Using mature concepts to generate new ideas: technology acceptance revisited

Christopher White*

School of Economics, Finance and Marketing,
RMIT University,
Melbourne Vic 3001, Australia
E-mail: christopher.white@rmit.edu.au
*Corresponding author

Adela J. McMurray

School of Management,
RMIT University,
G.P.O. Box 2476V Melbourne Vic 3001, Australia
E-mail: adela.mcmurray@rmit.edu.au

Priyantono Rudito

Strategic Investment and Corporate Planning,
P.T. Telekomunikasi Indonesia, Tbk., Indonesia
E-mail: prudito@telkom.co.id

Abstract: This study contributes to literature on consumer acceptance of new technology and in line with other research in this area builds on the technology acceptance model (TAM). In the proposed model, consumer perceived value was hypothesised to mediate the effects of perceived enjoyment, perceived ease of use and perceived usefulness on intentions to use 3G mobile technology in Indonesia. Additionally, different levels of technology readiness were posited to moderate the process. While the mediation hypothesis was not fully supported, this unique configuration of well-known constructs provided fresh insights into the drivers of consumer intentions and these are discussed from a theoretical and managerial perspective. The paper concludes with future research possibilities.

Keywords: technology acceptance; perceived value; technology readiness; segmentation; perceived enjoyment.

Reference to this paper should be made as follows: White, C., McMurray, A.J. and Rudito, P. (2012) 'Using mature concepts to generate new ideas: technology acceptance revisited', *Int. J. Technology Marketing*, Vol. 7, No. 4, pp.361–378.

Biographical notes: Christopher White moved into higher education in 1995 after a 13-year career in the international hospitality management field. Since then, he has worked at universities in Australia and Switzerland, and has published numerous research articles in leading international journals and conference proceedings.

Adela J. McMurray has an academic and industrial experience in manufacturing and service industries. She has over 65 publications, won best author and teacher awards, research grants totalling over $2.5 million. She is an editorial advisory board member for numerous journals and chairs the ITC at the Academy of Management.

Priyantono Rudito has spent 18 years in the Indonesian telecommunications industry and held a number of middle and senior managerial positions. He is currently the Director of Human Capital and General Affairs at Telkom Indonesia.

1 Introduction

Over the past five years, the number of mobile communication subscriptions in Indonesia has increased significantly (Evans, 2005) and mobile communication now plays an important role in boosting the Indonesian economy (Kim and Garrison, 2009). The tremendous growth in the number of mobile service users, particularly in the full mobility cellular service segment, saw market penetration reach 77% in March 2010 (Telekom, 2010). This service is operated by eight providers serving as many as 180 million subscribers and has exceeded the initial projection of 120 million users by the end of 2010 (Evans, 2005). The expectation is that the expansion trend will continue in the coming years, providing lucrative opportunities for significant investments to be made in this fourth most populous country in the world.

In response, all major Indonesian operators have taken steps to improve Indonesia's communications infrastructure by transforming their networks into a broadband-based convergence network. The competition amongst operators is intense and heavy pricing-based promotional activities to deal with the competition and to attract new consumers proliferates.

This paper contends that pricing is over emphasised as a predominant factor influencing technology adoption. Other influential factors need to be examined in order to develop deeper understandings of technology acceptance. Following an extensive literature review, we assert that a potential foundation model that could be further developed and applied to the Indonesian context is the technology acceptance model (TAM) originally proposed by Davis (1989).

From the TAM perspective technology acceptance is based on consumers' evaluation of two main acceptance dimensions, perceived usefulness (PU) and perceived ease of use (PEOU). PU is concerned with functional outcomes such as the benefits associated with using a particular technology, and PEOU is linked to assessments of the effort involved in learning to use a technology (Kulviwat et al., 2007). Since its inception numerous attempts have been made to extend the model (Venkatesh, 2000; Venkatesh and Davis, 2000a, 2003, 2008) by including mediators and or a variety of predictor variables. We contribute to this work in two important ways. First, we incorporate the concept of perceived value into the TAM. Despite the wide usage of value models in the marketing literature, little work has focused on perceptions of value and technology acceptance. We argue that perceived value enhances understandings of the acceptance process and will mediate the relationship between PEOU, PU and usage intentions (UI).

Second, since explaining why people accept technology does not provide insights into the behavioural processes underlying acceptance, we also examine how our extension of the TAM performs at different levels of an individual's technology readiness (TR). TR has been described as a state of mind that is formed by mental inhibitors and drivers associated with new technology, and various combinations of these two dimensions have been posited to influence behavioural predispositions in predictable ways (Parasuraman, 2000). Examining technology acceptance in conjunction with perceived value at different levels of TR will provide an important segmentation tool from a practical perspective and fill a gap in the literature as to how these constructs interact.

This rest of this paper sets out a review of the constructs under consideration and then presents the results of an empirical investigation to test our model.

2 Technology acceptance

Understanding how potential users accept a new technology has been a focus of many studies over the past 20 years. In an abundant literature, various technology adoption models were developed (Ajzen, 1991; Bhattacherjee and Sanford, 2006; Cocosila et al., 2009; Shin, 2009; Hsu and Kulviwat, 2006; Lin et al., 2007; Venkatesh et al., 2003). As a general pattern, each model proposed specific dimensions representing factors that indicate a tendency of the potential users to accept the technology; one of the most influential of these models is known as the TAM (Bagozzi, 2007).

The TAM was adapted from the theory of reasoned action (TRA) (Fishbein and Ajzen, 1974), and as such based in the social psychology domain. The TAM provided the first insights into why people adopt technology and as a theory facilitated the expansion of technology acceptance research across various contexts. Moreover, evidence indicates that the original constructs of PU and PEOU are still important determinants of use (Benbasat and Barki, 2007) and TAM has consistently outperformed the TRA and another extension of the TRA, the theory of planned behaviour (TPB) in terms of explained variance in IT contexts (Venkatesh et al., 2007).

