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The Role of Intelligence in e-Learning Usage: An Extension of UTAUT Model

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ABSTRACT

The main aim of this research is to ascertain the moderating role of intelligence and determine the mediating role of behavioral intention on the use of E-learning among Indonesian undergraduates. Specifically, by conducting survey in Indonesia, it covering 360 respondents among Indonesia undergraduates. This study examines the accuracy of Unified Theory of Acceptance and Use of Technology (UTAUT) and it is moderated by the intelligence level of users. The main contribution from this research is introducing intelligence level on UTAUT model to reveal the role of cognitive process level on an acceptance and usage of new technology. Our mediator results show that Performance Expectancy and Effort Expectancy are no mediation, facilitating condition and intelligence quotient (IQ) and social influence are fully mediation. The entire model has larger moderating effect to use behavior of E-learning among Indonesia undergraduates. However, the finding for the moderator result shows significant moderator influence in terms of social influence only. This research implies the three important findings for the policy makers. First, policy maker should provide the E-learning to undergraduate student in Indonesia such as communicate shared knowledge, teamwork and cooperation. Second, policy maker can explain that the important of social influence is a strong promoter for students to use blogs in their e-business learning and teaching. Last but not least, policy maker should more focus on social influence to use e-learning because it is able to attract the student's awareness and attention.

Key words: e-Learning, extension, role of intelligence, UTAUT

1. INTRODUCTION

Testing of Unified Theory of Acceptance and Use of Technology (UTAUT) model has been intensely considered in the midst of the conflicting empirical proof and hypothetical contradiction archived in the extant empirical technology management literature. Up to this point a large portion of the existing literature in created on the developed countries, and little is known about the success story of determinants attributes of UTAUT model from developing countries despite a few recent attempted studies [1][2][3]. Relatively, developing markets like Indonesia have problems on human development and education equality, abandoned them in the selection of new technology, particularly, e-learning adoption. The multifaceted nature and quick development of e-learning might require intelligence to make it fruitful [4]. Captivating Indonesia as research background could provide an alternate snapshot of the intelligence role on UTAUT model. Otherwise, the earlier discoveries of technology adoption in UTAUT framework in developing markets not really at a similar greatness with the developed countries due the role of intelligence. Expanding on these hypothetical suspicions, this exploration plans to observationally analyze intelligence moderating role on UTAUT model in the context of acceptance and use of e-learning in a relative developing in Indonesia.

Indonesia provides extraordinary condition setting of the intelligence role on UTAUT model. Right off the bat, Indonesia generally has littler technology users contrasted with their friends. Indonesia is the lowest despite the fact that their economy (GDP) is the most noteworthy contrasted with Malaysia, Thailand, Brunei, and Singapore. Indonesia is the most reduced contrasted with their companions. Human Development Index (HDI) is a pointer to demonstrate education quality and uniformity in a nation. It is generally used to dissect the dimension of education framework in a nation. Indonesia, there is close connection between technology users and HDI level. Indonesia's technology selection is firmly identified with their HDI. At the point when the HDI builds, the technology adoption likewise increments. As such, education or intelligence theoretically is related with technology selection.

Indonesia likewise gives fascinating preview with regards to terms of e-learning acceptance and use. It is accounted for that E-learning in Indonesia confronted difficulties because of framework and ability of the education partner. Indonesian Students and educators feel it is difficult to embrace e-learning since they need to gain again from the earliest starting point. This is count with earlier research [4][5] where the technology selection will confront challenges due to the willingness of clients. This willingness is firmly identified with their education level or intelligence.

There is a genuine guide to demonstrate the role of intelligence on technology selection [6]. He completed an examination about utilizing web in learning process. The discoveries are intriguing where the greater part of Indonesian understudies did not utilize web as a major aspect of learning process. He relates that finding with the intelligence student where intelligence students are bound to utilize web instead of less-performed students.

