

Modified-TAM Analysis of the Implementation of the e-Hospital System on Polyclinic Service

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ABSTRACT

Background: Technology in the field of health services allows an individual to get a productive life and a longer life expectancy. The purpose of this study was to provide describe of obstacles in the implementation of the e-Hospital system, especially EMR services at the Dermatology & Venereology (DV) Polyclinic "X" Hospital from the perspective of service providers.

Subjects and Method: This qualitative descriptive research was done with natural observation and using electronic questionnaire based on Modified-TAM Analyses. It was conducted since February-June 2022. The study participants were determined based on the Non-Random Purposive Sampling technique which included all of DV Polyclinic staff at "X" Hospital (3 doctors, 2 nurses, and 2 administrative staff).

Results According to the results, it was found that the implementation of the e-Hospital system at the DV Polyclinic was still not running optimally. The most commonly encountered barrier factors based on the Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Behavioural Intention (BEI) components was the perception that "e-Hospital cannot replace the conventional system" (50%); and for the PTH & SI components was "the hospitals are not ready to run e-Hospital system" (60%).

Conclusion: The hospital management needed to re-evaluate which constraint factors cause these perspectives, which could be an obstacle in implementing the e-Hospital system. In addition, it was necessary to re-emphasize the e-Hospital system and its benefits through periodically training, affirm the vision and mission related to the system, and do periodic feedback evaluations from service providers so that the hospital management could comprehend which obstacles were found and were able to make changes and increase the motivation of service providers to use the e-Hospital system.

Keywords: e-Hospital System, Polyclinic Services, Service Provider, TAM

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Cite this as:

Pratama DG, Agung IWP, Purwadhi (2022). Modified-TAM Analysis of the Implementation of the e-Hospital System on Polyclinic Service. *J Health Policy Manage.* 07(03): 218-226. <https://doi.org/10.26911/thejhpm.-2022.07.03.06>.



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BACKGROUND

Digital health is transforming healthcare delivery worldwide to meet the growing challenges of growing populations. Digital transformation and disruptive innovation illustrate the comprehensive reorientation

of the industry, including its business models, including the hospitals (Laksono, 2012). Most hospitals take the initiative to adopt digital transformation into Health Information System (HIS) to produce a better quality of health services, one of

which is the e-Hospital system. HIS is an integrated information system that handles all hospital management processes, from diagnostic services, medical procedures, medical records, pharmaceuticals, pharmaceutical warehouses, billing, personnel databases, payroll, and accounting to control management (Rumambi, 2021).

The e-Hospital system is a HIS that uses workflows based on ICT (Information & Communication Technology) solutions. The system is open-source, can be configured, and is easily adapted to user requests (National Informatics Centre, 2015). The use of ICT in hospitals has been inevitable since the hospital is a complex organization that requires reliable integration of information produced by many units to deal with the patients' needs (Christasani, 2021). The Indonesian Ministry of Health has established an action strategy map for HIS with the regulation of its development standard policies to integrate all service flows in hospitals, thereby facilitating decision making and achieving efficiency in hospitals. However, implementing a system in its course also requires evaluation, and the assessment of the implementation of the HIS is critical to improving the system's performance by identifying its shortcomings and advantages. Judging from the benefits of the HIS, which is essential in supporting health services and improving the quality, effectiveness, and efficiency of services, a continuous evaluation of system implementation is needed. The evaluation and improving the quality of health services are generally influenced, especially by human resources (Fadilla, 2021).

The "X" Hospital is one of the hospitals that has implemented the e-Hospital system since 2012. In its development, the implementation had also been carried out in various outpatient polyclinic

services. However, within the performance, there were still many challenges, especially from the perspective of the service providers. If left unevaluated, these obstacles could negatively impact health services, such as long patient waiting times and declining hospital image. Therefore, it was necessary to re-evaluate which barriers may be felt from the perspective of service providers, one of which was by analyzing using the Technology Acceptance Model (TAM). TAM is one of the models that can be used to analyze the factors that influence the information system implementation (Al-Adwan, 2015). This model was first introduced by Fred Davis in 1986 and mentioned three factors that affect a system: (1) Perceived Usefulness (PU), (2) Perceived Ease of Use (PEOU), and (3) Behavioural Intention (BEI). In addition, based on the development of the research, two other factors also influence the model (Figure 1), including (1) Perceived Threat (PH) and (2) Social Influence (SI) (Christasani, 2021). Based on the problem's background and the lack of research on TAM analysis of HIS, the researchers were interested in described barriers to implementing the e-Hospital system on polyclinic services based on TAM-modified analysis.

