

AN EMPIRICAL INVESTIGATION OF THE COURSE WEBSITE ACCEPTANCE MODEL (CWAM)

JOSHUA IGNATIUS, T. RAMAYAH
Dept. of Operations Management, School of Management
Universiti Sains Malaysia
11800 USM Penang, Malaysia

Abstract

There exists a plethora of technologies, including course websites that cater for the realization and expansion of eLearning in terms of its course-content delivery. Nevertheless, the technologies (i.e. course website) alone do not express the successful outcomes due to the implementation alone. Students' behavior and responses toward the technology (i.e. course website) will eventually determine whether the implementation is successful. Therefore, this paper seeks to highlight two important beliefs, i.e. perceived ease of use and perceived usefulness that has been widely applied to understand technology acceptance. More importantly, it remains the sole objective of this paper to validate the instrument of course website acceptance in a public institution of higher learning. Two main steps were involved in the validation of the instrument, which are 1) Exploratory validation of the initial R-type factor analysis and Cronbach Alpha reliability assessment, and 2) Confirmatory validation that includes convergent, discriminant and construct reliability assessment. The three constructs, i.e. course website usefulness, ease of use and usage were found to be just identified models that have sufficient regression weights. An item was dropped from course website usefulness, while three items each were dropped from the course website usefulness and ease of use constructs respectively. The findings suggest that the instrument that is in English might be the cause of these dropped items.

Keywords: Technology Acceptance Model, eLearning, Instrument Validation

1. Introduction

The main contention of this paper is that eLearning tools do not ensure implementation success, let alone in promoting technology acceptance. Rather, students have to decide for themselves to embrace or behave receptively towards the course website that was intended to supplement their face-to-face classroom learning process. Nevertheless, the intention to accept or reject the course website is based on a series of tradeoffs between the perceived benefits of the course website and the complexity of learning (or using) it. This phenomenon can be reasonably explained by using the Theory of Reasoned Action (TRA), which essentially argues that social behavior, is motivated by an individual's attitude towards executing that behavior. Therefore, the change of behavior is the result of the function of one's beliefs about the outcome of the behavior and an evaluation of the value of each of those outcomes (Ji-Won Moon & Young-Gul Kim, 2001). The Technology Acceptance Model (TAM) pioneered by Davis (1989) advances the TRA and suggests that perceived usefulness (PU) and perceived ease of use (PEU) are key determinants that inevitably lead to the actual usage of the course website among students. PU is defined as the extent to which the student believes that using the course website would enhance his/her job performance. PEU on the other hand, is defined as the extent to which the student believes that using the course website would be free from effort (Davis et al., 1989).

2. Literature Review

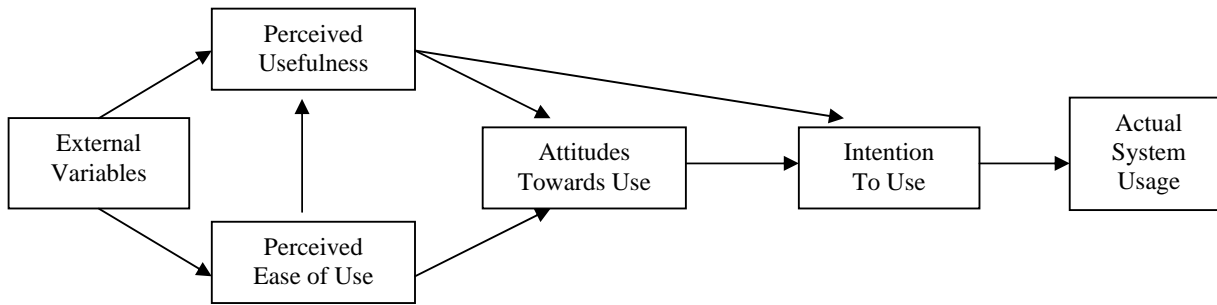


Figure 1: Technology Acceptance Model (TAM) (Davis et al., 1989)

Although TAM was influential in predicting and explaining technology acceptance in general, it lacks the specificity of users' opinions on specific system or technology (such as the course website). Due to this reason, researchers (e.g. Davis & Venkatesh, 1996; Venkatesh & Davis, 2000) pursued vigorous validation and extension of the TAM under different environments to increase its explanatory power. Additionally, a number of modified TAM models (e.g. Agarwal & Prasad, 1998; Chau, 1996; Chau & Hu, 2001; Horton, Buck, Waterson & Clegg, 2001; Hu, Chau, Sheng & Tam, 1999; Igarria, Zinatell, Cragg & Cavaye, 1997; Jiang, Shu, Klein & Lin, 2000) were developed to address acceptance of new technologies and their industrial application.

