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CULTURE AND STUDENT SAMPLES AS MODERATORS OF CONTINUED IT USAGE: A META-ANALYSIS OF IS CONTINUANCE LITERATURE

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Abstract

The benefits from ICT investments materialize through sustained usage rather than initial acceptance. Hence, the amount of research on continued IT usage (IS continuance) employing the Expectation-Confirmation Model (ECM) has been increasing steadily in recent years. In this body of literature, empirical results regarding the correlations between the key constructs of ECM have not been entirely consistent. Thus, we conduct a meta-analysis of prior IS continuance literature to examine whether the flux in the results can be explained by the presence of moderating effects. First, we investigate whether the cultural context of the empirical study or the use of student samples has influenced the results. Second, we examine whether including perceived ease of use in the ECM has received consistent empirical support. The results demonstrate that both cultural context and student samples potentially act as moderators, and thus have caused the flux in the empirical results. Furthermore, the results show that perceived ease of use is a viable extension to ECM.

Keywords: IS continuance, expectation-conformation theory, meta-analysis, technology acceptance

1 INTRODUCTION

The fact that benefits from investment in ICT only materialize for companies through sustained usage, rather than initial acceptance, has been widely addressed in literature on individual-level technology adoption (Bhattacherjee 2001a; Kim & Son 2009). The focus of this stream of research has gradually been shifting from initial acceptance (e.g., Davis 1989) toward understanding of the drivers of continued use (e.g., Bhattacherjee 2001a; Kim & Son 2009; de Guinea & Markus 2009). According to Bhattacherjee (2001a), the long-term viability of an IS and its eventual success depend on its continued use rather than first-time use.

Compared to the amount of literature based on initial technology acceptance, continued use has not, thus far, enjoyed a comparable level of attention (Larsen et al. 2009). However, the number of publications within this stream has been increasing (e.g., Hayashi et al. 2004; Limayem & Cheung 2008; Thong et al. 2006; Kim & Son 2009; Guinea & Markus 2009). One of the key contributions to the literature on continued use is the Expectation-Confirmation Model (ECM) developed to assess Information System (IS) continuance by Bhattacherjee (2001a), which has had several subsequent studies built upon it (e.g., Thong et al. 2006; Limayem & Cheung 2008; Larsen et al. 2009).

Given that the stream of research examining continued IS use using the ECM is expanding, it has become viable for the further development of the research to scrutinize the consistency of the key assertions of the theoretical perspective it is constituted on. In particular, we address two areas where the prior literature offers mixed or inconclusive empirical evidence. First, there is flux regarding the correlations between the key constructs of ECM. Some studies have reported high correlations (e.g., Limayem & Cheung 2008; Lin et al. 2005; Sorebo et al. 2009), while others have found the correlations to be either low or even negative (e.g., Recker 2010; Hong et al. 2006; Lee 2010). Second, Bhattacherjee (2001a) did not include perceived ease of use (PEOU) in his original model, whilst subsequent studies (e.g., Thong et al. 2006; Tao et al. 2009; Lee 2010) have found significant relationships between PEOU and the constructs of the original ECM. As a result, research examining the extent to which the central tenets of ECM have been proven to be empirically consistent, and whether incorporating PEOU is a meaningful addition to ECM, is appropriate.

We believe that a potential reason for the somewhat mixed results obtained in prior literature may relate to the moderating effects caused by the sample characteristics. In practice, we conduct a meta-analysis of the prior ECM-based IS continuance literature and examine the effect of one contingent factor (the geographical area where the data were collected), and one individual related factor (students vs. non-students).

First, as ECM-based studies have been conducted in several geographical areas such as Hong Kong, Norway, South Korea Taiwan, the Ukraine, and the USA, we investigate whether the results vary across different geographical areas. Second, the use of student samples in empirical studies has been much debated in the literature (Oakes 1972; Schultz 1969). Prior literature has found stronger relationships between Technology Acceptance Model (TAM) constructs in studies using student samples (Schepers & Wetzels 2007). Thus, we test whether the ECM results vary across student and non-student samples. To the best of our knowledge, this is the first meta-analysis of ECM-based studies.

