
Analysis of Hospital Readiness to Face the 'Smart Hospital' Era

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Abstract

Introduction : Smart hospital is an emerging and fast-developing innovation in the context of a rapid increase of internet users, an increasing demand for high-quality medical resources, and an aging population worldwide. It generally involves the use of the optimized and automated processes built on an information and communications technology (ICT) environment, especially based on the Internet of things (IoT), to offer assessment, consultation, direct treatment, services, and integrated care. This innovation has the potential and has already gained initial evidence to improve healthcare access, efficiency, or even effectiveness. Yet, along with these positive impacts and promises, a number of issues and challenges also appear. **Methods:** Study This is study quantitative with design survey research. Study This done on the month of June 2023. Instruments used in study This use questionnaire with the HOT-Fit method consisting of the 47 questions divided in 6 groups question namely: Human, Organization, Technology, Knowledge Users Regulations and Benefits. Subject for this study is hospital managers, administration staff and health workers. Data analysis using analysis multivariate. **Result:** 22 hospital state that digitization service health to a very smart hospital important one of them is applied For increase quality service House hurts and improves satisfaction patient. In application of smart hospital Sick need integrate between technology, service and regulation. **Conclusion :** Smart hospitals can influence health and medical policies and create new medical values by defining and quantitatively measuring detailed indicators based on data collected from existing hospitals. Simultaneously, appropriate government incentives, consolidated interdisciplinary research, and active participation by industry are required to foster and facilitate smart hospitals.

Keywords: digitization health service, smart hospital, technology , service, policy

INTRODUCTION

Development technology be very fast. All field life man Already No Can Again released from development technology, incl in field health. A number of year Finally, focus on the field health has shift from treatment disease become prevention oriented, consumer centred treatment. In line with change that, hospital has introduce intelligence artificial based on Artificial Intelligence (AI), robotics, and technology information into the world of health. Selong with industrial revolution 4.0 hospital hope effort This can increase quality treatment and diagnosis of disease (1).

Enhancement quality service health very important for society. Especially for Indonesia whose territory divided become a number of island with condition different geographic (2). Utilization digital technology to be right solution For answer challenge service health in Indonesia. Everyone should support effort this. Besides use digital technology in various field is effort adaptation consequence world of technology development, No denied, also in field health society. Utilization digital technology in the field health expected can increase quality service in a manner more efficient and effective from before(3).

Use technology information in the field service health especially hospital Already become something need tree. Hospital managing big data, which is currently This Already No Can Again managed manually. Moment this, technology information role important in the service process to patient, no only become supporters data processing (4). The focus is How A Hospital do optimization utilization technology information in do service to patient in a manner more kind and comprehensive. one method For reduce cost medical with method create interconnection with facility medical related others in society like clinics, pharmacies, and laboratories, which are mutually exclusive integrated and oriented Padda patient centered care where patient given access For various information health so that patient can choose method treatment like what to they live. Reason this is what supports developed and developing countries For develop the hospital industry become a smart hospital (4).

“Smart hospital” is A draft Hospital intelligent focused on optimization service patient at hospital with use system technology information internet based and support connectivity equipment medical and non- medical, so can give quality and affordable service satisfying for patient(5). The concept of "smart hospital" makes it possible applied in Indonesia, reminded amount large population and potential Indonesian society as the largest gadget market share in Southeast Asia (6).

Moment This Indonesian people have relative internet access intense. Based on 2018 BPS Telecommunications data, ownership home internet access households in Indonesia is 66.22%, so can also used in implementation smart hospital. Development Hospital with draft smart hospital requires A involving grand design various side. Start from development physique building until with development application and psychology patient in accept service smart hospital (7).

The application of Smart Hospital in Indonesia is necessary involve cross- sector for make it easy public in access service health. At the end in 2021, Ministry health Republic of Indonesia, released print blue healthcare digital transformation strategy. Facility service health consists from health centres , clinics and doctors general and service support is all Hospital general and special . Primary and secondary services is end front service serving medical public of 272 million people throughout Indonesia. Utilization technology information in field health range from planning health until provision various information health level individual and society(8). However, various function existing application cause system information health fragmented, and existing data No can shared. WHO stressed importance prioritize principle continuity service health. Service medical in which institution medical Keep going monitor health status patient. Monitoring ongoing and comprehensive patient care help professional health evaluate the care given. Review results proper administration can facilitate communication between institution medical and efficient and effective make reference in accordance need. Regulation of the Minister of Health of the Republic of Indonesia No. 21 of 2020 concerning Plan strategic. From 2020 to 2024, the Ministry of Health appealed effort reorientation development health, incl integration system information health, activity research and development. Digitization health level national and regional is matter normal. That No easy and needed planning. Because that is, the digitization process service health must planned with Be careful good at level national nor area. because That important for Hospital For understand How technology, service and regulations that must be applied For apply the concept of "smart hospital".

