The Evaluation of Nutrition Information System Using Combined Method of Unified Theory of Acceptance and Usage of Technology (UTAUT) and Task Technology Fit (TTF)

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Abstract. After more than five years of SIGIZI application implementation, problems arise from hardware, software, brainware to sociotechnical components. Evaluation is needed to find out if the information system remains reasonable to be used, requires improvement or update. This research aims at evaluating the information system SIGIZI based on combined method of UTAUT and TTF. This is a quantitative research with a survey approach, located at all Public Health Centers that implement SIGIZI in the working areas of Banyumas health office. The object is SIGIZI application and the subject is nutrition officers who use SIGIZI. It uses purposive sampling technique. The data are collected using questionnaire. The analysis results indicate that there is relationship of task characteristic and technology characteristic with task-technology fit; there is performance relationship expected from SIGIZI with user acceptance; task-technology fit, ease level of SIGIZI, social influence and condition of SIGIZI facility are not related to user acceptance; there is relationship of task-technology fit with performance expected from SIGIZI; ease level of SIGIZI is not related to performance expected from SIGIZI; there is relationship of technology characteristic and performance expected from SIGIZI.

1. INTRODUCTION

In the implementation of Vision and Mission strategy of the Ministry of Health of the Republic of Indonesia, particularly a strategy to improve health surveillance, monitoring and information systems, the Directorate of Nutrition Development has sought to improve nutrition surveillance system through stabilization of website based nutrition data reporting. The Nutrition Information System (SIGIZI) is a simple SMS gateway and website based reporting application. With this reporting system, any information of toddler malnutrition can be delivered and handled quickly. Information of the application is highly helpful for decision makers to coordinate with regions, improve the performance of program executors and make it planning and evaluation material for the activities.

Data and information of nutritional status cannot be provided partially. Therefore, the Central Government must always coordinate with provincial/ regency/ municipal governments and health services such as Public Health Centers and Integrated Services Posts. Basically, the Central Government collects data of nutritional status from regional government, and the regional government has previously collected the data of nutritional status of the community in its area.

One of the constraints for current nutrition reporting system is lack of use of information technology, thus immediate natured information cannot be managed well as a result of insufficient network system, either at provincial or regency/municipal level. To solve such weakness, the Directorate of Public Nutrition has developed a website based reporting system in support of reporting of nutrition development activity indicator outcome from regions. This system is a reference for nutrition development activity data and information management officers in data entry of nutrition development activity indicator outcome of each region quickly, accurately and continuously. By applying this website based reporting system, the progress of nutrition development activity outcome can be found out immediately and continuously, which will be utilized in decision making, policy formulation, follow-up response and planning material {6}.
With regard to the change in policy of RPJMN 2014-2019 on the indicators of nutrition development, the Nutrition Information System (SIGIZI) adapts to new indicators or variables in which the data input and its report unavoidably change from previous SIGIZI. This change may cause the data unavailable. According to WHO {18}, the standard components that influence the performance of health information system are health information system resource, indicator, data source, data management, information product, dissemination and data usage.

Surveillance through the application has been implemented since 2011, however, no evaluation has been made. Evaluation is needed to detect any problems arising which may disrupt services, management and WHO {18} decision making processes at health facilities of first level. Such problems may arise from hardware, software, brainware and sociotechnical components. Evaluation is needed to find out if the information system has been used appropriately, requires improvement or update. The evaluation is helpful for finding out how the performance of an implemented information system is and also for further development of the information system. Information of evaluation of SIGIZI performance, whether it has been functioning and generated health information as needed, and any problems disrupting the performance of SIGIZI are unknown. Therefore, evaluating user acceptance is the main factor whether or not this program will be useful in conformance to its purpose, thus evaluation of acceptance of SIGIZI must be conducted.

This research combines two methods, UTAUT and TTF, in applying Nutrition Information System. This combination of both methods is chosen as it is considered able to describe evaluation of system from user perspective, that is user acceptance related to technology and task that must be performed, expected performance, expected ease level, social influence, and facility condition in support of the system implementation. This combined method of UTAUT and TTF can evaluate user acceptance for 70.75% in the implementation of hospital information system {12}.

Setting aside technical aspects in the discussion of evaluation of information system, successful use of information system can be determined by the behavior of such information system users. User’s behavior takes role in determining how successful the application of information system is. However, this is lack of further attention, both in its development and in its evaluation of information system {19}.