2 EXPECTATION-CONFIRMATION MODEL OF IS CONTINUANCE

Bhattacherjee (2001a) developed the ECM based on the Expectation-Confirmation Theory (ECT) (Oliver 1980) and empirically tested it among online banking customers. ECT is widely used in consumer behavior literature to study consumer satisfaction, post-purchase behavior (e.g.

repurchasing, complaining), and services marketing in general (Bhattacherjee 2001a; Oliver 1980). ECM is built on the assumption that the users – after first time acceptance and a period of initial use – will form an opinion on which their pre-acceptance expectations are confirmed, which is measured with the *Confirmation* (CON) construct. After confirmation, the user forms a perception about the benefits of using the IS, which is captured with *Perceived usefulness* (PU). Thus, *perceived usefulness* can be viewed as the post expectation belief (Bhattacherjee 2001a). After a period of time, both *confirmation* and *perceived usefulness* form the basis of user *satisfaction* (SAT) with the IS in question. Finally, *perceived usefulness* and *satisfaction* impact on the willingness of users to continue the usage of an IS, which is measured with *IS continuance intention* (INT). The original ECM is presented in Figure 1 and shown with solid lines.

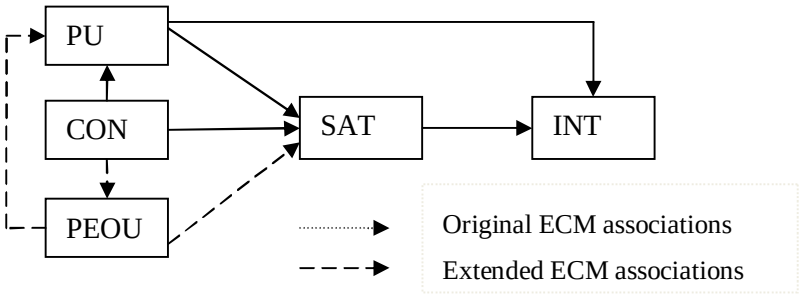

Figure 1. The ECM model.

After the original ECM, a number of extensions have emerged in the literature (e.g., Thong et al. 2006; Hong et al. 2006). One of the most frequent extensions is to add *perceived ease of use* (PEOU) (e.g., Tao et al. 2009; Lee 2010). PEOU was not included in the original ECM framework since, according to Bhattacherjee (2001a), the evidence from TAM-based studies demonstrates that PU alone is adequate in the IS continuance context. Bhattacherjee (2001a) stated that PU is the only belief that can be demonstrated to consistently influence user intention across the temporal stages of IS use.

Thereafter, a number of studies have included PEOU in the original ECM framework (e.g., Thong et al. 2006; Tao et al. 2009; Hong et al. 2006; Lee 2010). Specifically, Hong et al. (2006) compared ECM with and without PEOU and found adding PEOU to the framework increases its explanatory power by 17% within the mobile internet context. There are at least two main arguments for including it in ECM. First, there is strong evidence from TAM-based studies that PEOU is a significant antecedent of technology use (Venkatesh & Bala 2008; Davis 1989). Second, the inclusion of PEOU can help to better understand the role of the complex nature of an IT in explaining user behavior in the continued IT use context. This is particularly salient if the IT being studied is continuously being altered by new services/functionalities (e.g. mobile services) that are introduced on a regular basis, or if it contains a vast number of functionalities, making the system very complex. The new relationships in the extended ECM are shown in Figure 1 with dotted lines. The conceptualizations of the constructs of the extended ECM are shown in Table 1.

Construct	Definition
Confirmation	The degree to which the users' original expectation is confirmed
Perceived usefulness	The salient beliefs that using the IS will enhance his or her job performance
Perceived ease of use	The degree to which an individual perceives using the IS is free of effort
Satisfaction	Individual's feelings of pleasure or disappointment resulting from comparing their perceptions of IS to their expectation level
Intention to use	The intention to participate and continue using the IS

Table 1. IS continuance constructs.