Similarly in Malaysia, the advancement of the TAM is kept abreast with the latest development and diffusion of technologies in respective industries. In 2001, Jantan, Ramayah and Chin conducted a study to understand multiple factors that influence PC acceptance among small and medium sized companies. Contrastingly, Ramayah et al. (2003) replicated the TAM to understand the receptiveness of Malaysian consumers in the E-banking sector. In addition, Ramayah, Siron, Dahlan and Mohamad (2002) used the TAM to study technology usage amongst owners/managers of SME's. Recently, the study was extended to include the moderating effect of self-efficacy to assess the acceptance of web-based supply chain management among SMEs (see Ramayah & Jantan, 2003).

Despite many applications that were accessed by TAM in Malaysia, there is no study that seeks to elucidate on the acceptance of course websites as a technology to enhance a student's performance. The fact that many studies in the west (e.g. Seal and Przasnski, 2001) had highlighted the use of world wide web (WWW) as a tool to change the student – teaching model gives rise to the need for Malaysian education system to view WWW as a potential to improve our *status quo*. Applications of WWW that has been used extensively are e-discussion groups, e-boards and course websites has impacted the teaching – learning methodology in the information age (e.g. Brown and Neilson, 1996; Chrisman and Harvey, 1998). Seal and Przasnski (2001) added that course websites improve students' understanding of the course materials. They suggested that course websites could be used as a teaching enhancement to the conventional methods.

3. Research Instrument

The three constructs of TAM (i.e. ease of use, usefulness and usage) that have been widely used and tested in previous research were applied to CWAM. A similar study researched (i.e. Selim, 2003) was to apply TAM to investigate course website usage acceptance among undergraduate students from an accredited college of business and economics at United Arab Emirates. The operational definitions for the constructs of CWAM were a modification from TAM, which are as follows:

- Course Website Usefulness (Cweb_U) – The students belief that using course websites will increase their learning performance, efficiency, and effectiveness (Davis, 1989);
- Course Website Ease of Use (Cweb_EOU) – The degree to which the student expects the use of the course websites to be free of effort (Davis, 1989);
- Course Website Usage (CWUSE) – The actual usage of the course website (which is used as an indicator to the acceptance of the course website) (Davis, 1989).

Table 1
List of Items

Cweb_U	Description
PU1	Using the course website improves the quality of the course work I do
PU2	Using the course website enables me to accomplish course tasks more quickly.
PU3	Using the course website makes it easier to study the course material.
PU4	Using the course website increases my productivity.
PU5	Using the course website enhances my effectiveness in the course work.
PU6	I find the course web site useful in the course work.
Cweb_EOU	
PEU1	Using the course website is easy for me.
PEU2	It was easy for me to become skillful at using the course website.
PEU3	I find the course website easy to use.
PEU4	I find the course website to be flexible to interact with.
PEU5	My interaction with the course website is clear and understandable.
PEU6	I find it easy to get the information I want from the course website.
CWUSE	
USE1	I use the course website a lot to do my course work.
USE2	I use the course website whenever possible to do my course work.
USE3	I use the course website frequently to do my course work.
USE4	I use the course website whenever appropriate to do my course work.

Note: All items employed the 7-point Likert scale (strongly disagree – strongly agree)

4. Population and Sample

The population consisted of 360 students enrolled in the second year management degree from a particular public institution of higher learning. The sample was selected through convenience sampling. These students have been exposed to the course website during their Business Research Methodology coursework. The demographic profile of the respondents is presented in Table 1. Majority of respondents are female (17.5%), 22 years of age and from a Malay lineage that depicts the typical profile of a public institution of higher learning in Malaysia. Only a small percentage of respondents do not have Internet access from home (13.3%). It was also found that majority of them have been engaging in the Internet for 1 to 2 years and preferred Internet Explorer as their web browser. Most students engage in Internet activities only a few times per month with each session lasting for approximately 1 to 2 hours.