SUBJECTS AND METHOD

1. Study Design

This research was conducted at Dermatology & Venereology Polyclinic in Bandung "X" Hospital in February – June 2022. This research was qualitative descriptive, in the form of case studies that describe clearly and detail the behaviours that had been observed by researchers to draw conclusions.

2. Inclusion Criteria

The participants of this study were all the polyclinic staff, including 4 specialists doc-

tors, 3 nurses, and 2 administrative officers of the DV Polyclinic, that was carried out by Non Random Purposive Sampling. The participants were determined based on the roles, expertise, and professions related to the implementation of the e-Hospital system at the research site. All participants had previously been given information about the research and research objectives.

3. Exclusion Criteria

This study has 5 variables that describe the barriers to the implementation of the e-Hospital system consisting of components PU (Perceived Usefulness), PEOU (Perceived Ease of Use), BEI (Behavioural Intention), PTH (Perceived Threat), and SI (Social Influence).

4. Operational Definition of Research Variables

The operational definition of each variable is as follows:

PU (Perceived Usefulness): A level where a person believes that using a particular technological system can help improve their work performance.

PEOU (Perceived Ease of Use): A degree to which a person believes that using a particular technological system can minimize the physical and mental effort required to perform a job.

BEI (Behavioural Intention): A measure of the strength of a person's interest/interest in carrying out a particular habit.

PTH (Perceived Threat): A level where a person believes that using a particular technology can adversely affect the flow of the current system.

SI (Social Influence): A condition where social factors (peer influence and the influence of superiors/management) and their reflections can impact the acceptance of a particular technology.

5. Study Instrument

The data were obtained through direct observation and indirect interviews by filling out electronic questionnaires, created based on the development of corresponding literature. The questionnaires were made in the form of a google form link containing important question points and were described in the form of choices and briefly filled prepared based on the theoretical framework and previous research that had been adjusted to the research objectives. If needed, a short interview would be conducted via zoom media based on the points that need to be completed from the results of the analysis of temporary data.

6. Data Analysis

Identification of data that was suspected of having an essential role concerning the objectives of the study based on the similarity of information of each participant and direct observation. In this case, the entire data were the results of the questionnaire and direct observation.

Categorize the results based on predetermined problem factors and adjusted to theoretical concepts and previous research based on the modified TAM model. Reducing the data results in each category and making mapping patterns in the form of main points that formed the basis for analyzing the obstacles that were readjusted to the formulation of research problems and objectives. Concluding, the results of data analysis mapped with related patterns and presented in the results section became the basis for the discussion of research findings.

7. Research Ethics

Informed consent was given to each participant, approved before the study, and listed in the electronic questionnaire sheet.

RESULTS

Below are the results of the description of the obstacles in the implementation of the e-Hospital system, especially EMR services

1. Sample Characteristics

Table 1. Sample characteristics

Charateristics	Category	Frequency	Percentage
Gender	Male	3	33.3%
	Female	6	66.7%
Age	≤ 50 years old	7	77.8%
	>50 years old	2	22.2%
Education	Vocational High School	1	11.1%
	Diploma	3	33.3%
	Bachelor	1	11.1%
	Specialist	2	22.2%
Employment Status	Bachelor of the 2 nd degree	2	22.2%
	Permanent employee	7	77.8%
Working Periods	Partner employee	2	22.2%
	<15 years	5	55.6%
	15-30 years	3	33.3%
	>30 years	1	11.1%

at Hospital "X" Dermatology & Venereology (DV) Polyclinic from the perspective of service providers.

