

Value-based Adoption of Mobile Internet: An empirical investigation

Hee-Woong Kim ^{*}, Hock Chuan Chan, Sumeet Gupta

Department of Information Systems, National University of Singapore, S16 #05-08, 3 Science Drive 2, Singapore 117543, Singapore

Available online 14 July 2005

Abstract

This study examines the adoption of Mobile Internet (M-Internet) as a new **Information and Communication Technology (ICT)** from the value perspective. M-Internet is a fast growing enabling technology for Mobile Commerce. However, despite its phenomenal growth and although M-Internet essentially provides the same services as stationary Internet, its adoption rate in many countries is very low compared to that of stationary Internet. The well-known Technology Adoption Model (TAM) has been used for explaining the adoption of traditional technologies. Most adopters and users of traditional technologies (e.g., spreadsheet, word processor) are employees in an organizational setting who use the technology for work purposes, and the cost of mandatory adoption and usage is borne by the organization. In contrast, adopters and users of M-Internet are individuals who play the dual roles of **technology user and service consumer**. Most of them adopt and use it for personal purposes, and the cost of voluntary adoption and usage is borne by the individuals. Thus, the adopters of new ICT, especially M-Internet, are also **consumers rather than simply technology users**. By adopting the theory of consumer choice and decision making from economics and marketing research, this study develops the **Value-based Adoption Model (VAM)** and explains customers' M-Internet adoption from the **value maximization perspective**. The findings demonstrate that consumers' perception of the value of M-Internet is a principal determinant of adoption intention, and the other beliefs are mediated through perceived value. The theoretical and practical implications of VAM related to M-Internet are discussed.

© 2005 Elsevier B.V. All rights reserved.

Keywords: Mobile Internet; Value-based Adoption Model; Technology Adoption Model

1. Introduction

With the rapid adoption of the Internet and electronic commerce (e-commerce), the acclimatization of

consumers to mobile devices, and the advent of third generation (3G) technology, Mobile Commerce (M-Commerce) is set to become one of the most promising and lucrative growth markets. 3G technology, which started in Japan in 2001, supports rich media such as video clips whereas only text is supported by second generation (2G) technology [53]. According to the Ministry of Posts and Telecommunications of Japan, the Japanese M-Commerce market is expected

^{*} Corresponding author. Tel.: +65 6874 4867.

E-mail addresses: kimhw@comp.nus.edu.sg (H.-W. Kim),
chanhc@comp.nus.edu.sg (H.C. Chan), g0202136@nus.edu.sg
(S. Gupta).

to expand to 1.1 trillion yen (US\$9.4 billion) in FY 2005 [39]. The main reason for this rapid growth of M-Commerce is the rapid adoption of Mobile Internet (M-Internet) as a medium of communication, contents service and commerce, which has in turn come about as Japanese mobile service providers adopt 3G technology. As the growth of M-Commerce is closely linked to that of M-Internet, a clear and comprehensive understanding of M-Internet adoption is therefore essential to understanding M-Commerce adoption. As an initial step toward understanding customer behavior related to M-Commerce, this study examines the adoption of M-Internet.

In Japan, the number of people using M-Internet has already exceeded those using stationary Internet [57]. The growth of the M-Internet market has been estimated to grow from \$272 billion in 2000 to \$2600 billion in 2004. Despite its phenomenal growth, M-Internet is still in its infancy in most countries. Accordingly, research in M-Internet has been limited, although the subject is fast gaining interest in the information systems research community. Previous research has mainly focused on technological developments (e.g., [7,51]), overlooking users' perspective of M-Internet [34]. Only a few studies [2] have explored how individuals use M-Internet and the factors influencing its adoption. Although the information technology (IT) adoption literature is rich in studies on factors of technology adoption, the technologies being studied are most often business software applications, email systems and personal productivity applications. Conventional adoption models have been extended and modified by some researchers to explain the adoption of telecommunication-oriented services like telemedicine [28] and mobile telephones [35] because conventional theories in their original forms are inadequate when explaining the adoption of such technologies.

