

The Effect of Attitudinal and Satisfaction Factors on Household Broadband Penetration in Malaysia

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ABSTRACT

The aim of this paper is to investigate the effect of attitudinal construct and satisfaction towards household broadband penetration (HBP) in Malaysia. Information and communication technology (ICT) is the most efficient way to develop the literacy of knowledge and skills among its users, and broadband is the key factor to spread the ICT infrastructure. By understanding the factor of continuance of broadband intention (CBI), the researcher explores the factors that affect HBP as well. Furthermore, this study will gauge the effectiveness of the Universal Service Provision (USP) projects especially 1Malaysia Internet Center1Malaysia (Pi1M) towards CBI. The findings will provide evidence and suggestions for policy makers and service providers to improve the implementation of USP projects or to suggest any better projects to ensure a sustainable growth of broadband penetration in Malaysia. The study adapted the model of adoption of technology in household (MATH) and the information system (IS) continuance usage model using a cross-sectional, survey-based study. The relations among the constructs of the proposed model were then hypothesised according to the literature findings and examined using SMART PLS 3.0. The population and samples of the study were drawn from the users of Pi1M in six regions of Malaysia (northern, central, southern, east coast, Sabah, and Sarawak). The cross-sectional study was conducted between October and December 2016 and involved 406 respondents. The results indicate that attitudinal construct is the key factor that has shaped customers' continuing behaviour intentions towards broadband usage and subscription. On the contrary this study find negative association between satisfaction and CBI among Pi1M users. Despite the growing number of studies on intention and adoption of technology, little research has been done on theory-building and the linkage between CBI and the two aforesaid factors: attitudinal construct under the MATH model and satisfaction. This study was conducted to fill the gap.

Keywords: Continue Broadband Intention (CBI), Satisfaction, MATH Model, Public telecenters, Smart PLS, Digital divide

1.0 Introduction

In many countries the policy to ensure the growth of broadband coverage is very important because it serves as the catalyst for internet penetration (1). Nowadays, broadband affects daily business productivities. The International Telecommunication Union (ITU) estimates a ten-percent increase in broadband penetration especially on mobile broadband technology, which in turn, could increase a country's total productivity factor by 4.2% in the long run (1). However, only few studies have been conducted on the critical technology management especially in terms of broadband penetration in households.

Many other initiatives have been introduced by the government to ensure the growth of HBP and reduce the digital divide. One of the key projects is the deployment of 1Malaysia Internet Center1Malaysia (Pi1M) in 2012 (skmm.gov.my, 2014). Pi1M was chosen as the subject of this study due to the significant amount of investment made by MCMC on telecenters types of projects since 2009. Given this point the present research intends to study the impact of Pi1M's deployment on HBP after years of implementation nationwide. Without prejudice, the key objective of this deployment is to introduce the usage of broadband among the dwellers within a particular area. As explained by Kiran and Vasantha (2), consumers' inclination towards a product or services is important in creating purchase intention. However, a study by Aziz, Razak, and Malek et.al (3) uncovered that MCMC has been facing challenges on how to increase attraction and has continuously motivated people to use broadband either in the telecenters or at home. Nevertheless, in some places, telecenters are still seen as a place for users to access government's websites and play games.

1.1 The 1Malaysia Internet Center

1Malaysia Internet Center (Pi1M) has now reached eight years of execution and it has brought numerous social and financial effects to the users, especially the rural dwellers. This is precisely the expectations of the Commission, which is to give broadband services and administrations to underserved zones. The Commission has always endeavoured to move forward the usage of Pi1M

every now and then. In 2013, they began presenting PIIM in urban territories, focusing on underserved areas and poor group, particularly by incorporating the debilitated and the groups who live in Individuals' Housing Project (PPR). Other than providing access to broadband services (4), PiIM also offers ICT and entrepreneurship development trainings, and users can utilise other services such as printing, overlaying, photocopying at very minimum charges. Unfortunately, there is no recent study on the impact of PiIM on any telecenter deployed by MCMC to the HBP. One study by Aziz et al. (3) find that telecenters have been focusing heavily on introducing the Internet and at certain extent, are still seen as places where children, teenagers, and youth access government's websites and play games only. Given these points, this study is considered necessary for policy makers to understand the factors that have influenced the usage and success of public telecentres in order to improve broadband penetration.