Despite the popularity of the TAM limitations have been recognised. Bagozzi (2007) pointed to the simplicity of the model and questions how two predictors can capture a full range of human UI and behaviours. He added that attempts to increase predictors have led to a broadening of the model and not a deeping. Others have noted that more work is necessary to understand the antecedents of PU and PEOU in order to benefit practice. Ironically these authors on one hand suggested that future research should focus on the TRA and TPB, then on the other suggested that both these models have limitations. (Benbasat and Barki, 2007). Rarely, in any academic discipline consensus on all aspects of a problem or question is achieved. The best one can do is to select a model that has some recognised academic history and clearly acknowledge the limitations associated with it. Findings then can be interpreted within these constraints. Attempts to broaden models by including additional predictors do not enhance theoretical understanding and in this study we deepen TAM in response to recommendations by Bagozzi (2007). Understanding the moderating effects of TR will provide deeper insights into how the original TAM components work and the inclusion of an affective variable recognises the importance of recent theoretical advances in this area (White, 2010). Finally we consider

perceived value, a concept that deepens the TAM by incorporating price and quality dimensions as well social influences.

2.1 Technology readiness

An extension of the TAM involved integrating another well-known technology adoption concept, the TR index and TRAM, as it is known, was posited to be a better way to conceptualise technology adoption processes in consumer settings. In this model PU and PEOU were hypothesised to mediate the relationship between TR and UI (Lin et al., 2007). TR consists of four dimensions: optimism and innovativeness that represent positive dispositions toward technology, and discomfort and insecurity that have the inverse effect. The notion that TRAM would perform better than either alone holds intuitive appeal; however, PU and PEOU have been shown to partially mediate the TR-UI relationship, which raises issues about the causality inferences.

A stream of research has examined the relationship between TR and taxonomy of technology adoption customers. Parasuraman and Colby (2001) identified five types of customers, referred to as explorers, the first to adopt; then pioneers, skeptics, paranoids and finally laggards. Empirical work since then has shown support for this model. As displayed in Table 1, explorers score high on optimism and innovativeness, and low on discomfort and insecurity, while laggards score the opposite. Pioneers are high on all TR dimensions and sceptics are low on all. Paranoids are high on all dimensions except innovativeness (Massey et al., 2007). The possibility that levels of TR can accurately identify adopter segments has very important practical implications for marketing managers who are interested in more that just how a particular process works but who want to understand how processes can enhance decision-making.

Table 1 The relationship between dimensions of TR and adopter types

Type	*Drivers*		*Inhibitors*	
	Optimism	*Innovativeness*	*Discomfort*	*Insecurity*
Explorers	High	High	Low	Low
Pioneers	High	High	High	High
Skeptics	Low	Low	Low	Low
Paranoids	High	Low	High	High
Laggards	Low	Low	High	High

Source: Parasuraman (2000)

The taxonomy resembles Rogers' (1995) diffusion of innovations (DoI) theory that describes a process by which an innovation is communicated over time to members of a social system. The DoI model posits that different segments of a population adopt innovations in a uniform and predictable way. For example, innovators, the first to adopt represent 2.5% of the market. Early adopters account for 13.5% of the market, and so on through to laggards (2.5%), the last to adopt. While some interesting research has developed this line of inquiry (Wang and Hausman, 2006), TR segments provide a more promising option.

The taxonomy proposed by Parasuraman and Colby (2001) organises segments based on drivers and inhibitors that are viewed as trait-like dispositions that do not necessarily conform to a bell-shaped curve (Massey et al., 2007; Tsikriktsis, 2004). TR has been chosen here because unlike the DoI it was designed specifically for technology and has shown promising results that offer an opportunity for further exploration.

Understanding the differences between segments will allow for better-targeted promotional campaigns through to improved inventory management strategies. From an academic perspective, knowing the way different segments adopt technology can add to a growing interest in understanding moderating effects. For example, Venkatesh et al. (2003) examined age, gender, experience and voluntariness of use; Srite and Karahanna (2006) focused on national culture and Nasco et al. (2008) examined the task type, dominance and social influence in technology acceptance contexts.

The notion that TR could moderate adoption processes was first raised by Agarwal and Prasad (1998) and Parasuraman (2000), and was empirically tested in M-commerce (Kleijnen et al., 2004) and online transaction contexts (Ranaweera et al., 2005). In both studies significant moderation effects were reported, but the full range of potential TR segments was not examined as samples were split in two. Massey et al. (2007) using cluster analysis identified five TR segments but reduced these to four as one cell had a single subject. These authors reported that TR consumer segments varied in user requirements and evaluations and recommended that TR play a major role in online interface design. Moreover, Tsikriktsis (2004) found evidence for a four-factor solution that differed slightly from that of Massey et al. (2007). A broad proposition is offered below to guide this aspect of our study. Hypotheses that are more specific cannot be made as it is not known how many segments will be derived from data collected in Indonesia.

P1 Different segments of TR will moderate the relationship between the predictors and UI.

2.2 Perceived enjoyment

The TAM framework was developed in a 'controlled' work situation and to confirm the model's applicability in an uncontrolled context, such as the open marketplace, adjustments are necessary (Lin et al., 2007). Research has indicated (Pagani, 2004) that this transition will be more likely to succeed with the inclusion of an affective variable such as perceived enjoyment (PE) (originally defined as the extent to which the activity of using computers was perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated (Davis et al., 1992).

PE has been shown to influence user technology acceptance (Agarwal and Karahanna, 2000; Koufaris, 2002; Kulviwat et al., 2007; Stern et al., 2008; Van Der Heijden, 2004; Venkatesh, 2000; Wann-Yih and Chia-Ying, 2007) in numerous studies and to have implications for hedonic systems; following this line of research, we incorporate PE into the TAM as a predictor of UI alongside PU and PEOU.