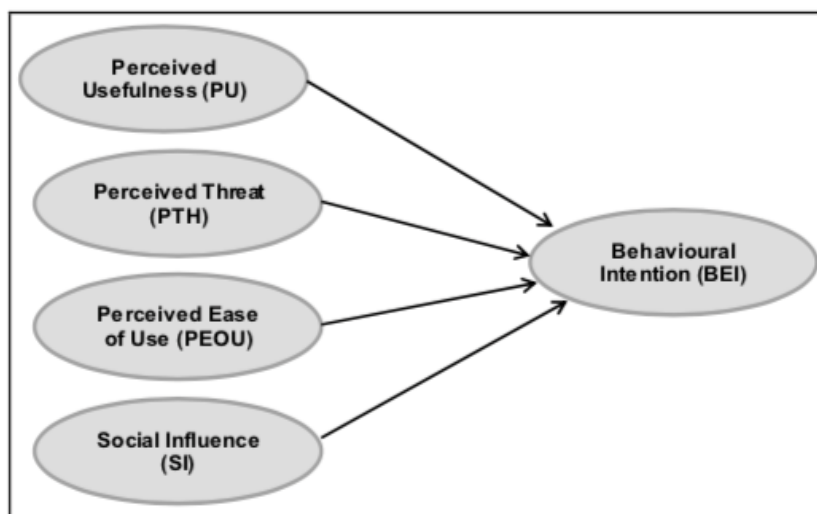


Figure 1. Modified-TAM Analysis

The characteristic of participants (9 staff of the DV polyclinic) are described in the following table (Table 1). On the table depicted gender, age, last education, employment status, and working periods. Based on the characteristics of the participants, we can assume that the majority of participants are female (66.7%), with the

majority aged ≤50 years (77.8%), and most are diploma graduates (33.3%). Meanwhile, judging from the employment status, most participants are permanent employees (77.8%) with a service period of ≤15 years (55.6%). Figure 1 show the variables included in this study.

2. Implementing the e-Hospital System Based on Modified-TAM Model Components

Table 2. The Questionnaires

Questions	Answers
PU, PEOU, BEI	
Do you think the use of e-Hospital system can improve the effectiveness and performance of your current work?	Yes/No
Do you think that the use of the e-Hospital system can improve the quality of health services for patients?	Yes/No
Do you think that the use of the e-Hospital system can help increase the hospital credibility in society?	Yes/No
Do you think that the e-Hospital system services can replace the whole conventional medical services?	Yes/No
If not, what is the underlying reason ?	Description
Do you think the current e-Hospital system is considered to simplify and speed up the flow of polyclinic health services?	Yes/No
Do you think that the e-Hospital system services are currently considered easy to use?	Yes/No
If there is a regular e-Hospital system training and development program organized by the hospital, are you willing to participate?	Yes/No
Do you feel that it will be easier to master the use of the current e-Hospital system if given periodic training?	Yes/No
PTH	
Do you feel that there will be many obstacles found in the implementation of the e-Hospital system in the future and it will be difficult to adapt to the new system?	Yes/No
If so, what obstacles might be found?	Description
In your opinion, is your current hospital (polyclinic) ready to run the e-Hospital system for daily services?	Yes/No
If not, what is the underlying reason ?	Description
SI	
Are the hospital IT staffs easy to contact and able to work well together in handling the constraints of daily e-Hospital system services?	Yes/No
Have you found any obstacles in terms of <i>teamwork</i> between staffs during the implementation of the e-Hospital system?	Yes/No
If yes, write down the problems... (example: communication problems, etc.)	Description
Have you found any obstacles in terms of integration (<i>teamwork</i>) with other professions* during the service of the polyclinic e-Hospital system?	Yes/No
If yes, write down the problems... (example: communication problems, etc.)	Description
Others	
Suggestions and solutions related to the interest and motivation for the use of e-Hospital system...	Description
Notes :	

*adapted to each respondent's profession (doctor, nurse, administration officer)