In the interim, the achievement of e-learning reception such mixed learning in Indonesia is because of the development of instructors [7]. Mixed learning in Indonesia must be more innovation in light of the fact that there is variety of information level among Indonesian students. Otherwise,

intelligence level may give distinctive effect on e-learning reception for Indonesian students.

Strikingly, UTAUT model has no intelligence variable in the model. It is propounded to clarify the purpose of explaining users' acceptance behavior have shown remarkable contribution in explaining the users intention, however studies have come with findings that UTAUT builds do not completely clarify the varieties in user behavior and intention to adopt information technology framework (E-learning) though exact [8][9]. Unified theory of acceptance and use of technology (UTAUT) proposed by [5] were used by [10] in disclosing user intention to use EXELSA in Indonesian university and builds up that the model though great, could just clarify 27.3 percent varieties with respect to goal of utilization conduct among university students and lecturers. While trying to fill this the gap created by UTAUT to completely clarify the varieties in user behavior few specialists have proposed extra factors to cross over any barrier. An effective technical help were proposed and builds up this directly affects PEOU and PU to clarify user behavior however this examination is done in Spain and effect in clarifying behavioral intention was same as UTAUT's develop [11]. Quality information, service and instructors were proposed in Taiwan and found an effect on user behavior [12]. Individual differences were proposed to clarify the variety in aim to utilize behavior in E-learning yet did not get to IQ of undergraduates [13]. All the above attempts though good, still could not address the variety passes in the intention behavior and real use partly because these analysts fail to address a noteworthy suspicion blemish of the model which assume that individuals essentially can design their conduct and are normal and will naturally survey PU and PEOU before creating goal to utilize and the actual use syndrome. UTAUT has no solution with respect to how to make technology simple to utilize (Mathieson, 1991). UTAUT is examined while being connected in education as far as acceptance and use of e-learning purposes [14]. Nonetheless, these behavioral lapses by in UTAUT lead this exploration to distinguish intelligence, a precipitator of good arranging, sanity and development as a mediator to clarify and enhance UTAUT.

This investigation proposes as lacuna in moderating effect of intelligence (IQ) as a determinant to clarify the varieties in behavior intention and use behavior among students in Indonesia considering the reality this territory of research has neither been investigated in Indonesia nor inside the mission to enhance the forecast of UTAUT's builds nor among then students in Indonesia. The consideration of "IQ" in UTAUT model of this variable offers "freshness" and "creativity" in the theory. Again that IQ were demonstrated that it is significant determinants in predominant firm value and that there exist a strong and noteworthy association among intelligence as estimated in IQ and firm value [15]. Connecting the finding of [15] to the technology Acceptance Model, this examination posits that individual intelligence could clarify further the varieties in the model and that distinctions in Intelligence as estimated in IQ are successful directing that could clarify further the failures in the apparent handiness and usability to clarify intention and actual use of data framework (E-learning).

Furthermore a large portion of the different attempts to improve the UTAUT model are made in different nations other than Indonesia which implies that such finding cannot clarify absolutely the instance of conduct expectation to utilize E-learning among Indonesian students. This concern leaves insufficient literature with regards to Indonesia in regards to E-learning acceptance behavior among students in Indonesia.

2. UTAUT

For many years, there are extensive studies on the determining the psychological factors behind an action behavior of individual. For instance, theory of reasoned action (TRA) explain about behavioral outcomes of human beings [16]. The central concept of that theory posits that human beings consider the implications of their actions before actually go to perform the act or otherwise [17]. The theory further explains that attitude is determined by the perception linked to the consequences of a given behavior or action and therefore the perception or intention formed about the consequence of a given behavior relates positively with the behavior being pursued. Alternatively, if a person develops strong intention regarding an act or behavior the higher the Likelihood that the behavior will be acted upon [16].