2. MATERIALS AND METHOD

This is an explanatory research that uses a survey method approach, which means that in this research activity, the researcher tries to determine the relationship between variables based on the data obtained from the samples determined in a population. The population of this research is nutrition officers of Public Health Centers or health workers of Public Health Centers in Banyumas Regency with task using SIGIZI. There are 39 Public Health Centers in Banyumas Regency that implements the Nutrition Information System. This research uses a purposive sampling technique. Its respondents are 50 people. The instrument of this research is questionnaire. All of the questions are valid (p < 0.05) and reliable (Cronbach Alpha = 0.947). It uses linear regression analysis to analyze the data.

3. RESULTS AND DISCUSSIONS

3.1 Respondent’s Characteristics

Based on the univariate analysis, it is found out that most of the respondents are female (96%); most of the respondents are ≤ 30 years old (44%); most of respondents’ period of services is 6-10 years (30%); most of respondents are of D3 graduate (74%); most of respondents’ position is nutrition officer of Public Health Center (44%); most of respondents have been using SIGIZI for 1-5 years (42%); daily use of SIGIZI is < 2 hours (60%).

3.2 Results and Discussion

| Factor          | Coefficient | 95% CI       | p Value | R     | R²   |
|-----------------|-------------|--------------|---------|-------|------|
| (Constant)      | -6.771      | -16.985 - 3.443 | .189    | 0.702 | 0.492 |

Table 1. Factors Related to Task-Technology Fit
Based on the results of hypothetical test, the task characteristic variable has p value = 0.023 ($\alpha < 0.05$), thus we may state it as statistically significant/real, with confidence level (CI) 95% and difference range from 0.066 to 0.839. The technology characteristic variable has p value = 0.000 ($\alpha < 0.05$), thus we may state it as statistically significant/real, with confidence level (CI) 95% and difference range from 0.333 to 0.799.

According to the correlation analysis results, it is found that there is relationship of task characteristic and technology characteristic with task-technology fit ($R= 0.702$). Sugiyono {16} states that R value of 0.60 to 0.799 indicates existence of strong relationship, that is between task characteristic and technology characteristic with task-technology fit.

The determination analysis results in $R^2$ (R Square) value of 0.492 or (49.2%). This indicates that the percentage of contribution of influence of independent variables (task-technology fit characteristic) on the dependent variable (task-technology fit) is 49.2%. In other words, the independent variable variation used in the model is capable of explaining 49.2% of the dependent variable variation. Meanwhile, the remaining 50.8% is influenced or explained by other variables.

This results in the following straight line equation:

\[ Y = -6.771 + 0.452 X_1 + 0.566X_2 \]

Where:

- $Y$ = task-technology fit
- $X_1$ = task characteristic
- $X_2$ = technology characteristic

The constant of -6.771 states that if the value of task characteristic and technology characteristic is 0, the task-technology fit is -6.771.

The regression coefficient of variable $X_1$ is 0.452, which means that if the other independent variables are fixed, 1% increment of task characteristic will increase the task-technology fit for 0.452.

The regression coefficient of $X_2$ is 0.566, which means that if the other independent variables are fixed, 1% increment of technology characteristic will increase the task-technology fit for 0.566.

Completing various tasks requires support from various functions/features of the information system application. Task characteristic is attributed to the nature and type of task requiring completion with information technology assistance.

The results of research by Osang and Bukie {10} indicate a significant relationship between task-technology fit and organization performance, satisfaction and user performance as well as utilization. According to the research by Fuller and Dennis {5}, designing an information system requires a better understanding of how to adapt technology and working structure.

Technology characteristic is attributed to the nature and type of computer system (hardware, software, data, and networking) in order to support task implementation for improved performance of the information system users. Significant information technology infrastructure is required by health services, including system interoperability, control security, and system compatibility. Both information quality and information technology service quality dimension have positive and significant influence on user satisfaction dimension in human aspect {4}.

Ammenwerth et al., {1} state that IT adoption in health services environment depends on the fitness of individual user attributes (for example computer anxiety, motivation), technology attributes (for example usability, functionality, performance), and task attributes (for example organization, task complexity).

The information technology system which will soon be implemented needs to be adapted to the processes in health organization to allow evolution and adaptation. The important factors to assess the preparedness include external environment, organization leadership, structure and culture,
standardization of services, management, access to information, composition of information technology, and infrastructure [15].

