Technology Readiness Index of Agricultural Extension Officers in Bandung City, Indonesia, towards Digitalization of the "Buruan Sae" Program

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Submitted: July 10, 2021; Revised: October 22, 2021, December 6, 2021; Accepted: December 7, 2021; Published: November 28, 2022

ABSTRACT

Currently, "Buruan Sae" is a leading program in Bandung City, during the pandemic, this program was used to solve the problem of food security for every community. The government also promotes every community to implement urban farming in the city. Meanwhile, digitization is a step that is expected to be carried out in the future. To prepare for the transformation in this direction, the initial step is to measure readiness. Therefore, this study aims to determine the readiness of Agricultural Extension Officers (AOE) in Bandung as a necessary initial step in assisting the digital transformation of the "Buran Sae" program. AOE from the Department of Food and Agriculture were used as the sample population considering that they are the "spearhead" of this program. Using the Technology Readiness Index (TRI) Model, the value obtained was 3.365, which can be categorized as Medium Technology Readiness group. The amount of Explorers group namely 37.5% indicated that the majority of extension officers will accept the technology quickly. Furthermore, no part of the population can completely resist technological change as implied by the absence of the Laggards group. In the future, the results are expected to become a fundamental basis for the Department of Food and Agriculture to achieve digital transformation and this program will continue to be the main answer to every community's problem of food and agriculture.

Keywords: Buruan Sae; agriculture; extension officers; food; technology readiness index

INTRODUCTION

Bandung is one of the big cities in Indonesia, reports in 2020 showed that it has 14,577 people living for every 1 Km^2 of land (BPS-Statistics (Jawa Barat), 2021). Challenges related to limited land are the main problems usually faced by big cities, including the agriculture sector. To address this issue, the Bandung government devised an innovative program called "Buruan Sae". It is an integrated urban farming program promoted by the Bandung City Food and Agriculture Service Department that aims to address food inequity by gardening in the existing yard or land to meet family food needs. Along with this program, the government has also tried to create farming solutions in big cities, known as urban farming. In general, urban farming is an innovation to solve the problem of production, transportation, and logistics in agricultural activities in a city (dos Santos, 2016). Inaugurated in the era of the COVID-19 pandemic, this program has caught the attention of the public. Problems during an unstable pandemic condition can trigger negative effects related to (1) Inflation and prices, (2) Quantity of food/market demand-supply, (3) Food quality, and (4) access to food

DOI: http://doi.org/10.22146/agritech.67535
ISSN 0216-0455 (Print), ISSN 2527-3825 (Online)

(Lal, 2020). Through the "Buruan Sae" program, the Bandung city government promoted the community to utilize and improve the function of the remaining land in their homes. One of the stakeholders who play a crucial role in this program is agricultural extension officers. They have the common task of accessing and transferring information to solve farmers' problems (Munthali et al., 2018). Furthermore, the increase in knowledge and technological advancements has provided benefits for agriculture by providing farmers with the latest information related to their potential challenges. The role of extension officers is very important, this is because farmers tend to achieve a quality production cycle when they have access to supervision and guidance (Otieno, 2019). Quality involvement and performance in this program have helped them to earn several awards. Bandung is included among the 3 best cities in the Regional Development Award by the Ministry of National Development Planning/Bappenas 2021. This achievement is proof of how the government solved food security problems during this pandemic.

Currently, Indonesia has rules related to digitization, in early 2021, the President of Indonesia signed a decree related to the Acceleration and Expansion of Regional Digitization, including the "Buruan Sae" program which will deal with ICT use in the future implementation. This is due to the realization that agriculture is one of Indonesia's leading sectors. In several developed countries, urban farming has evolved towards the use of renewable technology although its application has been faced with several barriers such as social, cultural, economic, and poor knowledge of the potential users (Abdullah et al., 2017; Carolan, 2020; Tsyplakova et al., 2020).