As there is progress in information system, TRA has been extended and modified to predict the behavioral towards MIS implementation. It was extended due to the identification of human behavior on information system application [18]. At present, many user acceptance models with different determinants are created to identify the user agreement of information systems which is an important factor to indicate a system success or failure [19]. Many scholars attempted to predict user acceptance towards a new technology [20] [21]. However, no comprehensive instrument to measure the variety of perceptions of information technology innovations had existed until [22] attempted to review and compare the existing user acceptance models with an ultimate goal to develop a unified theory of technology acceptance by integrating every major parallel aspect of user acceptance determinants from those models. That theory is Unified Theory of Acceptance and Use of Technology (Hereafter UTAUT).

UTAUT is a theoretical advancement over existing theories used to examine adoption and diffusion related research. Eight theories and models were reviewed, mapped and integrated constructs: theory of reasoned action (TRA), technology acceptance model (TAM), motivational model (MM), theory of planned behavior (TPB), a combined theory of planned behavior/technology acceptance model (C-TPB-TAM), model of PC utilization (MPCU), innovation diffusion theory (IDT), and social cognitive theory (SCT) [22]. The combination is comprehensive by unifying acceptance and usage behavior through omitting the repetitions found on those theories.

UTAUT facilitates in examining user's intention to use an information system and consequent usage behavior. Firstly, it modifies TRA, Theory of Planned Behavior (TBP), and Technology Acceptance Model (TAM) by introducing four key independent dimensions, namely, performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) as direct determinants of usage intention and behavior [22]. UTAUT model argues that acceptance and usage of model heavily relies on the demographic profile. Hence, it adds the moderating variables in the model, namely, gender, age, experience, and voluntariness of use [22].

The first two dimensions: PE and EE are extended version of TAM. PE is extension from perceived of usefulness in TAM,

meanwhile, EE is extension from perceived ease of use. Lastly, the remaining two constructs, SI and FC are derived from TPB. Due to the similarity of UTAUT with those three theories, academia favors UTAUT in predicting the acceptance and usage behavior towards information system (Baron et al 2006). Relate back to the context of this study, using UTAUT might be useful as the conceptual framework in explaining the acceptance and usage of e-learnings among undergraduate students in Indonesia.

UTAUT therefore is the unification for better behavioral prediction in acceptance and use of information system. E-learning as a technology concept within educational sector is faced with use behavior inconsistencies and UTAUT assertion has shown less than proportionate impact in generating effective way of assessing the full reason for such differences in E-learning acceptance.

In reaction to this technology adoption, this research posits as a primary hypothesis that intelligence is a moderating factor that could establish its maximal effect to explain that relationship. UTAUT has ignored the fact that human beings by nature are not entirely rational in their decision making and do not always plan their behavior as assumed by existing theories [24]. This research links this limitation of rationality and decision making to 'intelligence factor' and proposes that as a moderator. The theory again fails to identify how to make the technology use easy yet perceived ease of use is a construct in UTAUT that influences intention and use behavior. Within a complex technology system users must show creativity to master the usage of a system and thus intelligence becomes a germane factor considering the fact that creativity in the use of technology has to do with a person's intelligence. Finally the theory ignores a vital premise which is the intention to use and expectation of a person, a context that is linked to intelligence. Forming the intention to use E-learning is common however people's expectation to be able to succeed in the use of the technology wards them off. Intelligence therefore beefs up the confidence of the use behavior in that their expectation to succeed does not become a threat.

3. RESEARCH METHODOLOGY

In order to examine the Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Condition, intention to use e-learnings, it is commonly predicted by few variables, which are: gender, voluntariness of use and experience. This estimation is treated as baseline model where the latter those three variables are the control variables and independent variables with the purpose of rigorous estimation model.

