Examine Behavioral Intention to Use Internet of Thing into TRAM

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บทคัดย่อ บทความนี้นำเสนอการสำรวจความตั้งใจในการนำอินเตอร์เน็ตของสรรพสิ่งไปใช้งานด้วยโมเดลความพร้อมและการยอมรับเทคโนโลยี กลุ่มตัวอย่างที่ใช้ในการตรวจสอบครั้งนี้ คือ กลุ่มตัวอย่างที่เป็นอาสาสมัครที่มีประสบการณ์ในการใช้งานระบบอินเตอร์เน็ตผ่านอุปกรณ์ชาญฉลาดต่าง ๆ ได้แก่ โทรศัพท์เคลื่อนที่ แท็บเล็บ หรือทั้งอุปกรณ์ทั้งสองประเภท กลุ่มตัวอย่างจะต้องยินดีที่จะให้ข้อมูลเพื่อนำมาใช้ในงานวิจัย จำนวนกลุ่มตัวอย่าง คือ 39 คน ผลการทดสอบพบว่า โมเดลที่สร้างมีความสอดคล้องกับข้อมูลที่ได้รับมาจากผู้ตอบแบบสอบถาม โดยมีค่าสถิติของโมเดลที่ผ่านการปรับแต่งแล้วดังต่อไปนี้ ค่าไคสแควร์ 13.07 ค่าองศาของความเป็นอิสระ 8 ค่าไคสแควร์สัมพัทธ์ 1.634 ค่าความน่าจะเป็นของระดับนัยสำคัญเท่ากับ .109 ค่าสัมประสิทธิ์กำหนดของความตั้งใจในการใช้งานอินเตอร์เน็ตของสรรพสิ่ง คือ .354 ค่าสัมประสิทธิ์กำหนดของการรับรู้ประโยชน์ที่ได้รับ คือ .591 และค่าสัมประสิทธิ์กำหนดของ การรับรู้ความง่ายต่อการใช้งาน คือ .464 สมการที่ได้จากโมเดลมี 3 สมการ สมการที่ 1 คือ BI = .300PEU + .837PU สมการที่ 2 คือ PEU = -.421INS - .387DIS และสมการสุดท้าย สมการที่ 3 คือ PU = .510OPT + .308INN

คำสำคัญ: โมเดลความพร้อมและการยอมรับเทคโนโลยี, ไอโอที, อินเตอร์เน็ตของสรรพสิ่ง

Abstract—This article present an examination of behavioral intention of Internet of Thing into Technology Readiness and Acceptance Model (TRAM). The sample is a volunteer who used to use internet on smart devices such as mobile phone or tablet or both devices; and has a willingness to answer a questionnaire. The finding demonstrate that structural model derives from Technology Readiness and Acceptance Model is consistent with collected data. (χ^2 = 13.07, df = 8, χ^2 /df = 1.634, p = .109) R^2 of this model was .354. R^2 of Perceived of Usefulness was .591. R^2 of Perceived of Ease of Use was .464. There are three equations were generated from structural model as BI= .300PEU + .837PU (1), PEU=-.421INS - .387DIS (2) and PU = .510OPT +.308INN (3)

Keywords: TRAM; IoT; Internet of Thing

I. INTRODUCTION

By the emergence of the technology acceptance model presented by Davis in 1985[1], the model has been widely proven and been wide range of used by an information system researchers in a variety of situations and countries. Later, in 2000 Parasuaman [2] presented the concepts used to measure the level of readiness for the technology using common personality dimension. The idea of Technology Readiness Index was raise up.

When combining the two ideas above together, the new model was generated. The model is used for measuring technology usage behavior with technology readiness factor. This model was called Technology Readiness and Acceptance Model: TRAM, presented by C. Lin, H. Shih, and P.J. Sher [3].

This research need to explore, evaluate and compare a TRAM for Behavior Intention under Internet of Thing context with a purposed TRAM model in previous research.

II. LITERATURE REVIEW

For examining TRAM, we need to review a basic concepts and model those are combined together to be a

TRAM. Those ideas are Technology Acceptance Model, and its originated Theory of TAM, Theory of Reasoned Action or TRA; and Technology Readiness Index. The last concept we also need to review is a TRAM itself.