Table 2 Consumer perceived value

Authors	*CPV dimensions*	*Definition*
Zeithaml (1988), Monroe (1990), Cravens et al. (1988) and Dodds et al. (1991)	Price	The amount of money paid by consumers
	Quality	The measurement of how well a product performs its intended functions
Porter (1990)	Product quality	Similar as quality definition above
	Special features	Other product feature that does not influence a product basic function but enhances its overall value
	After-sale service	Service provided by seller after a consumer buys a product
Holbrook and Hirschman (1982)	Product quality	Similar as quality definition above
	Symbolic value	A specific symbol or status that consumer gets by purchasing a product
	Hedonic value	A feeling that arises when using a product (usually linked to enjoyment)
	Esthetic value	Product design that enhance its outer appearance
Sheth et al. (1991)	Social	Ability of a product to enhance someone's social status, self-concept and presence by invoking specific social image
	Emotional	Likeliness of a product to increase the chance of positive emotional response
	Functional	Reliability, durability and price of a product
	Epistemic	Product's capacity to arouse curiosity, offer novelty or satisfy a desire for knowledge and may be important for consumers who are considering new experiences
	Conditional	Temporary functional or social value, which arises when situational factors moderate the perceived value-outcome process
Sweneey and Soutar (2001)	Functional value (performance/quality)	The utility derived from the perceived quality and expected performance of the product
	Emotional value	The utility derived from the feelings or affective states that a product generates
	Social value (enhancement of social self-concept)	The utility derived from the product's ability to enhance social self-concept
	Functional value (price/value for money)	The utility derived from the product due to the reduction of its perceived short term and longer term costs

Source: After Sweneey and Soutar (2001)

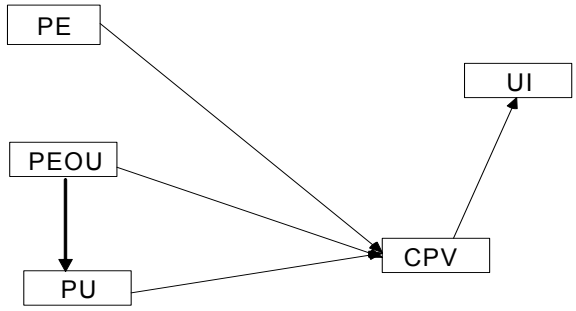
2.3 Consumer perceived value

Consumer perceived value (CPV) has gained worldwide acceptance as a marketing effectiveness metric. Graf and Maas (2008) noted that over the last few years, the value concept has consistently been the fundamental basis for all marketing activities and many studies have explored the mechanisms by which marketing actions affect consumers' value perceptions (c.f., Bolton and Drew, 1991; Teas and Agarwal, 2000; Zeithaml, 1988). Perceived value has been shown to significantly influence consumers' satisfaction, trust and loyalty (Kim and Kankanhalli, 2009) and is closely related to perceptions of service and product quality (Wang, 2008). Table 2 displays important inputs into the development of the construct and it appears that most conceptualisations of value converge around functional, emotional or hedonistic and social dimensions.

Perceived value has been viewed as an overall estimate of an adoption object (Kim et al., 2007), something that is missing in the TAM, and the inclusion of a value concept would enhance understandings of technology adoption. Despite this realisation, there is a lack of empirical research on the role of value in such contexts.

Turel et al. (2007) reported that CPV influenced intentions to use information technology, and perceived value has been shown to fully mediate the influence of variables similar to PU and PEOU and PE on UI (Kim et al., 2007; Ko et al., 2009) in mobile commerce and internet contexts. A valid and reliable model of CPV for durable goods, developed by Sweeney and Soutar (2001), has also been adapted and extended to mobile phone services (Heejin et al., 2006) and consists of four dimensions, functional in terms of price and quality, social and emotional.

Figure 1 Theoretical model



Notes: PE – perceived enjoyment
PEOU – perceived ease of use
PU – perceived usefulness
UI – usage intentions
CPV – consumer perceived value

Given that our model has an affective variable (PE) that is similar to the emotional value dimension in the CPV, we will remove the emotion component of CPV to reduce the possibility of multicollinarity; CPV will be conceptualised as a construct consisting of a price, social and quality value dimensions. Each of these dimensions has been considered in research modelling behavioural intentions in telecommunication-related contexts (Blery et al., 2009; De Marez et al., 2007; Herbjørn et al., 2005; Norizan and Norasiah,

2010; Pavlos and Adam, 2008). It is therefore hypothesised that the concept of perceived value acts as a mediator in the model. Figure 1 displays the extended TAM.

H1 CPV will fully mediate the relationship between PE, PEOU, PU and UI.

3 Research method

Self-administered questionnaires were distributed to anonymous respondents in the Greater Jakarta and Bandung cities. These were chosen as the most suitable cities in which to conduct the survey because these areas are where the greatest number of potential consumers of wireless broadband services can be found. A systematic random sampling technique determined potential respondents to participate in our study. The data of potential mobile broadband service demand for 2009 published by the Indonesian National Telecom guided the sample proportion. A mall-intercept strategy was conducted from July until October 2009 and resulted in 704 respondents yielding a response rate of 55%.

3.1 Sample

Indonesian mobile consumers over 18 years of age were determined to be the target population for this study because wireless broadband services are likely to be utilised by consumers who have primary platform technology. Criteria for inclusion in the study were as follows:

- the respondents were Indonesian citizens
- they came from the AB social economic status (SES) category with minimum monthly household spending of 200 dollars, and were located in greater Jakarta and Bandung
- the respondents were aged between 18 and 55 years (based on a Indonesian law regulations, their accessibility to mobile services information, and availability)
- the respondents were not users of mobile broadband technology and services but were exposed to information about this technology
- they owned cellular devices that supported mobile service applications
- the respondents consented to participate in the survey.

3.2 Instrumentation

The CPV scale consisted of 14 items capturing three value dimensions of quality, social and price. These were based on the scale first developed by Sweeney and Soutar (2001). This model has been used in a variety of contexts and demonstrated strong validity and reliability. The four dimensions of TR were operationalised with a 36-item scale first proposed by Parasuraman (2000) and a further 25 items captured PU, PEOU and UI (Davis, 1989). PE consisted of six items (Agarwal and Karahanna, 2000; Teo et al., 1999) and all items were anchored to a seven-point strongly agree/disagree interval scale.

Following Triandis (1983) method, the scales were translated into Bahasa Indonesia, then English and again into Bahasa.

