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Fishermen Intentions Toward Floating Net Cage based on Technology Acceptance Model and Theory of Reasoned Action

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Abstract—In order to support offshore aquaculture in Indonesia, a floating net cage is being developed by Pusat Studi Kelautan ITS and will be placed in Sidoasri Village, Malang, Indonesia. The use of floating net cage will shift the habits of the fishermen. It will be very for the effort of developing the floating net cage if it will be rejected by the fishermen. Therefore, it is important to measure the factors influencing fishermen intention as a potential user to use the cage. In this paper, Technology Acceptance Model is integrated with Theory of Reasoned Action to identify the factors. The findings of this study, obtained that fishermen intentions to use floating net cage is influenced by their attitude and subjective norm, while perceived usefulness and perceived ease of use have a role to affect the intentions indirectly.

Keywords—Fishermen, Floating Net Cage, Technology Acceptance Model, Theory of Reasoned Action, Survey.

I. INTRODUCTION

Offshore aquaculture is one of aquaculture techniques which aims to meet human needs and overcome overfishing issue happening nowadays [1]. Based on that, Pusat Studi Kelautan LPPM ITS is developing floating net cage used for aquaculture, especially for offshore aquaculture. This cage is planned to be placed in Sidoasri Village, Malang, Indonesia. One of the obstacles of this project is fishermen in Sidoasri as potential user. They have no knowledge and experience to use floating net cage and to do aquaculture. Furthermore, their neighborhood, Sendang Biru, has similar product used for aquaculture. Unfortunately, the aquaculture didn't run successfully and failed to gain profit. From the conditions above, can lead fishermen in Sidoasri resist to use this product, so factors influencing their intentions to use need to be identified.

The purpose of this research is to identify factors influencing fishermen intentions to use floating net cage. In this paper we are using Technology Acceptance Model (TAM). TAM is a model to describe user response, so that factors affecting user acceptance can be identified [2]. Then, TAM is integrated with its antecedent theory, which is Theory of Reasoned Action (TRA). TRA is a model that learn the determinants of human's behavior based on social psychology [3], [4]. The integration between TAM and TRA aims to accomodate social factor that may affect person's behavior when particular technology is given to them.

This paper proceeds as follows: Section 2 reviews the theoretical background used in this paper. Section 3 introduces research model and hypothesis. Section 4 details the methodology. Section 5 presents data analysis and results. Section 6 discusses the findings obtained and section 7 concludes the overall research in this paper.

II. THEORETICAL BACKGROUND

Theory of Reasoned Action. Theory of Reasoned Action (TRA) learns the determinants of human's behavior from social psychology field. Basic theory in TRA is to predict and explain human's behavior in general [3], [4]. TRA consists of several variables, actual behavior, behavioral intention, attitude toward behavior, and subjective norm. Actual behavior of a person is determined by behavioral intention and behavioral intention is determined by attitude toward behavior also subjective norm.

A. Technology Acceptance Model.

Technology Acceptance Model (TAM) adopted and developed from Theory of Reasoned Action (TRA) for technology usage [5]. This model derived from the need to understand why people resist a technology, so as system evaluation can be conducted, predict user response, and improve user acceptance. TAM consists of several variables, perceived usefulness, perceived ease of use, attitude toward using, behavioral intention to use, and actual system use [2].

B. Research Model and Hypothesis

Research Model. Model in this paper, proposed based on need to identify factors influencing fishermen intentions in Sidoasri to use this cage. TAM and TRA are integrated to accomodate social factor that may influence person's behavior or decision when particular technology given to them. It is due to their lack of knowledge about floating net cage and failures happened in Sendang Biru on aquaculture. Proposed model in this paper consists of 5 variables, perceived usefulness, perceived ease of use, subjective norm, attitude toward using, and behavioral intention to use as shown in Figure 1. Where perceived usefulness, perceived ease of use, attitude toward using, and behavioral intention to use are variables from TAM, while subjective

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norm, attitude, and behavioral intention are variables from TRA.

