




Unified Theory of Acceptance and Usage of Technology (UTAUT) Model to Predict Health Information System Adoption

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Abstract


In order to improve the quality and performance of health services, health information systems are one of the most important technologies in health management. This study aims to determine the factors that influence the adoption of nutrition information system by nutrition officers of primary health care by using Unified Theory of Acceptance and Usage of Technology (UTAUT) Model. This research is quantitative research with survey approach, located in 39 primary health care of Banyumas district. Sampling technique using purposive sampling. Respondents are 50 people. The research instrument used questionnaire. Based on regression test results known that factors related to use behaviour is behavioral intention. While the facilitating condition is not related to use behavior. Factors associated with behavioral intention is the performance expectancy, effort expectancy and social influence.

Introduction

Quality improvement and cost reduction are the two main challenges in health services. In order to improve efficiency and effectiveness, the application of information technology and computers in health services developed significantly (Blumenthal and Glaser, 2007; Chaudhry et al., 2006; Jha et al. 2009). Some studies have found that if health services do not adopt information technology for additional support, management will become ineffective, and lose credibility by patients (Aggelidis and Chatzoglou, 2009). Therefore, information technology needs to be applied to health services.

Information and communication

technology (ICT) is all digital technology that supports the retrieval, storage, processing and exchange of electronic information for health promotion, preventing disease, diagnosing diseases, managing chronic diseases, and so on (Bashshur et al., 2009; Gagnon et al. 2012). In the health sector, ICT refers to a series of projects or services that enable telehealth, interdisciplinary clinical support, and knowledge transfer (Gagnon et al, 2013). The use of ICTs has the potential to promote health services centered on lower-cost patients, improve the quality of services and share information, educate health professionals and patients, encourage new forms of relationships between patients and health care providers,

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reduce travel time, etc. (Bashshur et al, 2009; While and Dewsbury, 2011). The use of ICTs in the health care system has promoted the quality of health and access to health services which has led to significant reductions in errors and medical costs. Internet-based health applications include electronic health records, electronic prescriptions, e-health, to improve the efficiency of health services and reduce errors in the process of providing care.

The application of information technology in health systems often faces problems, complexity and health information systems adopted by healthcare providers slowly (Lluch, 2011). Health institutions in adopting the application and technology of health information systems focus more on the sophistication of functional features and techniques than the needs and features of end users (Jha et al., 2006). As a result, the level of use of health information technology (IT) is low, resistance, abandonment of the use of health information technology (IT), and the demand for alternative methods. Therefore, to get a substantial effect, reactions from end users must be considered thoroughly (Holden and Karsh, 2010).

Although the benefits of information technology for health services already known, but still needed a new adaptation for health workers. Implementation of information technology in health care systems has been proven difficult (Boonstra and Broekhuis, 2010; Davidson and Heslinga 2006). The application of information technology in health systems often faces problems, complexity and health information systems adopted by healthcare providers slowly (Lluch, 2011). Health institutions in adopting the application and technology of health information systems focus more on the sophistication of functional features and techniques than the needs and features for end users (Jha et al., 2006). As a result, the usage level of health information technology (IT) is low, resistance, abandonment of health information technology (IT) usage, and the demand for alternative methods. Therefore, to get a substantial effect, reactions from end users must be considered thoroughly (Holden and Karsh, 2010).

Actually, user acceptance of information

technology plays a key role in adopting and implementing new technologies in the health sector. But it is not sufficient in understanding how and how institutions adopt information technology so that it can cause failure in the implementation of new technology (Kijsanayotin et al., 2009). Measurement of adoption rates is very helpful in the success of the implementation of the system, and the use of information technology adoption theory is very important to predict the reaction of end-users to health information technology (Holden and Karsh, 2010). Theories that discuss the issue of adoption of information technology in the social system that developed in the last decade include: Theory Acceptance Model (TAM), and Unified Theory of Acceptance and Usage of Technology (UTAUT) (Liu et al, 2005).