MATERIALS AND METHODS

This is study quantitative with design survey research. Study This done on the month June 2023. Instruments used in study This use questionnaire with the HOT-Fit method consisting of the 47 questions divided in 6 groups question namely: Human, Organization, Technology, Knowledge Users, Regulations, and Benefits. Subject for this study is hospital managers, administration staff and health workers. Data analysis using analysis multivariate. This study involved 50 respondents from 22 hospitals.

RESULTS

On research this, researcher use method evaluation with HOT-Fit method. Method evaluation This is A method For see in a manner whole system with put 6 components important in system information ie human (Human), organization (Organization), technology (Technology), knowledge users, regulations and benefits . Component human (Human) assess system information from side use system (system use) in frequency and extent function and investigation something system. Besides that system *use* is also related with who uses, rate usage , training , knowledge , expectations and attitudes accept or refused. Study This using 50 respondents who came from from 22 hospital in Indonesia. With characteristics as following:

Table 1. Characteristics Respondents

| Characteristics | N=50 | % |
|---------------------|------|------|
| Type Sex | | |
| Man | 21 | 42 |
| Woman | 29 | 58 |
| Age | | |
| 20 - 30 Years | 24 | 48 |
| 30 - 40 Years | 11 | 22 |
| 41-50 Years | 6 | 12 |
| < 50 Years | 9 | 18 |
| Education | | |
| Bachelor degree | 10 | 20 |
| Grade 2 | 40 | 80 |
| Position | | |
| Practitioner | 20 | 26.7 |
| Hospital Management | 30 | 43.3 |
| Long Working Time | | |
| 2- 5 Years | 17 | 34 |
| 6 – 10 Years | 6 | 12 |
| < 10 Years | 27 | 44 |
| Hospital Type | | |
| Type A | 2 | 9 |
| Type B | 3 | 13 |
| Type C | 5 | 22 |
| Type D | 12 | 56 |

Source : Primary Data, 2023

From the table on can concluded that respondents in research This dominated by women as many as 29 respondents (58%). mostly. Respondents aged 20-30 Years as many as 24 respondents (48%). Education of the most respondents is Strata 2 graduates as many as 40 respondents (80%). Respondent average in study This is management Hospital as many as 30 respondents (43.3%) with the longest working time is more from 10 years as many as 27

respondents (44%). In study This most respondents _originate from Hospital type D is as many as 12 hospital (56%).

1. Analysis Results Univariate

a. Description Human Factors

Factor system *use* is known as much as 56.8% users agree that system digitization service health easy understood . Application digitization service health make it easy work daily as much as 61.4% of respondents answer agree. 68.2% of respondents answer agree that application digitization service health support performance employee. Digitization service health increase quality performance employee as much as 65.9% of respondents answer agree with statement. As many as 61.4% of respondents state agree that employee Hospital flexible in application digitization service health.

b. Description organizational factor

As many as 70.5% of respondents agree that unit support in face transformation digitization service health . As many as 61.4% of respondents agree that party management support in face transformation digitization service health . 61.4% of respondents agree that party management Hospital provide adequate facilities For face transformation digitization service health. Hospital own support technical in face transformation digitization service health as much as 63.6% of respondents state agree with the statement. As many as 59.1% of respondents agree that party management Hospital do thorough preparation For face transformation digitization service health.

c. Description Technology factor

As many as 79.5% of respondents agree that digitization servant health increase communication between units. 65.9% of respondents agree that digitization service health save time in serve information . Digitization service health speed up presentation information , as much as 63.6% of respondents state agree . As many as 70.5% of respondents state agree that digitization service health own good *response* times . 61.4% of respondents agree that digitization service health provide system reliable security. As many as 70.5% of respondents state agree that digitization servant health present updated data. Digitization service health own completeness of the required data as much as 79.5% of respondents state agree. Digitization service health own various function complete facilities as much as 63.6% of respondents state agree . As many as 75% of respondents stated agree that Digitization service health

own speed access high. Digitization service health provide relevant information as much as 77.3% of respondents state agree. 75% of respondents state agree that Digitization service health provide helpful information for cross sectoral. 75% of respondents state agree that Digitization service health provide accurate information. As many as 79.5% of respondents agree that Digitization service health have good user documentation. As many as 77.3% of respondents state Digitization service health support need information .

