THE THEORY OF USER ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT): A META-ANALYTIC REVIEW OF EMPIRICAL FINDINGS

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ABSTRACT

The unified theory of acceptance and use of technology (UTAUT) proposes that performance expectancy, effort expectancy, and social influence predict behavioral intention towards the acceptance of information technology. The theory further proposes that facilitating conditions and behavioural intention predicts use behavior in the acceptance of information technology. Ever since its inception, the theory has been assessed using different applications, and it has become a dè factor model of measuring user acceptance. Nonetheless, in terms of statistical significant magnitude and direction, reports on the model are diverse. Therefore, in this study, based on 37 selected empirical studies, a meta-analysis was conducted in order to harmonize the empirical evidence.

The outcome of the study suggests that only the relationship between performance expectancy and behavioural intention is strong, while the relationships between effort expectation, social influence and behavioural intention are weak. Similarly, the relationship between facilitating condition, behavioural intention and use behaviour is also weak. Furthermore, the significance of the relationship between facilitating condition and use behaviour does not pass the fail safe test while the significance of the relationship between behavioural intention and use behaviour does not pass the fail safe test satisfactorily. Implications for further studies are also discussed.

Keywords: *Information Systems (IS), Adoption, UTAUT, Meta-Analytic Review.*

1. INTRODUCTION

Information technology pervades the international community from programmable home appliances to organization applications. Increase in technological innovation and application with awesome advantages brought changes to human life and work endeavours. As people, organizations and governments moved towards the use of Information Technology. Such move of change has increased the human computer interaction, which is the sole aim of performing a task (Card, Moran and Newell ,1983). Interaction between humans and computers is affected by quite a number of human factors and its characteristics (Whitley, 1997), to which studies have come up with theories and models to investigate factors that influences humans to use computers and its applications.

The design, development and acceptance of information technologies have received substantial attention in the past few decades. Many theoretical models have been proposed to give explanations to end users acceptance behaviour. The newest amongst them is the Unified theory of adoption and use of technology (UTAUT) by Venkatesh et al. (2003), which has been applied and empirically tested in different domains. Since its inception many empirical studies have been conducted using UTAUT. The model is believed to be more robust than other Technology acceptance model in evaluating and predicting technology acceptance (Venkatesh et al., 2003). Although, the model has been widely used, tested and validated, the outcome of empirical studies has been inconclusive in respect to the magnitude, direction and significance of the relationships amongst the model. In social sciences the issue of variety in statistical significance is common because of complexity in human behaviour. Therefore, mixed outcomes in different studies are not uncommon, but it does undermine the accuracy of the models, UTAUT inclusive. Consequently, identifying users' history towards technology acceptance is difficult and

complicated for the academia and information technologist.

Information Systems (IS) researchers, Information Technology (IT) managers and e-commerce decision makers can benefit from the importance of meta-analysis on UTAUT as a knowledge cumulating tool (Hwang and Schmidt,2011) by having better understanding of concrete pre-cursors to users acceptance towards a technology and its applications. Armed with this knowledge IT managers and other decision makers can take more successful steps in attaining increase in technological patronage and usage. Studies have shown that to achieve a top level IT management success, accurate IT prescription is of paramount importance (Benbasat & Zmud, 1999).

The objective of this study is to investigate the validity of UTAUT and reveal how much this validity is substantiated in present literature. In order to achieve this we harmonized existing results on UTAUT through a meta-analysis. Integrating empirical results of the theory can assist in understanding the application of UTAUT to variety of technology in general. Meta-analysis also fosters examination of relationship between the dimensions of a model as a whole. Thus, analyzing relationships between the constructs of UTAUT with a larger sample of subjects becomes feasible than any individual study.

The outline of this study is as follows, a revision on UTAUT with discrepancies and consistent results in the existing literature, methods of study selection and coding of empirical findings based on 37 carefully selected studies. We concluded by discussing the outcome of the study, limitation of the study and implications for future studies. We anticipate that the outcome of this study can be relatively used as a point of reference while testing UTAUT in the nearest future.