Unified Theory of Acceptance and Usage of Technology (UTAUT) (Venkatesh et al., 2003) is a model developed by combining various models of human behavior theory, namely the Theory of Reasoned Action / TRA, TAM, Motivational Model / MM, Theory of Planned Behavior / TPB, TAM + TPB, Model of PC Utilization / MPCU, Innovation Diffusion Theory / IDT, and Social Cognitive Theory / SCT. Studies that analyze the goal of end users is to actively use health information technology. The UTAUT model is known to have 20% to 30% explanatory power greater than TAM, the average only shows an explanation power of 40 to 50% about end user behavior intentions to use information technology. UTAUT is the most dominant and comprehensive theory in the literature related to current interest in using technology (Schaupp, Carter, and McBride, 2010). UTAUT can explain up to 70% of the variants of the behavior intention. UTAUT is also proven to be robust when used in cross-language and cultural studies (Oshlyansky, Cairns, and Thimbleby, 2007). The UTAUT model is a useful tool to assess the chance of success introducing new technology and exploring factors that influence user behavior intentions. This is also possible evaluating interventions, which aim to increase the tendency of users to adopt and use new information systems in the context of UTAUT (Chien et al., 2013)

In recent years, a lot of research have

been done in the context of adoption and use of information technology in health services to find out acceptance of information technology users and influential factors, important when information technology is implemented in health practices, because of the rapid implementation of information technology in all sub-systems of health. One example is the information system built by the Indonesian Ministry of Health, Directorate of Nutrition.

In order to implement the vision and mission strategy of the Indonesian Ministry of Health, especially the strategy to improve the surveillance system, monitoring and health information, the Directorate of Nutrition has sought to improve the nutrition surveillance system through the consolidation of website-based nutritional data reporting. NUTRITION INFORMATION SYSTEM is a simple website-based reporting application and SMS gateway. With this reporting, information about under-five malnourished children can be sent and handled quickly. Information from the application is very helpful for decision makers to be able to coordinate with the region, improve the performance of program implementers and as an evaluation and planner of activities (Kemenkes RI, 2013).

Surveillance through this application has been carried out since 2011, but has never been evaluated. Evaluation is needed to detect the emergence of problems that can disrupt the process of service, management and decision making in health facilities. These problems

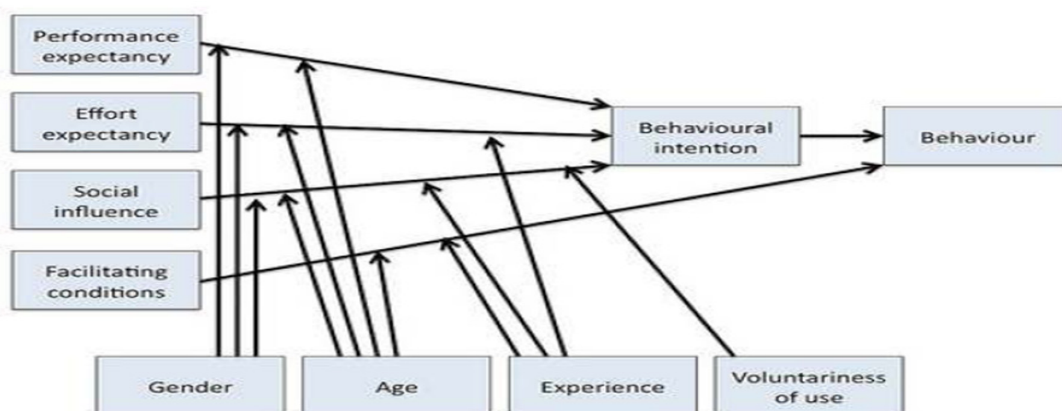
can come from hardware, software, brainware and sociotechnical components. Evaluation is needed to find out whether the information system is suitable for use, needs to be repaired, or updated. This research aims to determine the factors that influence the adoption of nutritional information systems by puskesmas nutrition officers using the Unified Theory of Acceptance and Usage of Technology (UTAUT) model.

