Optimization Strategy of Utilization of Information and Communication Technology (ICT) in the Development of Integrated Agricultural Systems (Simantri Program) in Bali

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Abstract— *Simantri (Integrated Agricultural Systems) Program is an agricultural sector development program having been implemented by Bali Province Government since 2009. One of its objectives is to support the development of integrated and agribusiness-based agricultural diversification. Agribusiness sectors have significant differences if associated with the gap of mastering information and communication technology (ICT). The role of ICT optimally affects motivation for farmers to apply Simantri Program effectively in order to obtain the effects of increasing income and welfare. This study uses survey research design by examining a sample drawn from the existing population. The samples totaled 50 Farmers' group union scattered in the regencies of Buleleng, Bangli, and Badung. The respondents were purposively determined i.e. three people per Farmers' group union, so that the total respondents were 150 people. The main variables include usefulness, ease of use and attractiveness of ICT, attitudes towards ICT and usage optimization strategy. Strategies to optimize the utilization of ICT in Simantri Program are designed to add value to the level of success of the Simantri Programme today. Data analysis techniques in the design optimization of the use of ICT strategy model uses PLS-SEM model analysis with analysis tools SmartPLS version 3.0 M3 Strategies to optimize the utilization of ICT in the development of Simantri program in Bali can be done with the highest priority to optimize the level of satisfaction of users of ICT (user satisfaction), in this case the farmers' group union members, then on the other hand take the steps oriented to impact the use of ICT itself, both individual impact (individual impact) and the impact of organizational (organizational impact), accompanied by an increase in the quality of information systems implemented (system quality).*

Keywords— optimization strategy, information technology and communications, Simantri Program.

I. INTRODUCTION

In order to develop the agricultural sector, the Bali Province Government has implemented Simantri (Integrated Agricultural Systems) Program in 2009. This program is a breakthrough in efforts to accelerate the adoption of agricultural technology, because it is a pilot model in the development of accelerated transfer of technology to rural communities. One goal of Simantri Program is supporting the development of integrated and agribusiness-based agricultural diversification. Simantri success is influenced by many factors, among which include the ability of the entrepreneurial spirit and agribusiness management (Dinas Pertanian Tanaman Pangan dan Hortikultura Provinsi Bali, 2014).

According Solahuddin (1998), the agribusiness sector should be able to be built into the leading sectors and the economies of rural economic empowerment so that the program can run well. In an effort to make agribusiness a major sector of agribusiness, a good management is required. One of them is the management of agribusiness technology.

Utilization of ICT for the development of agriculture in Indonesia is not yet optimal. The same is true in the development of Simantri Program in Bali. At the moment, ICT seems to to escape in the study of the underdevelopment agricultural sector. Farmers lagging information is very large compared to the urban community so an imperfect asymmetric market always happens and it becomes one of the factors that lead to lameness of development. ICT adoption by farmers is slow so that various cases appear that causes ICT to be seen as a negative thing and is not suitable for farmers. Learning from the experience of other countries, the use of ICT for the agribusiness sector in Indonesia should be optimized, so that it can be used together to improve the competence and usefulness for the development of agribusiness and agriculture in a broad sense. The role of ICTs is optimally expected to affect motivation for farmers to apply Simantri Program effectively in order to obtain the effects of increasing income and welfare.

Information and communication technologies (ICTs) are all activities that aim to acquire, process, store, and disseminate information in various forms i.e., voice, images, data, either in the form of text and numbers which are a combination of computing and telecommunications-based microelectronics (Alter, 1992; Haag and Keen, 1996; Martin *et al.*1999; Lucas, 2000; Longley and Shain, 2012). Strategic use of ICTs in the development of agribusiness can be seen from the viewpoint of the development aspects of agribusiness information systems. In this regard, Hermawan (2006) expresses the need for attention to the production of information, information processing, distribution as well as market information.

Strategies to optimize the utilization of ICT in the development Simantri Program in Bali can use approach or theory Technology Acceptance Model (TAM), which explains the interest of farmers' behavior using ICT.

Technology Acceptance Model (TAM) is a theory that explains the interest behavior using ICT. The theory was developed by Davis (1989) and later used by several other researchers like Adam *et al.* (1992), Szajna (1994), Chin and Todd (1995), Gefen and Straub (1997), Igbaria *et al.* (1997), and Venkatesh and Morris (2000). TAM is based on the theory of reasoned action (TRA) developed by Fishbein and Ajzen (Sanjaya, 2005).