2. LITERATURE REVIEW

The UTAUT is a unified model that was developed by Vankatesh et al (2003) based on social cognitive theory with a combination of eight prominent information technology (IT) acceptance research models. The authors examined the predictive validity of eight models in determining the behavioural intention and usage to allow fair comparison of the models. The eight models are; The Theory of reasoned action (TRA), The theory of Planned behavior (TPB), The technology acceptance model (TAM), The motivational Model (MM), A model combining the technology

acceptance model and the theory of planned behavior (C-TAM-TPB) ,The model of PC Utilization (MPCU),The innovation diffusion theory (ID) and Socio Cognitive Theory (SCT).

The unified model outperformed the eight individual models (adjusted variance (R^2) of 70 percent). The UTAUT model uses four core determinants of usage and intention (performance expectancy, effort expectancy, social influence, and facilitating conditions) alongside with four moderators (gender, age, experience and voluntariness of use) of key relationships. Previous works that have used UTAUT are briefly discussed in the following paragraphs.

AlAwadhi and Morris (2008) investigated the adoption of e-government services using UTAUT, the survey was carried out on 880 students revealed that performance expectancy, effort expectancy and peer influence determine students' behavioural intention. Similarly facilitating conditions and behavioural intentions determine students' use of e-government services. Also, Biemans, Swaak, Hettinga & Schuurman (2005) used the UTAUT model to examine nurses behavioural intentions towards the use of Medical Teleconferencing Application, the study revealed that performance expectancy and effort expectation are high predictors of behavioural intention but social influence prediction power is low. In a cross cultural study of IT adoption, Oshlyansky,Cairns and Thimbleby (2007) found that performance expectancy, effort expectancy and social influence predicts use intention. Furthermore, Šumak, Polančič and Heričko (2010) found that social influence have a significant impact on students behavioural intention to use moodle and students' behavioural intentions is a powerful predictor of the use of the e-learning system. Cheng, Liu, Song and Qian (2008) investigated the validity of UTAUT using 313 intended users of Internet banking in China, the result suggest that performance expectancy and social influence are strong predictors of behavioural intention. In a similar study, Cheng, Liu, and Qian (2008) found performance expectancy and social influence of the UTAUT constructs as predictors of users behavioural intention towards internet banking.

In addition, an empirical study by Fang, Li, and Liu (2008) suggests that performance expectancy, effort expectancy and social influence significantly predicts managers intention to engage in knowledge sharing using web2.0. Maldonado, Khan, Moon and Rho (2009) examined the acceptance of an e-learning technology in secondary school in Peru,

240 Students took part in the survey. Result from their study suggests that social influence significantly predicts behavioural intention. In the same study, Maldonado et al. (2009) found behavioural intention to significantly predict use behaviour. Carlsson, Carlsson and Hyvönen (2006) examined the acceptance of mobile telephone and found that performance expectancy, effort expectancy and social influence are predictors of behavioural intention.

Also, Wu, Tao and Yang (2007) investigated the acceptance of 3G services in Taiwan and found performance expectancy and social influence as predictors of behavioural intention. Interestingly,