Method

This is a quantitative research with a survey approach, located in all (39) puskesmas in the work area of the Banyumas DKK that implements the Nutrition Information System. The sampling technique used in this study purposive sampling. The respondents of this study were 50 people, namely puskesmas officers who used the Nutrition Information System. The research instrument was a questionnaire with a Likert scale (strongly agree, agree, disagree, strongly disagree). All questions were valid ($p < 0.05$) and reliable (Cronbach Alpha > 0.7). Data analysis using linear regression analysis. Figure 1. is a framework for the Unified Theory of Acceptance and Usage of Technology (UTAUT) model.

Result And Discussion

Based on univariate analysis it was found that the majority of respondents' sexes were women (96%); the majority of the respondents' ages ranged from ≤ 30 years (44%); the majority of respondents work 6-10 years (30%); the majority of education respondents graduated



Picture 1. *Unified Theory of Acceptance and Usage of Technology (UTAUT) model.*

Table 1. Factors related to Behavior of Use

| Model 1 | Coefficient | 95% CI | | p value | R | R2 |
|-------------------------------------|-------------|---------|--------|---------|-------|-------|
| (Constant) | 5.514 | -.858 - | 11.887 | .088 | 0,538 | 0,290 |
| Behavioral intentions | .466 | .181 - | .751 | .002 | | |
| Sigizi facility condition | .067 | -.125 - | .258 | .486 | | |
| Respondent Age | -.115 | -.248 - | .018 | .088 | | |
| Working experience on Health Centre | .124 | -.011 - | .259 | .071 | | |
| Model 2 | Coefficient | 95% CI | | p value | R | R2 |
| (Constant) | 2.770 | -2.469 | 8.008 | .293 | 0,486 | 0,236 |
| Behavioral intentions | .452 | .166 | .737 | .003 | | |
| Sigizi facility condition | .084 | -.109 | .277 | .387 | | |

Source : Primary Data

D3 (74%); the majority of respondents were puskesmas nutrition officers (44%); the majority of experiences using the Nutrition Information System range from 1-5 years (42%); the majority use daily Nutrition Information System <2 hours (60%).

The results of the UTAUT Variable Correlation and Regression Analysis are listed in Table 1.

Based on the results of hypothesis testing behavioral intention variable is $p = 0.002$ ($\alpha < 0.05$), it is said to be statistically significant / significant, with a confidence level (CI) of 95%, the difference between 0.181 to 0.751. The correlation analysis results show that there is a relationship between behavioral intention with the use behavior ($R = 0.538$). Sugiyono (2008) states that the R value of 0.40 to 0.599 indicates that there is a fair / moderate relationship, namely between behavioral intention and use behavior.

The results of the analysis of determination obtained the value of R2 (R Square) of 0.236 or (23.6%). This shows that the percentage contribution of the influence of the independent variable behavior intention on the dependent variable use behavior is 23.6%. Or variations in the independent variables used in the model can explain 23.6% of the variation of the dependent variable. While the remaining 76.4% is influenced or explained by other variables.

The straight line equation that we get is:
 $Y = 5,514 + (0,466) X1 + (0,067) X2$

Where:

$Y = use\ behaviour$

$X1 = behavioural\ intention$

$X2 = facilitating\ condition$

A constant of 5.514 states that if behavioral intention and facility conditions, is 0 then the use behavior is 5.514. The regression coefficient of X1 variable is 0.466, meaning that if the independent variable is fixed, then every increase of 1% of behavioral intention will increase the use behavior of 0.466. X2 regression coefficient of 0.067 means that if another independent variable has a fixed value then every 1% increase in facility conditions will increase the use behavior by 0.067.