d. Description Factor Knowledge User

As many as 59.1% of respondents state understand related technology computers and 9.1% of respondents state No understand related technology computer . As many as 72.7% of respondents state agree that they understand internet technology . 56.8% of respondents state understand with system in organization Hospital . 68.2% of respondents state agree that they understand about digitization service health . As many as 68.2% of respondents agree that they know benefit from digitization service health . 75% of respondents state agree that they know profit for users digitization service health . As many as 70.5% of respondents know profit application digitization service health .

e. Description Factor Regulation

70.5% of respondents state that digitization service health have staff analysis system . As many as 65.9% of respondents state agree that Hospital own staff programmer in implement digitization service health . As many as 61.4% of respondents feel agree that Hospital need own hardware staff inside implement digitization service health. Digitization Health Services have staff *maintenance* network as much as 54.5% of respondents state agree . As many as 63.6% of respondents state agree that digitization service health must integrated with system One healthy by the Ministry of Health . 61.4% of respondents state there is a Director's Decree that regulates about digitization service health at hospital . As many as 63.6% of respondents state that after application digitization service health will done training to the staff periodically .

f. Description Factor Benefit

As many as 65.9% of respondents state Digitization service health beneficial For service . 70.5% of respondents state Digitization service health help present complete

information . As many as 68.2% of respondents state application digitization service health make it easy staff For interact with units at hospital . 65.9% of respondents state that Digitization service health increase productivity . 68.2% of respondents state System supporters digitization service health easy operated / used . As many as 70.5% of respondents state Application Digitization service health increase performance Hospital. 70.5% of respondents state Application digitization service health increase service Hospital. A total of 68.2 respondents state Application digitization service health increase satisfaction patient .

2. Analysis Results Multivariate

Table 2. Analysis Multivariate

| <i>Net Benefits</i> | P> t | Prob > F | R > Square d |
|---------------------|-----------------|--------------------|------------------------|
| <i>Human</i> | 0.416 | | |
| <i>Organization</i> | 0.029 | | |
| <i>Technology</i> | 0.111 | 0.0000 | 0.9582 |
| Knowledge User | 0.001 | | |
| <i>Regulation</i> | 0.021 | | |
| Benefit | 0.021 | | |
| Constanta | 0.001 | | |

Source : Primary Data, 2023

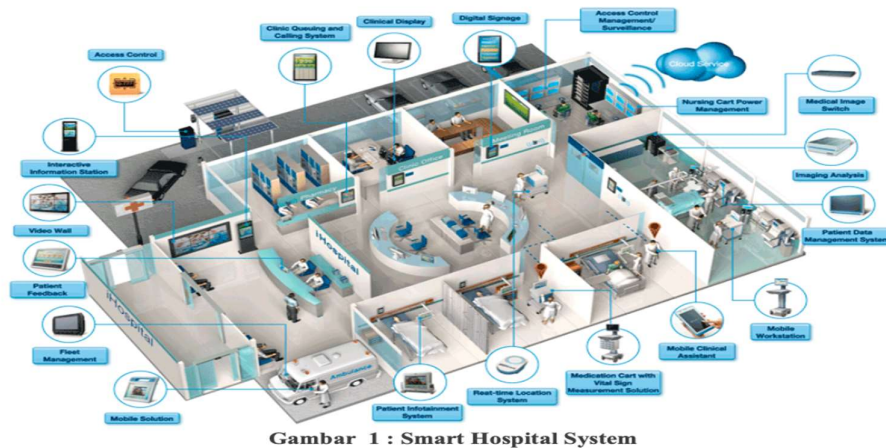
Independently simultaneous have significant influence on the dependent variable namely human factors, organization, technology, leadership and regulation effect on net benefits. The R-Square value is 0.9582 which means all independent variables can explain the dependent variable of 95.82%.