the authors also found performance expectancy, effort expectation, social influence and facilitating conditions as predictors of use behaviour. He and Lu (2007) further suggest that performance expectancy and social influence are predictors of behavioural intention towards consumer's acceptances of mobile advertising. The authors also found that facilitating condition and behavioural intention predicts use behaviour. Cheng, Liu, Qian & Song (2008) examined the acceptance of internet banking, results suggest that performance expectancy and social influence predicts intention.
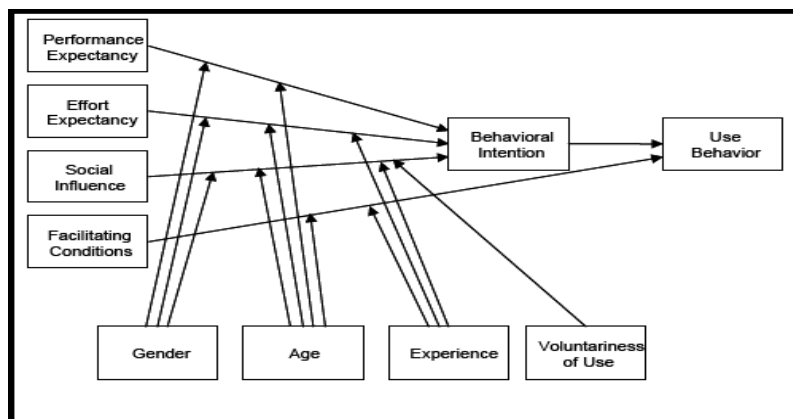

Figure1. Unified Theory Of Acceptance And Use Of Technology (UTAUT) (Source: Venkatesh Et Al., 2003).

As much as some studies have supported that the four predictive factors of UTAUT predicts intention and use behavior, results from some other studies suggest otherwise. Li & Kishore (2006) studied the Use of Online Community Weblog Systems, the results indicated that scales for the four constructs in UTAUT including performance expectancy, effort expectancy, social influence, and facilitating conditions have invariant true scores across most but not all subgroups. The authors expressed need for caution when interpreting UTAUT. In a structured PLS-Graph Conceptual Model, Tibenderana and Ogao (2008) found performance expectancy and social influence to be non-significant in predicting behavioural intention to use electronic Library services in Ugandan Universities. Performance expectancy, effort expectancy and social influence were found to be non-significant in predicting intention in a study investigating the acceptance of an interface robot and a screen agent by elderly users (Heerink,Kröse,Wielinga and Evers, 2009).

Similarly, Šumak, Polančič and Heričko (2010) suggested that performance expectancy and effort expectancy are non-significant predictor of behavioural intention. In a related study, Cheng, Liu, Song and Qian (2008) discovered that effort expectancy does not significantly predict behavioural intention. Similar studies have also found effort expectancy to be non-significant in predicting behavioural intention (See Cheng, Liu and Qian 2008; He and Lu 2007;Wu, Tao and Yang 2007). In a study to investigate the role played by motivation in e-learning technology adoption, Maldonado, Khan, Moon and Rho (2009) found facilitating condition to be non- significant in predicting use behaviour. Cheng, Liu, Qian, Song (2008) also examined the acceptance of internet banking and found that effort expectancy does not predict customers intention to use internet banking. In the context of eGovernment, Schaupp, Carter and Hobbs (2009) investigated the acceptance of E-Filing by the American tax payers. Results from the study suggest that performance expectancy and

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social influence predicts behavioural intention. Interestingly, the study revealed that effort expectancy is not a predictor of behavioural intention. The inconsistency in the outcomes of the studies on UTAUT leaves the output of the relationships in the model inconclusive.

3. METHODOLOGY

Glass (1976) defined meta-analysis as statistical analysis of a large collection of analysis results for the purpose of integrating the findings. Shaughnessy et al. (2006) further defined meta-analysis as the approach in which data is summarized and reported. Lastly, DeCoster (2004) described meta-analysis as a method used to provide information to support a particular theoretical statement concerning strength or consistency of a specific relationship. Following the approach of Lipsey & Wilson, (2001) and Ma and Liu (2004) we employed their approach for data collection, selection criteria, articles usage permission, coding and subsequent data analysis.