A. Technology Acceptance Model

Behavioral usage of technology has been studied for prediction and explanation how end-user adopts and accepts information technology and systems. The beginning of TAM [4 - 5] was adapted model of fishbein and Ajzen's theory [6 - 7] is called "Theory of Reasoned Action (TRA)". This theory expresses an attitude of end-user toward technology in organizations. TRA argues that behavior of individual has been predicted by his or her behavioral intention. The TAM was developed for explanation about intention to use, and for acceptance of new technology in organizations.

[4 - 5] There are three endogenous variables in TAM such as a Perceived usefulness (PU) refer to "the degree to which enhance his or her job performance", a perceived ease of use (PEU) refer to "the degree to which an individual believes that using a particular system would be free of physical and mental effort", and a behavioral intention to use (BI) refer to "an individual's subjective probability that he or she will perform a specified behavior" [4].

B. Technology Readiness Indexed

The first Technology Readiness Indexed, TRI, was developed by Parasuraman and has been defined as "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work" [2-3, 8]. So that TRI is a list of indicators to measure an individual's beliefs and thoughts towards a technology.

Component of technology Readiness are used to group users based on positive and negative beliefs of technology in more complex way. Parasuraman [2] states that person who is optimistic and innovative as well as has lesser discomfort and insecurity feeling will be more ready to use a new technology. Those components of TRI are including Optimism refers to "a positive view of technology and belief that it offers people increased control, efficiency, and flexibility in their lives"; Innovativeness is "a tendency to be an early adopter of technology and opinion leader"; Discomfort defines as "a perception of being unable to control the technology and a feeling of being overwhelmed by it"; and Insecurity is "suspicion of technology and doubt about its capability to work" [8 - 9].

C. Technology Readiness and Acceptance Model

Technology Readiness and Acceptance Model [3, 10], TRAM, was a newest model that was presented by Lin, Shih, and Sher [3]. This model combines TRI's common personality dimension with TAM's perception technology dimension and behavior dimension together. The model expresses how those personality dimensions can affect a TAM's perception technology affecting behavior intention to use the technology that affecting Actual use technology of user.

The expanded TRAM model that was proposed by N. Larasati, Widyawan, and P.I. Santosa [10] is shown in figure 1.

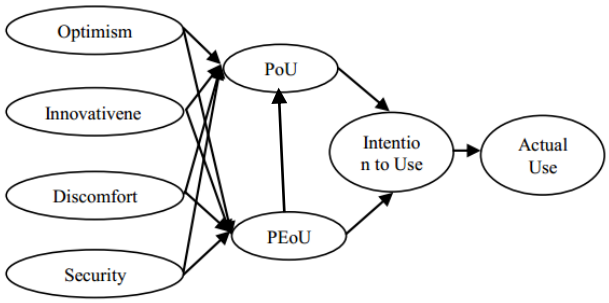

Figure 1. Technology Readiness and Acceptance Model [10]

III. RESEARCH DESIGN

A. Population and Sample

A research population was people who were used to use internet by mobile or smart devices and known or used to hear about Internet of Thing technology. The sample of this research was volunteer who willingness to answer a questionnaire. A number of respondent were 39 persons.

B. Data collection

To made data precise, accuracy and corrected, all data in this study were administered by respondents themselves. Not only questionnaire was made but also data was collected via Google form. The questionnaire was spited into seven sections as followed table.

TABLE I. CATEGORY OF QUESITON

Categories	Number of question
Optimism (OPT)	4
Innovativeness (INN)	4
Disconfort (DIS)	4
Insecurity (INS)	4
Perceived of Usefulness (PU)	4
Perceived Ease of Use (PEU)	4
Behavioral intention (BI)	3

This research employed 5 points of Likert scale to measure attitude, opinion, feeling, and perceptions of the respondent under social circumstance. The meanings of this research scale were strongly agree, somewhat agree, moderate, somewhat disagree, and strongly disagree. The values of a scale were 5, 4, 3, 2, and 1 respectively.

C. *Research model*

From the expanded model of TRAM and their research hypotheses [3, 10], the study model framework was created as a figure 2 below.