C. Hypothesis Development.

Each hypothesis exhibits the relationship between variables or constructs indicated by the arrow in the proposed model in Section 3. The hypotheses in this paper are formulated based on basic model used, i.e. TAM and TRA. Where hypothesis 1, 2, 3, 4, and 5 are formulated based on TAM, while hypothesis 5 and 6 are formulated based on TRA. The hypotheses are given below.

H1 : Perceived ease of use has effect on perceived usefulness.
H2 : Perceived ease of use has effect on attitude toward using.
H3 : Perceived usefulness has effect on attitude toward using.
H4 : Perceived usefulness has effect on behavioral intention to use.
H5 : Attitude toward using has effect on behavioral intention to use.
H6 : Subjective norm has effect on behavioral intention to use.

III. RESEARCH METHOD

A. Data Collection

In this research, data was collected and used to test the formulated hypothesis. Data was obtained through survey questionnaire to fishermen in Sidoasri as potential user of this floating net cage. Survey questionnaire is done for 2 days. To avoid misunderstanding in answering the question, the fishermen are guided to answer each question. From the survey, 24 respondents are obtained of the total 80 fishermen in Sidoasri. They didn't have enough knowledge and experience to use floating net cage and to do aquaculture. After data preprocessing is done, there are only 22 data that can be continued to the next analysis, while the rest is deleted because of missing value.

B. Measurement of Variables/Constructs

In this paper, variables in the model (referred to as constructs) are measured by using multiple items called indicators. Indicator is a measured variable used to conclude a variable or construct [6]. Based on theory and previous research, indicators for each variable are determined. For perceived usefulness and perceived ease of use, measured by 4 and 3 indicators respectively [7]. For attitude toward using and subjective norm, measured by 3 and 2 indicators respectively [8]. While behavioral intention to use measured by 2 indicators [9]. Indicators for variables or constructs are given in Table 1 with total of 14 indicators. The indicators used to arrange research questionnaire. For all indicators, Likert-type scales were used ranging from strongly disagree (1) to strongly agree (5).

IV. DATA ANALYSIS AND RESULTS

Data are collected and summarized as depicted in Table 2. Then, the data are analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with Smart-PLS v3.2.7 program. In PLS-SEM, after the model is built and data are collected, model parameters are estimated based on the data obtained. From the estimation results, evaluation is done for measurement model and structural model [10]. Evaluation of measurement model related to indicators used to measure a variable or construct. While evaluation of structural model related to hypothesis testing to identify relationship between variables or constructs.

A. Measurement Model.

Evaluation of measurement models consists of individual item reliability, internal consistency reliability, convergent validity, and discriminant validity with the following criteria [5], [9].
1. Individual item reliability: loading factor $(\lambda) \geq 0.7$
2. Internal consistency reliability: cronbach's alpha and composite reliability ≥ 0.7
3. Convergent validity: AVE ≥ 0.5
4. Discriminant validity: the square root of AVE is greater than the correlation between variables or constructs.

The results for measurement models evaluation for individual item reliability, internal consistency reliability, and convergent validity are shown in Table 3. For individual item reliability, each indicator has loading factor above 0.7. For internal consistency reliability, cronbach's alpha and composite reliability values are above 0.7 for all variables or constructs. Also for convergent validity, AVE value for all variables or constructs are above 0.5. Then for discriminant validity, the results are shown in Table 4. From the table, obtained that the square root of AVE is greater than the correlation between variables or constructs. From the evaluation of measurement model, can be concluded that indicators in the model have met the criteria and can proceed to evaluation of structural model.