The most prominent model employed to explain the adoption and usage of technology by individuals is the Technology Adoption Model (TAM) [15]. Based on the Theory of Reasoned Action, TAM is a parsimonious model, asserting that all influences of external variables such as system design features on behavior are mediated by *Usefulness* and *Ease of Use*. TAM was originally developed to explain individuals' adoption of traditional technology (e.g., Spreadsheet, email, Software development tools) in an organizational setting. However, TAM has its limitations in explaining

the adoption of new Information and Communication Technology (ICT) such as M-Internet. Most adopters and users of traditional technologies are employees in an organizational setting, where they use the technology for work purposes, and the cost of mandatory adoption and usage is borne by the organization. In contrast, adopters and users of new ICT are individuals who play the dual roles of technology user and service consumer. Most of them adopt and use the new ICT for personal purposes, and the cost of voluntary adoption and usage is borne by the individuals. For example, one of the major issues in adopting and using M-Internet is monetary cost, such as usage fee. Potential adopters of M-Internet are mobile service consumers who will consider prices and evaluate M-Internet based on its benefits and costs. Thus, the adopters of new ICT, especially M-Internet, are consumers rather than simply technology users.

Our research aims to examine M-Internet adoption as a new ICT from the consumer perspective, and not just from the technology user perspective. A number of studies exist on consumer choice and decision making in the economics [31,40] and marketing literature [6,12,33,52,61]. The basic and common assumption in examining consumer behavior is value maximization. For example, the prospect theory [31] was proposed to explain the choices made by individual customers. In this theory, the value function is adopted and defined over perceived gain or loss relative to a reference point. It basically proposes that people choose the behavior that leads to the highest payoff.

The principles of cost–benefit analyses are exemplified in the concept of value, which is broadly defined as the trade-off between total benefits received and total sacrifices. A value-based model would be able to capture the monetary sacrifice element and present adoption as a comparison of benefits and costs. We propose and empirically test a Value-based Adoption Model (VAM) of M-Internet by integrating the most relevant findings of the technology adoption and value literature. This combined framework represents a novel approach to understanding consumers' adoption of mobile technology. Our findings should help in the theoretical understanding of the adoption behavior of individual consumers in a voluntary and personal context. In practice, our findings could guide mobile service developers in augmenting their offerings.

The paper is structured as follows. In Section 2, a literature review on *perceived value* and its relevance to this study is presented. In Section 3, we propose our research model and hypotheses based on the literature review. Section 4 describes the research methodology followed by results and discussion in Sections 5 and 6, respectively. In Section 7 we discuss the theoretical and practical implications of our research; we also highlight opportunities for future research in the section. Section 8 concludes the paper with a brief summary.

2. Conceptual background

2.1. Mobile Internet and Mobile Commerce

Mobile Commerce, also known as M-Commerce, is basically any e-commerce done in a wireless environment, especially via the Internet [53]. The major characteristics of M-Commerce that differentiate it from other forms of e-commerce are mobility and reach. Users can initiate real-time contact with commercial and other systems wherever they happen to be (mobility). With M-Commerce, people can be reached at any time (reach).

Mobile Internet is an enabling technology for M-Commerce. M-Commerce uses radio-based wireless devices to conduct business transactions over the Web-based e-commerce system [45]. Mobile devices create an opportunity to deliver new services to existing customers and attract new ones. M-Commerce began with analog based first-generation wireless (1G) technology in 1979, which was gradually replaced in the early 1990s with second generation (2G) digital radio technology which could accommodate text. Third generation (3G) technology supporting rich media such as video clips began in 2001 in Japan, and is currently proliferating at a fast pace. Between 3G and 2G is 2.5G, an interim technology based on GPRS and EDGE that can accommodate limited graphics. In Singapore, WAP and GPRS technology are offered by mobile service providers like Singtel, M1 and StarHub. GPRS is a radio technology for GSM networks that adds packet-switching protocols, allows a shorter set-up time for ISP connections, and offers the possibility for service providers to charge customers by the amount of data sent rather than connect time. GPRS is a 2.5G enhancement to

GSM, and is the most significant step toward 3G, needing a similar business model, and service and network architectures.

Although M-Internet essentially provides the same services as stationary Internet, its adoption rate in many countries is very low compared to that of stationary Internet. The services offered by M-Internet can be categorized into 3Cs—Commerce, Communication and Contents. Commerce ranges from mobile banking and e-ticketing to physical product purchases while email and interactive services such as Yahoo! Chat are considered communication services. Contents include downloads, news, traffic/stock updates and other time-sensitive, location-based services.

2.2. Previous research on value

Value is emphasized in the field of economics, and it has its foundation in exchange, utility and labor value theories, as well as in marketing, accounting and finance, while also having roots in psychology and social psychology. Researchers have come up with many different terms to describe value, generally differentiating by context the same basic concept: consumption value [44], acquisition and transaction value [52], service value, customer value [60], consumer value [27] and perceived value [61].