3.1 Selection of Studies

A detailed literature search was performed using Science Direct, Emerald, ProQuest, EBSCO, PsycArticles, and Dissertation Abstracts Online, IEEE, GoogleScholar and ACM. A compendium of studies on technology acceptance that used UTAUT was gathered using search words such as "UTAUT, User Acceptance, and Technology Adoption". Furthermore, we identified the use of the UTAUT model using references in other articles (Lipsey & Wilson, 2001). In order to be included in the meta-analysis, the paper has to meet the following criteria adapted from Ma and Liu (2004):

a. Be a behavioural study.

b. Involve technology investigation.

c. Involves empirical testing of UTAUT directly or indirectly.

d. Reported correlation co-efficient between the constructs of UTAUT or other values that can be converted to correlations.

e. Reports a sample size.

f. It must be published or dated after 2003 when UTAUT was first published to 2011.

In addition, effect sizes (r) from various samples vary, therefore, studies that fail to report enough statistical data to calculate effect sizes of the study were not included in the meta-analysis. A general concern while conducting a meta-analysis is publication bias. Owing to the fact that only studies with statistical significant results are published in academic journals, the sizes of the effect sizes

reported in articles are larger than unpublished studies (Ma and Liu, 2004). Therefore, reporting only the published papers will result into file drawers problem since an important method in meta-analysis is the calculation of the average effect size of individual studies. There is every likelihood that meta-analytic results may be inflated due to the file-drawers problem. In order to avoid this, we included academic conference papers from the Association of computer machinery, IEEE digital library and Proquest Academic database for online thesis, besides the papers from journals.

Furthermore, we took caution in assuming that individual study is independent (independent effect sizes), which is a general assumption in meta-analysis. Because some authors violate this by reporting two or more correlation based on a single sample. Thus, we cross checked to see if the correlations were not based on the same study before final selection. In this study, a total of 96 empirical studies were discovered, seventy one (71) studies were without correlation coefficient or other statistical metrics that can be used. We corresponded with 20 authors with contact details in their paper and 12 of the authors provided us with inter-item correlations between the constructs in their study. Amongst the 37 selected information systems (IS) studies, there are 24 Journal Papers, 6 conference papers, 7 PhD thesis papers. A total of 153 correlation coefficients were obtained from the studies.

3.2 Variables Recorded

The six (6) variables examined in each study were coded as performance expectation (PE), effort expectancy (EE), social influence (SI), facilitating condition (FC) behavioural intention (BI) and Use Behaviour (UB). The calculation of effect sizes and other derivatives of meta-analysis were based on these important variables of the UTAUT model. Other variables investigated by Venkatesh et al. (2003) but without significant effect were not included in this study.

3.3 Computation of Effect Sizes

Correlation co-efficient (r) was the effect size metric chosen for this study because of its wide accessibility and availability in technology accepted literature, also because of its ease of interpretation and availability of formulae to convert other test statistics to correlation coefficient. In many studies, it is not uncommon to have researchers reporting different statistical value such as correlation coefficient, F,t-value, p-value and chi square.

Nonetheless, achieving insight into the depth of the strength of the relationships between factors in a study becomes cumbersome without a uniform metric. Therefore, converting metrics into a uniform format becomes pertinent before a meta-analysis can be conducted. In this study, we adopted the Pearson's correlation co-efficient as effect size index representing the empirical strength of the relationship between each pair of the UTAUT construct. We followed the approach described by Lipsey & Wilson (2001) and Ma & Liu (2004), for each of the pair of the UTAUT construct: performance expectancy (PE), effort expectancy (EE), social influence (SI), faciliatating condition (FC), behavioural intention (BI) and use behaviour (UB) the effect size was computed such that it is simply a correlation coefficient (r) if reported, otherwise a conversion is made using equation (1) if other metrics such as t-value was reported. This procedure by Rosenthal (1984) and has been widely adopted by several studies (See Szymansky& Henard, 2001; Ma and Liu 2004). The effect sizes of variables in each study were computed to access prediction effect towards behavioural intention and use behaviour. Effect sizes reported by authors were not recalculated but were used directly. The computed outcome of effect values were computed into excel spreadsheet. Generally, about 96% of the effect sizes were calculated using the means and the mean and standard deviation spreadsheet. 4% of the effect sizes were calculated using the F or t test spreadsheet.

$$r = \sqrt{\frac{t^2}{t^2 + \delta f}} \quad \text{Where } \delta f \text{ is the degree of freedom}$$

…..equation (1)

4. DATA ANALYSIS

The analysis of the data computed was reported in two phases. The first phase described the range, direction, statistical significance and the sample size of the correlation. The multiplicities of the existing findings were described. The univariate analysis of the correlation was investigated in the second phase. Therefore, statistical significance and essential tendencies of the findings were deducted.