3 RESEARCH METHODOLOGY

3.1 Hypotheses development

To investigate the consistency of results obtained in the ECM-based studies, we examine the relationships between the constructs that are included in the extended ECM. These relationships are not formally hypothesized in this paper. However, these relationships lay the foundation for the subsequent stage of the research process, i.e. the investigation of the moderating effects of the cultural context and student vs. non-student sample.

Numerous studies have examined the influence of culture on the adoption and diffusion of new IT (e.g., Straub et al. 1997; Al-Gahtani et al. 2007; Sun & Zhang 2006). Based on the findings of this body of literature, it is plausible to assume culture also influences continued IT use.

Several approaches have been proposed for studying cultural effects in relation to technology use (Al-Gahtani et al. 2007). Among those, Hofstede's cultural dimensions (Hofstede 2001) have been widely used in IS research (Straub et al. 1997). These dimensions facilitate national-level analyses and allow multiple country comparisons. Hofstede (2001) describes four dimensions that can be used to distinguish different cultures: Power Distance Index (PDI), Uncertainty Avoidance Index (UAI), Individualism (IND) and Masculinity (MAS). Table 2 lists the four dimensions along with a brief description of each. The possible relationships between these dimensions with regard to IS use are discussed in the following.

Dimension	Description
Power Distance	Degree of inequality among people which the population of a culture considers normal
Uncertainty Avoidance	Degree to which people in a culture feel uncomfortable with uncertainty and ambiguity
Individualism	Degree to which people in a culture prefer to act as individuals rather than as members of groups
Masculinity	Degree to which values like assertiveness, performance, success, and competition prevail among people of a culture over gentler values like quality of life, maintaining warm personal relationships, service, care for the weak, etc.

Table 2. Hofstede's four cultural dimensions.

First, it has to be stated that a computer based system is less capable of delivering information with rich social cues. This filtering out of social cues is known as the leveling effect (Straub et al. 1997). For societies in which the distance between managers and workers is seen to be high with regard to power, the leveling effect of computer-based system is not seen or felt to be a desirable feature (Straub et al. 1997). Thus, in high PDI cultures, we expect that the correlations between the ECM constructs will be lower than in low PDI cultures. Second, according to the social presence theory, people in societies that exhibit low levels of individualism may be against certain technologies, such as communication technology, since they mute the group effect (Sun & Zhang 2006). Thus, in low IND cultures, we expect the correlations between the ECM constructs will be lower than in high IND cultures. Third, according to the information richness theory, individuals choose systems by matching the information requirements of the task to the information richness of the system (Straub et al. 1997; Al-Gahtani et al. 2007). In societies with high UAI, individuals have higher needs for the richness of technology. Thus, in high UAI cultures, we expect that the correlations between the ECM constructs will be lower than in low UAI cultures. Finally, it can be predicted that a system that does not convey the social presence of the communicator will not be favored in cultures in which masculinity is a strong cultural value (Straub et al. 1997). Thus, from the above discussion, we can expect that in societies with high PDI, low IND, high UAI and high MAS, individuals will not be positive towards

IT, meaning that the correlations between the extended ECM constructs will be low.

Most of the ECM-related studies have been conducted in Hong Kong, Norway, Taiwan, the Ukraine, and the USA. Hofstede's indices values for these countries are retrieved from Hofstede (2001) and Bradley (1997) and given in Table 3. Following the procedure suggested by Straub et al. (1997), we have combined Hofstede's indices to create a 'Combined Index' (CI) for these cultures. To calculate this index, UAI, PDI and MAS were added to the 100-IND, which is in keeping with the argument that IND moves in the opposite direction to other scales in its effect on the perceptions and use of an IT. The purpose of calculating CI is to mathematically express the simultaneous effect of all four Hofstede's dimensions as a single number. However, it should be viewed as a useful approximation.

Country	PDI	IND	MAS	UAI	CI
South Korea	60	18	39	85	266
Hong Kong	68	25	57	29	229
Taiwan	58	17	45	69	255
Norway	31	69	8	50	120
USA	40	91	62	46	154
Ukraine	23	51	13	57	142

Table 3. Country specific Hofstede's indices values.