3.3 Pre-testing

Following university ethics approval, a pre-test was undertaken to establish the content validity (McMurray et al., 2004) of the instrument items by obtaining feedback from eleven mobile broadband technology experts. The pre-test was conducted in Jakarta and Bandung, where the experts were headquartered. The experts were research and development heads, vice presidents, assistant vice presidents, general managers, executive regional general managers, and managers at Telkom Indonesia and other mobile broadband service operators involved in mobile broadband technology development in Indonesia. Six of the eleven participants were Telkom Indonesia managers who worked in the area of wireless broadband product management. Telkom was chosen for its competence and experience in managing wireless broadband products since it pioneered the availability of the product in Indonesia.

Based on the relevance scores provided by the participants on each questionnaire item, the mean relevance score (MRS) was calculated to ensure the item relevance was maintained in the instrument. Feedback and suggestions offered by the experts were analysed using the NVivo application, and used to strengthen the questionnaire items for each construct. The general consensus was that the constructs, dimensions and items were appropriate for the mobile broadband technology in an Indonesian context.

3.4 Pilot study

A pilot study based on a representative sample of telecommunication consumers in Indonesia was conducted to establish the reliability of the various scales and 100 complete responses to the questionnaire were obtained. Analysis of the pilot study data showed acceptable coefficient alpha values of the constructs (PU = 0.862; PEOU = 0.756; PE = 0.909; UI = 0.882; TR = 0.875; CPV = 0.879) and open-ended responses regarding the clarity and meaning of items indicated that minor changes to the questionnaire format were necessary and once completed, the study proper proceeded with confidence.

3.5 Data analysis

Prior to analysis data were screened for outliers, missing values, normality, linearity and multicollinearity. Some negative skewness was evident in the majority of items; however, this was not deemed to threaten the integrity of the findings in this study as items were to be combined to form composite variables. Exploratory factor analysis using maximum likelihood with direct oblimin rotation was used as correlations between the components were expected. Items that double loaded or contributed less than 0.4 to the factor were removed (Hair et al., 2006).

The remaining items were summed and averaged based on a parcelling technique (Hall et al., 1999) to form variables and entered into path analysis using AMOS 17. The significance of indirect effects were calculated by using a bootstrapping option in AMOS 17 that is based on a nonparametric re-sampling procedure that computes

confidence intervals by taking repeated samples from the dataset (MacKinnon et al., 2002; Preacher and Hayes, 2008).

4 Results

The alpha values of the main study measures yielded results similar to those of the pilot study, with α scores over 0.70 (see Table 3), as recommended (Nunnally, 1978). All correlations between the variables are significant and the higher scores between PE and all other variables attest to the importance of including an affective element in the TAM.

Table 3 Means, alphas and correlations between variables

	Mean	*Alpha*	*PEOU*	*PE*	*PU*	*UI*	*TR*	*CPV*
PEOU	5.12	0.754	1					
PE	5.6	0.894	.521**	1				
PU	5.74	0.876	.522**	.620**	1			
UI	4.91	0.878	.392**	.500**	.480**	1		
TR	5.09	0.82	.533**	.421**	.404**	.360**	1,000	
CPV	5.38	0.835	.432**	.535**	.532**	.396**	.417**	1

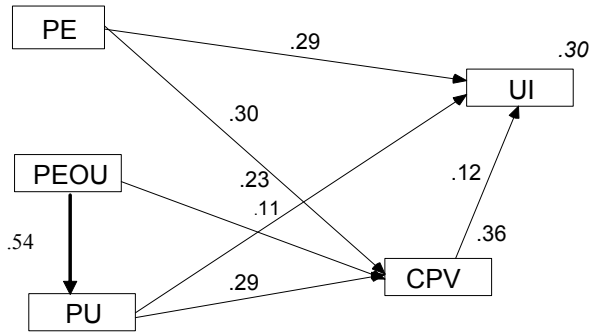
Notes: **p = .001
PE – perceived enjoyment
PEOU – perceived ease of use
PU – perceived usefulness
UI – usage intentions
CPV – consumer perceived value
TR – technology readiness

To address Hypothesis 1 a procedure described by Hoyle and Smith (1994) was used to test for mediation. Here the predictor – outcome paths are compared with and without the mediator; if a path is zero with the mediator in the model, full mediation has occurred.

PE, PU and PEOU all had a significant direct effect on UI at the 0.01 level and explained 30% of the variance in the dependent variable. When the mediator was included PE and PU still had a significant direct impact on UI, although the path estimates reduced slightly indicating that partial mediation occurred for these variables. The PEOU/UI path was no longer significant, suggesting CPV fully mediated this relationship. Significant indirect effects were noted for PE and PU via CPV on UI. PEOU had a significant direct effect on PU; however, no indirect influences on UI via PU or CPV were evident. Based on these findings H1 can be rejected as full mediation was not observed across all predictors.

Figure 2 displays the path coefficients and R squared values of the final model with non-significant paths removed. The model was a good fit to the data and produced a chi-square of 4.15 with one degree of freedom (p = 0.042); the CFI was 0.997 and the RMSEA was 0.065. The predictors together explained 30% of the variance in UI.

Figure 2 Path analysis showing significant path estimates and R square



Notes: R square values in italics
PE – perceived enjoyment
PEOU – perceived ease of use
PU – perceived usefulness
UI – usage intentions
CPV – consumer perceived value
TR – technology readiness

In order to test proposition 1 a two-step cluster analysis determined the optimal number of segments. This cluster technique handles continuous data and large sample sizes, and has been embraced by researchers across a variety of academic disciplines (Borglin et al., 2006; Chan et al., 2008; Ferla, 2009; Tseng et al., 2008). The two-step algorithm is based on Bayesian Information Criteria and automatically identifies the cluster groupings.

Table 4 displays the cluster output. A distinct five-segment solution was generated with relatively even percentages of respondents distributed across five segments. These segments, however, do not easily conform to the patterns displayed in Table 1. Cluster five, for example is close to an explorer type, but for the low innovativeness score; moreover, clusters 1 and 2 could be described as paranoids. It appears that the model as presented by Parasuraman (2000) is not replicated in an Indonesian context.