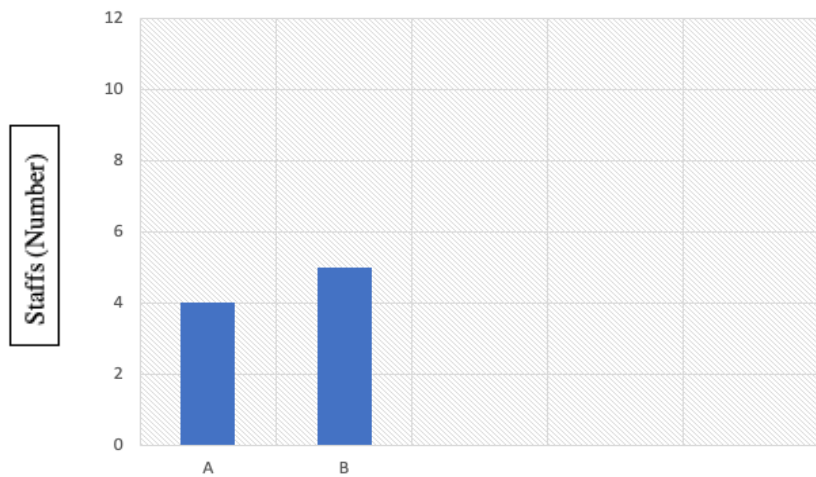


Figure 2. The Number of Participants With Perspective of Finding Obstacles in e-Hospital Implementation Based on Modified-TAM Model

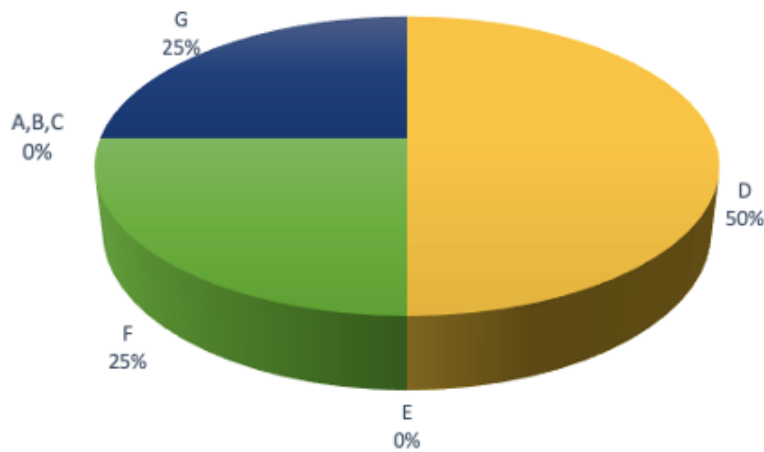


Figure 3. The Percentage of PU, PEOU, BEI Components in e-Hospital Implementation Obstacles Based on Service Providers

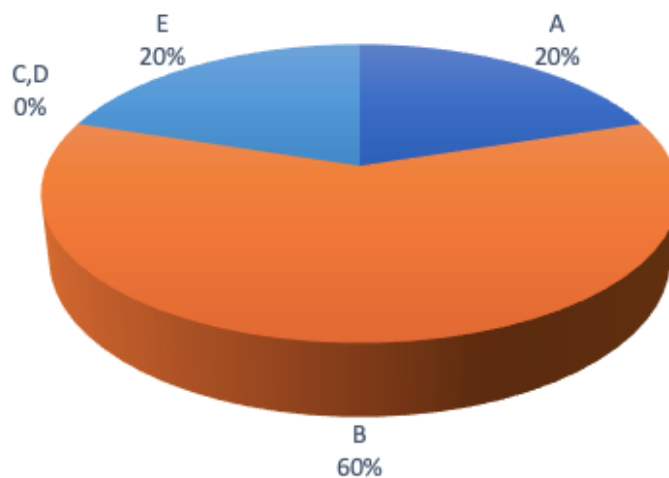


Figure 4. The Percentage of PTH & SI Components in e-Hospital Implementation Obstacles Based on Service Providers

Based on the analysis of the questionnaire (Table 2) results, the following diagram illustrates the number of participants who found obstacles in implementing the e-Hospital system based on Modified-TAM model components (Figure 2). Later on, the questionnaire results carried out an analysis of the factors based on Modified-TAM Model components. The following diagram illustrates the factors of PU, PEOU, and BEI components that were most often encountered by all service providers in the implementation of the e-Hospital system (Figure 3). The following diagram illustrates the factors of PTH & SI components that were most often encountered by all service providers in implementing of the e-Hospital system (Figure 4).