1.2 Household Broadband Penetration (HBP)

Household broadband penetration (HBP) is an international index by International Telecommunication Union (ITU) (1) established with the objectives to gauge a country's broadband penetration rate. Eventhough HBP in Malaysia for 2015 already surpassed 71% and is on upward trend (5), surprisingly the rate in some states has significantly dropped and was inconsistent (Figure 1.1). This was notable in states with the lowest HBP, such as Perlis, Negeri Sembilan, and Terengganu, which marked a significant drop of 23% from end of June 2014 to further 39%, but increased to 57.3% at the end of 2016. In contrast, Putrajaya recorded the highest penetration among the states, with 96% of HBP in 2014 which increased to 98.5% in 2015, although a steep fall (61.9%) was noted at the end of 2016.

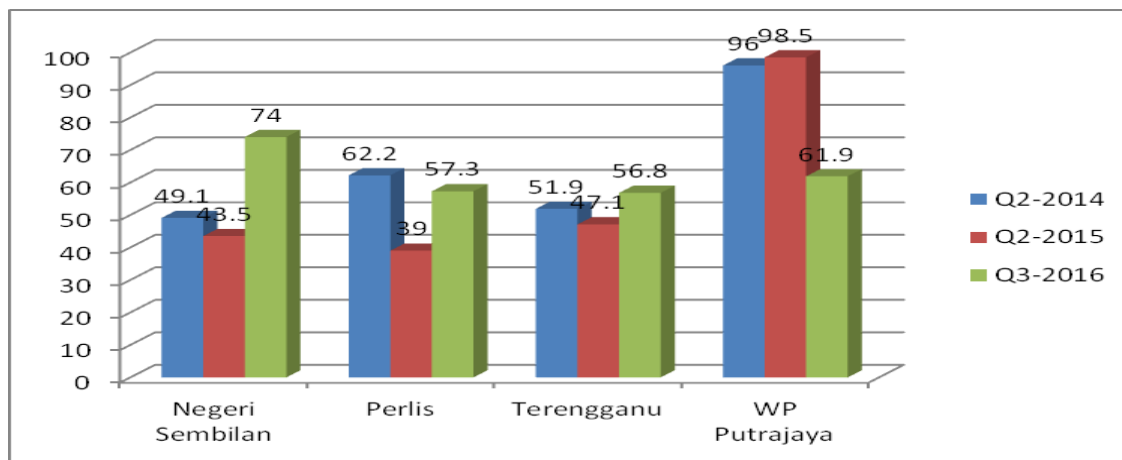


Figure 1.1 The comparison of household broadband penetration for 1 year period from Q2 2014 to Q3 2016. (Source: Communication & Multimedia Pocketbook, www.skmm.gov.my, 2015)

As indicated by Prieger (6), the drop of household broadband penetration may be caused by a few factors, such as (1) the facility being too expensive, (2) low service quality, (3) inadequate service quality, or (4) users' lacking of exposure to computers. A number of studies were conducted on the initial use and adoption of information system (IS), but only a few focused on broadband penetration in households. In another study by Muraina (7), factors that determine broadband intention were uncovered. Niehaves and Plattfaut (8) found that the MATH model has more explanatory power (R^2) compared to UTAUT. Furthermore, Kim and Malhotra (9) argue that the adoption and the first use of any technology does not necessarily lead to the desired managerial outcome unless the use continues. Given these points, the present study will provide new knowledge with regard to the continuance of broadband intention model. The study hence set the following objectives:

- i. To investigate the relationship between attitudinal construct in MATH model and CBI among the users of public telecenters in Malaysia.
- ii. To investigate the relationship between satisfaction and CBI among the users of public telecenters in Malaysia.
- iii. To investigate the impact of the moderating factor of gender on CBI among the users of public telecenters in Malaysia.

Research Hypotheses

Many studies have provided empirical evidence on the intention to use technology and several studies have also examined the use of the information system (IS) theories. Nevertheless, the issues were addressed in different perspectives thus have produced solutions only on some issues (7). As mentioned by Tan and Teo (10), the positive attitude of individuals will most likely form an intention to perform the behaviour. Accordingly, the present study will focus on the theoretical models of MATH and the IS continuance usage model as a foundation to the research.