Table 4 Adopter segments based on the four TRI dimensions

Cluster	*1*	*2*	*3*	*4*	*5*
Size	24% (160)	23.4% (156)	20.2% (135)	17.5% (117)	14.8% (99)
Optimism	5.52	5.85	6.04	4.70	6.00
Innovativeness	4.90	3.54	5.61	3.94	3.56
Discomfort	5.00	4.88	5.59	4.22	3.75
Insecurity	5.11	5.92	6.06	5.37	4.29

In order to reduce the complexity of the model, the scores for the drivers of TR, (optimism and innovativeness) and the inhibitors (discomfort and insecurity) were summed and averaged to form two higher order factors of TR. These were then subjected to the two-step cluster method described above and a four-cluster solution was produced (see Table 5).

Table 5 Adopter segments based on a two-dimension TR conceptualisation

Type	*Laggards*	*Explorers*	*Pioneers*	*Skeptics*
Size	32.7% (218)	31.8% (212)	20.8% (139)	17.4% (98)
Drivers	4.43	5.27	5.77	4.54
Inhibitors	5.24	4.98	5.87	3.92

A clearer pattern has emerged and it is possible to label the segments according to some of the characteristic types displayed in Table 1. In order to address proposition 1 the model displayed as Figure 2 was tested simultaneously across the four segments with all paths unconstrained. This produced a chi-square of 8.31 with 4 degrees of freedom ($p = 0.081$). Next, all paths were constrained to be equal and reestimated; this produced a chi-square of 50.99 with 22 degrees of freedom ($p = 0.000$). Subtracting the chi-square and degrees of freedom from the constrained and unconstrained models results in a difference of chi-square 42.68 with 18 degrees of freedom, which is significant at 0.001. Proposition 1 can be accepted as different levels of TR moderate the adoption process. Table 6 shows the differences in path coefficients between the various constructs for each of the four types and the theoretical and practical implications of the findings presented above will now be addressed.

Table 6 Path coefficients and p values between constructs

Path	*Pio*	*Exp*	*Skep*	*Lag*
PU to CPV	0.32*	0.05	0.52*	0.26*
PE to CPV	0.18	0.34*	0.08	0.35*
PEOU to CPV	0.08	0.03	0.14*	0.05
CPV to UI	0.21*	0.05	0.30*	0.01
PE to UI	0.37*	0.30*	0.29*	0.18*
PU to UI	0.07**	0.28*	0.05**	0.27*
R-square UI	0.17	0.30	0.26	0.17
R-square CPV	0.31	0.15	0.44	0.31

Notes: p values in italics
*Significant at $p < 0.05$
**Significant indirect effects at $p < 0.05$
PE – perceived enjoyment
PEOU – perceived ease of use
PU – perceived usefulness
UI – usage intentions
CPV – consumer perceived value
TR – technology readiness

5 Discussion

The inclusion of PE and CPV into the TAM produced a cohesive conceptualisation of the technology adoption process evidenced by the model data fit statistics. PE and PU have the strongest direct impact on UI and a further indirect effect is transferred through CPV. Again the inclusion of PE (Agarwal and Karahanna, 2000; Koufaris, 2002;

Kulviwat et al., 2007; Stern et al., 2008; Van Der Heijden, 2004; Venkatesh, 2000; Wann-Yih and Chia-Ying, 2007) has been shown to be an important addition and should be considered as an integral component of the TAM. Moreover, the parsimony of TAM is not comprised as it can be operationalised with six additional items. The addition of an affective component into TAM places what was largely a cognitive model into the affect, cognition and conation conceptualisation of attitudes that has a long history in philosophic and social science thought and research (Bagozzi, 1978; Bagozzi et al., 1979; Bootzin et al., 1991; Breckler, 1984) thus constituting a deepening of the original model rather than broadening.

If predictive ability was the aim, then one could question the rationale of including CPV in the model given that it increases the explanatory power by only 1% and unlike previous studies, did not fully mediate the predictors (Kim et al., 2007; Ko et al., 2009). It is not until the moderated results are examined that the importance of this inclusion is evident and the information displayed in Table 5 provides insights into this.

Before dealing with the practical implications of these findings a few words regarding the taxonomy is in order. We did not reproduce the five-segment model however the cluster solution based on a two higher-order dimensions (drivers and inhibitors) replicated Tsikriktsis' (2004) findings from a sample of UK consumers also produced a four-cluster solution that excluded paranoids. Our results raises a possibility that the four segment model may have cross-cultural potential and more research is necessary to confirm this exciting possibility.

From a practical perspective the findings show that for pioneers UI is directly influenced by PE and CPV. Pioneers comprise 20.8% of the sample and have high scores on both the drivers and inhibitors of TR. Marketing managers should emphasise the fun and enjoyment aspects of using this technology when targeting pioneers, but need to consider these aspects within a context where quality, price and social value are also important. Over reliance on enjoyment alone as the key benefit would be a mistake and negatively influence UI.

Explorers are characterised by high scores on drivers and low scores on inhibitors and this type comprised 31.8% of the sample. PE and PU have a direct impact and CPV does not play a significant role in influencing UI. Put simply, in order to attract and retain customers with explorer characteristics managers need focus only on PE and PU. For a type that is strong in optimism and innovativeness it seems that value in terms of price, self-esteem and quality are out-ranked by enjoyment and usefulness. This finding has implications for communication strategy and product design, and market research is needed to elaborate the kind of functions that explorers require in their telecommunication devices and services. Given that price is not an issue for explorers, firms may be able to charge a premium for enhanced useful features.

The third type is skeptics and this segment is low in both drivers and inhibitors of TR. They make up 17.4% of the sample and they share similar characteristics with pioneers, but here CPV plays a stronger role in influencing UI. In terms of marketing actions the enjoyment aspects are still important to consider but more emphasis should be placed on price, social esteem and quality in order to foster desirable intentions towards the product.