In line with the TRA, TAM study also captures the internal variables through some external variables associated with the thing that stands in the ICT target. According to Davis (1989) in the TAM concept, there are two important antecedents that predict behaving interest (behavioral intention) in using ICT namely perceived benefits (perceived usefulness) and perceived ease of use. Both are an internal variable within the individual. Previous empirical studies show that both the individual internal variables have strong support empirically (Venkatesh and Morris, 2000).

The functions of ICT can be considered effective if the user remains back to using ICT, because they are satisfied with the information and facilities provided. Ali and McGrath (2011) find that the intention to go back to using ICT (intentions to re-use) is influenced by the perception of users to the benefits of information (information usefulness), ease of use (usability) and attractiveness, which is mediated by attitudes toward using ICT itself. Previously, Davis (1989) calls "the benefits of information" (information usefulness) "perceived benefit" (perceived usefulness) and "ease of use" (usability) as "the perceived ease of use". These findings indicate that in addition to providing information that is relevant to users, ICT managers should also consider the technical aspects and aesthetic attributes that can cause the overall attractiveness of ICT facilities to be utilized.

Chen and Wells (1999), Gao and Koufaris (2006), and Karson and Fisher (2005) as quoted Ali and McGrath (2011) show that the change in user behavior such as adoption, purchase decision and the repeated use of ICT is very reliable in determining the effectiveness of the use of ICT.

The main problem facing the Bali Province Government in the development of agriculture is the unefficiently built ICT systems both upstream and downstream. It becomes an obstacle so the targets and indicators of success of Simantri program have not been fully achieved. The low and insufficient use of ICT as well as mastery of technology in general is a weakness in the implementation of Simantri Program, both at the Bali province, and district levels (Head of the Department of Agriculture and Horticulture in Bali, 2015).

Optimal conditions are expected to form through the formulation of strategies to optimize the usefulness of ICT in the development of Simantri program in Bali defined as a condition of the best and most profitable in the use of ICT, which refers to the successful model of information system as defined by DeLone and McLean (1992) updated with the formulation of DeLone and McLean (2003). Successful models, according DeLone and McLean (1992), are a dependency relationship between the independent variables or variables with the dimensions of success that serve as the dependent variable. In a study by DeLone and McLean (1992), the measurement of these aspects is divided into six main categories: quality of the system, quality of information, use, user satisfaction, the impact of the individual, and organizational impact. These dimensions interact with respect to each other.

In the renewal model of DeLone and McLean (2003), there are additions and details of category. Additions include quality of service, purpose (intention to use), and profits (net benefits). In DeLone and McLean research (2003), success in dimension category selection is based on the goal or outcome. Results expected broadly refer to the impact of information systems on the performance or achievements of the organization. Successful models can be implemented to analyze how much and how important the information systems used in the organization. Within their own organization, the role of information systems is reflected in the profit (net benefits) perceived and obtained.

Associated with Simantri developmental programs are successful models of DeLone and McLean (2003) which can be used as measurement whether the use of ICT is optimal or not in the program. There are six dimensions to measure the optimal utilization of ICT in the Simantri Program. They are the quality of the system, quality information, and quality of service, the use of the system, user satisfaction, and net benefits.

II. METHODOLOGY

This study uses survey research design aimed to make an accurate estimate of the characteristics of the overall population of Farmers' Group Union in the Simantri Program by reviewing a sample drawn from the population.

Research carried out at the location of the development of Simantri program in Buleleng, Badung and Bangli is determined intentionally (purposive). The study is limited to the use of home telephone service (fixedline), cell phones (mobile phones), computers, and the Internet or convergence of these facilities.

The population in this study is Framers' group union in the Simantri Program across Bali until 2014 that amounted to 502 units. The research sample was purposively determined i.e. farmers in 50 Farmers' Group Union in Simantri. Respondents were also purposively determined i.e. three people per group union that the overall number of respondents was 150 people.

The main variables include usefulness, ease of use and appeal of ICT, attitudes towards ICT and usage optimization strategy. Strategies to optimize the utilization of ICT in Simantri Program were designed to add value to the level of success of the Simantri Programme today. The data analysis techniques in the design optimization of the use of ICT strategy model used PLS-SEM model analysis with analysis tools of SmartPLS version 3.0 M3.

III. RESULTS AND DISCUSSION

3.1 The Model

The strategy model design to optimize the utilization of ICT in the development of Simantri Program consists of four main variables, namely the usefulness of ICT (IU), the ease of use of ICT (USB), the attractiveness of ICT (ATR), and attitudes towards ICT (AT-IT). Variable attitude towards ICT (AT-IT) is the second level variable (second-order construct) the formation of a three-level variable first (first-order construct) is shown in Figure 1.