1.3 Model of Adoption Technology in the Household (MATH)

A considerable amount of literature has been published on the MATH model. Developed by Venkatesh and Brown (2001), the model proposes attitudinal, normative, and control constructs to predict people's intention to adopt technology in a household.

1.4 Attitudinal Construct

The attitudinal construct consists of relative advantage (RA), utilitarian outcome (UO), hedonic outcome (HO), and service quality (SQ). The construct is one of the major determinants that create individuals' perceptions towards behaviour. The

acceptance and willingness to use broadband especially in low broadband penetration areas will determine the success of any applications or systems especially e-Government websites or portal. Therefore, it is crucial for the government to develop an excellent system, although the success is much influenced by the collaboration between government and the willingness of the citizens to use the technology (11). One study (12) proposes and validates relative advantage and other factors such as UO, HO, and SQ to determine the adoption of an innovation. Given these points, the following research question (RQ) and hypothesis are posited:

RQ1: What is the effect of attitudinal construct on the CBI among public telecenter users?
 H1: Attitudinal construct will have a positive relationship on CBI.

1.5 IS Continuance Usage Model

It is believed that users are viewed as the central part of information system, therefore as suggested by Muraina (13), the determinant of both satisfaction and dissatisfaction of technology will determine the onward usage. The present study will use the model proposed by Muraina (14), which suggests that the factor of user satisfaction be a means of measuring the success of information system. Other studies by Jung, Chung, and Leue (15) mention that satisfaction is a critical measure of the success and effectiveness of information system. At the same time, Chen et al. (15 p.30) define satisfaction as “the degree to which one believes that an experience evokes positive feelings.” Accordingly, the present study hypothesises the following linkage to answer the second RQ:

RQ2: What is the effect of satisfaction on the CBI of public telecenter users?
 H2: Satisfaction will have a positive relationship with CBI.

Therefore, this study adopts the research model as in Figure 2.3.

1.6 Moderator

Ooi et al. (17) suggest that future research include a moderating construct to examine the inter relationship among the adoption factors. Additionally, Rahman and Aziz (18) mention that demographic characteristics (such as age, income, gender, and race) are often assumed to have significant effects on consumers’ perceptions. Nevertheless, the present research focuses only on gender due to the simpler analysis on categorical data for the moderating construct, and other demographic variables will need to be assessed further in future research. The research question and hypothesis of moderating effect are as follows:

RQ3: Does gender moderate the effect of attitudinal construct on CBI?

RQ4: Does gender moderate the effect of satisfaction to CBI?

H3a: Gender will moderate the effect of attitudinal construct on the CBI among public telecenters users.

H3b: Gender will moderate the effect of satisfaction on the CBI among public telecenters users.

Therefore based on the underpinning theory for this research, the following framework (Figure 2.1) is proposed.

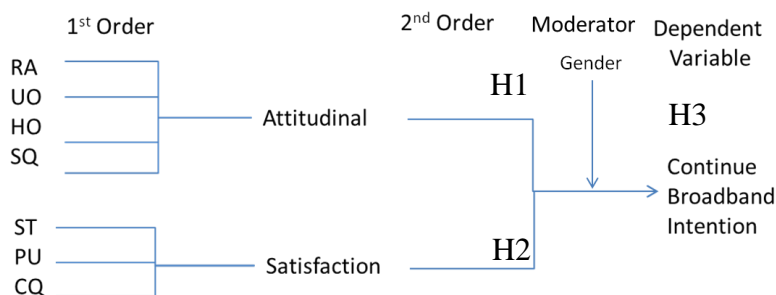


Figure 2-1 The research framework for the continue broadband intention (CBI)