The last type are laggards, high on discomfort and insecurity and low on optimism and innovativeness. The enjoyment aspects are significant but the impact of PE on UI for laggards is weaker than for any other type. PU should be emphasised over enjoyment and

value plays a negligible role in influencing consumer intentions. In order to reduce levels of discomfort and insecurity, managers should provide options for in-store trial and consider ways of educating laggard to build confidence.

In a broad sense these findings question the relevance of PEOU as a component of consumer technology adoption. In Davis' (1989) seminal article on TAM, PEOU played a negligible role in terms of directly influencing UI, and in a revised TAM (Venkatesh and Davis, 2000b) PEOU was shown to influence PU but no indirect effects on UI were reported. Both of these studies were in work situations where one would expect ease of use to be important. Many of today's technology consumers were born into a technologically rich environment and surely do not face the challenges of those born pre-1990s. Moreover, as the purchase of 3G mobile technology is enjoyable, as contrast to a work-related function, the benefits derived from enjoyment as demonstrated here may override the importance of PEOU as a predictor.

PE was a significant predictor of UI for all types however the intensity of the relationship fluctuated from a beta weight of 0.37 for pioneers to 0.18 for laggards. There is no doubt that PE should be a permanent addition to the TAM and these findings have shown that enjoyment attributes and messages should not be viewed as a one-size-fits-all solution; different customer types based on TR levels will have different PE requirements.

The other addition to our model was CPV and it has been shown to influence UI for pioneers and skeptics but not for explorers or laggards. CPV has played an important role in understanding consumer loyalty (Kim and Kankanhalli, 2009) and product quality (Wang, 2008) and now can assist in understanding technology acceptance and readiness to adopt. CPV is most influential when there is an even balance between the drivers and inhibitors, that is, either high/high or low/low as is the case with the pioneers and skeptics. These types are in some respects ambivalent in that they do not have a strong position either way and in such cases CPV and PE form intentions. PU and PE dominate when there are large discrepancies between drivers and inhibitors. These findings have further evidenced the efficacy of including a value concept in a technology adoption model (Kim et al., 2007; Ko et al., 2009). One might question this inclusion if predictive ability were the main criteria however, understanding the way something works is just as important as explaining variance in an outcome variable. We have clearly shown here that CPV plays a unique and meaningful role in influencing technology acceptance across statistically distinct types based on TR.

6 Conclusions

The aim of this study was to develop a model of technology adoption, the TAM by incorporating other well-known constructs to provide unique insights into mobile 3G technology adoption process in an Indonesian context. PE was the first addition, perceived value followed and the impact of different levels of TR on the model was examined. The research hypothesis was rejected, as CPV did not fully mediate the three predictor variables. The proposition was supported however as different levels of TR were found to moderate the adoption process. Clearly, the addition of CPV has complemented the original TAM. The value construct in conjunction with levels of TR can provide practitioners with a set of specific actions to assist in designing communication and product development strategies.

There are many interesting possibilities for future research based on what has been presented here. One step would be to test the stability of model across different geographical locations and product categories and at the same time examine the TR adopter segments in more detail. Do the four types appear as clearly as they did here? Alternatively, will a five-type model based on four dimensions of TR emerge? What other characteristics are associated with each type? In this study we focused on intentions, and more work is needed to understand how the model influences actual purchase in cross-sectional and longitudinal research designs.

References

Agarwal, R. and Karahanna, E. (2000) 'Time flies when you're having fun: cognitive absorption and beliefs about information technology usage', *MIS Quarterly*, Vol. 24, No. 4, pp.665–694.

Agarwal, R. and Prasad, J. (1998) 'A conceptual and operational definition of personal innovativeness in the domain of information technology', *Information Systems Research*, Vol. 9, No. 2, pp.204–215.

Ajzen, I. (1991) 'The theory of planned behavior', *Organizational Behavior and Human Decision Processes*, Vol. 50, No. 2, pp.179–211.

Bagozzi, R.P. (1978) 'The construct validity of the affective, behavioral, and cognitive components of attitude by analysis of covariance structures', *Multivariate Behavioral Research*, Vol. 13, No. 1, pp.9–13.

Bagozzi, R.P. (2007) 'The legacy of the technology acceptance model and a proposal for a paradigm shift', *Journal of the Association for Information Systems*, Vol. 8, No. 4, pp.244–254.

Bagozzi, R.P., Tybout, A., Craig, S. and Sternthal, B. (1979) 'The construct validity of the tripartite classification of attitudes', *Journal of Marketing Research*, Vol. 16, No. 1, pp.88–95.

Benbasat, I. and Barki, H. (2007) 'Quo vadis, TAM?', *Journal of the Association for Information Systems*, Vol. 8, No. 4, pp.212–218.

Bhattacherjee, A. and Sanford, C. (2006) 'Influence processes for information technology acceptance: an elaboration likelihood model', *MIS Quarterly*, Vol. 30, No. 4, pp.805–825.

Blery, E., Batistatos, N., Papastratou, E., Perifanos, I., Remoundaki, G. and Retsina, M. (2009) 'Service quality and customer retention in mobile telephony', *Journal of Targeting, Measurement and Analysis for Marketing*, Vol. 17, No. 1, p.27.

Bolton, R. and Drew, J. (1991) 'A longitudinal analysis of the impact of service changes on customer attitudes', *Journal of Marketing*, Vol. 55, No. 1, pp.1–9.

Bootzin, R., Bower, G., Crocker, J. and Hall, E. (1991) *Psychology Today: An Introduction*, McGraw-Hill, New York.

Borglin, G., Jakobsson, U., Edberg, A. and Hallberg, I.R. (2006) 'Older people in Sweden with various degrees of present quality of life: their health, social support, everyday activities and sense of coherence', *Health and Social Care in the Community*, Vol. 14, No. 2, pp.136–146.

Breckler, S. (1984) 'Empirical validation of affect, behavior, and cognition as distinct components of attitude', *Journal of Personality and Social Psychology*, Vol. 47, No. 21, pp.1191–1205.

Chan, M.F., Ho, A. and Day, M.C. (2008) 'Investigating the knowledge, attitudes and practice patterns of operating room staff towards standard and transmission-based precautions: results of a cluster analysis', *Journal of Clinical Nursing*, Vol. 17, No. 8, pp.1051–1062.