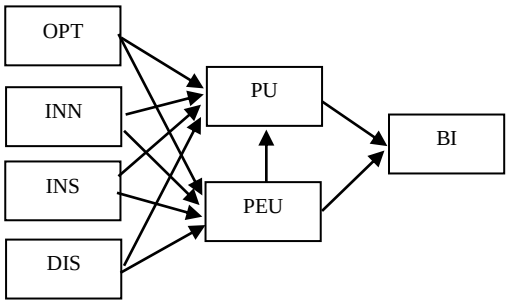

Figure 2. Research Model

The research model was similar as original model except there was not a variable corresponded with *Actual Use* and was not a relationship between *Intention to Use* and *Actual Use*

D. *Hyprothese*

As a TRAM [3, 10], There were twelve hypotheses for testing, but the hypotheses of this research which was generated for research model were:

H1: User's optimism toward a technology affects positively to perceived of usefulness technology
H2: User's optimism towards a technology affects positively to perceived ease of use technology
H3: User's innovativeness towards a technology affects positively to perceived of usefulness technology
H4: User's innovativeness towards a technology affects positively to perceived ease of use technology
H5: Discomfort felt by user towards a technology affects negatively to perceived of usefulness technology
H6: Discomfort felt by user towards a technology affects negatively to perceived ease of use technology
H7: Insecurity felt by user towards a technology affects negatively to perceived of usefulness technology
H8: Insecurity felt by user towards a technology affects negatively to perceived ease of use technology
H9: Perceived ease of use technology affects positively towards perceived of usefulness technology
H10: Perceived of usefulness technology affects positively towards the Behavioral intention using technology
H11: Perceived ease of use technology affects positively towards the Behavioral intention using technology

All eleven proposed hypotheses have been tested after structure equation model had already fitted and had been evaluated.

IV. RESULT

A. *Reliability Testing*

First of all, the variable reliability testing was conducted employed a Cronbach Alpha reliability test. The variable was stated as reliable when their Cronbach Alpha value were greater than 0.7. The next table showed the Cronbach alpha of all variables.

TABLE II. CRONBACH'S ALPHA RELIABILITY TESTING VALUE

Variable	Cronbach's Alpha
Optimism (OPT)	,928
Innovativeness (INN)	.834
Discomfort (DIS)	.701
Insecurity (INS)	.823
Perceived of Usefulness (PU)	.774
Perceived Ease of Use (PEU)	.797
Behavioral intention (BI)	.940

According to a table III, all Cronbach's Alpha value were accepted due to their value were more than .7. Therefore all variable have a reliability and available to use for the next operation.

B. *Mean and Standard Deviation*

The next table showed a descriptive statistics of all variable by using mean and standard deviation, under a Likert scale.

TABLE III. JUST IDENTIFICATION MODEL STATISTICS

Statistics	Mean	S.D.
Optimism (OPT)	4.096	1.072
Innovativeness (INN)	3,667	.872
Discomfort (DIS)	2.840	.689
Insecurity (INS)	2.558	.816
Perceived of Usefulness (PU)	3.650	.760
Perceived Ease of Use (PEU)	3.556	.668
Behavioral intention (BI)	3.632	.907

The table III presented the mean value of optimism, innovativeness, perceived of usefulness, perceived ease of use, and behavioral intention were at somewhat agree level. The mean value of discomfort, and insecurity were at moderate level.

C. *Model Fitting*

Based on initiation research model and according to collected data, the relationship among the variables in the model was determined. The figure of result model has

been shown in figure 3 and the relevance statistics value of result model has been showed in the next table.

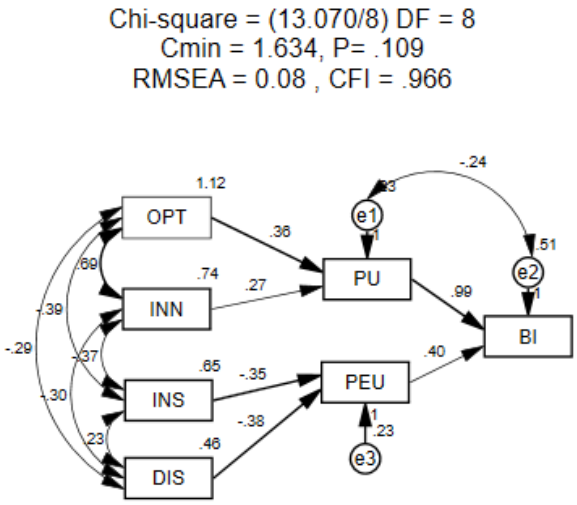

Figure 3. Just Identification Model

Refer to a figure 3, those relationships in model were a relationship from Optimism and Innovativeness to Behavioral Intention to use technology was mediated by perceived usefulness; a relationship was from Discomfort and Insecurity to Behavioral Intention and was mediated by perceived ease of use. In addition, there was no relationship from perceived ease of use to perceived usefulness.