4.1 The descriptive Statistics

Using the 153 correlation coefficients obtained from the studies, Table 1 shows that some studies did not report all the five correlation or their equivalents. Out of the 153 correlation coefficients, (43) PE-BI correlations were obtained from (37) studies, (42)

PE-BI correlations were reported from 36 studies, (36) SI-BI correlations were reported from 31 studies, 16 FC-BI correlations were reported from 13 studies and 16 BI-UB correlations were reported from 13 studies. The number of studies for PE-BI and EE-BI were approximately the same, the number of studies for SI-BI is a little lower than the first two. While the number of studies for FC-BI and BI-UB were low and reporting the same low 16 correlations from 13 studies respectively. Concerning the strength of individual correlation coefficient, Table1 shows that the range of the effect sizes moves from insignificant to strongly significant. Although, most studies reported significant results, it could be noted that some of the studies reported insignificant results. All the five relationships reported high positive significance but PE-BI reports the highest positive significant correlations. Moreover, FC-BI and BI-UB have equal but highest negative non-significant correlation. Furthermore, the sample size varies from one study to another, as the sample size was as low as 41 in a study, while it is as high as 1607 in a related study. The average sample size shows that number of subjects in the PE-BI, EE-BI and SI-BI are very close while the sample size for both FC-BI and BI-UB are the same and lower than the first three relationships.

4.2 Direct Effect Analysis

Using the simple means, sample size adjusted mean and the Fisher r to Z transformation method (Fisher 1932; Lipsey and Wilson (2001). The average of all the individual effect sizes is regarded as a simple mean. A sample size-weighted average of the individual effect size is considered as sample size adjusted mean (equation 2). Correlations were transformed to Fisher's Z (using equation 3) for analysis and later back-transformed in the correlation metrics for result presentation.

$$r = \frac{\sum N_i \, r_i}{\sum N_i} \quad \text{where } N_i \text{ and } r_i \text{ are sample size and effect size of test } i \text{ respectively}$$

..equation (2)

$$Z = 0.5 * \ln\left(\frac{1 + r}{1 - r}\right) \quad \text{where } r \text{ is an individual correlation coefficient}$$

..equation (3)

Table1:Summary Of Selected Correlation

Link	No of Studies	No of Correlation Coefficients	Range of correlation		Positive significant correlation		Negative significant correlation		Range of Sample size			Cumulative sample size
			from	To	#	%	#	%	from	To	Ave	
PE-BI	37	43	0.10	0.70	42	97.7	1	2.3	41	1607	257	11057
EE-BI	36	42	0.07	0.70	40	95.2	2	4.8	41	1607	262	10995
SI-BI	31	36	0.12	0.89	35	94.6	2	5.4	41	1607	252	9304
FC-UB	13	16	0.11	0.79	13	81.3	3	18.7	55	722	191	3048
BI-UB	13	16	0.12	0.84	13	81.3	3	18.7	55	722	191	3048

Table2: Summary Of Means, Variances, Correlations

Link	Sample Adjusted r	Simple mean r	Standard Deviation	Correlation from Zr	Standard Error	Sample Variance	Fail safe	Confidence Interval @99%
PE-BI	0.4982	0.4919	0.1486	0.5361	0.1581	0.0221	167.03	(.43,.55)
EE-BI	0.4224	0.4131	0.1509	0.4356	0.1601	0.0228	76.67	(.35,.47)
SI-BI	0.4235	0.4019	0.1658	0.4236	0.1715	0.0275	47.15	(.33,.47)
FC-UB	0.3566	0.3556	0.2047	0.3769	0.2774	0.0419	-1.05	(.22,.50)
BI-UB	0.4104	0.4125	0.0221	0.4356	0.2774	0.0490	5.57	(.40,.42)