From the calculated CI value, we observe that South Korea, Hong Kong and Taiwan can be grouped together (average CI = 250) as their CI values are very close to each other. We may call this group a representative of non-western culture. On the other hand, Norway, the Ukraine, and the USA can be grouped together (average CI = 138). Similarly, we may call this group a representative of western culture. This type of grouping was done due to the limited sample size for each country (discussed in the Moderator Analysis section). This kind of grouping is supported by the extant literature (Schepers & Wetzels 2007). The hypotheses related to the cultural effect on IS use are given in Table 4.

Hypothesis #	Hypothesis
H1a	The correlation, CON-PU is significantly stronger for Western than Non-western cultures
H2a	The correlation, CON-SAT is significantly stronger for Western than Non-western cultures
H3a	The correlation, PU-SAT is significantly stronger for Western than Non-western cultures
H4a	The correlation, PU-INT is significantly stronger for Western than Non-western cultures
H5a	The correlation, SAT-INT is significantly stronger for Western than Non-western cultures

Table 4. Culture related hypotheses.

Using student samples for empirical studies has been a much debated issue for many decades (Oakes 1972; Schultz 1969), and IS is not an exception. Researchers have found stronger relationships between TAM constructs for student samples (Schepers & Wetzels 2007). On the other hand, it is well established that age is a potential moderator of IS initial use. For example, Venkatesh et al. (2003) found that younger users placed more importance on PU. Analogous with this line of reasoning, we expect that the correlations in the extended ECM are stronger for the student sample than the non-student sample. The related hypotheses are given in Table 5.

Hypothesis #	Hypothesis
H1b	The correlation, CON-PU is significantly stronger for students than non-students
H2b	The correlation, CON-SAT is significantly stronger for students than non-students
H3b	The correlation, PU-SAT is significantly stronger for students than non-students
H4b	The correlation, PU-INT is significantly stronger for students than non-students
H5b	The correlation, SAT-INT is significantly stronger for students than non-students

Table 5. Type of respondent related hypotheses.

3.2 The literature search

A review of the relevant literature published over the period from 2001 to 2010 was conducted. Firstly, we searched in databases such as ABI/INFORM, Business Source Complete, Electronic Journals Service, ScienceDirect, and Wiley InterScience. The search was conducted by using keywords like Expectation-Confirmation, Expectation-Disconfirmation, information systems continuance, and post-adoption use. Webster and Watson (2002) suggest going through a journal's table of contents with a keyword-based search. Thus, to ensure that the relevant articles were included, we performed a manual search of each issue (from 2001 to 2010) of the six highest ranked journals from the senior scholar's basket of IS journals: MIS Quarterly, Information Systems Research, Information System Journal, Journal of the Association of Information Systems, Journal of Management Information Systems and European Journal of Information Systems.

Thereafter, we went backward by reviewing the citations for the articles identified to find more articles. Each article was examined to ascertain that the following criteria applied: 1. The study has to be supported by quantitative data. 2. The study has included the three factors of the basic ECM framework to explain continuance intention (*confirmation, perceived usefulness, and satisfaction*).

Certain articles passed the above criteria but were excluded from the meta-analysis if e.g. the correlation matrix was not reported (Bhattacherjee 2001b). Finally, after the systematic literature review (Webster & Watson 2002; Okoli & Schabram 2010) a total of 21 articles were retained for the meta-analysis.

3.3 The meta-analysis

We found a total of 22 studies from the 21 articles. In Bhattacherjee and Premkumar (2004), the authors reported three studies (two for the Computer Based Tutorials, and one for the Rapid Action Development Tool). We included two studies (one for each system) from these in the analysis. To avoid a potential bias in the results caused by using the same research settings, we did not include all three studies. Table 6 summarizes the research settings of all the studies included in the meta-analysis.