Table 2. Factors Related to User Acceptance

| Factor                        | Coefficient | 95% CI     | p Value | R   | R²   |
|-------------------------------|-------------|------------|---------|-----|------|
| (Constant)                    | 8.384       | 4.822 - 11.947 | .000    | 0.39 | 0.349 |
| Task-technology fit           | .037        | -.065 - .138 | .468    |      |      |
| Expected performance of sigizi| .145        | .022 - .267  | .022    |      |      |
| Ease level of sigizi          | .002        | -.117 - .120 | .977    |      |      |
| Social influence              | .109        | -.003 - .220 | .055    |      |      |
| Condition of sigizi facility  | .007        | -.114 - .127 | .910    |      |      |

Based on the results of hypothetical test, the expected SIGIZI performance variable has p value = 0.022 (α< 0.05), thus we may state it as statistically significant/real, with confidence level (CI) 95% and difference range from 0.022 to 0.267. Based on the test results, it is found that there is relationship of expected performance of nutrition information system with its user acceptance.

From the results of multiple correlation analysis, it is found that there is relationship of expected performance of SIGIZI with user acceptance (R= 0.59). Sugiyono [16] states that the R value of 0.40 to 0.599 indicates an existing sufficient/moderate relationship between the expected performance of nutrition information system and the user acceptance.

Based on determination analysis, the R² (R Square) value is 0.349 or (34.9%). This indicates that the percentage of influence contribution of independent variable (Task-technology fit; Sigizi expected performance; Sigizi ease level; Social influence; and Condition of sigizi facility) on the dependent variable (User Acceptance) is 34.9%. In other words, the independent variable variation used in the model is capable of explaining 34.9% of the dependent variable variation. Meanwhile, the remaining 60.8% is influenced or explained by other variables.

Meanwhile, the test results indicate that the task-technology fit (p=0.468); ease level of nutrition information system (p=0.977); social influence (p=0.055) and nutrition information system facility condition (p=0.910) are not related to user acceptance.

This results in the following straight line equation:

\[ Y = 8.384 + 0.037 \times X1 + 0.145 \times X2 + 0.002 \times X3 + 0.109 \times X4 + 0.007 \times X5 \]

Where:

- Y = user acceptance
- X1 = task-technology fit
- X2 = SIGIZI expected performance
- X3 = ease level
- X4 = social influence
- X5 = facility condition

The constant of 8.384 states that if the value of task-technology fit; expected SIGIZI performance; ease level; social influence; and facility condition is 0, the user acceptance is 8.384.

The regression coefficient of variable X1 is 0.037, which means that if the other independent variables are fixed, 1% increment of task-technology fit will increase the user acceptance for 0.037.

The regression coefficient of X2 is 0.145, which means that if the other independent variables are fixed, 1% increment of SIGIZI expected performance will increase the user acceptance for 0.145.

The regression coefficient of variable X3 is 0.002, which means that if the other independent variables are fixed, 1% increment of ease level will increase the user acceptance for 0.002.

The regression coefficient of X4 is 0.109, which means that if the other independent variables are fixed, 1% increment of social influence will increase the user acceptance for 0.109.

The regression coefficient of X5 is 0.007, which means that if the other independent variables are fixed, 1% increment of facility condition will increase the user acceptance for 0.007.
Based on the test results, it is found that there is relationship of expected performance of nutrition information system with user acceptance. Quick performance of information system can provide quality, valid and accurate information in capturing the data, and reliable database system, smooth data communication, quick and user friendly response in case of problems, mutually supporting hardware and software, good maintenance, improved service efficiency, effectiveness, productivity and quality will make it easy for users to accept the implementation of information system. This is in line with the research of Phichitchaisopa and Naenna [11], which shows factors with significant influence on performance, work expectancy, social influence, facility condition and behavioral intention for acceptance of health information technology.

Sun et al., [17] state that integrated model of acceptance of health information technology (technology acceptance model, the theory of planned behavior or the unified theory of use and acceptance of technology) is determined by five main factors: performance expectancy, work expectancy, social influence, facility condition, and threat assessment.

Meanwhile, the results of research by Lung Hsu [8], structural equation modeling outcome, shows that performance expectancy, work expectancy, social influence, perceived credibility, perceived convenience, and behavioral intention to use mhealth creates positive relationship, while hypothetical test deems financial and facility condition in the application of mhealth as unsupported.