In meta-analysis, some argue that there is no much difference between the simple mean and the Fisher's r to Z transformation (See Szymanski & Henard (2001); Mo et al 2004), but we decided to engage both methods is our study (equation 2 and 3) for clarity. Reliability adjusted mean was not computed in this study but sample size adjusted mean.

The Fisher's r to Z transformation results is quite larger than the simple mean and the sample adjusted mean except for some of the values SI-BI are almost the same. All in all the three values from the three methods are approximately the same. Therefore we can interpreted the result from these study based on both the Fisher's r to Z transformation method and sample size adjusted method. The magnitude of an effect size is regarded as small when it is close to 0.10, medium when it is close to 0.30 and large when it is close to 0.50 (Cohen 1977;Mo et al 2004). Following this rule, our meta-analysis implies a medium size effect for FC-BI and large size effect for all other relationship. Furthermore, our study suggests that the PE-BI relationship is the strongest while FC-UB is the weakest of the relationships.

Also, EE-BI relationship is stronger than SI-BI relationship (See Table 2). For more confidence that intervals include means (μ) a wider confidence interval is recommended (Cumming and Finch 2005). Therefore, a 99% confidence interval was computed for each mean estimate to depict its statistical significance. With the existence of variances and error, the confidence provides a range of effects that may exist in a true population. None of the intervals in Table2 is 0, thus we can conclude that all the mean effect is significantly different from zero. The significance of the effect sizes were further tested by computing the failsafe test. Using equation 3, the failsafe test (N) shows the amount in numbers of additional studies that is needed to confirm the null hypothesis (r=0) required to annul the conclusion that there exist a significant relationship amongst the pair of variables.

Consequently, Table 2 shows that the mean effect sizes of PE-BI, EE-BI and SI-BI are significantly different from zero to the extent that 47-167 null effect size is needed to revert mean effect sizes to a level considered as non – significant statistically, BI-UB requires 6 of null effect to make the relationship non-significance(Many study suggest significant relationship with behavioural intention). Nevertheless, the mean effect size of FC-UB did not pass the fail safe test with the negative (Nfs.05). Since individual level analysis (use of individual correlation) was employed in this study against the study level analysis (use of average correlation). We computed the sampling error variance and the standard deviation for each of the relationship to avoid under estimation of the sampling error sampling and generalization (Mo et al., 2004). Our result shows that the variances of sampling error are

close to each other. Therefore, individual level analysis is satisfactory for this meta-analytic study.

5. DISCUSSIONS

The summary of the results computed in the meta-analysis is depicted by Table 3. Using Cohen (1992) criteria of categorizing mean effect sizes as non-significant, small, medium or large. As depicted by the table, most of the effect sizes are small. This result however is consistent with the result of Venkatesh et al.(2003), except the results of BI-USE which is lower. This could be as a result of inability of authors to measure actual usage of systems being investigated.

Table3: Summary Of Effect Sizes By Dependent Variables

Link	Correlation from Zr	Size/weight
PE-BI	0.5361	Medium
EE-BI	0.4356	Small
SI-BI	0.4236	Small
FC-UB	0.3769	Small
BI-UB	0.4356	Small

Note: Effect sizes classification is based on Cohen's 1992 s = small (.2 <d <.5); M = Medium (.5 <d <.8); L = Large (d >.8);

5.1 Performance Expectancy and behavioural intention (PE-BI)

The effect size of performance expectancy can be classified as medium with a Zr of 0.5361. This is the largest effect size in the study, and it is consistent with previous literature showing that amongst the four major construct of UTAUT, performance expectancy has the highest co-efficient path weight (Venkatesh et al 2003, Wnag & Shih 2009; Dijk et al 2008). Users of Information Systems gives high regard to the level at which the system is advantageous to them in their daily routine. The ability of the system to assist users to achieve task quickly will motivate users to adopt the system.

