

TAM vs. PCI: An Analysis on the Theoretical Model Parsimony and Robustness across Cultures

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Abstract

This paper aims to evaluate the suitability of two classic models of technology acceptance applied in studying e-commerce adoption in Malaysia. Compared with Western countries, Malaysia is a multi racial and multi cultural society. Since established model of technology acceptance evolved from Western countries, there is a need to choose the appropriate theoretical model that is able to predict Malaysian e-commerce acceptance. This paper presents a comparison between Technology Acceptance Model and Perceived Characteristics of Innovation from the perspective of model parsimony and robustness across cultures.

1. Background of Study

Malaysia is progressing rapidly to transform its agricultural-based economy into an information technology-based economy in line with the Vision 2020 objectives. Efforts to increase ICT adoption among Malaysians include the establishment of Multimedia Super Corridor (MSC) in 1994, launching of MSC flagship applications, assistance of household Personal Computer purchasing, building broadband Internet connections, lowering the cost of Internet subscription etc. E-commerce, together with e-government development, became one of the flagship developments in MSC project [13]. As a result of these strategic moves, Malaysia ranks competitively (35th out of 65th countries) in the global e-readiness evaluation by The Economist Intelligence Unit in the year 2005 [3]. Despite numerous efforts, there were only 9.3% of Malaysian Internet users who shop online in 2005 [6].

There are many different theories and models to predict factors that influence new technologies acceptance. This research, therefore, is an examination of the suitable model to explain technology acceptance among consumers in developing countries, such as Malaysia. In view of this problem, this research aims to evaluate two classic models from the perspective of model parsimony and the robustness of variance explained across different cultures. As the world has become highly connected, business practitioners face the challenge of technology adoption across cultures. This research adds preliminary knowledge to the technology adoption literature to increase the awareness of adapting the appropriate research model based on different cultures, which could,

therefore, allow business practitioners and academicians to make appropriate decision.

2. Technology Acceptance Model (TAM)

TAM is specifically used for modelling user acceptance of information systems [2]. The main objective of TAM is to explain individual computing technology acceptance using a parsimony and theoretical justified model [1]. TAM is one of the most widely applied technology adoption models in the information systems literature mainly due to its parsimonious, i.e. economical to apply, in research settings. The goal of TAM is individual's behavioural intention (BI) to adopt a technology, which will predict actual technology use. Davis [1] posits that perceived usefulness (PU) and perceived ease of use (PEOU) jointly determine an individual's attitude towards using a technology. Perceived usefulness, on the other hand, is postulated to be influenced by perceived ease of use and perceived usefulness itself is a direct determinant of individual's behavioural intention.

3. Perceived Characteristics of Innovation

An innovation is "an idea, practice or object that is perceived new by an individual or other unit of adoption" [9]. This definition assumes technology that is well accepted in a society may not be necessarily well accepted by members in another society. The same analogy applies to e-commerce. E-commerce may be a well-known business platform for consumers in other countries but to Malaysian consumers, e-commerce is still a new innovation. As such, it is reasonably appropriate to treat e-commerce as an innovation in Malaysia.

Moore and Benbasat [7] developed the Perceived Characteristics of Innovation (PCI) by expanding Rogers [9] innovation characteristics in the theory of innovation diffusion. Innovation characteristics determined the decision to adopt an innovation [9]. Constructs included in PCI are ease of use, result demonstrability, visibility, image and voluntariness, together with relative advantage, compatibility and trialability. Moore et. al. [7] refined Rogers' [9] model by studying perceived attributes (secondary attribute).

4. Model Parsimony Issue

As a parsimonious model, TAM hypothesised that only two beliefs are sufficient to explain individual's behavioural intention to adopt technology. Many researchers, however, found that there are other external variables which are not explained by TAM, and could contribute to the variance explained in their research model. Most researchers resort to extend TAM to include external variables, for example Venkatesh and Davis' [16] TAM2, which included subjective norm, image, job relevance in the original TAM.

By doing so, however, the original objective of TAM, i.e. being parsimonious model, is violated. Plouffe, Hulland and Vandenbosch [8] found that there are tradeoffs to maintain parsimony in a model. For example, TAM has substantially lower explained variance (a difference of 12%) compared to PCI due to the lower number of descriptive richness in TAM in the research conducted by Plouffe et. al. The consequence of limited descriptive richness is more devastating when it comes to managerial implication. Since TAM only incorporates two beliefs, managers are often forced to consider only up to four possible solutions (i.e. only PU is significant, only PEOU is significant, both PU and PEOU are significant or both perceptions are not significant) to explain technology acceptance. Compared to PCI, the richer number of beliefs enables managers to identify far more specific perceptions for decision making.

5. Technology Innovation Adoption across Cultures

Studies of technology innovation adoption have so far focused on the North America or Western countries [15]. Recently, research has started to apply technology acceptance models in other countries, including Asian countries (e.g. [14], [10], [12]). Although this research does not intend to study cultural effects on e-commerce acceptance in Malaysia, the purpose of the following paragraph is to illustrate the existence of difference of individual culture across countries.