Research Methodology

Puspa and Ishi (19) state that an appropriate research design is crucial in determining an appropriate data collection method, such as type of data, data collection technique, and sampling methodology. In the present cross-sectional study, the data collection was performed only once in a determined period of time. Thirty-four self-administered questionnaires were used in a survey (20) form (Table 3). The questions were divided into two categories: (i) multiple choice questions that capture demographic variables such as age, gender, education, income and background of broadband usage; and (ii) a five-point Likert scale questions that were designed to address issues related to continue broadband intentions. The questionnaires were reviewed by six experts in academia and industries and minor improvements were made based on their feedback. A total of 1200 questionnaires were distributed nationwide, and in every region, four Pi1M centres were selected randomly and one-hundred questionnaires were given to the manager of each centre. The questionnaires were later given randomly to the respondents who are the registered users of the Pi1M. Weekly follow-ups were made to the Pi1M managers and the questionnaires were then collected after two months. A total of 406 completed questionnaires were received and 20 were excluded due to missing data. Ultimately a response rate of 36.5% was obtained, about the same result as Chin et.al (21). The collected data were then analysed using Smart PLS 3.0 for

measurement and structural model analysis. Smart PLS 3.0 was chosen because it makes minimal demands on the data distributions, sample size, and measurement of scales; in fact, this study was predictive in nature. Nowadays, the use of PLS path modelling is becoming more appropriate for real world applications and more advantageous for complex models in which the primary and crucial measures for data reliability was successfully performed.

Data Analysis and Results

A total of 1200 questionnaires were distributed to twelve telecenters in six regions. Altogether, 406 responses were received hence representing a 33.8% ($n = 406$) response rate. However, 20 samples with 20% missing data were removed from the analysis, leaving 386 samples. Among the respondents, 61% ($n = 235$) are females and 31 % ($n = 151$) are males and 39% ($n = 149$) are in the group of 17 to 24 years old and the least (6%) ($n = 23$) are the respondents between 44 to 55 years of age. In terms of education level, most of the respondents were undergraduate or have higher diploma (35%) ($n = 136$) and postgraduates recorded the second highest ($n = 83$) and diploma holders were the least with 7% ($n = 27$).

1.7 Convergent Validity

The collected data were first analysed on the measurement model using Smart PLS as this was the crucial measures for evaluating data reliability. As illustrated in Figure 4.1, the latent constructs such as relative advantage (RA), utilitarian outcome (UO), hedonic outcome (HO), and service quality (SQ) that formed the second order construct (attitudinal) were measured. At the same time Content Quality (CQ) and Perceived Usefulness (PU) forming the second –order construct for Satisfaction. It is called second-order construct because it contains all indicators of its first-order subconstructs, and later, prediction of the model was made on the basis of the second-order construct Lowry and Gaskin (22). The first order construct was qualified to be conceptually explained before the hypothesising of the second-order construct. The modified path analysis (Figure 4.1) with a standardised loading of at least 0.5 (as stated by Bagozzi et. al [18,19]) demonstrates adequate support for convergent validity to ensure that only good items are carried over to the CFA stage of validation. The internal consistency of the model was measured by measuring the instrument’s convergent validity, which consists of composite reliability (CR) and average variants extracted (AVE). The measurements were performed using Smart PLS 3.0.