The fail safe test shows that 167 null effect sizes are expected to make the computed effect size non-significant. This however is not possible considering that fourty three (43) coefficients were used to compute the effect size.

However, the derived effect size of PE-BI in this study is further tested with it statistical significance and we found that the out-put is statistically different from zero with a confidence interval of (.43,55) and thus we can say that the difference between the

theorized parameter and the observed estimate in this study is not statistically significant at the 1% level using a 99% confidence Interval.

5.2 Effort Expectancy and behavioural intention (EE-BI)

Table 3 shows that the effect size (Zr) of effort expectancy is small with a weight of 0.4356. However this value is consistent with previous literature (Venkatesh et al 2003; Dijk et al 2008). Users of Information Systems are concerned with the ease that is associated with the use of the information system. A complex system or a web interface that is difficult to navigate can make users uninterested in adopting the system or website (Byun & Finnie, 2011). The issue regarding the level of computer literacy amongst the population can alter the perception of respondents to the ease associated with using an information system, because computer savvy users may be indifferent.

The fail safe test shows that 76 null effect sizes are expected to make the computed effect size non-significant. However this is hard to realize considering that fourty two (42) coefficients were used to compute the effort expectancy effect size.

Furthermore, the derived effect size in this study is further tested with it statistical significance and we found that the out-put is statistically different from zero with a confidence interval of (.35,.47). Thus the difference between the theorized parameter and the observed estimate in this study is not statistically significant at 1% level using a 99% confidence interval.

5.3 Social Influence and behavioural intention (SI-BI)

The effect size of social influence can be classified as small (See Table 3) with a Zr of 0.4236. This result is consistent with previous literature showing the effect of social influence on intention to adopt a technology (Venkatesh et al 3003; Wang &Shih 2009).

Besides an effective and easy to use information system, end-users might not be obliged to use the system until they are motivated by important others (people) that can influence their attitude and behaviour. With the way people's life are molded round role models, public figures, sportsmen and celebrities, an encouragement by such important figures to use the system can motivate users to adopt the use of an information system (Taiwo et al., 2012).

The fail safe test shows that 47 null effect sizes are expected to make the computed effect size non-

significant. This however is hard to obtain considering that thirty six (36) coefficients were used to compute the effect size.

However, the derived effect size in this study is further tested with it statistical significance and we found that the out-put is statistically different from zero with a confidence interval of (.33, .47) and thus we can say that the difference between the theorized parameter and the observed estimate in this study is not statistically significant at the 1% level using a 99% confidence Interval.

5.4 Facilitating condition and behavioural intention (FC-BI)

Table 3 depicts a small effect size (Zr) of facilitating condition with a weight of 0.3769.The FC-BI relationship accounts for the lowest effect size in the study. This could be as a result of inability of most studies to measure the actual usage of the information systems being invested. Therefore, few studies actually reports the outcome of the effect of facilitating conditions on use behaviour, rather many authors reports the effect of facilitating condition on intention which Venkatesh et al had hypothesized and found non-significant. In some studies, facilitating condition has been found to be significant in predicting intention (Foon and Fah, 2011; Venkatesh et al 2011a; Venkatesh et al 2011b). Thus, the outcome on the relationship between the facilitation condition and use behaviour can be said to be inconclusive. Although empirically, there might be inconclusive argument on the effect of FC on UB or BI, it is important to note that qualitative research have shown that the contribution of provision of organizational and technical infrastructure for users towards the acceptance of a technology cannot be overemphasized (Alawadhi and Morris 2009). Furthermore, the derived effect size of the FC-UB relationship is further tested with it statistical significance and we found that the out-put is statistically different from zero with a confidence interval of (.22,.50). Thus the difference between the theorized parameter and the observed estimate in this study is not statistically significant at the 1% level using a 99% confidence Interval. Nevertheless, the effect of facilitating condition on intention do not pass the fail safe test showing a negative value, thus the consistency in the outcome of FC-BI relationship is questionable.