B. Structural Model.

Evaluation of structural models begins with collinearity test. Model is indicated collinear if VIF value exceed 5. Then hypothesis test is done to identify relationship between variables based on p value. If p value $< \alpha$ then, there is relationship between variables or constructs, otherwise there is no relationship between variables or constructs (in this paper using 5% of significance level) [10]. From collinearity test, the model is not indicated collinear with VIF value below 5 for all variables or constructs. Then continued with hypothesis testing and obtained the results as shown in Figure 2. Based on the results, perceived ease of use has no influence toward perceived usefulness, in other words, the result didn't support for H1. But perceived ease of use has influence toward attitude toward using (with p value < 0.05) and the result support for H2. Perceived usefulness has influence toward attitude toward using and the result support for H3. But perceived usefulness has no influence toward

behavioral intention to use and the result didn't support for H4. Attitude toward using has influence toward behavioral intention to use and the result support for H5. While subjective norm has influence toward behavioral intention to use and the result support for H6.

V. DISCUSSION

From the analysis, several relationships are not in accordance with the basic theory. In TAM, perceived ease of use has effect on perceived usefulness and perceived usefulness has effect on behavioral intention to use [2]. While the relationship between perceived ease of use toward perceived usefulness and perceived usefulness toward behavioral intention to use are not proven on the analysis. It is in contrast to the previous research, where attitude toward using not included in final TAM because perceived usefulness can directly influence behavioral intention to use without using attitude toward using as mediator [11].

After the model has been adjusted or re-specified, the model consists of 4 relationships. Behavioral intention to use is determined by attitude toward using and subjective norm. Then attitude toward using determined by perceived usefulness and perceived ease of use. From the final model, obtained R2 value = 0.676 for behavioral intention to use. From the value obtained, it can be concluded that behavioral intention to use mainly determined by its antecedents, i.e. attitude toward using and subjective norm. While R2 value for attitude toward using achieve 0.593 and it can be concluded that attitude toward using mainly determined by its antecedents, i.e. perceived usefulness and perceived ease of use. Even though perceived usefulness and perceived ease of use didn't directly influence behavioral intention to use, they influence behavioral intention to use indirectly through attitude toward using.

VI. CONCLUSION

From this research, factors influencing fishermen intentions to use this cage by integrating TAM and TRA have been identified. Factors directly influencing fishermen intentions are attitude toward using and subjective norm. Also factors indirectly influencing fishermen intentions are perceived usefulness and perceived ease of use through attitude toward using. It can be used to support this cage before it is implemented in Sidoasri, regarding factors influencing fishermen intentions.
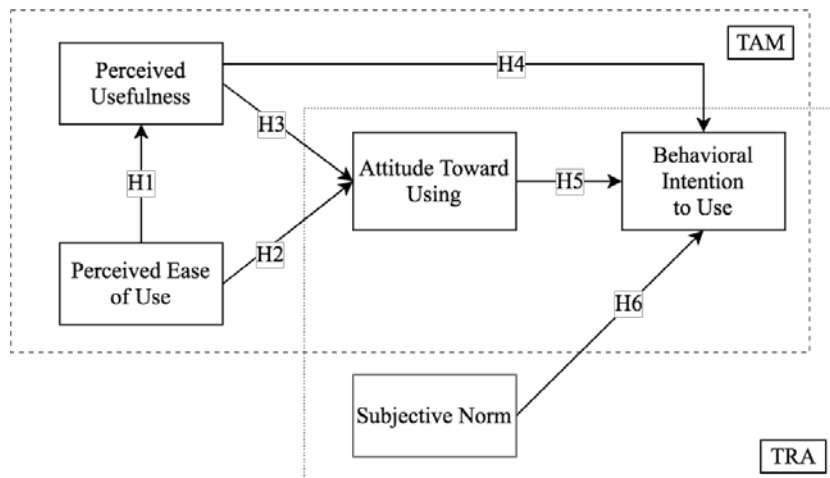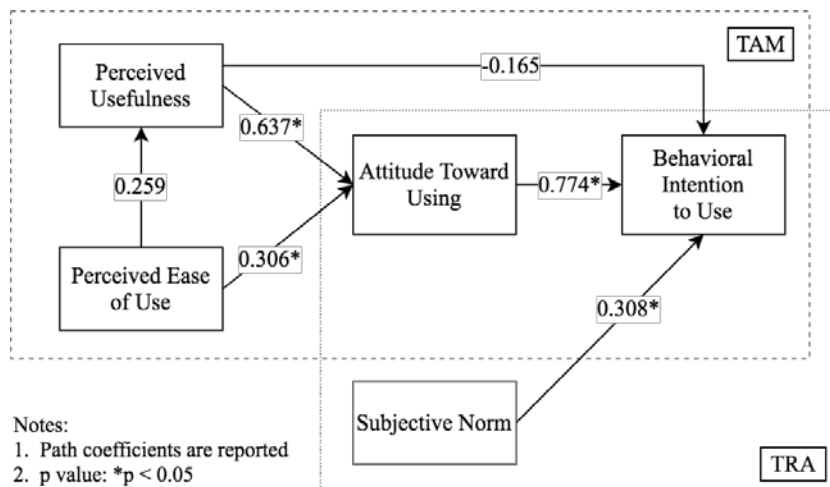

