Users' Perception of the Hospital Information System in a Maternity Hospital in Lampung, Indonesia

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Abstract

Hospital information systems (HIS) have been applied on a massive scale; however, user evaluation of their effectiveness, efficiency, and service quality improvements remain rare. This study aimed to describe the utility of information systems from the users' point of view by using the Technology Acceptance Model (TAM) in a maternity hospital in Lampung, Indonesia. The study provided an overview of the features of the information system and the workflow of the user through this information system. Screenshots were taken by using Camtasia Studio 2.0 Trial Version application software for one day (two shifts) in the outpatient service. The HIS generally supported the workflow, but not all application modules were fully applied. The obstacles appear to be at the registration unit/outpatient registration and queue dashboard, cashier unit, pharmacy unit, medicine storage/room, and poly unit/checking room. A TAM framework, which included perceived ease of use and perceived usefulness of the information system, revealed that the currently implemented HIS was not perceived as optimal. However, users are still optimistic and aware of the usefulness of the information system in supporting their jobs. Thus, leaders have committed to initiate the potential development of this information system in the inpatient polyclinic.

Keywords: Health informatics, hospital information systems, users' perception

Introduction

Generally, the development of information system in the health care service is focused on designing and applying information technology that is suitable for the health care sector.^{1,2} Therefore, the assumption is that information system implementation only looks at the way the system is designed and purchased in its developmental stage.³ It is very rare to pay attention to the level of acceptance by health care workers as end users during the development of an information system. Consequently, there are many cases of information system implementation failure because of users' resistance to use such information technology. Harmony between technology and healthcare workers' systems will bring about user acceptance of or resistance to the technology and determine whether they use it and integrate it into their

routines.

In several studies, there are many exceptions, such as the framework for evaluating an information system in the health care service. However, in explaining and knowing the general reaction of the user toward the information system, the Technology Acceptance Model (TAM) is one commonly used model, comprising as much as 10% of all models evaluating information systems.⁴ A percentage of 30%-40% shows significant result toward the acceptance of user's technology, although it is still simple.⁵ In health care services, the TAM framework is considered to be too economical. It is because of the actualization of this simple concept has not been able to be developed yet in a more detailed and in-depth way as the thought framework in exploring user's acceptance as one of the important aspects in the

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information system implementation business in health care service.^{6,7}

A maternity hospital in Lampung Province is currently applying the Computerized Provider Order Entry system as the clinical information system for supporting health care services in the outpatient polyclinic. In simple terms, the provider, in this case, the specialist physician, orders a prescription, a physician's assistant (nurse in the examination room/polyclinic) inputs the prescription into the system, the prescription is transmitted to other units, and the patient obtains the prescribed medication from the pharmacy unit. The outpatient information system consists of four units, that are registration, the practice room, the pharmacy and pharmacy storage, and the cashier. There are 20 end users, each of whom has direct access to or can deal with one or more units, for example, one end user can deal with the registration unit and the cashier unit. The outpatient service can be run in two shifts, shift I (07:00 a.m. - 02:30 p.m.) and shift II (02:30 p.m. - 09:00 p.m.). Therefore, the aim of this study was to describe information system utilization from the perspective of users by applying the TAM framework in the early phase of the implementation of a clinical information system at a maternity hospital in Lampung.

Method

A system analysis with action research was conducted to evaluate to what extent the information system was used, including which features were used and which were not used, in the line of duty. Furthermore, information system utilization perception of users was also measured by using the TAM framework, which focused on perceived ease of use and perceived usefulness. The semi-structured questionnaire of the TAM model framework was used to evaluate these two aspects. Perceived ease of use is determined by examining the degree to which someone believes that a technology can be used easily. Perceived usefulness measures the degree to which someone feels that a technology benefits their productivity. Furthermore, to assess problems that occur while using the features of the information system modules, whether it be in commonly used or rarely used modules, a screenshot should be taken by using the software application Camtasia Studio 2.0 Trial Version 30 days for one day (two shifts) of the outpatient service.

These features in the information system are emphasized by four criteria; that are the patient's sociodemographic data, including the patient's full name (given and family names), the patient's telephone number, the patient's full address, the patient's age, the patient's emergency contact or guardian, and the consent form; the patient's medical records; validation of the patient's medical records by medical personnel or other personnel involved in the patient's treatment, so that the informa-

Figure 1. The Evaluation Framework of a Maternity Hospital in Lampung

tion can be accounted for legally; and admission procedures (administrative), including the date, time, filling in the fixated line also applying how to correcting the correct.⁸ Thus, from the workflow or the line of work, the types and frequencies of existing problems can be identified. This includes the temporal aspect, use of application features, inputted data visit, and outputted data visit (Figure 1).