Referring to the test results, it is known that the factor associated with the use behavior is behavioral intention. Intention will affect a person's attitude. Attitude is a reaction or response that is still closed from someone to a stimulus or object. Attitude is a person's feelings, thoughts and tendencies which are more or less permanent regarding certain aspects of their environment. Attitude is an evaluative bias towards a stimulus or object that has an impact on how someone is dealing with that object. According to Fishbein in Mulyati, et al. (2015) attitude is affective responses or judgments of someone's positivity towards an object. Attitude originates from beliefs about behavior (behavioral beliefs) and one's evaluation of the consequences to be borne (Montano, 2008 in Mulyati, 2015). While the facility condition

factor (facilitating condition) Nutrition Information System is not related to the use behavior, even though the effect of respondent age and work experience have been controlled. However, the test results also show that the age of the respondent and the experience of working in the health center affect the relation of the condition of the nutritional information system facility to the behavior of use.

UTAUT explains behavioral intentions to use or adopt information technology by proposing four predictive factors (Venkatesh et al., 2003): performance expectancy, effort expectancy, social influence, and facilitation conditions. Venkatesh et al., (2003) identified four key moderators believed to influence the relation between major determinants and intentions: gender, age, voluntariness, and experience.

Nematollahi et al., (2017) results showed that there is a direct positive relation between Effort Expectancy and Behavioral Intention ($p = 0.01$) as well as between facility conditions and behavioral intention ($p = 0.04$) and between facility conditions and Use behavior ($p = 0.01$). In addition, there is a direct and

positive relation between behavioral intention and use behavior. To improve the Electronic Medical Records use behavior in hospitals it is recommended that managers and policy makers consider increasing behavioral intentions and information system facility conditions.

Lian and Yen (2014) state that older information system users tend to see high risks in adopting technology and information technology capabilities for older users are generally lower than younger users. In addition, older users tend to have a tradition / habit barrier that is relatively higher than the younger generation because older users generally know manual / conventional services rather than virtual services. Based on these findings, this research concluded that the obstacles experienced by older users causes a decrease in the interest of parents to use information systems. Older information system users want a system that is easy to use and ergonomic. Those who have experienced using health information systems will be more adaptable to various forms of information systems used, whether information systems with modern conditions or simple facilities.

Table 2. Factors related to behavioral intentions

| Model 1 | Coefficient | 95% CI | | p value | R | R ² |
|-------------------------------------|-------------|--------|--------|---------|-------|----------------|
| (Constant) | 7.735 | 2.052 | 13.417 | .009 | 0,7 | 0,491 |
| Expected Performance | Sigizi .381 | .235 | .527 | .000 | | |
| Sigizi user friendliness | .196 | .025 | .367 | .026 | | |
| Social influence | -.119 | -.289 | .051 | .166 | | |
| Sex_recode | -.365 | -2.663 | 1.934 | .751 | | |
| Respondent age | -.017 | -.135 | .100 | .769 | | |
| Working experience on Health Centre | .002 | -.113 | .117 | .972 | | |
| Sigizi using experience | -.101 | -.393 | .191 | .488 | | |
| Model 2 | Coefficient | 95% CI | | p value | R | R ² |
| (Constant) | 7.701 | 2.939 | 12.463 | .002 | 0,696 | 0,484 |
| Expected Performance | Sigizi .374 | .234 | .515 | .000 | | |
| Sigizi user friendliness | .199 | .034 | .364 | .019 | | |
| Social influence | -.110 | -.270 | .050 | .174 | | |
| Respondent age | -.025 | -.064 | .013 | .185 | | |

Source: Primary Data

From the results of the hypothesis test can be seen that the expected performance variable (performance expectancy) is $p = 0,000$ ($\alpha < 0,05$), so it is statistically significant, with a confidence level (CI) of 95%, the difference between 0.235 to 0.527. So based on the effort expectancy variable $p = 0,026$ ($\alpha < 0,05$), it is said to be statistically significant, with a confidence level (CI) of 95%, the difference between 0.25 to 0.367. The results of correlation analysis show that there is a relation between expected performance (performance expectancy), expected convenience (effort expectancy), and social influence with behavioral intention ($R = 0,7$). Sugiyono (2008) states that the R value of 0.60 to 0.799 shows that there is a strong relation between expected performance (performance expectancy), expected convenience (effort expectancy) with social influence and behavioral intention.