Article	Target technology and sample characteristics	Type of respondents	Country
Bhattacherjee 2001a	Users of online banking. Mean age of the respondents was 33.7 years.	122 mixed users**	USA
Hsu et al. 2004	College student users of WWW.	235 students	Taiwan
Bhattacherjee and Premkumar 2004	Undergraduate student users of computer based tutorial.	54 students	USA
	Graduate student users of the rapid action development tool.	77 students	USA
Lin et al. 2005	Undergraduate student users of WWW.	254 students	Taiwan
Thong et al. 2006	The mobile internet users of e-government services. The age of the respondents ranged from 16 to 60 years. The average age was 30 years. Most of the respondents were in their 20s (48.0%), 30s (35.0%).	811 mixed users**	Hong Kong
Hong et al. 2006	The mobile internet users of e-government services. The age of the respondents ranged from 13 to 76 years. The average age was 25.4 years. Most of the respondents were in their 20s (53.1%), 30s (18.0%) and teens (23.6%).	1826 mixed users**	Hong Kong
Roca et al. 2006	Users of e-learning. People who attended UN staff college training. Average age: 33.7 years. 45% of the respondents had completed a college/university degree and 19% had completed postgraduate degree.	172 mixed users**	Mixed*
Liao et al. 2007	Users of e-learning. Most of the respondents were in	400 mixed	Taiwan

	their 20s (46.27%), 30s (30.92%). Precisely, 34.97% of the respondents were students.	users**	
Hsieh and Wang 2007	Organization users of an ERP system.	200 non-students	Hong Kong
Limayem and Cheung 2008	Undergraduate student users of e-learning.	505 students	Hong Kong
Sorebo and Eikebrokk 2008	Organization users in a mandated context.	161 non-students	Norway
Bhattacherjee et al. 2008	Organization users of a document management system.	81 non-students	Ukraine
Liao et al. 2009	Users of e-learning. A total of 33.1% of respondents reported student as their profession. A total of 95% of the students who were registered in the e-learning system were adults.	626 mixed users**	Taiwan
Kang et al. 2009	Undergraduate student users of online services.	349 students	South Korea
Larsen et al. 2009	Teachers who use e-learning for teaching.	135 non-students	Norway
Sorebo et al. 2009	Teachers who use e-learning for teaching.	124 non-students	Norway
Tao et al. 2009	Student users of business simulation games.	185 students	Taiwan
Recker 2010	Organization users of modeling grammars.	529 non-students	Mixed*
Kim 2010	Graduate student users of mobile data services.	214 students	South Korea
Deng et al. 2010	Graduate and undergraduate student users of mobile internet services.	289 students	USA
Lee 2010	Students of a continuing education program using e-learning. Most of the respondents were between 18 and 24 years old (55.4%) and had school diplomas or Bachelor's degrees (51%).	363 mixed users**	Taiwan

*: *Studies not taken in the type of culture moderator analysis.*

**: *Studies not included in the type of respondents moderator analysis.*

Table 6. Summary of the research settings.

From each study, we obtained the following information: sample size, the reliability of the constructs, correlations for each hypothesis. We followed the guidelines of Hunter and Schmidt (2004) to analyse data. First, the reported correlations were corrected for measurement error using the following formula.

$r = \frac{r_{xy}}{\sqrt{r_{xx}}\sqrt{r_{yy}}}$, where r_{xy} is the observed correlation in the specific study, r_{xx} and r_{yy} are the reliability of the estimates of the two variables in the correlation.

Then, we calculated the average correlation in which each correlation is weighted by the number of observations in that study using the following formula.

$\bar{r} = \frac{\sum N_i r_i}{\sum N_i}$, where $\bar{r}$ is the meta-analysis effect size corrected for reliability and measurement error, r_i is the correlation value after correcting measurement error, and N_i is the sample size of the particular study.

Thereafter, we calculated the 95% confidence intervals of the corrected effect sizes using standard error to determine the significance of each relationship. As suggested by Hwang (1996), confidence intervals that do not include zero ensure that the relationship is significant.

A final test was performed to determine the robustness of the findings. We calculated the fail-safe statistic for each of the relationships. The fail-safe value provides the number of non-significant correlations (studies) that would have to be included in the sample to reverse the conclusion that a significant relationship existed. The fail-safe value can be calculated using the following formula as specified by Hunter and Schmidt (2004):

$FSN = k\left(\frac{\bar{r}}{r_c} - 1\right)$, where r_c is the pre-specified value of a correlation.