Therefore, this research constructs use E-learning as the function of demographics profile, such as gender, voluntariness of use and experience as follow. The function is given as in (1).

$$Use\ of\ E-learning = f\left(\begin{array}{c}Gender, \text{voluntariness of use}, \text{experience}, \text{Performance Expectancy},\\ \text{Effort Expectancy}, \text{Social Influence}, \text{Facilitating Condition}\end{array}\right) \quad (1)$$

To test the above function empirically, the cross-sectional data is run under the estimation regression model (2).

$$\begin{aligned} Use\ of\ E-learning_i &= \propto_1 + \beta_1 Gender_i + \beta_2 voluntariness_i \\ &+ \beta_3 Experience_i \\ &+ \beta_4 \text{Performance Expectancy}_i \\ &+ \beta_5 \text{Effort Expectancy}_i \\ &+ \beta_6 \text{Social Influence}_i \\ &+ \beta_7 \text{Facilitating Condition}_i + \varepsilon_i \end{aligned} \quad (2)$$

Next, this estimation is treated as demography model where added the demography variable as moderator into baseline model with the purpose of rigorous estimation model.

Therefore, the new function of the Demography model is represented in (3)

$$Use\ of\ E-learning = f\left(\begin{array}{c}Gender, \text{voluntariness of use}, \text{experience}, \text{Performance Expectancy},\\ \text{Effort Expectancy}, \text{Social Influence}, \text{Facilitating Condition},\\ \text{Performance Expectancy} * \text{Gender}, \text{Effort Expectancy} * \text{Gender},\\ \text{Social Influence} * \text{Gender}, \text{Facilitating Condition} * \text{Gender},\\ \text{Effort Expectanc} * \text{Experience}, \text{Social Influence} * \text{Gender},\\ \text{Facilitating Condition} * \text{Gender}, \text{Social Influence} * \text{Voluntariness}\\ of\ use\end{array}\right) \quad (3)$$

To test the above function empirically, the cross-sectional data is run under the estimation regression model in(4).

$$\begin{aligned} Use\ of\ E-learning_i &= \propto_1 + \beta_1 Gender_i + \beta_2 voluntariness_i \\ &+ \beta_3 Experience_i \\ &+ \beta_4 \text{Performance Expectancy}_i \\ &+ \beta_5 \text{Effort Expectancy}_i \\ &+ \beta_6 \text{Social Influence}_i \\ &+ \beta_7 \text{Facilitating Condition}_i \\ &+ \beta_8 \text{Performance Expectancy} * \text{Gender}_i \\ &+ \beta_9 \text{Effort Expectancy} * \text{Gender}_i \\ &+ \beta_{10} \text{Social Influence} * \text{Gender}_i \\ &+ \beta_{13} \text{Facilitating Condition} * \text{Gender}_i \\ &+ \beta_{11} \text{Effort Expectancy} * \text{Experience}_i \\ &+ \beta_{12} \text{Social Influence} * \text{Experience}_i \\ &+ \beta_{13} \text{Facilitating Condition} * \text{Experience}_i \\ &+ \beta_{14} \text{Social Influence} \\ &* \text{Voluntariness of use}_i + \varepsilon_i \end{aligned} \quad (4)$$

The main idea of this research is to examine the moderating role of intelligence in the context of UTAUT. Therefore, the intelligence is introduced into the demography model. This research follows full model in constructing the estimation model. It is noteworthy that full model is measured by using one proxies, which is IQ.

Therefore, the new function of use of E-learning is as in (5).

$$Use\ of\ E-learning_i = \propto_1 + \beta_1 Gender_i + \beta_2 voluntariness_i + \beta_3 Experience_i + \beta_4 \text{Performance Expectancy}_i + \beta_5 \text{Effort Expectancy}_i + \beta_6 \text{Social Influence}_i + \beta_7 \text{Facilitating Condition}_i + \beta_8 \text{Performance Expectancy} * \text{Gender}_i + \beta_9 \text{Effort Expectancy} * \text{Gender}_i + \beta_{10} \text{Social Influence} * \text{Gender}_i + \beta_{11} \text{Facilitating Condition} * \text{Gender}_i + \beta_{12} \text{Effort Expectancy} * \text{Experience}_i + \beta_{13} \text{Social Influence} * \text{Experience}_i + \beta_{14} \text{Facilitating Condition} * \text{Experience}_i + \beta_{15} \text{Social Influence} * \text{Voluntariness of use}_i + \beta_{16} \text{Performance Expectancy} * IQ_i + \beta_{17} \text{Effort Expectancy} * IQ_i + \beta_{18} \text{Social Influence} * IQ_i + \varepsilon_i \quad (5)$$