This indicates that there is a need to Investigate users' readiness in adopting the new technology. Several related studies have been conducted on how potential users can recognize their level of interest and accept them. A previous study conducted in India reported that agricultural stakeholders have successfully mapped the level of readiness (Vankudothu et al., 2018). Consequently, the implementation of ICT as well as the failures, and potential risks can be calculated. The readiness to implement the smart farming concept has also been assessed in Thailand. Farm owners and managers were significantly influenced by the support variable from the institution and the perceived usefulness of the technology (Duang-Ek-Anong et al., 2019). In the approach of calculating the level of readiness, the Technology Readiness Index (TRI) is the most popular scale model. TRI is an investigative approach that shows the scale's psychometric properties (Parasuraman, 2000). Therefore, it can be used to determine the likelihood of potential users adopting new technologies. According to Parasuraman & Colby, (2015) TRI has a total of 4 components, as shown in Figure 1.

These components can be used to measure the perspective of individuals to adopt and embrace new technologies in their workplace. Optimism and innovation are categorized as components that provide a positive impact, or in other words, promote users to

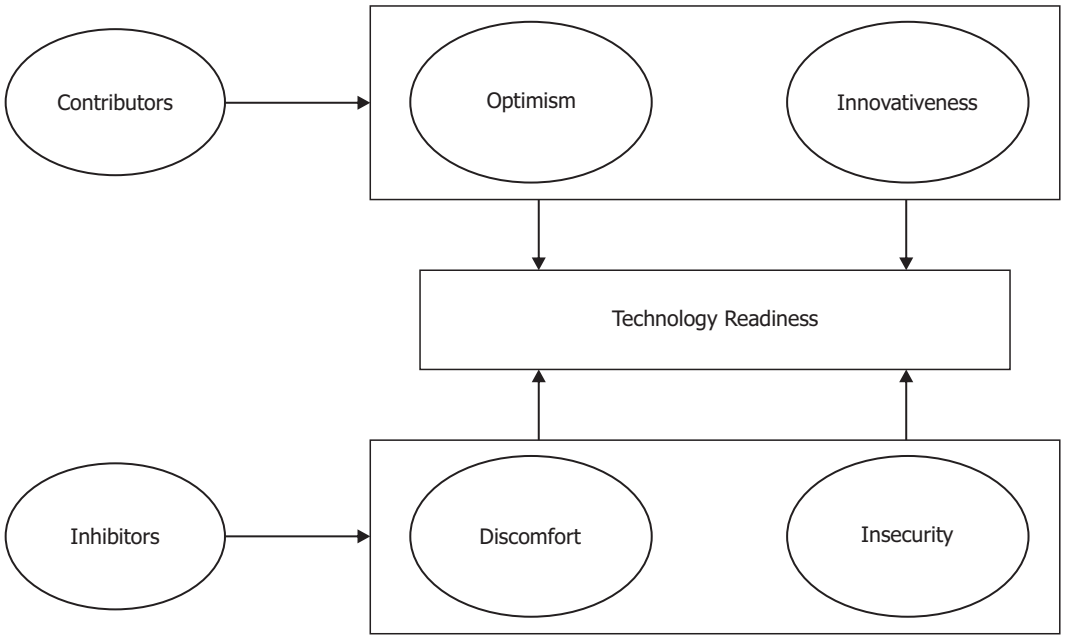

Figure 1. TRI model (Parasuraman & Colby, 2015)

adopt the technology. Optimistic users believe that technology will improve the quality of work, while Innovativeness is a behavior of interest in something new, it shows the attitude of a user who wants to continue to learn about latest things. Meanwhile, Discomfort and Insecurity are inhibitor components, they help to identify the negative influence level of the user. Discomfort is the behavior of refusing to make changes to work procedures, in this case, the users feel more comfortable with the traditional way. Insecurity is the negation of optimism, where users feel technology is not a safe thing. A sense of security is only established when users finally believe in technologies. Through this component, users will be measured on how they respond to the security and privacy of their data in digital form.

The readiness of an organization can be divided into 3 categories, namely:

When TRI <= 2.89, the Agricultural Extension Officer is in the Low Technology Readiness category

When TRI>=2.90 and TRI <=3.51, the Agricultural Extension Officer is in the Medium Technology Readiness category

When TRI>3.51, the Agricultural Extension Officer is in the High Technology Readiness category

Parasuraman also provided other conclusions on the results of the TRI calculation (BAKIRTAŞ, 2017), there are 5 groups of users in the face of new technology adoption, as shown in Table 1.