Table 2
Demographic Profile

Variable		Frequency	Percent
Gender	Male	19	79.4
	Female	86	17.5
Age	20 years old	23	21.9
	21 years old	39	37.1
	22 years old	43	41.0
Race	Malay	42	40
	Indian	15	14.3
	Chinese	44	41.9
	Others	4	3.8

Internet Access Availability	Yes	91	86.7
	No	14	13.3
Web Browser	Internet Explorer	93	88.6
	Netscape Navigator	0	0
	Both	12	11.4
	Others	0	0
Length of Use	< 1 year	0	0
	1 year – 2 years	41	39
	2 years – 3 years	33	31.4
	3 years – 4 years	0	0
	4 years – 5 years	15	14.3
	5 years – 6 years	16	15.2
Frequency of Use	Once a month	7	6.7
	Few times a month	37	35.2
	Once a week	21	20.0
	Few times a week	33	31.4
	Once a day	3	2.9
	Few times a day	4	3.8
Usage	Almost never	8	7.6
	< 30 mins/day	14	13.3
	30mins – 1hour/day	19	18.1
	1 hour – 2 hours/day	47	44.8
	2 hour – 3 hours/day	17	16.2
	> 3 hours/day	0	0

5. Analyses and Findings

5.1 Exploratory Validation of Measurement Models

An R-type exploratory factor analysis with Varimax rotation was performed to validate whether the items in each section loaded into their expected categories. As presented in Table 2, the results show two distinct factors for PEU and PU as well as a single factor for usage. Three items, each from PU and PEU were dropped respectively due to cross loading of items. The dropped items from PU reflect the long-term usefulness of using the course website. Since these students have been introduced to the course website without prior experience, this study believes that it will take a while before the students familiarize themselves with the technology and find it useful. On the other hand, the three dropped items from PEU might lead the respondents to misinterpret the ease of use of engaging in the course website as the usefulness of having an easy to use course website. This could also be a probable cause for the cross loading of items.

The variance explained for PEU and PU are 34.54 and 37.15 respectively, with cumulative variance of 71.69. Although the criteria used to identify the loadings by Igarria et al. (1995) was that each item should load 0.50 or greater on one factor and 0.35 or lower on another factor, this study employed the 0.70 – 0.45 instead. There are two reasons for this decision, which are as follows: 1) due to the students relatively short exposure to the course website, the students might perceive the usefulness and ease of use construct to be somewhat related, and 2) using Igarria et al. (1995) criterion would lead to an elimination of an item from PEU and PU construct, therein resulting in a common factor as tested in this study.

Table 3

Factor and Reliability Analysis for the Independent Variables

Variables	Factors	
	1	2
Perceived Usefulness		
Using the course website increases my productivity	.71	.340

Using the course website enhances my effectiveness in the course work	.82	.340
I find the course website useful in the coursework	.76	.421
Perceived Ease of Use		
Using the course website is easy for me	.42	.82
It was easy for me to become skillful at using the course website	.30	.82
I find the course website to be flexible to interact with	.17	.80
Variance (71.33%)		
	38.1	33.23
Eigenvalue		
	7.45	1.10
Reliability (Cronbach alpha)		
	0.89	0.87

MSA = 0.82, $\chi^2 = 1156.22$, $p < 0.01$

R-Type exploratory was also run for the dependent variable, that is the usage of the course website. An item was dropped, as there is insufficient measure of sampling adequacy.

Table 4
Factor Analysis for the Dependent Variable

Variable	Loadings
I use the course website a lot to do my course work	.85
I use the course website whenever possible to do my course work.	.77
I use the course website frequently to do my coursework.	.79
Eigenvalue	2.43
Percentage Variance	65.01
Reliability (Cronbach alpha)	0.73

MSA = 0.66, $\chi^2 = 65.42$, $p < 0.01$

5.2 Examination on the Psychometric Properties of the Measurement Models

This study believes that there should be four steps in assessing the validity and reliability of an instrument before being fitted into a structural model. The first step is the content validity, followed by convergent, construct, discriminant and nomological validity. However, the first step was omitted as the items for the measurement model had been in existence for close to two decades. Nevertheless, they have not been rigorously tested albeit a few attempts in various settings such as PC acceptance factors in small firms by Igarria et al. (1997). For this purpose, this study seeks to test the constructs separately before fitting it into a structural model as a whole in future research. In other words, convergent and discriminant validity tests will be carried out, with each preceding validity measure less rigorous than the successive tests.