Figure 1. Proposed Research Model.

Notes:
1. Path coefficients are reported
2. p value: *p < 0.05

Figure 2. Structural Model Evaluation Result

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TABLE 1.
INDICATOR OF VARIABLES/CONSTRUCTS

Variables/Constructs Constructs		Indicators
Perceived Usefulness	PU1	Using this floating net cage would increase my productivity
	PU2	Using this floating net cage would enhance my effectiveness on the job
	PU3	Using this floating net cage would make it easier to do my job
	PU4	I would find this floating net cage useful in my job
Perceived Ease of Use	PEOU1	Learning to operate this floating net cage would be easy for me
	PEOU2	It would be easy for me to become skillful at using this floating net cage
	PEOU3	I would find this floating net cage easy to use
Attitude Toward Using	ATU1	Using this floating net cage is a good idea
	ATU2	Using this floating net cage is a wise idea
	ATU3	I like the idea of using this floating net cage
Subjective Norm	SN1	People who are important to me would think that I should use this floating net cage
	SN2	People who influence my behavior would think that I should use this floating net cage
Behavioral Intention to Use	BI1	I intend to use this floating net cage
	BI2	Given that I had access to this floating net cage, I predict that I would use it

TABLE 2.
MEASURES OF TECHNOLOGY ACCEPTANCE

Variabel Laten	Indikator	Rata-rata
Perceived Usefulness	PU1	4.045
	PU2	3.864
	PU3	3.909
	PU4	4.182
Perceived Ease of Use	PEOU1	2.773
	PEOU2	3.182
	PEOU3	3.091
Attitude Toward Using	ATU1	4.182
	ATU2	4.000
	ATU3	4.273
	ATU4	3.773
Behavioral Intention to Use	BI1	4.182
	BI2	4.364
	BI3	3.455
Subjective Norm	SN1	3.591
	SN2	3.500
	SN3	3.545

TABLE 3.
LOADING FACTOR, CRONBACH'S ALPHA, COMPOSITE RELIABILITY, AND AVE RESULTS

Variables/Constructs	Indicators	Loading	Cronbach's alpha	Composite Reliability	AVE
ATU	ATU1	0.81	0.795	0.88	0.71

	ATU2	0.865			
	ATU3	0.852			
BI	BI1	0.913	0.734	0.881	0.788
	BI2	0.862			
PEOU	PEOU1	0.797	0.832	0.9	0.752
	PEOU2	0.864			
	PEOU3	0.934			
PU	PU1	0.838	0.923	0.941	0.8
	PU2	0.884			
	PU3	0.903			
	PU4	0.95			
SN	SN1	0.98	0.966	0.983	0.966
	SN2	0.986			

TABLE 4.
DISCRIMINANT VALIDITY RESULTS

	ATU	BI	PEOU	PU	SN
ATU	0.843**				
BI	0.763*	0.888**			
PEOU	0.471*	0.519*	0.867**		
PU	0.716*	0.427*	0.259*	0.895**	
SN	0.348*	0.558*	0.265*	0.123*	0.983**

Notes:
** Square root of AVE
* Correlation between variables/constructs

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