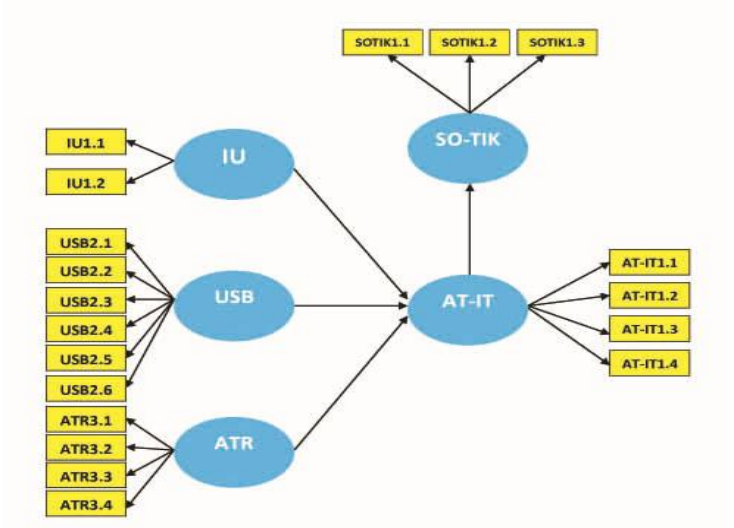

FIGURE 1 STRATEGY MODEL DESIGN

Measurement of all indicators used interval data with a value of 1-10 where the numbers 1-10 are the value continuum of the worst assessment to the best assessment. The indicators were measured from each of the variables shown in Table 1.

To check the strategy model design to optimize the utilization of ICT in Simantri Program, the following hypotheses are proposed

1. The level of utilization of ICT in the development of Simantri program is not optimal.
2. Utilization of ICT influenced by ICT utilization indicators, ease of use of ICT and the attractiveness of the use of ICTs.

TABLE 1
VARIABLE MODEL STRATEGIES OPTIMIZING UTILIZATION OF ICT AND THE INDICATORS

Variable	Indicator
1. Usefulness of ICT (IU)	
IU1.1	Information quality
IU1.2	Credibility provider
2. Ease of Use of ICT (USB)	
USB 2.1	Hardware availability
USB 2.2	Time availability
USB 2.3	Access avaiability
USB 2.4	Security availability
USB 2.5	Cost availability
USB 2.6	Information availability
3. Attractiveness of ICT (ATR)	
ATR 3.1	Design creativity
ATR 3.2	Attractiveness quality of management
ATR 3.3	Coverage area
ATR 3.4	Promotion
4. Attitude toward use of CIT (AT-IT)	
AT-IT 1.1	Realibility
AT-IT 1.2	Responsiveness
AT-IT 1.3	Security
AT-IT 1.4	Physical evidence
5. Optimization strategy of ICT utilization (SO-TIK)	
SOTIK 1.1	Quality of information system
SOTIK 1.2	Impact
SOTIK 1.3	User satisfaction

3.2 Evaluation of Measurement Model (Outer Model)

Evaluation of the measurement model checks the validity and reliability of indicators that measure constructs or latent variables. In this study the three latent variables, namely the usefulness of ICT (IU), the ease of use of ICT (USB), and the attractiveness of ICT (ATR), as well as attitudes towards ICT (AT-IT) and strategies for optimizing the use of ICT (SO-ICT) are a measurement model with reflective indicators, so the evaluation of the measurement model is done by checking the convergent and discriminant validity of the indicators and composite reliability.

Through the work process of SmartPLS analysis version 3.0 M3 the amount of the value of the indicator that reflects the variable (loadings of reflective indicators) and the value of each indicator for each variable are identified and seen clearly in Figure 2.

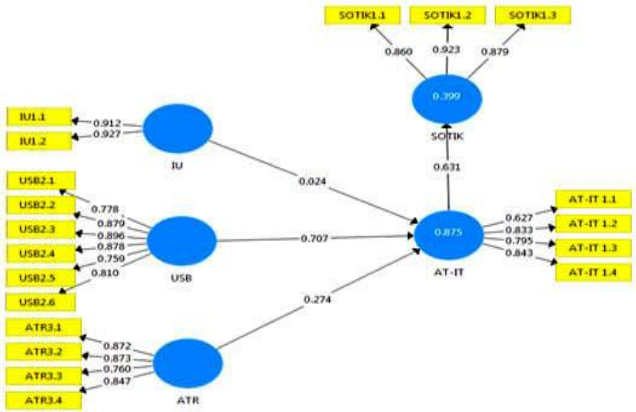

FIGURE 2 THE DESIGN OF THE STRATEGY MODEL OF OPTIMIZING THE UTILIZATION OF ICT BY ALL INDICATORS

Based on the results of measurements of all valid indicators with loading values > 0.5, the value of outer loading can determine the contribution of each indicator against the latent variables, where the highest value indicating the strongest indicator is a measure of the latent variable. All indicators have outer loading values greater than 0.60. These results indicate that the variables above are valid variable.