The application of information technology in the organization is expected to improve individual performance as member of the organization and is also expected to improve the organizational performance. In order to influence the organizational performance, the implementation of information system requires strong support from manager, colleagues, regulations and funding.

Meanwhile, the test results show that the task-technology fit; ease level nutrition information system; social influence and nutrition information system facility condition are not related to user acceptance. This is possible since the users have been highly responsible for and aware of task implementation, even if the information system is not fully fit for and accommodating their tasks, encounters difficulty in the use of information system, is not fully supported by the organization, and the facility condition has not been optimally supporting SIGIZI operation, the nutrition officers keep using and learning SIGIZI since it is their main task and function.

| Factor                  | Coefficient | 95% CI      | p Value | R     | R²    |
|-------------------------|-------------|-------------|---------|-------|-------|
| (Constant)              | 10.305      | 3.937 - 16.673 | .002   | 0.598 | 0.357 |
| Task-technology fit     | .455        | .269 - .642 | .000   |       |       |
| Sigizi ease level       | -.020       | -.312 - .273 | .892   |       |       |

Based on the hypothetical test, the value of task-technology fit variable is p 0.000 (α< 0.05), thus we may state it as statistically significant/real, with confidence level (CI) 95% and difference range from 0.269 to 0.642. The ease level of SIGIZI variable has p value of 0.892 (α>0.05), thus we may state it as statistically significant/real, with confidence level (CI) 95% and difference range from -0.312 to 0.273.

According to the results of correlation analysis, it is found that there is relationship of task-technology fit and ease level with expected performance (R= 0.598). Sugiyono [16] states that R value of 0.40 to 0.599 indicates existing sufficient/moderate relationship between task-technology fit, ease level with expected performance.

Based on determination analysis, the R² (R Square) value is 0.357 or (35.7%). This indicates that the percentage of contribution of influence of independent variables (task-technology fit, ease level) on the dependent variable (expected performance) is 35.7%. In other words, the independent variable variation used in the model is capable of explaining 35.7% of the dependent variable variation. Meanwhile, the remaining 64.3% is influenced or explained by other variables.

This results in the following straight line equation:

\[ Y = 10.305 + 0.445 \times X_1 + (-0.020) \times X_2 \]
The constant of 10.305 states that if there is no task-technology fit and the value of ease level is 0, the SIGIZI expected performance is 10.305.

The regression coefficient of variable X1 is 0.445, which means that if the other independent variables are fixed, 1% increment of task-technology fit will increase the ease level for 0.445.

The regression coefficient of X2 is -0.020, which means that if the other independent variables are fixed, 1% increment of ease level will decrease SIGIZI expected performance for -0.020.

Based on the test results, it is found that there is relationship of task-technology fit with expected performance. Meanwhile, the relationship of ease level nutrition information system is not related to expected performance. Ease does not always support information system expected performance. The expected performance of information system is assessed from the quality of generated information, accuracy and reliability (non-error).

The results of research by Lee et al., [7] shows: data quality, authorization, timeliness, reliability, and relationship with users are dominant factors in measuring task-technology fit using mobile insurance. Performance expectancy and effort expectancy mediate the influence of task-technology fit on intention using information system; and data quality is related to the use. Such factors influence performance expectancy in using information system.

The results of research by Nematollahi et al., [9] show that there is direct positive relationship between Effort Expectancy and Behavioral Intention (p = 0.01) and between facilitating condition and behavioral intention (p = 0.04) and between facilitating condition and use behavior (p = 0.01). In addition, there is direct and positive relationship between behavioral intention and use behavior. In order to increase the use of Electronic Medical Records at hospital, it is suggested that managers and policy makers consider effort expectancy and information system facilitating condition.

Table 4. Factors related to expected ease level

| Factor                | Coefficient | 95% CI  | p Value | R    | R²   |
|-----------------------|-------------|---------|---------|------|------|
| (Constant)            | 10.803      | 3.579 -  | 18.027  | .004 | 0.329 | 0.108 |
| Technology characteristic | .215       | .036 -  | .394    | .020 |      |      |

Based on the results of hypothetical test, the technology characteristic variable has p value = 0.020 (α < 0.05), thus we may state it as statistically significant/real, with confidence level (CI) and 95% difference range from 0.036 to 0.394.

According to the correlation analysis results, it is found that there is relationship between technology characteristic and expected ease level (R= 0.329). Sugiyono [16] states that R value of 0.20 to 0.399 indicates existence of low relationship, that is between technology characteristic and expected ease level.