This study collected and analyzed data using the framework to search for further structure of module features. Observations were conducted in stages to obtain an overview of the users' options when they worked with the hospital information system (HIS) module features. For example, when the user chooses/clicks on the "Registration" menu, three options of module features will appear, consisting of "Outpatient," "Inpatient," and "Emergency" modules. Each of these chosen/clicked menus would prompt the user to select one of several 'module' features in this HIS. The sequence of the table is defined by which one of the menus and modules appeared first as the prompt click/choose.

This study continued to present additional modules according to each user's privileges. This indicated that only certain units could have access to these modules. For example, the cashier unit can only see the "Receipts Printing", "Outpatient Cashier", "Prescription Printing", "Inpatient Cashier," and "Income Report" module features on their HIS screen and do not have access to the inpatient nursing station unit. Users at the latter could only see nursing examination modules for work. The sequence numbers of these unit and privilege modules were defined by impromptu options that were chosen/clicked.

A letter of permission to conduct research at an maternity hospital in Lampung was from the Director of the Hospital. The data were confidential, and only the study investigators could access the data. This study also passed Ethics Review from the Concentration of Health Management and Information Systems, School of Public

Health Sciences, Faculty of Medicine, Public Health and Nursing at Gadjah Mada University No. KE/FK/449/EC.

Results

Based on previous business applications, information system features on an maternity hospital in Lampung–Indonesia were composed of 12 types of modules, which are installed to eight types of user groups. The menu types are listed in Figure 2. Based on the workflow

model, access rights are allocated to each user in the working units. Information system application model utilization in the outpatient clinic by the end user includes the outpatient registration unit, poly/practice room, cashier, and pharmacy/medicine storage. Therefore, the workflow can be described as follows (Figure 2).

The workflow starts in the registration unit, when the patient arrives and shows his or her medical treatment card. It can be retrieved through the search feature by

Figure 2. The Original Workflow of a Maternity Hospital in Lampung

Table 1. Findings of the Hospital Information System Problem in a Maternity Hospital

Outpatient Registration and Queue Dashboard Unit	Cashier Unit	Pharmacy/medicine Storage Unit	Poly/examination Room Unit
<ul style="list-style-type: none"> On the menu where data are entered on patient demographics, specifically addresses, it would be nice if there was an address made up of the name of the village first, so that the subdistrict and district/city would be filled in automatically. Because a patient who made a registration generally memorizes the name of the village residence, it is very confusing especially the presence of area expansion. It would be worthwhile if the data entered into the system could all be printed directly, so there would no longer be a need to rewrite said data on the patient's medical treatment card. There are inadequate officers who habitually use computers and no more staff information technology. Only two officers with nursing background input patients' data that know how the system works. So due to lack of staff, the cashiers themselves entry the registration. The registration officer inputs the data after the patients go home. The screen displayed in the dashboard (screen for the waiting-list patients) had a feature of small letters due to the small size of monitor. Then the transitional is too fast showing 10 number patients waiting room. It would be good if there was a sign to show the number of patients that were being examined in the examination room, so that the next patient in the waiting room knows they will be examined next. A mistake when patients to the dashboard is the complaint from patients at which patients who make registration via telephone, often come late, so that the queue number is overlapped. There has been no standard procedure for an appropriate business process, whether the patient is immediately the next patient or he/she has to wait until the next three patients and then turn. Search on the name of patients who forget to carry the medical treatment card is taken because the users often do not know, as a result, patients can have two number of the same patient. 	<ul style="list-style-type: none"> The main problem is the slow rate of data transfer from a computer in the examination room to one in the cashier room, so that the cashier must calculate the price of medication manually. Often receiving that recipe wrong and late, so that it should be confirmed to the examination room. When calculating the cost of each therapy and medication, the cashier cashier must round up each unit cost to thousands, so the calculation must still be done manually. The cashier improvised by replacing that recipe entered from the examination room match them to medicine inventory. It would be better if there are information systems applying CDS as an alert of medicine prescription. 	<ul style="list-style-type: none"> Pharmacy unit has the same obstacles with the cashier unit, including the slowness of medicine data transmission prescribed from examination room. As a result, it still uses manual prescription from the cashier in the provision of the medicines. Loading about drug inventory list in forms of available types of medicines and their price, the implementation now for users is limited to listing new names of medicines and their price. 	<ul style="list-style-type: none"> Nurses often input data instead of doctors, resulting in errors in the prescription. There is often human error, such as when the nurse accidentally makes the wrong click while inputting data; as a result, errors will appear on the patient's dashboard.

entering keywords (patient's number, patient's name, husband's name, etc.). Some problems regarding the application features in each unit in the outpatient polyclinic in a maternity hospital in Lampung can be described as follows (Table 1).