Cocosila, M., Archer, N. and Yufei, Y. (2009) 'Early investigation of new information technology acceptance: a perceived risk – motivation model', *Communications of AIS*, Vol. 25, No. 1, pp.339–358.

Cravens, D.W., Holland, C.W., Lamb, C.W., Jr. and Moncrief, W.C., III (1988) 'Marketing's role in product and service quality', *Industrial Marketing Management*, Vol. 17, No. 3, pp.285–304.

Davis, F.D. (1989) 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', *MIS Quarterly*, Vol. 13, No. 3, pp.319–340.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1992) 'Development and test of a theory of technological learning and usage', *Human Relations*, Vol. 45, No. 7, pp.659–687.

De Marez, L., Vyncke, P., Berte, K., Schuuurman, D. and De Moor, K. (2007) 'Adopter segments, adoption determinants and mobile marketing', *Journal of Targeting*, *Measurement and Analysis for Marketing*, Vol. 6, No. 1, p.78.

Evans, P. (2005) *South-East Asia Mobile Communications and Mobile Data Markets*, 2nd ed., Paul Buddle, Communication, Sydney Australia.

Ferla, J.M.G. (2009) 'Student models of learning and their impact on study strategies', *Studies in Higher Education*, Vol. 34, No. 2, pp.185–202.

Fishbein, M. and Ajzen, I. (1974) 'Attitudes towards objects as predictors of single and multiple behavioral criteria', *Psychological Review*, Vol. 81, No. 1, pp.59–74.

Graf, A. and Maas, P. (2008) 'Consumer value from a consumer perspective: a comprehensive review', *Journal für Betriebswirtschaft*, Vol. 58, No. 1, pp.1–20.

Hair, J., Anderson, R., Babin, B., Tatham, R. and Black, W. (2006) *Multivariate Data Analysis*, 6th ed., Prentice-Hall, London.

Hall, R.J., Snell, A.F. and Foust, M.S. (1999) 'Item parceling strategies in SEM: investigating the subtle effects of un-modeled secondary constructs', *Organizational Research Methods*, Vol. 2, No. 2, pp.233–239.

Heejin, L., Richard, W. and Jungkun, P. (2006) 'M-loyalty: winning strategies for mobile carriers', *Journal of Consumer Marketing*, Vol. 23, No. 4, pp.208–218.

Herbjørn, N., Per, E.P. and Helge, T. (2005) 'Intentions to use mobile services: antecedents and cross-service comparisons', *Academy of Marketing Science Journal*, Vol. 33, No. 3, p.330.

Holbrook, M.B. and Hirschman, E.C. (1982) 'The experiential aspects of consumption: consumer fantasies, feelings, and fun', *The Journal of Consumer Research*, Vol. 9, No. 2, pp.132–140.

Hoyle, R. and Smith, G. (1994) 'Formulating clinical research hypotheses as structural models: a conceptual overview', *Journal of Consulting and Clinical Psychology*, Vol. 62, No. 2, pp.429–440.

Hsu, S. and Kulviwat, S. (2006) 'An integrative framework of technology acceptance model and personalisation in mobile commerce', *International Journal of Technology Marketing*, Vol. 1, No. 4, pp.393–410.

Kim, H.W., Chan, H.C. and Gupta, S. (2007) 'Value-based adoption of mobile internet: an empirical investigation', *Decision Support Systems*, Vol. 43, No. 1, pp.111–126.

Kim, S. and Garrison, G. (2009) 'Investigating mobile wireless technology adoption: an extension of the technology acceptance model', *Information Systems Frontiers*, Vol. 11, No. 3, pp.223–233.

Kim, H-W and Kankanhalli, A. (2009) 'Investigating user resistance to information systems implementation: a status quo bias perspective', *MIS Quarterly*, Vol. 33, No. 3, pp.567–581.

Kleijnen, M., Wetzels, M. and De Ruyter, K. (2004) 'Consumer acceptance of wireless finance', *Journal of Financial Services Marketing*, Vol. 8, No. 3, pp.206–217.

Ko, E., Kim, E.Y. and Lee, E.K. (2009) 'Modeling consumer adoption of mobile shopping for fashion products in Korea', *Psychology and Marketing*, Vol. 26, No. 7, pp.669–687.

Koufaris, M. (2002) 'Applying the technology acceptance model and flow theory to online consumer behavior', *Information Systems Research*, Vol. 13, No. 2, pp.205–223.

Kulviwat, S., Bruner, G.C., II, Kumar, A., Nasco, S.A. and Clark, T. (2007) 'Toward a unified theory of consumer acceptance technology', *Psychology and Marketing*, Vol. 24, No. 12, pp.1059–1084.

Lin, C.H., Shih, H.Y. and Sher, P.J. (2007) 'Integrating technology readiness into technology acceptance: the TRAM model', *Psychology and Marketing*, Vol. 24, No. 7, pp.641–657.

MacKinnon, D.P., Lockwood, C.M., Hoffman, J.M., West, S.G. and Sheets, V. (2002) 'A comparison of methods to test mediation and other intervening variable effects', *Psychological Methods*, Vol. 7, No. 1, pp.83–104.

Massey, A.P., Khatri, V. and Montoya-Weiss, M.M. (2007) 'Usability of online services: the role of technology readiness and context', *Decision Sciences*, Vol. 38, No. 2, pp.277–308.

McMurray, A.J., Pace, R.W. and Scott, D. (2004) *Research: A Commonsense Approach***,** Thomson Learning Social Science Press, Melbourne.

Monroe, K.B. (1990) *Pricing: Making Profitable Decisions*, McGraw-Hill, New York.

Nasco, S.A., Kulviwat, S., Kumar, A. and Brunner, G.C., II (2008) 'The CAT model: extensions and moderators of dominance in technology acceptance', *Psychology and Marketing*, Vol. 25, No. 10, pp.987–1005.