DISCUSSION

This section discusses an overview of the e-Hospital system in the "X" Hospital and the analysis of the system's implementation acceptance. The "X" Hospital since 2012 had applied a technology-based HIS (e-Hospital) with a web-based Operating System (OS) with an HD server capacity of 2 TB. The process of designing the e-Hospital system, including the software, began with a blueprint / IT master plan application, but within the development, the hospital cooperated with another vendor. However, the preparation of the system was still adjusted to the National Standard for Hospital Accreditation. Since 2012, the system had undergone four times changes. The implementation of the e-Hospital system at DV Polyclinic is still limited to e-medical record services. Furthermore, the performance of the e-hospital system in this study was specifically about e-medical records implementation.

The analysis of the e-Hospital implementation obstacles was assessed based on the modified-TAM model with five influential factors: PE, PEOU, BEI, PTH, and SI. Based on the results on the number of participants who found obstacles to the implementation of the e-Hospital system at the polyclinic, it can be seen that the number of participants who found barriers (5 participants) was more remarkable than those who did not (4 participants). This representation showed that the implementation of the e-Hospital system in the polyclinic had not run optimally.

Furthermore, an analysis of the obstacle factors was carried out based on the modified-TAM model analysis. According to Figure 3 regarding the components analysis of PU, PEOU, and BEI, it was shown that the components found to be an obstacle were "the perception of providers that the e-Hospital system could not replace conventional services" (50%), "the perception that the e-Hospital system was not easy to use" (25%), and "the absence of desire to participate in system training" (25%). The underlying reasons were the belief that the hospital data, especially patient medical records, should still be kept in writing and must be more detailed to describe the patient's condition than e-Hospital based. In addition, some participants said that if the e-hospital system replaced the conventional system thoroughly, the hospital data could be lost if there was a system malfunction. Based on Figure 4 regarding the components of PTH and SI, it can be noticed that influential components were "the perception that the "X" hospital was not ready to run the e-Hospital system" (60%), followed by "the perception that the implementation of e-Hospital will cause many obstacles in the future" (20%), and "there were obstacles in terms of teamwork between staffs of dif-

ferent professions" (20%). This perception was based on the frequent encounters with supporting infrastructure problems, such as poor internet connection and e-Hospital system software disruptions during daily services. In addition, there was also an opinion that the training of the e-hospital system was still not carried out regularly, so there was no equal distribution of information and benefits of the scenario among all staff. As for the representation of suggestions and solutions from all participants regarding the implementation of the e-Hospital system based on the components on the questionnaire, it was expected that the hospital to create a more accessible and more practical e-Hospital system for hospital services and improve the implementation of e-Hospital in all aspects of hospital services.

Based on these findings, the hospital management needed to re-evaluate which constraint factors cause these perspectives, which could be an obstacle in implementing the e-Hospital system. In addition, it was necessary to re-emphasize the e-Hospital system and its benefits through periodically training, affirm the vision and mission related to the system, and do periodic feedback evaluations from service providers so that the hospital management could comprehend which obstacles were found and were able to make changes and increase the motivation of service providers to use the e-Hospital system. We hope that the data conclusions in this study can be the basis for developing the latest modification theory related to implementing TAM-based e-Hospital, for example, with hospital management modifications. These considerations will undoubtedly have an impact on improving the performance of the hospital in the public eye.

AUTHOR CONTRIBUTION

Devina Gracia Pratama is the leading researcher who determined the research topic, included all related variables, and collected data at the research site. I.Wiseto P.Agung and Purwadhi conducted a further theoretical analysis based on the latest theories and previous relevant studies and provided input in compiling the research.

CONFLICT OF INTEREST

There are no conflicts of interest

FUNDING AND SPONSORSHIP

None

ACKNOWLEDGEMENT

We thank all parties contributed in this research, especially the research team and the DV Polyclinic staff who are very supportive and open in helping the research process so that it can be completed properly.

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