According to cultural research, there are differences between individuals in different countries based on the dimension of individualism/collectivism (societies in which the interests of the individual prevail over the interests of the group versus societies in which the interests of the group prevail over the interest of the individual), power distance (the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally), uncertainty avoidance (the extent to which the members of a culture feel threatened by uncertain or unknown situations) and masculinity/femininity (masculinity stands for a

society in which social gender roles are clearly distinct while femininity is a society having gender roles overlap) [4]. For example, Hofstede [4] found that individuals in the United States have high levels of individualism, followed by masculinity and uncertainty avoidance. Individuals in the United States have low power distance level. Compared to Malaysia, power distance level among Malaysian is soaring, almost reaching the maximum point (score range: 0 to 100). In contrast, Malaysian society is a collective society, i.e. very low individualism among Malaysians. Surprisingly, Malaysians have lower uncertainty avoidance level compared to the Americans.

The differences of cultures among individuals across countries invoke the interests of some researchers to study the differences of technology acceptance in different countries. Srite [14] compares behavioural intentions to use personal computers between Chinese and United States (US) students. Srite [14] found that, as expected, TAM applies consistently on US sample, where perceived usefulness, perceived ease of use are significant to behavioural intention to use and perceived ease of use determines perceived usefulness. Furthermore, subjective norms do not have significant effect on behavioural intention, a finding that is consistent with that argued by Davis [1]. Ironically, perceived usefulness and perceived ease of use were not significant to behavioural intention for Chinese sample. While subjective norms, which are not supposed to have significant effect on behavioural intention [1], turned out to be significant. The only similarity between the results of Chinese and US samples is the conceptual link between perceived ease of use and perceived usefulness.

The findings by Srite [14] raised the issue of TAM robustness across countries. Inaccurate results may be obtained if TAM was to be applied in Malaysia context, since China and Malaysia have almost the same cultural values [4]. Furthermore, if a manager relies on the results of TAM, using the findings from Srite [14] for example, then usefulness and ease of use of a technology are not important criteria at all (even though ease of use is significant to usefulness, however, usefulness have no significant impact to behavioural intention. Hence, the significant relationship of ease of use becomes indecisive). In addition to this, Srite [14] indicates that there are other external variables which were not captured in TAM that leads to inconclusive results. This again proved that although being parsimonious, TAM does not provide rich descriptive findings on the occurring phenomenon [8].

In studying technology innovation adoption across countries, Slyke, Lou and Belanger [12] adopted the Diffusion of Innovation (DOI) model to predict e-

commerce usage among students from India, Hong Kong, China and the US. The results suggest that DOI model is able to explain the factors of e-commerce acceptance in the four countries. In addition to this, Slyke, Belanger and Sridhar [11] conducted another study of e-commerce adoption in India and empirically prove that perception on DOI model is successful in predicting behavioural intention to adopt e-commerce across nationalities. Nevertheless, there are variations of perceptions among residents in different countries. This is considered normal as residents in developed countries (for example, the US) and developing countries (for example, India) have different views (knowledge) on e-commerce. In a preliminary study comparing e-commerce acceptance behaviour between Japan and US samples, it was found that DOI (scales used was PCI) successfully predict intention to adopt e-commerce across national cultures (61% variation in Japan versus 63% variation in the US). Furthermore, though there is significant difference between variance explained using DOI model for North America and Japan, the difference is relatively small, despite the distinct difference in cultural values between the two countries [5].

Straub, Keil and Brenner [15] tested TAM in the United States, Switzerland (European) and Japan (Asian) and found that TAM does not hold for the Japan (Asian) sample. Adjusted R-square for Japan was 0.01 and is not significant ($p=0.19$). Both PU and PEOU failed to predict system use in Japan sample. Though Straub et. al. (1997) did not test cultural dimensions with TAM in their research; preliminary results based on cultural theoretical prediction and empirical TAM data suggest that TAM may not be robust across East and West cultures.

Although both TAM and PCI model have considerable explanatory power, TAM is low in descriptive richness that allows researchers and managers to draw conclusion upon [8]. Moreover, a comparison of variance explained for both studies, i.e. Srite [14] and Kimery and Amirkhalkhali [5], indicates that PCI model yields consistent variance explained across cultures, suggesting PCI model is more robust and reliable across countries. Based on the empirical justifications from the literatures, this research decided to adopt PCI model to study e-commerce acceptance among Malaysian consumers.

Table 1: Summary of TAM and PCI Models

	TAM	PCI
Theoretical Constructs	Perceived Usefulness Perceived Ease of Use	Relative Advantage Ease of Use Compatibility Triability Result Demonstrability Visibility Image Voluntariness
Model Parsimony	$2^2 = 4$ possibilities for decision making	$2^8 = 256$ possibilities for decision making
Asian Studies (Sampling in this study)	Srite et. al. (2006) (Supported but inconclusive result)	Kimery et. al. (2007); Slyke et. al. (2004); Slyke et. al. (2005)
North America Studies (Sampling in this study)	Davis et. al. (1989); Srite et. al. (2006); Straub et. al. (1997)	Moore et. al. (1997); Kimery et. al. (2007); Slyke et. al. (2004); Slyke et. al. (2005)

6. Conclusion

This paper proposes the evaluation of model parsimony and model robustness for researchers in the process of identifying suitable model for technology acceptance studies. Social setting is more complicated in Malaysia as there are multi races and cultural community interacting together. PCI model is adopted to study e-commerce adoption in Malaysia because the model could provide richer set of beliefs and is robust across different cultures.

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