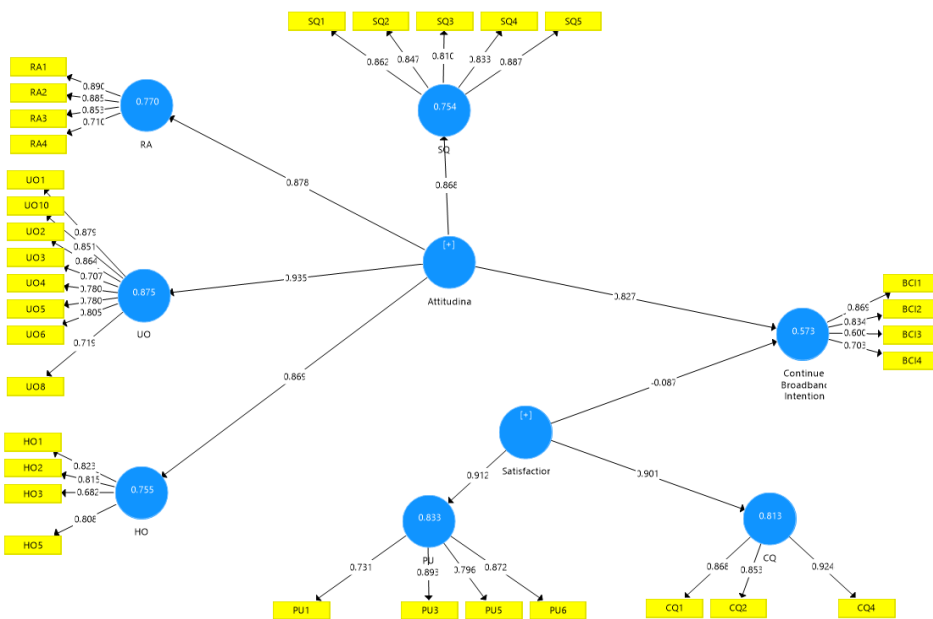


Figure 4.1 Modified path analysis

The convergent validity results are shown in Table 4.1 where all items construct are above the minimum requirement, thus satisfy the reliability requirements as stated by Bhattacharjee et. al (13, 20). (The requirement is for the composite reliability to be greater than 0.70 and AVE greater than 0.50.)

1.8 Discriminant Validity

The discriminant validity was tested using Fornel and Lacker criteria, and Heterotrait Monotrait Ratio (HTMT). Fornel and Lacker was assessed by comparing the correlations construct (R^2) and the square root of the AVE for each construct as illustrated in Table 4.2. A square root of the AVE greater than the correlation indicates an adequate Fornel and Lacker value for the discriminant validity.

Table 4.1 Convergent Validity

Construct	Item	F.Loading	CR	AVE	Validity Met
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		<i>Ist Order</i>			
Continue Broadband Intention	BCI1	0.869	0.842	0.576	Yes
	BCI2	0.834			
	BCI3	0.600			
	BCI4	0.703			
Content Quality	CQ1	0.868	0.913	0.778	Yes
	CQ2	0.853			
	CQ4	0.924			
Hedonic Outcome	HO1	0.823	0.864	0.615	Yes
	HO2	0.815			
	HO3	0.682			
	HO5	0.808			
Perceived Usefulness	PU1	0.731	0.895	0.681	Yes
	PU3	0.893			
	PU5	0.796			
	PU6	0.872			
Relative Advantage	RA1	0.890	0.903	0.701	Yes
	RA2	0.885			
	RA3	0.853			
	RA4	0.710			

Table 4.1 (Continue)

Construct	Item	F.Loading	CR	AVE	Validity Met
Service Quality	SQ1	0.862	0.928	0.720	Yes
	SQ2	0.847			
	SQ3	0.810			
	SQ4	0.833			
	SQ5	0.887			
Utilitarian Outcome	UO1	0.879	0.934	0.641	Yes
	UO10	0.851			
	UO2	0.864			
	UO3	0.707			
	UO4	0.780			
	UO5	0.780			
	UO6	0.805			
	UO8	0.719			
Attitudinal	<i>2nd Order</i>		0.959	0.529	Yes
	RA	0.878			
	HO	0.869			
	UO	0.935			
Satisfaction	SQ	0.868	0.927	0.560	Yes
	PU	0.912			
	CQ	0.901			

Further analysis of HTMT was done to indicate discriminant validity. According to Henseler et.al (21), HTMT and discriminant validity are valid if the HTMT does not exceed 0.9 as shown in Table 4.3, or else one can conclude lack of discriminant validity on the measurement model. Therefore as a conclusion this measurement model demonstrated adequate convergent and discriminant validity.

Table 4.2 Discriminant Validity: Fornel and Lacker Criterion

	CQ	HO	PU	RA	SQ	UO
CQ	0.882					
HO	0.583	0.784				

PU	0.706	0.619	0.825			
RA	0.567	0.734	0.665	0.838		
SQ	0.743	0.676	0.697	0.704	0.848	
UO	0.699	0.77	0.766	0.743	0.718	0.8

Note: The diagonal values (bolded) are square root of AVE; off diagonal is correlation among the first order construct

Table 4.3 Discriminant Validity: Heterotrait Monotrait Ration (HTMT)

	CQ	HO	PU	RA	SQ	UO
CQ	1					
HO	0.671	1				
PU	0.826	0.708	1			
RA	0.661	0.831	0.79	1		
SQ	0.838	0.757	0.79	0.79	1	
UO	0.774	0.84	0.862	0.836	0.77	1