The results of the 4 TRI components can help divide users into 5 groups, each group indicates the response to digitization in their work.Explorers are potential users who have high positive and low negative values, this group will be more ready to adopt the new technology. Pioneers are potential users who even though they believe in technology still have a high negative value. This group only needs the right education and information the possibility of them receiving new technology is very large. Sceptics are potential users who have low scores in all components, this group still has the possibility of accepting digitization in their work. Organizations just need to make sure that the new technology will benefit them. Paranoids are potential users who are optimistic about technology but do not yet understand how it will help them, hence, this group fears risking their job when they adopt new technology. Laggards are potential users who have the lowest positive and the highest negative value, they are also the opposite of explorers. They are the last group to adopt the technology. The organization needs to open their insights and perceptions related to new technology. Therefore, this study will help the Government assess the readiness of Agricultural Extension Officers (AOE) as the right first step to ensure the digital transformation of the "Buruan Sae" program. Additionally, the results will be used as a reference for the readiness to adopt new technology.

MATERIALS AND METHODS

This study used a survey method by gathering information that involves submitting a series of questions which have been previously formulated and in a specific order to a sample of individuals selected to represent a defined population. The variables in the questionnaire were based on the TRI model, which is depicted in Figure 1.

Population and Sampling

The population in this study was AEO from the Department of Food and Agriculture, Bandung City, Indonesia. To determine the minimum number of respondents, the following formula was used (Adiyarta et al., 2018; Cahyani et al., 2020).

$$n = \frac{N}{1+N(d)^2} \quad (1)$$

Where n= Sample, N= population, and d= Precision value 5% or signification 0,05. With a precision value of 0.05 and a population of 9, the minimum number of officers required for this study is 8.

Table 1. Technology segment characteristics (Parasuraman & Colby., 2001)

Technology segments	Optimism	Innovativeness	Discomfort	Insecurity
Explorers	H	H	L	L
Pioneers	H	H	L	H
Sceptics	L	L	L	L
Paranoids	H	L	H	H
Laggards	L	L	H	H

Types and Sources of Data

Data types are divided into 2 categories namely qualitative from direct field observations and interviews with stakeholders as well as quantitative from the results of questionnaires distributed to each officer, this data are in the form of numeric and are measurable (Hardani et al., 2020). Data sources are divided into 2 categories, primary data were taken directly during the study with a direct questionnaire given to the sample population. Meanwhile, secondary data were obtained from previous activities that have been reviewed previously (Hermawan & Amirullah, 2016). This study used academic reference, such as journals, proceedings, and statistical data owned by the government or the company.

Study Procedure

The stages of activities carried out in this study are shown in Figure 2.