This evaluation is done by comparing the square root of average variance extracted (AVE) of each latent variable to the correlation between the latent variables in the model. The criterion is that if the value of the latent variable √AVE greater than the AVE value, this indicates variable indicators have good discriminant validity. Recommended AVE value is greater than 0:50.

The fifth variable has an AVE value above 0:50 and AVE root value higher than the correlation of the latent variables. This means testing discriminant validity with AVE roots indicates that all of the above variables is said to be good / valid.

This evaluation is done by looking at the value of composite reliability of the block indicator that measures the construct and Cronbach alpha values. Values of composite reliability and Cronbach alpha value is said to be good if it is above 0.70.

The value evaluation results of the composite reliability and Cronbach alpha show that the three latent variables are above 0.70, so it can be stated that the block indicators is reliable to measure the research variables. Based on the results of the evaluation of convergent and discriminant validity of each indicator, it can be concluded that the indicators were declared valid and reliable.

Testing a structural model to assess the effects of each direction of the relationship (causal path) and hypothesis testing that has been set, it uses special techniques of SmartPLS version 3.0 M3 i.e. bootstrapping techniques. Based on the results of the technical analysis, the usefulness variable of ICT is not significant in all directions, while the other variables have a significant correlation at a significant level (p value) of 5% and the t-statistic values> 1.96.

Based on data from the results of the analysis and looking at the criteria of model fit, this model shows the acceptable suitability and has highest predictive relevance. This is evidenced from all the assessment criteria that can be met (Q^2 value is greater than 0 or having a positive value) (Chin, 1998).

Based on the analysis, indicators relative to usefulness variable of ICTs (IU), the ease of the use of ICT (USB), the attractiveness of ICT (ATR), the intention of re-use of ICT (AT-IT), and strategies for optimizing the use of ICT (SOTIK) obtains loading score > 0.5. That is, all the indicators are valid indicators, so that the analysis can be continued. (Hair *et al*., 2011).

3.3 Utilization of ICT in Simantri Program

Based on an assessment of indicators of variable this study, the use of information and communication technology (ICT) in Simantri Program in Bali is not optimal. This is indicated by the value of the average scores on all variables, namely the variable benefit of ICTs (IU), variable ease of use of ICT (USB), variable attractiveness of ICT (ATR), and variable attitudes towards ICT (AT-IT) categorized into the category of bad from 0-10 interval.

There are two indicators that contribute to non-optimal Farmers' Group Union of Simantri Program participants feel the benefit of ICTs (IU) i.e. the quality of information (IU.1) and credibility of ICT providers (IU.2).

The highest score is indicated by the credibility of the provider (IU1.1) with a score of 2.41 and the lowest score with a score of 2.03 is shown in the quality of information (IU1.2). However, the average score of the two indicators show a score of 2.22 and categorized into the category of bad in the interval 1-10. That is, Farmers' Group Union of Simantri Program participants have not felt the benefit of ICT in running the Simantri program.

Indicators that contribute to the non-optimality of the Simantri Program participants are that they feel the ease of use of ICT (USB) i.e. the availability of the device (USB2.1), the availability of time (USB2.2), the availability of access (USB2.3), the availability of security (USB2.4), availability fees (USB2.5), and availability of information (USB2.6).

The highest score is indicated by the availability of security (USB 2.4) with a score of 2.37 and the lowest score with a score of 2.18 shown in the quality of information about access availability (USB 2.3). However, the average overall score of 2.25 indicates a bad condition in the interval 1-10. Conditions that illustrate the use of ICT in the Simantri Program are not optimally supported by the ease perceived by the Farmers' Group Union.

There are four indicators that contribute to poor perceived attractiveness of ICT Farmers' Group Union of Simantri program (ATR) i.e. creativity design (ATR3.1), the appeal of the quality manager of ICT (ATR3.2), the catchment (ATR3.3) and promotion (ATR3.4).

The highest score is indicated by the attractiveness of ICT quality manager (ATR 3.2) with a score of 2.43 and the lowest score with a score of 2.25 indicated on design creativity (ATR 3.1). The average score of the attractiveness of ICT by 2.32 at intervals of 1-10 represent poor attractiveness of ICT used by Farmers' Group Union of Simantri Program.