Table 7 shows the meta-analysis results. Cohen and Cohen (1983) established a general heuristics to judge the magnitude of the effect sizes as strong (0.50), moderate (0.30), or weak (0.10). As can be seen from the corrected average correlations, the relationships are moderate to strong. From the values of the 95% confidence interval, we see that there is no interval containing zero. It suggests that all the relationships were significant. The fail-safe value ensures the robustness of the findings. A rule of thumb is that the fail-safe value should be at least twice the number of studies (k) in the meta-analysis. All of the correlations of the ECM had the ratio of the fail-safe value to the number of studies greater than 2.0. Thus, all the correlations of the extended ECM were significant.

Correlation	Total N	k	Mean	S.D	95% confidence interval		Fail-safe value to reduce the mean effect size to 0.1	Decision
					Lower limit	Upper limit		
CON-PU	7712	22	0.48	0.20	0.40	0.56	84	significant
CON-SAT	7712	22	0.57	0.30	0.44	0.70	103	significant
PU-SAT	7712	22	0.45	0.29	0.33	0.57	77	significant
PU-INT	7351	20	0.67	0.12	0.62	0.72	114	significant
SAT-INT	7351	20	0.57	0.12	0.52	0.62	94	significant
CON-PEOU	5273	10	0.48	0.21	0.35	0.61	38	significant
PEOU-PU	5273	10	0.49	0.33	0.29	0.69	39	significant
PEOU-SAT	5273	10	0.50	0.24	0.35	0.65	40	significant

Table 7. Meta-analysis results.

3.4 Moderator analysis

A heterogeneity (or homogeneity) test can be used as an aid in deciding whether observed effect sizes are more variable than would be expected based on sampling error alone (Hedges 1982). If they are, then there is a strong basis for searching for moderators (Hunter & Schmidt 2004).

We performed a moderator analysis only for the relationships of the original ECM because we had only a limited number of studies (only 10) with the *perceived ease of use* extension. As a result, we did not have a sufficient sample size to categorize these studies using the moderator variables.

In order to investigate the existence of moderators, the Q statistic for each relationship was calculated (Cooper & Hedges 1994). The calculated Q value was compared to a critical value, which is the chi-square value with k-1 degrees of freedom, where k is the number of studies. If the Q value exceeds the critical value, a moderating effect may exist. Table 8 illustrates the results of the moderator analysis. From this table, we see that the calculated Q value exceeds the critical value for each relationship indicating the presence of moderators in the relationships.

Correlation	Q value	Critical value	Decision
CON-PU	449.58	32.67	Yes
CON-SAT	1422.15	32.67	Yes
PU-SAT	1018.10	32.67	Yes
PU-INT	393.11	30.14	Yes
SAT-INT	907.09	30.14	Yes

Table 8. Moderator analysis (Homogeneity test).

To examine the moderating effects, clusters of studies were formed based on the data in Table 6.

First, we distinguished between non-western cultures (China, South Korea and Taiwan; k=12, N=5968) and western cultures (Norway, Ukraine and USA; k=8, N=1043). We excluded studies (Recker 2010; Roca et al. 2006) that had mixed respondents to avoid potential biases in the results.

Thereafter, we distinguished between students (k=9, N=2162) and non-students (k=6, N=1230). Again, because samples that included students and non-students may have biased the results, we did not include certain studies (Bhattacherjee 2001a; Thong et al. 2006; Liao et al. 2009; Liao et al. 2007; Roca et al. 2006; Hong et al. 2006; Lee 2010) in the analysis.

Finally, a Fisher Z-test was conducted to investigate the significance (at 0.05 level) of the difference between the correlations of the two groups. As can be seen from Table 9, when we distinguished between the two cultures, the difference was significant for CON-PU, CON-SAT, PU-SAT and SAT-INT which means H1a, H2a, H3a and H5a are supported. The only relationship that was not moderated by culture was PU-INT, which may be due to the limited number of studies in the meta-analysis. Again, distinguishing between students and non-students demonstrates the difference was significant for CON-PU, CON-SAT, PU-INT and SAT-INT, which means H1b, H2b, H4b and H5b are supported. Overall, in most of the cases, the correlation coefficients of the student samples were greater than the ones using non-student samples. This finding is consistent with prior research conducted with TAM-based studies (Schepers & Wetzels 2007). The only relationship that was not supported was PU-SAT.