Norizan, K. and Norasiah, A. (2010) 'The effect of perceived service quality dimensions on customer satisfaction, trust, and loyalty in e-commerce settings', *Asia Pacific Journal of Marketing and Logistics*, Vol. 22, No. 3, p.351.

Nunnally, J. (1978) *Psychometric Theory*, 2nd ed., McGraw-Hill, New York.

Pagani, M. (2004) 'Determinants of adoption of third generation mobile multimedia services', *Journal of Interactive Marketing*, Vol. 18, No. 3, pp.46–59.

Parasuraman, A. (2000) 'Technology readiness index (TRI): a multiple-item scale to measure readiness to embrace new technologies', *Journal of Service Research : JSR*, Vol. 2, No. 4, p.307.

Parasuraman, A. and Colby, C. (2001) *Techno-Ready Marketing: How and Why Your Customers Adopt Technology*, Free Press, New York.

Pavlos, A.V. and Adam, P.V. (2008) 'Determinants of behavioral intentions in the mobile internet services market', *The Journal of Services Marketing*, Vol. 22, No. 4, p.280.

Porter, M. (1990) '*The Competitive Advantage of Nations*' Free Press, NY.

Preacher, K. and Hayes, A. (2008) 'Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models', *Behavior Research Methods*, Vol. 40, No. 3, pp.879–891.

Ranaweera, C., McDougall, G. and Bansal, H. (2005) 'A model of online customer behavior during the initial transaction: moderating effects of customer characteristics', *Marketing Theory*, Vol. 5, No. 1, pp.51–74.

Rogers, E. (1995) *Diffusion of Innovations*, 5th ed., Free Press, New York.

Sheth, J.N., Newman, B.I. and Gross, B.L. (1991) 'Why we buy what we buy: a theory of consumption values', *Journal of Business Research*, Vol. 22, No. 2, pp.159–170.

Shin, D.H. (2009) 'An empirical investigation of a modified technology acceptance model of IPTV', *Behaviour and Information Technology*, Vol. 28, No. 4, pp.361–372.

Srite, M. and Karahanna, E. (2006) 'The role of espoused national cultural values in technology acceptance', *MIS Quarterly*, Vol. 30, No. 3, pp.679–704.

Stern, B.B., Royne, M.B., Stafford, T.F. and Bienstock, C.C. (2008) 'Consumer acceptance of online auctions: an extension and revision of the TAM', *Psychology and Marketing*, Vol. 25, No. 7, pp.619–636.

Sweeney, J.C. and Soutar, G.N. (2001) 'Consumer perceived value: the development of a multiple item scale', *Journal of Retailing*, Vol. 77, No. 2, pp.203–220.

Teas, K. and Agarwal, S. (2000) 'The effects of extrinsic product cues on consumers' perceptions of quality, sacrifice, and value', *Journal of the Academy of Marketing Science*, Vol. 28, No. 2, pp.278–290.

Telkom (2010) 'Research report on mobile broadband service demand in Indonesia', P.T., Telekomunikasi Indonesia, Tbk., Indonesia, available at https://w3.telkom.co.id.

Teo, T.S.H., Lim, V.K.G. and Lai, R.Y.C. (1999) 'Intrinsic and extrinsic motivation in internet usage', *Omega*, Vol. 27, No. 1, pp.25–37.

Triandis, H. (1983) *Essentials of Studying Cultures*, Pergamon Press, New York.

Tseng, C.Y., Kuo, H.Y. and Chou, S.S. (2008) 'Configuration of innovation and performance in the service industry: evidence from the Taiwanese hotel industry', *Service Industries Journal*, Vol. 28, Nos. 7/8, pp.1015–1028.

Tsikriktsis, N. (2004) 'A technology readiness-based taxonomy of customers: a replication and extension', *Journal of Service Research*, Vol. 7, No. 1, pp.42–52.

Turel, O., Serenko, A. and Bontis, N. (2007) 'User acceptance of wireless short messaging services: deconstructing perceived value', *Information & Management*, Vol. 44, No. 1, pp.63–73.

Van Der Heijden, H. (2004) 'User acceptance of hedonic information systems', *MIS Quarterly*, Vol. 28, No. 4, pp.695–704.

Ventakatesh, V. (2000) 'Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model', *Information Systems Research*, Vol. 11, No. 4, p.342.

Ventakatesh, V. and Bala, H. (2008) 'Technology acceptance model 3 and a research agenda on interventions', *Decision Sciences*, Vol. 39, No. 2, pp.273–315.

Ventakatesh, V. and Davis, F.D. (2000a) 'A theoretical extension of the technology acceptance model: four longitudinal field studies', *Management Science*, Vol. 46, No. 2, p.186.

Ventakatesh, V. and Davis, F.D. (2000b) 'A theoretical extension of the technology acceptance model: four longitudinal field studies', *Management Science*, Vol. 46, No. 2, pp.186–204.

Venkatesh, V., Davis, F.D. and Morris, M.G. (2007) 'Dead or alive? the development, trajectory and future of technology adoption research', *Journal of the Association for Information Systems*, Vol. 8, No. 4, pp.268–286.

Ventakatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003) 'User acceptance of information technology: toward a unified view', *MIS Quarterly*, Vol. 27, No. 3, pp.425–478.

Wang, Y.S. (2008) 'Assessing e-commerce systems success: a respecification and validation of the DeLone and McLean model of IS success', *Information Systems Journal*, Vol. 18, No. 5, pp.529–557.

Wang, Y. and Hausman, A. (2006) 'Consumer adoption of short message service (SMS): a suggested framework', *International Journal of Technology Marketing*, Vol. 1, No. 4, pp.431–445.

Wann-Yih, W. and Chia-Ying, L. (2007) 'A contingency approach to incorporate human, emotional and social influence into a TAM for KM programs', *Journal of Information Science*, Vol. 33, No. 3, pp.275–297.

White, C.J. (2010) 'The impact of emotions on service quality, satisfaction and positive word-of-mouth intentions over time'. *Journal of Marketing Management*, Vol. 26, No. 5, pp.381–394.

Zeithmal, V.A. (1988) 'Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence', *Journal of Marketing*, Vol. 52, No. 1, pp.2–22.