Usefulness Variable, ease of use, and appeal of ICT influence the attitude of the farmer members of Farmers' Group Union Simantri Program to ICTs. There are four indicators that show the attitude towards ICT namely reliability (AT-IT1.1), responsiveness (AT-IT1.2), assurance (AT-IT1.3), and the physical evidence (AT-IT1.4).

The highest score is indicated by the physical evidence (AT-IT 1.4) with a score of 2.37 and the lowest score with a score of 1.85 indicated by responsiveness (AT-IT 1.2). The condition describes the bad attitude of Farmers' Group Union of the Simantri Program towards the usefulness of ICT.

3.4 Strategy Optimizing Utilization of ICT in Simantri Program

Assessment of the indicators of the variables of this study indicates that the use of information and communication technology (ICT) in Simantri Program in Bali is not optimal. This is indicated by the value of the average scores on all variables, namely the variable benefit of ICTs (IU), the variable ease of use of ICT (USB), the variable of attractiveness of ICT (ATR), and variable attitudes towards ICT (aT-IT) which is categorized into the poor category of the interval 0-10.

Based on the results above, a strategy is formulated. Assessment of variables strategy to optimize the utilization of ICT in Simantri Program (SO-ICT) with three indicators: the quality of information systems (SO-TIK1.1), impact (SO-TIK1.2), and the satisfaction of users of ICT (SO-TIK1.3) shows that the highest score indicated by user satisfaction (SOTIK 1.3) with a score of 1.85 and the lowest score with a score of 1.60 indicated by the quality of information systems (SO-TIK1.1).

Optimal conditions are defined as the best and most favorable conditions in the use of ICT which refers to the successful model of the information system as defined by DeLone and McLean (1992) updated with the formulation of DeLone and McLean (2003).

Based on the analysis, a strategy to optimize the utilization of ICT in the development of Simantri program in Bali can be done with the highest priority to optimize the level of satisfaction of users of ICT (user satisfaction), in this case the farmer members of Farmers' Group Union, then on the other hand taking the steps oriented to impact the use of ICT itself, both the impact of the individual (individual impact) and the impact of organizational (organizational impact), accompanied by an increase in the quality of information systems implemented (system quality).

Simantri program is currently not optimal in the use of ICT and has not been able to achieve objectives consistent with the target. The role of ICT in Simantri Program may be in the form of support, enabler, and business drivers. The role of ICT as a support is in the sense that ICT supports all the activities that can be run quickly, accurately, and easily. As an enabler, ICT provides new solutions in solving the problems faced. Meanwhile, as the business drivers, ICTs can be a main / core business within the agency, in the sense of giving a new direction in business organizations / institutions that enable the achievement of a target optimally.

ICT also offers a huge opportunity as a business enabler and changes business patterns. Costs, risks and opportunities offered not only make IT strategic for the growth of the organization, but it is also important for the institutional continuity. Agrisbinis-oriented Simantri program must make use of this opportunity, so that the future growth and development may be appropriately targeted.

The strategy of optimizing the utilization of ICT serves as a guide for all human resources of Simantri Program. Strategic use of ICT, according to Day (2013), can be done through three approaches. First, the policy approach i.e. commitment and synchronization of stakeholders in the use of ICT and its use in fields or chain specific activities. Second, the approach to human resources (HR), namely improving the quality of human resources for ICT provider for Farmers' Group Union industry. Third, the institutional approach, namely the institutional strengthening of the Department of Agriculture as the executive coordinator of Simantri Program and ICT management units in the institutions under it.

IV. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

1. The use of ICT in the development of Simantri program is not yet optimal.

2. The utilization of ICT is influenced by usefulness indicators of ICT, ease of the use of ICT and the attractiveness of the use of ICTs.

3. Strategies to optimize the utilization of ICT in the development of Simantri Program in Bali can be done with the main priority of optimizing the satisfaction level of users of ICT (user satisfaction), in this case the farmers' group of union members, then taking the steps oriented to impacting the use of ICT itself, either the impact of the individual and the impact of organizational, accompanied by an increase in the quality of information systems implemented (system quality).

4.2 Recommendations

1. To improve the successful achievement of the Simantri program needs to optimize the utilization of ICT with the use of strategies that include optimization of the level of satisfaction of users of ICT, in this case the Farmers' group union members, followed by a step oriented to impact the use of ICT itself, both the impact of the individual and the impact of organization, accompanied by an increase in the quality of information systems implemented (system quality).

2. Formatively, Simantri Program planning documents need to be equipped with strategies to optimize the utilization of ICTs, so that there are guidelines for implementing the program, including the facilitator.

A conclusion section must be included and should indicate clearly the advantages, limitations, and possible applications of the paper. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

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