TABLE IV. JUST IDENTIFICATION MODEL STATISTICS

Statistics	Criteria	Value
Chi-square	-	13.070
Degree of freedom	-	8
Probability level	> .05	.109
Chi-squere/DF	< 2	1.634
RMR	< .05	0.38
CFI	> .90	.966
GFI	> 90	.919
RMSEA	< .05	.08

The table IV has shown that almost statistic value of result model met a criteria of fitted model, chi-square was not significant, chi-square/degree of freedom was less than 2, Goodness of Fit index was more than .90, except RMSEA (Root Mean Square Error Adjust) was .08 and was more than .05, that over a criteria.

After model is fitting, structure model testing was operated by calculating the t-value, coefficient value and R-square value. In this research, the 0.05 significance level with two-tailed test was applied to conduct the test. T-value was used to test the hypotheses were proposed in this study. The t-value among variables showed in the next table V.

TABLE V. P-VALUE OF T- TEST

Lane	Coefficient	P-value	Explanation
OPT→PU	.510	.000	Significant
OPT→PEU	.125	.243	Insignificant
INN→PU	.308	.010	Significant
INN→PEU	-1.10	.459	Insignificant
DIS→PU	-0.27	.771	Insignificant
DIS→PEU	-.387	.003	Significant
INS→PU	.123	.054	Insignificant
INS→PEU	-.421	.001	Significant
PEU→PU	.221	.099	Insignificant
PEU→BI	.300	.004	Significant
PU→BI	.837	.000	Significant

Further, the R^2 values of each endogenous was calculated. For this research, there are three endogenous variables including: Perceived Usefulness, Perceived ease of use, Behavioral Intention to use. Three R^2 value of this research were appreciate, value was greater than 0.20.

Table VI represented the R^2 value of endogenous variables in this study.

TABLE VI. R-SQUARE VALUE

Endogenous Variables	R-Square
Perceived Usefulness	.591
Perceived ease of use	.464
Behavioral Intention to use	.354

D. Hypotheses Testing

Refer to the evaluation of Just Identification Model, the validity of the proposed hypotheses were found out, so that they were able to accepted or rejected. The hypotheses was accepted if the value of the p-value less than .05, and vice versa.

Consequently, the hypotheses testing of this study have been collected and shown in table VII below.

TABLE VII. HYPOTHESIS TEST RESULT

Hypothesis	p-value	Explanation
H1	.000	Accept Hypothesis
H2	.243	Reject Hypothesis
H3	.010	Accept Hypothesis
H4	.459	Reject Hypothesis
H5	.771	Reject Hypothesis
H6	.003	Accept Hypothesis
H7	.054	Reject Hypothesis
H8	.001	Accept Hypothesis
H9	.099	Reject Hypothesis
H10	.004	Accept Hypothesis
H11	.000	Accept Hypothesis

This study conducted eleven hypotheses testing. However, there were only six hypotheses have been able to pass the test, the other were fail. The passed hypotheses were: H1, H3, H6, H8, H10, and H11.

E. Equation

Based on research structural model and coefficient value of significant, all equation were generated as follow:

$$BI = .300PEU + .837PU \quad (1)$$

$$PEU = -.421INS - .387DIS \quad (2)$$

$$PU = .510OPT + .308INN \quad (3)$$

All equations, (1) (2) and (3) showed that BI was predicted by two predictors were PEU and PU; PEU was predicted by two predictors were INS and DIS; and PU was predicted by two predictors were OPT and INN.

V. CONCLUSION

The research finding demonstrated that the t-test value showed a significant relationship between exogenous variables and endogenous variables as follow:

- Optimism has a positively affect to Perceived Usefulness.
- Innovativeness has a positively affect to Perceived Usefulness.
- Discomfort has a negatively affect to Perceived Usefulness Perceived ease of use.
- Insecurity has a negatively affect to Perceived ease of use.

The relationship among endogenous variable were:

- Perceived Usefulness has a positively affect to Behavioral Intention to use.
- Perceived ease of use has a positively affect to Behavioral Intention to use.

Three R^2 value of the model were fine, and were suitable for usage.

In concluded, the structural model showed that application of Technology Readiness and Acceptance Model or TRAM is appropriate for this research, although there are need to modify some relationship among variables. A collected data was good to go alone with the model, however this research model was not exactly corresponds with the original model.

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