DISCUSSION

a. Technology

Developments in the current digital era This has make quality data integration tall as part important in implementation digital transformation. Integrated information and systems service more health simple is necessary aspect Keep going improved For achieve a healthy Indonesia. Indeed, the process of integrating medical data is simple presenting Lots challenge . The amount application service health developed by the government central, regional and private raises challenge for integration system information service health . In fact, the intended application For promote and improve service health raises problem new, like deployment information about existing and various applications the standards that make it difficult For integrated and used . Based on results survey moment this , more of 400 applications health has built or developed by the government center and area(9) . Another problem with digitization service health is when Lots information medical documented manually . Health data in several area Still documented above paper and yet integrated digitally . Challenge main in collect health data public is moment This more from 80 institutions Indonesian medical no affected by digital technology . The data is fragmented and spread over hundreds application different medical , limiting standardization and data sharing . Moment This information Indonesian health spread and its system many . Provider service health accept a number of information(10). Most of the available data Still Not yet known . There is a need urge information platform integrated For support authority health national in maximizing service Hospital , mostly in predict disease patient. Sector Indonesian health has limitations on data protection , data standardization , rights patient and privacy (11) .

Smart hospital is A draft Hospital intelligent focused on optimization service patient at hospital with use system technology Internet based and supportive information connectivity equipment medical and non- medical, so can give quality and affordable service satisfying for patient. Technology information No Again only become supporters hospital service, but technology information plays a big role important in the service process to patient or family patient . Especially with change paradigm hospital service from physician centered care to patient centered care makes technology very helpful information in realize patient - focused services (12).



Gambar 1 : Smart Hospital System

Figure 1. Concept Smart Hospital Technology

Besides For optimization service health at hospital , the smart hospital concept also helps every patient have health data easy self For monitored and got used When anywhere and anytime patient the are . existing conditions during This often make patient difficulty For know their health data (medical record) because available form of data generally Still in paper based form . Wrong One objective main application the smart hospital concept is creation integrated system .Intended integration in service health at hospital includes integration service patient (service reference between facility different healthcare), stakeholder integration (hospital as part from entity service health need supported by other stakeholders such as Ministry health , service health , BPJS health and institutions others) and integration technology (use technology in integrate system information management Hospital , system reference integrated , and telemedicine).

Based on results study mentioned in description factor technology that majority respondent state that digitization service health increase communication between units, accelerate presentation information , digitization service health own various function complete facilities and also digitalization service health provide helpful information for cross sectoral this in line with study (8)who stated that technology be one factor important in smart hospital implementation (13).

Permenkes No. 21 of 2020 concerning Plan Ministry of Health Strategic Year 2020-2024 has been require exists effort governance changes development health that includes integration system information , research , and development health . Application the smart hospital system must supported with capable technology. From year to year , the number of the developers digital technology in the Health sector the

more increase . Most developer This has Work The same with registered government in a manner official at the Ministry of Communication and Information Technology as Organizer System and Transaction Electronics . However until moment this , not yet There is none of the developers digital technology in the Health sector , obtaining under the Ministry of Health. So far here it is , the developers only get shade through Cooperation Agreement .

Transformation digital services towards smart hospital must supported health data integration and development as well as development technology information . Moment This government publish Permenkes No 24 of 2022 which states that whole service health must apply integrated electronic medical record with One Healthy ministry health. With enactment matter This show that integration and development service health is very important System Information Health Technology continues develop so development application health participate needed For optimizing service and management health services at various levels health . Target activity the is Health center , clinic , hall health, hospitals , laboratories , pharmacies , and services health . Expected outcome is optimization service and management health level Health center , clinic , hospitals , laboratories , and pharmacies with support efficient and integrated application. Integration application health will focuses on integration and digitization service responsive emergency health , primary care , services pharmaceuticals , services health referrals , financing health , health HR management , covid-19 vaccination , internal management of the Ministry of Health , and infrastructure Ministry of Health. Very varied service the need an encompassing platform ninth service health .

In support the development of a smart hospital is one of them with expansion telemedicine technology. The era of digital disruption in the field health. No can done as fast as in other fields like *e-commerce* and banking , however gradual and measurable sector Indonesian health can adopt technology health with fast one adopted technology with fast is technology lots of *telemedicine* developed by innovators private in form company digital *start-ups* . There is the Covid-19 pandemic made use *telemedicine* increases broad. Use this *tele-medicine* related with government targets in reach *Univer- sal Health Coverage* (UHC) of at least 95% of amount resident or in a manner national as much as 257.5 million soul in 2020. Technology. This *telemedicine* can also become solution limitations infrastructure and resources Power manuvain health to be reason its limitations access service health for society (1).