5.5 Behavioural intention and use behaviour (BI-UB)

The effect size of BI-USE can be classified as small with a Zr of 0.4356(See table 3). This however

could be as a result of inability of many studies that employed UTAUT in their investigation of acceptance and adoption of technologies to measure the actual use behaviour of the new information systems being investigated. Therefore, few studies actually investigate the effect of intention on use behaviour rather many authors relied on the premise that there exist a strong relationship between intention and usage which Venkatesh et al had hypothesized and found significant.

The derived effect size in this study is further tested with it's statistical significance and we found that the out-put is statistically different from zero with a confidence interval of (.40, .42). Thus, the difference between the theorized parameter (Venkatesh outcome) and the observed estimate in this study is not statistically significant at the 1% level using a 99% confidence Interval. Users that show positive intention towards a technology actually exhibit that specific behaviour at a later time. However, our study found the BI-UB relationship had a less than desired fail safe test value of 5.56, thus about 6 null effect sizes are expected to make the computed effect size non-significant.

6. LIMITATIONS AND FUTURE-WORKS

Besides the selection criteria surrounding studies involved in this study, one of the limitations of this study is that the UTAUT theory is merely cited in many articles but not actually used. This led to the relative small sample size of studies that were employed in this study. The inability of a standardized and generally accepted effect size statistics would enhance meta-analytic outcomes (Lipsey and Wiley 2000;Ma and Liu,2004). Secondly, meta-analysis has the ability of indentifying whether the variation of correlation is due to chance, dimensions or methods employed. We were unable to achieve this because of the small size of the selected studies, although we earlier planned to examine the effects of the moderators and methods used by running multiple regressions. Thirdly, inability of the studies to measure use behaviour and the integration of some dimensions of UTAUT led to uneven number of correlations between the constructs. Therefore, some caution is advised when interpreting the results in the study. Future works could to attempts to resolve the above limitations. Besides the use of coefficient paths magnitude, reports on future studies of UTAUT should include correlations, T-test and other statistical measures that can be used to compute a meta-analysis. This shall enhance measuring the

consistency of findings and the parsimonious nature of UTAUT.

7. CONCLUSIONS

Through the meta-analysis, this study has succeeded in combining and investigating existing empirical literatures on Unified theory of acceptance and use of technology (UTAUT). The relationship between UTAUT was examined using a larger sample size of over 11,000 which could have been difficult to achieve in a single study. On the basis of meta-analysis reported in this article, generally, our findings confirms Venkatesh et al. initial findings amongst the five constructs of UTAUT, only the relationship between PE and BI is strong while others are slightly weak but significant.

Also the relationship between BI and UB is also reliable while the relationship between FC and UB is found to be fairly less than desired. Furthermore, all the five mean effects are statistically positive at $\alpha=0.01$ to attest to their statistical significance. The fail safe test further asserts the significance of the relationships. We discovered that 47-167 null effect size is needed to be hidden in file drawer for the mean correlation between the trio of PE,EE,SI and BI to be non significant, this seems unlikely. However the mean effect size of BI-UB has a weak fail safe value, suggesting that six (6) reports with null effects can make the effect non-significant. While the mean effect size of FC-UB failed the fail safe test, suggesting that addition of just one report with null effect can make the effect non-significant.

In conclusion, we discovered that majority of researchers cited UTAUT in their articles in order to support an argument rather than using it. Others that reported the use of UTAUT actually used it partially while only a few have reported the use of the actually theory. This paper contributes to the area of IS/IT adoption and diffusion research by showing the inadequacy and inconsistency in the use and output of a theory.

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