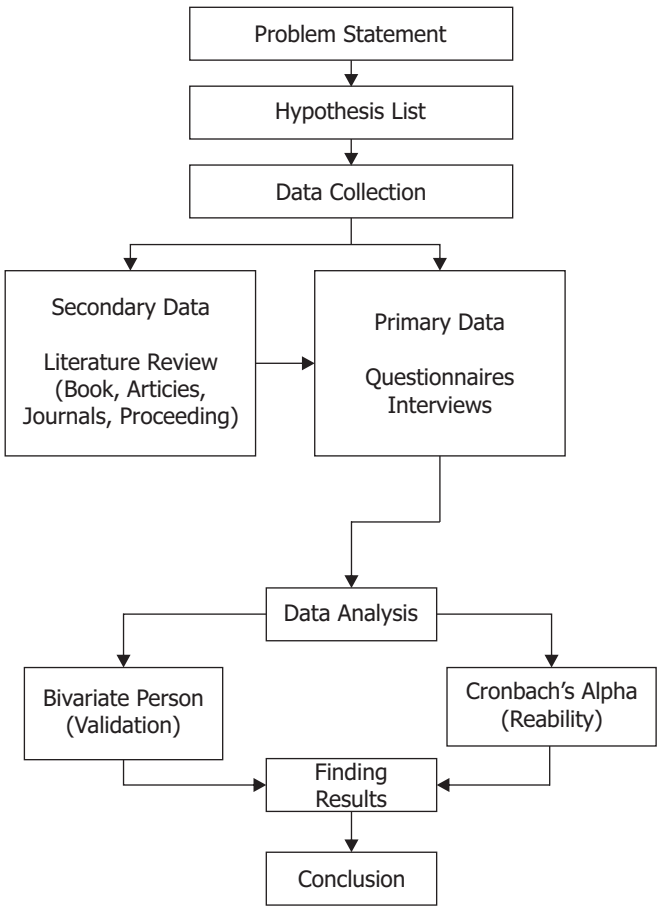

Figure 2. Research methodology

Starting from identifying the problem to be studied, this study identified the problems with agricultural extension in Bandung to digitize the "Buruan Sae" program. Based on the referral study results, the TRI model has some hypotheses on the readiness of a population which in this case, is agricultural extension officers. A total of 4 variables were considered as the parameters that determine the level of readiness. Subsequently, data collection was carried out in 2 categories, for secondary data, a literature review was carried out to find information related to the ongoing study. The information obtained originated from various sources related to the TRI model. The results were also used to collect primary data through instrument design using the TRI's question items. This instrument in the form of a questionnaire was distributed to the samples to obtain primary data. The data obtained were then processed using product-moment correlation validation and Cronbach's alpha rehabilitation to obtain TRI results. Furthermore, the TRI calculation results were divided into two, the first was the analysis results to determine the level of user readiness, while the second was the classification of each individual into 5 groups. At the end of the study, a population mapping of each group was generated, and the results contributed to providing information in determining necessary actions.

RESULT AND DISCUSSION

Bivariate Pearson Testing

To test the validity of the questionnaires, Bivariate Pearson or product moment correlation was used through SPSS. The sample data was declared valid when the value of Pearson Correlation was > r table with a significance level of 5%.

Based on the TRI model, each variable has several indicators to make the questionnaire more elaborate (Parasuraman, 2000). In this study, all the indicators referred to the TRI 2.0 model, which is more direct than the previous TRI model (Parasuraman & Colby, 2015). Table 3 shows that for the Innovativeness variable, two indicators had a correlation value of .720 and .729, while in the Insecurity variable, one indicator had a correlation value of .720 and the remaining had values above .80. A correlation with a minimum value of .70 m indicates good validity (Zijlmans et al., 2019). Therefore, it can be concluded that all variables have good validity values and pass the validity test, because the Pearson Correlation was > r table. Based on the number of samples collected, the r table value used was 0.707.

Cronbach's Alpha Testing

The reliability test used in this study was the Cronbach's Alpha method, the data is considered reliable and usable when the value is > 0.60.

Table 2. Data validation

Variables	Indicator variable	Corrected item-total correlation	Result
Innovativeness	INV_1	.720	Valid
	INV_2	.932	Valid
	INV_3	.824	Valid
	INV_4	.729	Valid
Optimism	OP_1	.964	Valid
	OP_2	.893	Valid
	OP_3	.911	Valid
	OP_4	.960	Valid
Discomfort	DIS_1	.836	Valid
	DIS_2	.853	Valid
	DIS_3	.848	Valid
	DIS_4	.801	Valid
Insecurity	INS_1	.720	Valid
	INS_2	.838	Valid
	INS_3	.931	Valid
	INS_4	.936	Valid

Table 3. Data reliability

Variable	Indicator variable	Cronbach's Alpha if item deleted	Result
Innovativeness	INV_1	.890	Reliable
	INV_2	.872	Reliable
	INV_3	.874	Reliable
	INV_4	.877	Reliable
Optimism	OP_1	.878	Reliable
	OP_2	.881	Reliable
	OP_3	.883	Reliable
	OP_4	.876	Reliable
Discomfort	DIS_1	.873	Reliable
	DIS_2	.865	Reliable
	DIS_3	.897	Reliable
	DIS_4	.883	Reliable
Insecurity	INS_1	.879	Reliable
	INS_2	.874	Reliable
	INS_3	.868	Reliable
	INS_4	.864	Reliable
Total Cronbach's Alpha		.884	Reliable

From Table 4, it can be concluded that all the variables presented are reliable and suitable for further processing as all Cronbach's alpha values were > 0.60. All the variables also had values above 0.80, meaning that the data presented were very good.

Finding Results

TRI Level Measurement

The TRI analysis is used to determine the level of users' readiness to adopt the latest technology available. A total of four measurement variables were used including Optimism, Innovativeness, Discomfort, and Insecurity. Each had a weighted value of 25%, which will later be divided by the number of questions in each variable. After the calculations, the level of agricultural extension officers in Bandung based on the TRI analysis is described as follows.