Discussion

Application model utilization was not as perfect as the one that has been composed to be applied in each unit. The application model provided to every outpatient service unit was not optimally used. One application model was not used once by the users, and the reason given was ignorance of the application model as an information system feature. In general that module had not yet once used, good on a cashier until in units of pharmacies/warehouse medicine, was the report. Therefore, no information was produced from the data input into infor-

mation system that were running. In addition, to report module, print module can do that. Moreover, in each unit, a printer was provided, whose function it was to print data by using the module. The printers' seals had not yet been broken because they had never been used. On the other hand, suppose in registration unit, in hope that the officer had to put in the data once in the computer, and the data could be printed as health care card form if the patient was registering.

The unwillingness of unknowing users is strongly affected by the lack of competent staff, particularly the absence of any more it staff in addition to the lack of mentoring from a vendor at the time of initial implementation.⁹ The educational background of the officers was also a significant influence on habits regarding the use of computer technology. A previous study reported that among the officers with college-level education were

officers who only graduated highschool.⁵

In addition, the HIS met many obstacles to implementation.¹⁰⁻¹² All maternity hospital in Lampung units agreed that data transmission from one unit to the other was slow, so that the other unit, which is obstructed manually, finished the job. Suppose there was only a data transmission receipt and therapy that must be paid for by the patient from space check into cash. As a result, the cashier should count again manually based on the list price of a who taped to the counter by using a calculator. Not to mention, when prescription drugs prescribed for space check were unavailable in the hospital's drug inventory. Finally, the cashier asked the specialist doctor to replace the type of medicines that were prescribed. This kind of misconduct might be crucial, because the principle function of an information system is not to hinder but to support the work of health care services.¹³

A unit cashier is an indispensable unit in the outpatient service,^{14,15} including in an maternity hospital in Lampung. This is because the cashier has multiple function, such as to receive the invoice from the examination room, to review the contents of prescription drugs given and determine if there is drug inventory/pharmacies, to record the price, and to send a prescription to the pharmacy.¹⁶ At certain times, when there are no officers in the registration unit, the officers must perform double duty (so the end user has double rights), as a cash unit and as a registration unit. For this, the unit cashier is required to know equation the effects of the types of a drug that equal and that is in inventory pharmaceutical warehouses, in addition, to take care of registration patients. As a result of the risk of error prescription very vulnerable to, remember function cashier last as the decision makers that recipe sometimes not doing confirmation at the doctor a specialist in the unit of space check concerned with the drug prescribed in patients.

The provision of prescriptions by unit pharmacies, it can be said less regard again that recipe written or displayed system of the unit of space check and units cash. In addition to the slowness of the last data transmission system, especially the unit pharmacies as a unit end in the service outpatient waiting for transmission of the unit of practices and cashier units, in which a possible change in the prescription in cashier unit, finally has to wait longer. As a result, in the provision of prescription, pharmacies officers see enough prescription manual given by the cashier unit, and when the prescribed last until in the hands of patients, display data transmission the recipe from the new system appears. Thus, it only became a kind of comparison for a prescription manual given. In other words, the information system in the unit was actually ineffectual.

An error actually originally occurred in the unit

poly/examination room, in which the prescription given by specialist physicians was not supported by drug inventory in pharmaceutical warehouses. Often, an assistant to the specialist physician (physicians commonly act as nurses) makes mistakes in inputting the therapy and medicines prescribed. Human error due to the lack of interface features that provide conformity application by medicine inventory is accused of being the root of existing problems in the polyclinic outpatient,^{17,18} including in this study setting. Hence, the application of conformity features in support of a work niche is important for flagging errors.^{19,20}

The principal problem was that there were no interface features that cross-reference the prescribed medicine with the medicine inventory available in the outpatient polyclinic in this maternity hospital in Lampung. This problem occurred in the examination room unit with the medicine storage unit. The main problem was the slow transition of prescribing, which was troublesome for the existing workflows.

Conclusion

The TAM framework revealed that the user's perception of the real benefit of the current information system cannot be felt optimally (perceived usefulness). Yet, the user is still optimistic and aware of the benefits of the information system in supporting a faster and more efficient workflow (perceived of ease of use). The firmness of the higher management commitment, so that the user will implement the current information system in outpatient polyclinic and started to develop the potential initiative of the information system development in the outpatient poly.

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