5.2.1 Convergent Validity

All constructs in the model (i.e. CWU, CWEOU, CWUSE) were tested and verified to ascertain that the items were related strongly to their respective construct. This confirmatory factor analysis (CFA) was run by using the structural equation modeling. CFA allows the specification of the exact relationship between the items and its latent construct. Using the criterion by Bagozzi and Yi (1988), all constructs registered above the suggested minimal level of convergent validity where regression weights above 0.6 are considered reliable. Figure 1 – 3 depicts the regression weights of the items to their respective latent constructs of perceived usefulness, ease of use and usage respectively. Since the three measurements models were just-identified (i.e. the number of sample moments equals the number of implied moments), it is unnecessary to identify how well the sample data is fitted into the variance-covariance matrix. In other words, it is known that the observed measures meet the minimal requirement of the parameters that are estimated for just-identified models. In contrast, it is required to assess the model fit due to the number of observed measures that are greater than the parameters to be estimated for over-identified models. In such a case, there are many possibilities to fit the sample data into the variance- covariance

matrix for the “best” solution. Therefore, it is deemed necessary to address whether the increased in the degrees of freedom has a “poor” impact on the model fit for over-identified models but not our case.

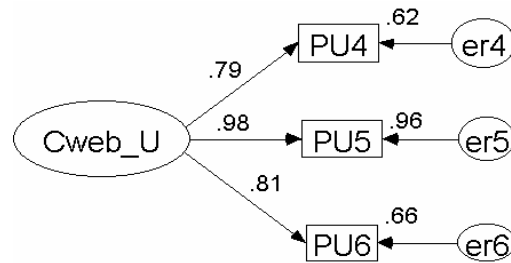


Figure 1: Convergent Validity for Perceived Web Usefulness

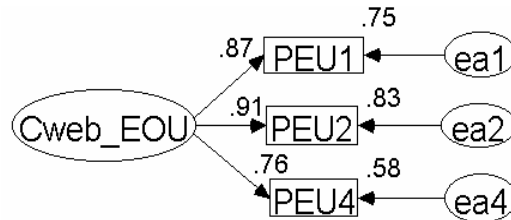


Figure 2: Convergent Validity for Perceived Web Ease of Use

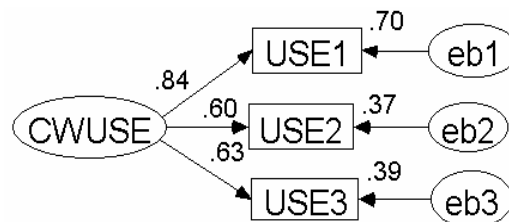


Figure 3: Convergent Validity for Web Usage

6.2.1 Construct Validity

The Cronbach Alpha has been the norm in assessing a construct’s internal consistency. Despite its widespread use and support on reliability, internal consistency has to be measured again once the measurement of each construct has been finalized (Anderson & Gerbing, 1988). The formula is as follows:

$$\frac{[\sum (\text{Standardized Loadings})]^2}{[\sum (\text{Standardized Loadings})]^2 + \sum (1 - \text{Standard error})^2}$$

The value of each construct of inter-/intra-functional technological learning is presented in table 4.

Table 5
Construct Reliability

	Cweb_U	Cweb_EOU	CWUSE
$[\sum (\text{Standardized Loadings})]^2$	6.66	6.45	4.28
$\sum (1 - \text{Standard error})^2$	0.26	0.27	0.86
$\frac{[\sum (\text{Standardized Loadings})]^2}{[\sum (\text{Standardized Loadings})]^2 + \sum (1 - \text{Standard error})^2}$	0.96	0.96	0.83
Internal Consistency (Cronbach’s Alpha)	0.89	0.87	0.73

As suggested by Nunnally (1978), all constructs registered higher construct reliability than the internal consistency of Cronbach Alpha greater than 0.7.

5.2.2 Discriminant Validity

Since all items have displayed adequate convergent validity, the next step is to assess the discriminant validity between perceived web ease of use and perceived web usefulness. That is, the extent to which it measures its construct of interest and not to another construct. In general, it is assumed that the correlation between constructs exhibits discriminant validity if the correlation between constructs is not equal to 1.00. However, this study pursues the discriminant validity tests with more rigorous efforts through the χ^2 difference tests where the χ^2 for the two exogenous constructs are compared (i.e. between Cweb_U and Cweb_EOU). In the first model, the correlations between the two exogenous are fixed at 1.00. The χ^2 fit indices registered 74.96 (9 d.f.) for the first model, while the “freely estimated” model charted 39.24 with 8 d.f. (figure 4). Since the difference between both models exhibit a $\chi^2 > 3.84$ for 1 d.f, both Cweb_U and Cweb_EOU are demonstrated to be statistically distinct.