Meanwhile, the determination analysis obtained R^2 (R Square) value of 0.491 or (49.1%). This shows that the percentage of the contribution of the expected performance (performance expectancy) independent variable, expected convenience (effort expectancy), and social influence to the behavioral intention dependent variable is 49.1%. Or variations in the independent variables used in the model can explain 49.1% of the variation of the dependent variable. While the remaining 50.9% is influenced or explained by other variables.

The straight line equation we get is:

$$Y = 7,735 + (0,381) X_1 + (0,196) X_2 + (-0,119) X_3$$

Where:

Y = behavioural intention

X_1 = performance expectancy

X_2 = effort expectancy

X_3 = social influence

A constant of 7.735 states that if the expected performance (performance expectancy), expected convenience (effort expectancy), and social influence are 0 then the behavioral intention is 7.735. The regression coefficient of X_1 variable is 0.381 meaning that if the independent variable is fixed, then every 1% increase in expected performance (performance

expectancy) will increase behavioral intention 0.381. Regression X_2 coefficient of 0.196 means that if the other independent variables are fixed, then every 1% increase in expected effort will increase behavioral intention by 0.196. X_3 regression coefficient of -0.119 means that if the other independent variables are fixed then each increase 1% of social influence will decrease behavioral intention by 0.119.

Based on the test results it is known that the factors associated with behavioral intention are the expected performance of nutritional information systems (performance expectancy), the easiness of nutritional information systems (effort expectancy) and social influence. Meanwhile the age factor of the respondent is a confounding variable for effort expectancy and social influence to behavioral intentions.

The results of this research prove that there is a relation between expected performance (performance expectancy), and behavioral intention with the use of information systems. The higher the expected performance (performance expectancy), the higher the behavioral intention of someone to use information systems. This is in accordance with the theory put forward by Venkatesh (2003) that the expected performance (performance expectancy) is closely related to behavioral intentions to use information systems (Hartono, 2008; Handayani, 2007).

Social influence (social influence) which is higher will increase a person's behavioral intention to use information systems, and vice versa. The results of this study are in accordance with the UTAUT theory which explains that social influence factors are closely related to a person's behavioral intentions to use information systems (Hartono, 2008; Sedana and Wijaya, 2010). The results also show that the effort expectancy will increase someone's behavioral intention to use information systems, and vice versa. User friendliness that must exist in health information systems: First, health information technology must be easy to use, by simplifying the task of learning and mastering the system, making it easier to remember how to do system tasks, and increasing flexibility in using. Second, the function of health services technology must be uncomplicated and flexible according to requirement, the system to

respond and search, the system is not difficult to use, information and data can be managed clearly and systematically by health staff (Phichitchaisopa and Naenna, 2013).

The facility conditions does not have a positive effect on usage behavior. This is not in accordance with previous results of the study (Kijisanayotin et al., 2009; Zhou et al., 2010; Rouibah et al., 2009). This implies that infrastructure support, such as a computer system is not the most important. Information technology devices are complementary, which is primarily behavioral intention. Modern or simple nutritional information systems that are available, will still be operated by the user because of the strong behavioral intention. Not enough infrastructure, another important condition that facilitates the adoption of health information systems by health workers is policy (Menachemi et al., 2011). There is infrastructure without its adoption policy that is less than optimal, for example, made a standard operating procedure for implementing health information systems, internal organizations provide technical support to use health information systems, such as information technology staff as technology support assistants for health care workers.

Conclusion

Based on the analysis of the influence of behavioral intention percentage contribution on the use behavior variable of 23.6%; the influence of expected performance variables percentage (performance expectancy), expected convenience (effort expectancy), and social influence (social influence) on the behavioral intention dependent variable is 49.1%. Therefore, the adoption of a health information system needs to consider behavioral intention, performance expectancy, effort expectancy, and social influence.

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