainties About eHealth	0.065
H1c	**Technology Infrastructure -> eHealth Usability**	**0.491**
H2b	Technology Infrastructure -> Concerns and Uncertainties About eHealth	0.129
H2c	Privacy -> Concerns and Uncertainties About eHealth	0.264
H2d	Security -> Concerns and Uncertainties About eHealth	0.055
H3a	eHealth Usability -> 9 Pemanfaatan eHealth	-0.007
H1d	Concerns and Uncertainties About eHealth -> eHealth Usability	-0.039
H3b	Concerns and Uncertainties About eHealth -> eHealth System Utilization	0.007
H3c	**Effectiveness -> eHealth System Utilization**	**0.647**

The path coefficients calculated for the proposed hypotheses, are listed in Table 6. Hypotheses H1a, H1c, and H3c are supported, while the remaining hypotheses (H1b, H1d, H2a, H2b, H2c, H2d, H3a and H3b) are not supported (P value>.05).

Table 7. Reliability and construct validity

Construct	Composite Reliability	Average Variance Extracted (AVE)
Task Characteristic	0.929	0.766
User Characteristic	0.961	0.892
Technology Infrastructure	0.877	0.705
Privacy	0.905	0.826
Security	0.963	0.897
eHealth Usability	0.959	0.854
Concerns and Uncertainties About eHealth	0.797	0.511
Implementation Effectiveness	0.948	0.860
eHealth System Utilization	1.000	1.000

Construct reliability is a metric used to assess the dependability of constructs involving latent variables. The information in the preceding table already demonstrates a reasonable degree of reliability; the value that is deemed dependable must be over 0.70. Cronbach's alpha and composite reliability are the methods used to evaluate this. Good reliability is defined as the composite reliability value between 0.6 and 0.7, and the predicted Cronbach's alpha value is higher than 0.7 in Table 8.

Table 8. Discriminant Validity

	Task Characteristic	User Characteristic	Technology Infrastructure	Privacy	Security	eHealth Usability	Concerns and Uncertainties About eHealth	Implementation Effectiveness	eHealth System Utilization
Task Characteristic	0.875								
User Characteristic	0.325	0.945							
Technology Infrastructure	0.446	0.510	0.840						
Privacy	0.171	0.146	0.347	0.909					
Security	0.194	0.125	0.364	0.782	0.947				
eHealth Usability	0.598	0.442	0.685	0.376	0.413	0.924			
Concerns and Uncertainties About eHealth	0.355	0.176	0.274	0.362	0.317	0.240	0.715		
Implementation Effectiveness	0.653	0.479	0.580	0.296	0.302	0.795	0.337	0.927	
eHealth System Utilization	0.580	0.427	0.499	0.248	0.269	0.509	0.229	0.650	1.000

The AVE ROOT value> Correlation with other constructs indicates that all of the roots of the AVE (Fornell-Larcker Criterion) of each construct are greater than the correlation with other variables as well as other latent variables, according to the table above. The criteria for discriminant validity in this model have been satisfied since all latent variables AVE Root value> Correlation with other components.

4. Conclusion

In research conducted in Indonesia with reference to the construct model above, the results obtained are 3 hypotheses accepted and 8 hypotheses rejected. Hypothesis 1a: task characteristics will positively affect eHealth Usability. there is a need for a means of communication with providers (BPJS Health / Health Insurance) so that there is a demand for health facilities (Health service facilities) to use eHealth (H1a accepted); Hypothesis 1c: Perceived technology infrastructure will positively influence eHealth usability. The results of the analysis of the sample population of respondents show that the availability of internet network infrastructure is still an issue where the largest respondent population comes from Java Island and is located in the city center, but there are still obstacles or barriers in the implementation of eHealth related to infrastructure availability (H1c accepted); and Hypothesis 3c: Perceived implementation effectiveness will positively influence eHealth utilization. The role of Health Care Facilities from both the public and private sectors has provided a positive opportunity in the implementation of eHealth so as to increase the utilization of eHealth, especially in Indonesia, however in its implementation there are still many obstacles conveyed by survey respondents related to costs, human resources/eHealth users and the geographical form of Indonesia (H3c accepted).

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