1.9 Hypothesis Testing

This study utilised standardised estimates for all the hypothesised paths. The findings show that the attitudinal factor has positive influence and significant result ($\beta = 0.827, t = 13.142, p < 0.05$) on continuance of broadband intention (CBI). However, satisfaction has negative influence but insignificant result of ($\beta = -0.087, t = 1.327$) towards CBI (lesser than the minimum requirement of T-value 1.645). Further analysis on attitudinal with effect size of $f^2 = 0.491$ reflects a large effect size on continuance of broadband intention. Among the attitudinal factors, UO ($Q^2 = 0.514$) gives the highest effect and HO ($Q^2 = 0.410$) the lowest. As for the effect of satisfaction, CQ recorded a higher value ($Q^2 = 0.586$) compared to perceived usefulness. Summary of the bootstrapping results are shown in Table 4.4.

Table 4.4 Summary of Result for Hypothesis Testing using PLS Algorithm and Bootstrapping

Path Coefficient	Beta	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Significant
Attitudinal -> CBI	0.827	0.063	13.142	0.000	Yes
Satisfaction -> CBI	-0.087	0.065	1.327	0.185	No

1.10 Moderating Effect Gender

The moderating analysis of this study found that gender moderates the effect of attitudinal and satisfaction factors on CBI. Figure 4.2 shows the weakening effect of the moderators on the two independent variables. The effect size of the moderating factors to attitudinal is medium ($f^2 = 0.345$), and a very small moderating effect of gender was noted on satisfaction ($f^2 = 0.002$). The overall moderating factor of gender strengthens the effects for both attitudinal and satisfaction when the value of R^2 improved from 0.573 to 0.645.

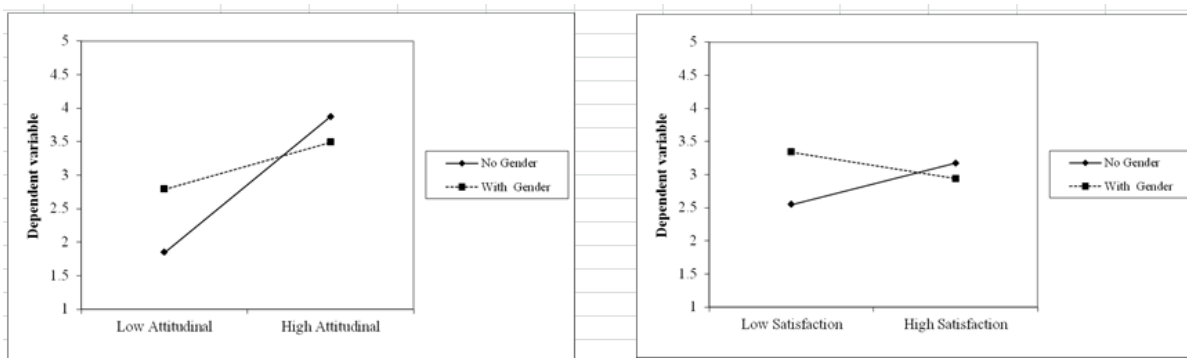


Figure 4.2 Moderating effects of gender on attitudinal and satisfaction

CONCLUSIONS

By adapting the MATH model, the present research investigates the roles of some factors towards the continuance of broadband intention (CBI) among the users. The results were obtained by using Smart PLS 3.0 and the findings reveal that the second order construct of attitudinal factor is significant, whereas satisfaction is not. The findings also attest that among the attitudinal factors, utilitarian outcome is the most important factor that policy makers and service providers need to focus on in order to ensure the sustainable growth of household broadband penetration in Malaysia. In fact, the deployment of broadband across many countries is a continuing effort, therefore the findings attest that policy makers also need to focus on the quality of the content. It needs to be updated from time to time especially on the benefits of the broadband and what it can offer. This study also find that gender factor plays an important role towards CBI where it had significantly moderate the effect towards CBI especially on attitudinal construct. The adoption of new technologies in households is always a complex process (26), but from time to time the diffusion of broadband has attracted unprecedented attention in the research and political community.

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