Whereas, α indicates the expected y-intercept when all independent variables are equal to zero, and $\beta_1, \beta_2, \beta_3,$ is unknown parameters which known as coefficient of the independent variables. These symbols indicate the slope or the coefficient of the correlation between all the independent variable to the dependent variable. The magnitude of the correlation between the independent and dependent variables are depending on the value of the coefficient. Thus, $\beta_1, \beta_2, \beta_3$ set as the parameter to measure the change in the value of dependent variable (y), as to the changes in the independent variables (x). On the other hand, the symbol of "ε"- epsilon is the i^{th} observation of the error or disturbance term.

4. DATA ANALYSIS AND RESULT

4.1 Data Collection

Self-administered structured questionnaire was used, thus the involvement of researcher is quite low. The researcher would be present to distribute, explain the context and purpose of the study to the randomly selected respondent prior to respondent filling and answering to the questionnaire. Quantitative research is concerned with quantifying the data that intedt to be collected.

4.2 Estimation Model

Regression analysis is a statistical tool that had been commonly used in the field of econometrics to investigate the relationship between variables. In this study, it had been adopted to test on the assembled data that underlie variables of interest. This research aims to investigate the relationship among UTAUT, intelligence, Behaviour intention, and use of E-learning so that the estimation on the causal variables effect can be made. Besides, it can also examine how significant are these variables related to each other statistically and how close is the degree of confidence between the true and estimated relationship. In this research, the purpose is to analyse the relationship between Use E-learning., demography (Gender, Voluntariness, and Experience), main independent (Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions), mediating variable which is intention to use of E-learning, and the moderating role of intelligence in the context of UTAUT.

There are three models in this study are considered, which are Baseline model, Demography model and Full model. This study focuses on the baseline model and includes all the independent variables, demography variables and mediating variable. A good model can have low R square value. However, a model with high R square value may also not fit the data. In the field of psychology, it is expected that the R square values would be low as long as they are related to the human behaviour. This unpredictable causes R square value to be lower than 50% due to human physical processes are unpredictable.

To explore the cross section data sample pooled from the data sources, the estimation model is constructed as following.

4.3 Baseline Model

Table 1 shows that intention to use e-learnings (BI) and voluntariness have significant effect on use behaviour among third year undergraduates at 1% significance level, PerformanceExpectancy (PE) significant at 5% significance level meanwhile Effort Expectancy (EE), Facilitating Condition (FC) and gender is significantly contributed to use behaviour among third year undergraduates at 10% significance level. Additionally, there are three variables have no effect on use behaviour among third year undergraduates, which are IQ, Social influence, and experience.

Table 1 : Model and Path Coefficients Assessment

Relationship	Std Beta	Standard Error (STERR)	T Statistics (|O/STERR|)	Decision
BI -> use	0.2240	0.0530	4.2320***	**Supported**
EE -> BI	0.0280	0.0640	0.2930	Not supported
EE ->use	0.0790	0.0490	1.5840	Not Supported
FC -> BI	0.0980	0.1010	1.0000	Not supported
FC -> use	0.0730	0.0490	1.5330	Not Supported
IQ -> BI	0.3830	0.0530	7.3630***	**Supported**
IQ ->use	-0.0350	0.0500	0.6540	Not supported
PE -> BI	0.1890	0.0600	3.0160***	**Supported**
PE -> use	0.1040	0.0500	2.0120**	**Supported**
SI -> BI	0.1540	0.0710	2.1180**	**Supported**
SI -> use	-0.0240	0.0520	0.5350	Not supported
Vol -> BI	-0.0240	0.0560	0.4510	Not supported
Vol -> use	0.5670	0.0500	11.4110***	**Supported**
Exp -> BI	0.1070	0.0700	1.5390	Not Supported
Exp -> use	-0.0160	0.0480	0.3590	Not supported
Gender -> BI	0.0950	0.0450	2.112**	**Supported**
Gender -> use	-0.0700	0.0560	1.758*	**Supported**