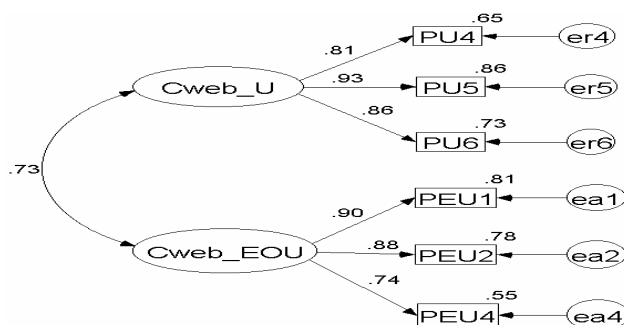


Figure 4: Freely Estimated Correlations between Course Website Usefulness and Ease of Use.

6.0 Discussions and Conclusion

The primary discourse of this paper is to describe a basic standard operating procedure in conducting an empirical investigation on the measurement models of course website acceptance. Despite the prevalent adoption of the TAM in various settings, this paper emphasized that validated measures from previous studies should go through a multi-stage tests for its instrument. The “calibration” process of the instrument is needed insofar as the probe (instrument) goes into new research territory where the dynamics of the settings are different. Among the differences that contributes to the environmental dynamics are as follows: 1) the work and national culture and 2) respondents whose *lingua franca* are not English). With regards to the former, public and private institutions of higher learning have different extent of usage and proficiency in terms of English language. Undergraduate courses are conducted in English in private institutions whereas public institutions adopt a mixture of both English and Malay language in the delivery of their course content. In addition, the profile of respondents in both institutions plays a role in the validity of the instrument. Given that Malays comprise majority of those that enrolled in public institution of higher learning, language might be a problem in answering structured questionnaires that are in English. In this study, Chinese and Malays account for approximately more than 80 percent of the respondents. An observable fact among these respondents are that both groups tend to converse among themselves in their mother tongue although the business research method course is taught in both English and Malay language.

With all this in mind, the validity tests that were carried out are effective in removing items which are biased and hard to comprehend. The R-type exploratory factor analysis (EFA) is believed to provide an overall assessment on the students’ ability to understand the differences between each dimension and its intended measured construct. In other words, EFA managed to address the basis of the differing perceptions by rotating and illustrating that ease of use and usefulness are actually two distinct concepts, while course website usage is a single distinct concept. Therefore, respondents in this research still managed to view each concepts as separate constructs, albeit having to sacrifice items which are confusable. In addition, the CFA was used to confirm each item’s internal consistency to

their respective construct. For the course usage construct, both items which are “I use the course website whenever possible to do my course work” and “I use the course website frequently to do my coursework” just managed to meet the minimal requirements of internal consistency as suggested by Bagozzi and Yi (1988). In our case, the latter is believed not to capture the latent meaning of usage, given that undergraduate students would use the course website when mandated instead of voluntary. Hence, perhaps then the wordings of “whenever possible” should be changed to “whenever necessary”. The extent of usage as depicted by the former item, on the other hand, suggests that the frequency of usage should be benchmarked against the number of times the student is required to extract information from the course website. Again this is the scenario between mandated and voluntary use of technology.

However, one might argue that Selim’s (2003) research provided a good model fit without having to sacrifice any items from its measurement model, which was applied to a similar environment as us – i.e. whose *lingua franca* are not in English. This study seeks to highlight that Selim (2003) used Maximum Likelihood Estimation (MLE), which is an estimation procedure that is sensitive to sample size above 400. Given that Selim (2003) had 450 samples, his model might be sensitive to data changes, which proves to show that all his measurement models indicate an overly good fit (based on the level of significance of the χ^2) without sacrificing any items. Hair et al. (1998) recommended that a sample size between 100 to 200 is most appropriate. This study employed 105 sample size which is within Hair et al.’s (1998) recommended sample size (100-200) for dealing with structural equation modeling with MLE as the estimation procedure.