Overall, we may conclude that the *type of respondent* and the *type of culture* are two potential moderators for the ECM.

Correlation	Type of culture				Type of respondent			
	Hypot-hesis #	Non-western	Western	Result	Hypot-hesis #	Student	Non-student	Result
CON-PU	H1a	0.52*	0.61*	supported	H1b	0.62*	0.31*	supported
CON-SAT	H2a	0.62*	0.71*	supported	H2b	0.63*	0.38*	supported
PU-SAT	H3a	0.39*	0.60*	supported	H3b	0.55*	0.68*	not supported
PU-INT	H4a	0.69	0.65	not supported	H4b	0.65*	0.50*	supported
SAT-INT	H5a	0.56*	0.72*	supported	H5b	0.63*	0.38*	supported

**: difference is significant at 0.05 level.*

Table 9. Analysis of the moderating effects with two moderators.

4 IMPLICATIONS

Given that the amount of research on IS continuance has been increasing, it is ever more important to recognize the potential influence of the empirical research setting. Thus, our meta-analysis has four key implications for IS continuance research.

First, analyzing the moderating effects demonstrated that the type of respondent is a potential moderator of ECM theory. It suggests the use of student samples appears to reinforce the correlations between the ECM constructs, except for the relationship between perceived usefulness and

satisfaction. A possible interpretation for this is that students perceive satisfaction as being determined also by other factors such as perceived enjoyment. Furthermore, an interesting area for further investigation would be to examine to what extent affective factors influence satisfaction and whether this could explain the difference between student and non-student samples. Taken together, the use of student samples may provide an overly optimistic view of the users' intention to continue using IT.

Second, with regard to the effect of culture, all correlations except the correlation between perceived usefulness and use intention are higher in studies with samples from western cultures. This leads us to ponder whether the items used in measuring the constructs of ECM stem from a western way of comprehending meaning and should they thus be culturally adapted in order to be more applicable to other cultural contexts.

Third, the meta-analysis provided clear support for all the key relationships of ECM. This indicates that ECM is fundamentally a robust theoretical tool.

Fourth, based on the meta-analysis, perceived ease of use is a meaningful extension to ECM. We suggest the complexity of the target technology and the users' interaction with it should be more carefully scrutinized and, based on this, researchers should determine whether to include perceived ease of use in the research model.

Altogether, the potential existence of moderating effects can explain the somewhat mixed empirical results between the key constructs of ECM. To sum up the main findings, the meta-analysis demonstrated that the key ECM relationships are consistent in the prior literature. Furthermore, cultural context and the use of student samples are viable explanations for explaining flux in the empirical results.

5 LIMITATIONS AND FUTURE RESEARCH

There are several limitations to this study and these provide ideas for future research. First, a potential limitation to be acknowledged is that the measures used in the analyzed studies vary. As argued by Petter and McLean (2009), the potential downside of including studies that use different measures in the meta-analysis is that the measurement is a moderator of the relationships between the constructs.

Second, only two potential moderators were included in the analysis of this study. In addition to the two moderators examined here, other moderating effects may exist. Previous studies have found differences in user acceptance between voluntary and mandatory systems (Wu & Lederer 2009; Venkatesh & Bala 2008), which suggest *voluntariness* is a potential moderator. Unfortunately, the number of studies was not sufficient to include *voluntariness* in the meta-analysis. Secondly, *type of technology* might be another potential moderator. For example, PEOU has been found to be the strongest belief affecting technology continuance regarding mobile internet services which frequently add new services (Thong et al. 2006). Again, due to the limited number of studies, we were not able to classify the studies according to this criterion. For further research, we propose that two additional moderators: *voluntariness* and *type of technology* be included in the analysis.

Third, in this research, we examined the correlation coefficients. As a second concrete path for further research, a meta-analysis investigating the causal paths would be highly appropriate. For this purpose, an individual meta-analysis for all possible relationships among the variables is required to develop a correlation matrix.

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