Based on determination analysis, the R² (R Square) value is 0.108 or (10.8%). This indicates that the percentage of contribution of influence of independent variables (technology characteristic) on the dependent variable (expected ease level) is 10.8%. In other words, the independent variable variation used in the model is capable of explaining 10.8% of the dependent variable variation. Meanwhile, the remaining 89.2% is influenced or explained by other variables.

This results in the following straight line equation:
Y= 10.803 + 0.215 X1
Where:
Y = expected ease level
X1= technology characteristic
The constant of 10.803 states that if the value of technology characteristic is 0, the expected ease level is 10.803.

The regression coefficient of variable X1 is 0.215, which means that if the other independent variables are fixed, 1% increment of technology characteristic will increase the expected ease level for 0.215.

Based on the analysis results, it is found that there is low relationship between technology characteristic with expected ease level. It is not necessarily easy to use an advanced information system. Users sometime prefer a simple but providing good performance and user friendly information system. Quality improvement of technology used in building the information system may improve ease of use and performance of the information system and organizational performance.

Many institutions try to continuously improve their quality of services. The quality is, among other things, achieved by improving the information system service. However, an advanced technology service is not necessarily linear with the ease obtained by the information system users. Ease will improve performance and productivity. According to previous researchers, with regard to the relationship between information system and user performance, many conclusions state that the sophistication of an information system is not linear with the ease of use. The sophistication of an information system will be linear with the ease of its use if the information system is indeed designed based on user’s need. User’s mental attitude when using the information system is the determinant factor. With regard to such mental attitude, it is the institution’s task to convince the users in considering the information system. Therefore, the application of information system is not only services superiority for the institution, but also a means for the users to support their performance.

The research of Seok Kim et al.,[14] proposes that hospital information system is predicted with Performance Expectancy (PE) ($\beta = 2.34, p < 0.01$), Effort Expectancy (EE) ($\beta = 2.21, p < 0.01$), social influence (SI) ($\beta = 2.63, p < 0.01$) and facilitating condition (FC) ($\beta = 2.84, p < 0.01$). The effect of this Behavioral Intention antecedent explains 72.8% variance in nurse’s intention to use hospital information system ($R^2 = 0.728$). The application of research model indicates that nurse acceptance of HIS is influenced by performance expectancy, work expectancy, social influence and facilitating condition, with performance expectancy having the strongest effect on user’s intention. According to the results of research by Ching Lee et al., [2], performance expectancy, effort expectancy and social have positive influence on behavioral intention in the application of clinic information system ($p < 0.001$) of which extent is 75% of variation.

Saleem et al., [13] suggest that in effort made in IT implementation, the main success (ranging from 75% to 90%) is determined by social technique, and less than 20% to 25% is determined by technical implementation. Therefore, IT implementation requires individual participation and trust and supporting system. At individual, organizational and management levels, it needs to involve final users’ suggestions in improvement of their working practice. They also need to consider other factors, such as usability, usefulness, and flexibility of IT tool sand individual training that will influence its use. At system level, supporting culture, positive outcome visibility of IT usage will improve the implementation. Developing and installing a feedback and evaluation mechanism, because of IT adoption, application and maintenance, will provide opportunity for continuous improvement [3].

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5. CONCLUSION
There is strong relationship between task characteristic and technology characteristic and task-technology fit ($R^2 = 0.702$), and the influence of task characteristic and technology characteristic on the Task-Technology Fit variable is 49.2%.
There is sufficient/moderate relationship between the expected performance of nutrition information system with the user acceptance ($R=0.59$), and the influence of SIGIZI expected performance variable on the User Acceptance variable is 34.9%.

There is sufficient/moderate relationship between task-technology fit, ease level and expected performance ($R = 0.598$), and the influence of task-technology fit variable; ease level on the expected performance variable is 35.7%.

There is low relationship between technology characteristic and expected ease level ($R= 0.329$), and the influence of technology characteristic variable on the expected ease level variable is 10.8%.

Meanwhile, the test results indicate that task-technology fit ($p=0.468$); ease level of nutrition information system ($p=0.977$); social influence ($p=0.055$) and nutrition information system facility condition ($p=0.910$) are not related to user acceptance.

6. SUGGESTION

For successful implementation of the nutrition information system, it is necessary to pay attention to task characteristic, technology characteristic, SIGIZI performance, task-technology fit and ease level.

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