Table 4. TRI Test Results

No.	Variable	TRI Value
1.	Optimism	1,149554
2.	Innovativeness	0,837054
3.	Discomfort	0,736607
4.	Insecurity	0,641741
Total TRI		3,364955

Table 5 shows the results of TRI where the total value was 3.364, based on the categories described on Figure 3, the level of readiness for agricultural extension in Bandung ranges from 2.90 to 3.51, which can be categorized as Medium Technology Readiness level. Optimism had the largest value of 1.149 followed by Innovativeness 0.837, meaning every agricultural extension officer in Bandung has a positive response to "Buruan Sae". In other words, users feel optimistic and also innovative in adopting and utilizing this urban farming technology. Furthermore, Discomfort had a value of 0.736 while Insecurity was 0.641, both values must be explained in reverse because they are negative. It can be concluded that the agricultural extension officers have a low level of Discomfort and Insecurity in adopting the program.

User Segmentation

Aside from the TRI score, there were also clusters divided into 5 groups that tell the individual level of readiness to accept the "Buruan Sae" program, the results are as follows.

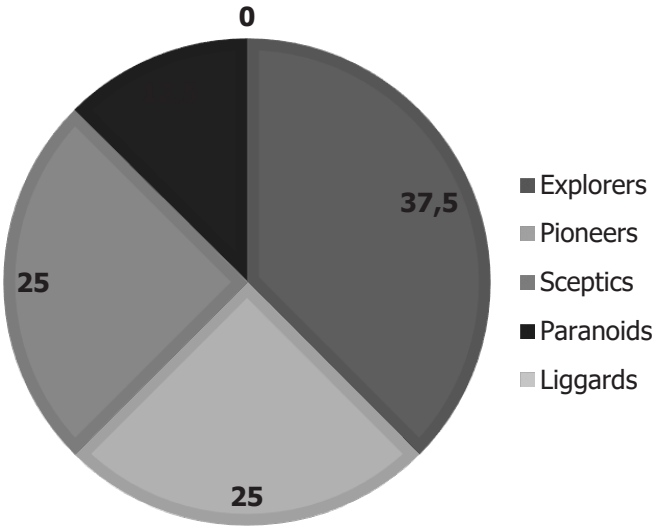

Figure 3. User profile

The total cluster obtained is shown in Figure 3, where the highest was Explorers at 37.5%, followed by Pioneers and Sceptics with 25%, and lastly the Paranoids at 12.5%. Based on the results, many users are ready to adopt new technology themselves. The Pioneers with quite a large percentage value at 25% need light guidance to adopt the urban farming technology, while Sceptics with a similar score require an explanation about how this latest technology will benefit them. Lastly, Paranoids which has a percentage value of 12.5% need extra guidance and information on the program. It can be concluded that most of users are ready to adopt this new program, but some must be given more explanation and guidance specifically those in the Explorer cluster. The government has established some programs to improve the competency of employees. The Department of Food and Agriculture is recommended to make an agreement with third parties such as a company or an academic with the Memorandum of Agreement giving an advantage to sides both such as Bandung Government and Telkom University. As a follow-up to the results of this study, several mentoring and training activities have been prepared and designed to improve every extension agriculture officer of the Department of Food and Agriculture.

CONCLUSION

Based on the results, the agricultural extension officers' level of readiness for the "Buruan Sae" program is in the Medium Technology Readiness category. This means that Bandung can be considered ready to conduct this urban farming program. According to Figure 3 which shows the number of Explorers and Pioneers with others,

the technology adoption process must be swift. The top 2 levels namely Explorers and Pioneers are dominant in the agricultural extension group in Bandung. However, there are still other groups classified as "Sceptics" and "Paranoids", which require appropriate direction and guidance going forward. The results obtained can be used by the Department of Food and Agriculture, Bandung to make efficient and effective policies. Future studies are recommended to develop an enterprise architecture and IT-Business Alignment strategy.

ACKNOWLEDGEMENT

The authors are grateful to the Department of Food and Agriculture for contributing primary and secondary data. This study is a collaborative program between Telkom University and the Department of Food and Agriculture, Bandung.

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