7.0 Directions for Future Researchers

Similar to all other researches, there exist allowances for extension of this research endeavor. In terms of the model fit, it is quite likely that this study’s research model caters to only the public institution that we set out to research. As the case with most just identified models, where there is a concern over the lack of generalizability – this study’s findings should be interpreted with caution by taking into consideration the profiles of the respondents and the dynamics of the environment. In terms of the methodological forefront, future researchers should extend the current technology acceptance items to developing countries where technology adoption is relatively new. The generation of the new items that reflect technology acceptance should also consider culture to be among the major barriers. With regards to statistical procedures, it should be reminded that basic statistical classical assumptions (such as adequate/optimum sample size) should be met when validating a model. For studies with large sample size (e.g. 400), it is suggested that future researchers should employ the split-half method to validate the validated measurement models. That is, the measurement models for both data sets are compared to verify whether there are any significant changes in terms of the goodness of fit indices.

References

- Agarwal, R., & Prasad, J. (1999). Are individual differences germane to the acceptance of new technologies?, *Decision Sciences*, 30(2), 361-391.
- Anderson, J.C. & Gerbing, D.W. (1988). Structural Equation Modeling in practice. *Psychological Bulletin*, 103, 411-442.
- Bagozzi, R.P. & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of Academy of Marketing Science*, 16, 74-94.
- Chau, P. Y. K. (1996). An Empirical Assessment of a Modified Technology Acceptance Model, *Journal of Management Information Systems*, 12 (2), 185-204.
- Chau, P. Y. K. (2001). Influence of Computer Attitude and Self-Efficacy on IT Usage Behavior, *Journal of End User Computing*, 12(1), 26-33.
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease Of Use, and User Acceptance of Information Technology, *MIS Quarterly*, 13, 983-1003.
- Davis, F. D., Bagozzi, R.P. & Warshaw, Paul R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982-1003.
- Davis, F. D. & Venkatesh, V. (1996). A Critical Assessment Of Potential Measurement Biases In The Technology Acceptance Model: Three Experiments, *International Journal Of Human-Computer Studies*, 45, 19-45.

- Hair, J., Anderson, R., Tatham, R. & Black, W. (1998). *Multivariate Data Analysis* (5th ed.). New York: Prentice Hall.
- Hu, P. J., Chau, P.Y.K., Sheng, O.R.L. & Tam, K.Y. (1999). Examining the Technology Acceptance Model Using Physician Acceptance of Telemedicine Technology, *Journal of Management Information Systems*, 16(2), 91-112.
- Horton, R.P., Buck, T., Waterson, P.E. & Clegg, C.W. (2001). Explaining Intranet Use the Technology Acceptance Model, *Journal of Information Technology*, 14, 237-49.
- Igbaria, M., Gumaraes, T. and Gordon, B.D. (1995). Testing the determinants of microcomputer usage via a Structural Equation Model. *Journal of Management Information Systems*, 11 (4), 87-114.
- Igbaria, M., Zinatelli, N., Cragg, P. & Cavaye, A. L. M. (1997). Personal Computing Acceptance Factors in Small Firms: A Structural Equation Modeling, *MIS Quarterly*, 21 (3), 279-305.
- Jantan, M., Ramayah, T., & Chin, W.W. (2001). Personal Computer Acceptance by Small and Medium Companies Evidence from Malaysia, *Jurnal Manajemen & Bisnis*, 3(1), 1-14.
- Jiang, J.J, Hsu, M.K., Klein, G. & Lin., B. (2000). E-commerce User Behaviour Model: An Empirical Study, *Human Systems Management*, 11(4), 265-76.
- Ji-Won Moon, and Young-Gul Kim (2001). Extending the TAM for a World-Eide-Web context, *Information & Management*, 38, 217-230.
- Nunnally, J. C. (1978). *Psychometric Theory*, 2nd ed. New York: McGraw- Hill Book Company.
- Ramayah, T. and Jantan, M. (2003). Attitude And Intention To Use Web-Based Supply Chain Management (SCM) Among SME'S: Moderating Effect Of Self Efficacy, The Third International Conference on Electronic Commerce Engineering (ICeCE2003), Hangzhou, China.
- Ramayah, T., Jantan, M., Nasser, M., Razak, R.C. & Koay., P.L. (2003). Receptiveness Of Internet Banking By Malaysian Consumers. *Asian Academy of Management Journal*, (8) 2, 1-29.
- Seal, K.C. & Przasnyski, Z.H. (2001). Using the world wide web for teaching improvement. *Computers & Education*, 36 (1), 33-40.
- Venkatesh, V. & Davis, F. D. (1996). A Model of the Antecedents of Perceived Ease of Use: Development and Test, *Decision Sciences*, 27 (3), 451-481.