b. Service

Digitization service health towards the "smart hospital" must be improvement oriented service to patients and satisfaction user. With the application of technologies such as artificial intelligence, surgical robots, and mixed reality, the diagnosis and treatment of diseases has become more intelligent . Using artificial intelligence to build the clinical decision support system, it has achieved certain results, such as the diagnosis of hepatitis, lung cancer, and skin cancer. The accuracy of artificial intelligence diagnosis results exceeds that of human doctors. Machine learning-based systems are quite often even more accurate than experienced physicians , especially in pathology and imaging . The most outstanding and representative product in the field of clinical decision support systems is IBM's Watson, an intelligent cognitive system that provides an optimal solution through in-depth analysis of all clinical data and literature data . The program has a great effect on the diagnosis of diabetes and cancer. Through the use of the clinical decision support system, doctors can give expert advice based on algorithms to improve the accuracy of diagnosis, reduce the incidence of missed diagnoses and misdiagnosis, and enable patients to receive timely and appropriate medical treatment (5).

Based on smart diagnosis, the patient's condition and disease status are more accurately described, which helps to develop a personalized treatment plan , and the program has been affirmed by experts. The treatment process itself will become more precise. For example, in tumors radiother - apy , the patient's radiotherapy process can be monitored dynamically throughout the process with the help of smart radiomics. Doctors can optimize the radiotherapy program, observe disease progress , and avoid the un-certainty of manual operation. In terms of surgery, the birth of surgical robots has pushed surgery to a new level. More famous robot systems include the Da Vinci system (Intuitive Surgical, Sunnyvale, CA, USA), Sensei X robotic catheter system (Hansen Medical, Auris Health, Inc., Redwoo City, CA, USA), and Flex® Robotic System (Medrobotics , Raynham, MA, USA). Compared with traditional endoscopic surgery, patients will have better results and faster recovery, and surgeons will enjoy equipment providing them with greater flexibility and compatibility. The implementation of remote surgery will also be more convenient. The application of mixed reality technology makes the development and implementation of the surgical plan easier. Professor Ye Zhewei of Wuhan Union Hospital (4) has done a lot of work in this area. His team implemented the world's first mixed reality-guided hip surgery for a 15-year-old patient with a left femoral neck fracture. By modeling the target and projecting it to the real world for exact matching, an interactive information loop is

built between the virtual world, the real world, and users. The emergence of this technology will bring subversive changes in medical education, research, communication, and clinical treatment.

A number of Hospital in Indonesia Already start utilise AI and robotics technology in service health like a smart robot that is utilized For help operation patient . Selong with results research , the majority respondent state that digitization service health beneficial For service , digitized service health capable serve complete information _ For help diagnose patients , as well as application digitization service health capable increase productivity service to patient as well as increase satisfaction customer . this _ Of course just will impact to income Hospital .

c. Regulation

Digitalization that gives convenience in gift service health for society to touch other related aspects . this need supported umbrella useful laws for community and providers service health . Based on results study mentioned that Hospital own regulation related digitization service health , besides That governance digitization service health refer to the rules ministry health Republic of Indonesia. This in line with study (9) who mentioned that every Hospital must own guidelines digitization service mega health to regulation government .

Transformation digitized service health refers to 5 rules government including Law No. 44 of 2009 concerning House ill where mentioned that Every hospital is mandatory do recording & reporting about all activity internal hospital administration form System Information Hospital Management (SIMRS). PP No. 46 of 2014 concerning System Health Information stating that governance System Health Information , incl System Information Health Efforts . Permenkes No. 82 of 2013 concerning SIMRS standard stating that Every the hospital is mandatory to organize SIMRS. Permenkes No. 1171 of 2011, Concerning SIRS which mentions that Every Hospital must carry out System Information of Hospital (SIRS). As well as Permenkes No 24 of 2022 concerning electronic medical record. Where every facility service health must apply record medical electronics. With exists governing regulations related digitization service health so Hospital and patient will own strength law in implementation.

ACKNOWLEDGMENTS

All respondent from 22 hospital that has help in study This as well as team research that has run research and compile article very well.

FOOTNOTES

Minister Of Health Regulation Of The Republic Of Indonesia Number 21 Of 2020 Concerning The Ministry Of Health's Strategic Plan For 2020-2024 (<https://www.balaiaceh.litbang.kemkes.go.id/wp-content/uploads/2021/03/1.-RAP-AGENCY-LITBANGKES-2020-2024.pdf>).

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