R Square: 0.3550
Adjusted R Square: 0.1160
The level of significance is denoted using the asterisk symbol with *, ** and *** which are equivalent to 10%, 5% and 1% level of significance respectively.

Besides that, it also shows that IQ and Performance Expectancy have significant effect on behaviour intention at 1% significance level, Social Influence and gender are significant at 5% significance level. Effort Expectancy (EE), Facilitating Condition (FC), voluntariness and experience have no effect on intention behavior. Since the Behavior use is significant with use behavior among undergraduates, this study show any variables is significant with behavior

intention will be partial mediation (competitive or complementary) or indirect only (complete mediation).

IQ, and social influence are not significant with use behavior, therefore this shows that IQ and social influence are complete mediation in baseline model. However, in this study, there is Expectancy (EE), Facilitating Condition (FC) and voluntariness no significant with behavior intention, and significant with use of behavior, they show that there is direct-only which mean no mediation.

Moreover, that behavior intention to use e-learnings has a strong effect of 0.1939 when it comes to its relationship to use behaviour among undergraduates. The intention to use e-learnings is the mediating variable. IQ, Performance Expectancy, social influence and experience have the magnitude of 0.1201, 0.3792, 0.1739, 0.1561 and 0.1138 respectively on intention to use e-learnings. The result shows consistent with [24], [17], they show that there was a positive association between Performance Expectancy, social influence and intention to use E-learning. Gender has the power of -0.1022 on intention to use behaviour among undergraduates and this is because we have more male respondents in the study. This showed that male has better use of E-learning than female.

This section discusses the findings of analysis and evaluation [22]. The descriptive statistics and after running the model under PLS and structural equation model (SEM), goodness of estimation show the variables in details. The goodness of measures – reliability test and convergent validity has been assessed to ensure the results of various constructs are within the acceptable range. The goodness of estimation is to find out whether the coefficient value is able to support the established hypotheses. The diagnostic results show that the model does not suffer from normality, multicollinearity and autocorrelation problems but heteroscedasticity problems. However, as only extreme deviations from heteroscedasticity are likely to have significant impact on your findings, the results are probably still valid.. This study has ensured the model is robust enough to answer the research question.

5. CONCLUSION

This study used UTAUT as the model to examine the relationship between the use of E-learning, demography (Gender, Voluntariness, and Experience), main independent (Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions), mediating variable which is intention to use of e-learning, and the moderating role of intelligence among Indonesia undergraduates. The findings of this research contribute to body of knowledge by extending the empirical knowledge and theory. The findings contribute towards introducing intelligence level on UTAUT model to reveal the role of cognitive process level on an acceptance and the usage of new technology. This research holds the view that individual differences in terms of intelligence play a vital role among the undergraduate students towards their willingness to accept E-learning, an additional variable that is postulated to enrich further the direct relationship of UTAUT's construct regarding intention and use behaviour by users.

Other theoretical concepts could be applied to study further this research. Besides, there are many other factors affecting the use of E-learning by students. Thus, the authors consider the implementation of those other factors and different concepts as a future work. As the scope of this study focuses only on undergraduate in Indonesia, the authors believe that the analysis results may be different for the study conducted on different culture and different countries such as Malaysia. Due to the fact that the data collection tool used in this study is questionnaire, the respondents may not answer the questions accurately according to what they think and behave, thus the results analysis may be bias. A better data collection tool should be considered to reduce the bias.

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