From the utilitarian perspective, customer value perceptions are a combination of the *acquisition value* and *transaction value* of the product [52]. Some studies have differentiated between *overall value*, *acquisition value* and *transaction value* [25,52], but since the same definition and measurements have been applied to both acquisition value and overall value in most studies, we will use only an overall value term without any specific reference to acquisition value. Modeling the perceived value of a product solely on price is an important but insufficient conceptualization because most of the time, customers consider attributes other than price, such as perceived quality of the product. Early interpretations of the *benefit* and *sacrifice* components center on perceived quality and monetary price [11,22,25]. These simplistic trade-off models ignore the multi-dimensionality of decision making and do not fully represent perceived benefits and sacrifices.

Appreciating that value not only has a functional aspect, several typologies of value have been pro-

posed. Sheth et al. [44] explained consumption in terms of functional value, social value, emotional value, epistemic value and conditional value. Any, or all, of the five consumption values may influence consumption experience, depending on the situation. Holbrook [27] proposed a typology of perceived value which includes eight types of value: convenience, quality, success, reputation, fun, beauty, virtue and faith. Both typologies are comprehensive in explaining the benefits customers get from consumption but they fail to take into account the costs associated with consumption.

Zeithaml's [61] definition of *perceived value* is the most widely accepted, according to which a consumer's perceptions of what is received and what is

given determine the consumer's overall assessment of the utility of a product. Table 1 presents the selected studies on perceived value with the benefit and sacrifice components over diverse contexts. We refer to the *perceived value* of M-Internet in this paper as a consumer's overall perception of M-Internet based on the considerations of its benefits and sacrifices needed to acquire and/or use it. The following section explains the role of perceived value in explaining technology adoption.

2.3. Using perceived value to explain adoption

In justifying the constructs of *perceived usefulness* and *ease of use* in TAM, Davis [15] cited theories

Table 1
Previous research on perceived value

Reference	Context	Content	
Zeithaml [61]	Product (beverages)	Research Benefit components Sacrifice components	Finding the antecedents of purchase behavior Intrinsic and extrinsic product attributes, perceived quality and other high level abstractions Perceived monetary price and perceived non-monetary price
Dodds et al. [22]	Product (calculator, stereo headset player)	Research Benefit components Sacrifice components	Finding the antecedents of willingness to buy Perceived quality Perceived price (having a curvilinear relationship to perceived value)
Kerin et al. [33]	Service (electric utility)	Research Benefit components Sacrifice components	Finding the antecedents of perceived store value Perceived merchandise quality, perceived shopping experience Perceived merchandise price
Chang and Wildt [11]	Product (apartment and PCs)	Research Benefit components Sacrifice components	Finding the antecedents of purchase intentions Quality Price
Sweeney et al. [49]	Retail environment (electrical appliances)	Research Benefit components Sacrifice components	Finding the antecedents of willingness to buy Technical service quality and product quality Relative price
DeSarbo et al. [20]	Service (electric utility)	Research Benefit components Sacrifice components	Finding the antecedents of perceived value Perceived quality Perceived price
Sweeney and Soutar [48]	Product (durable goods)	Research Benefit components Sacrifice components	Finding the antecedents of willingness to buy, willingness to recommend and not expecting problems with product Quality (functional value), emotional value, social value Price (functional value)
Petrick [42]	Service (cruise)	Research Benefit components Sacrifice components	Finding the antecedents of repurchase intentions and word of mouth Emotional response, quality and reputation Behavioral price and monetary price
Baker et al. [6]	Retail environment (cards and gifts)	Research Benefit components Sacrifice components	Finding the antecedents of store patronage intentions Merchandise quality perceptions Monetary price perceptions
Chen and Dubinsky [12]	E-commerce environment	Research Benefit components Sacrifice components	Finding the antecedents of purchase intention Perceived product quality and valence of experience Perceived risk and product price

from multiple disciplinary domains. Of significance is the cost–benefit paradigm from behavioral decision theory [30] which explains an individual’s choice among various decision-making strategies as a cognitive trade-off between the effort required to employ the strategy (i.e., ease of use) and the quality (i.e., usefulness) of the resulting decision [15]. That relationship is analogous to the definition of perceived value in this study. Perceived value is treated as a trade-off between the “give” and “get” components of a product [21]. According to [61], perceived value is the consumer’s overall assessment of the utility of a product based on perceptions of what is received and what is given. From the consumer choice perspective, consumers estimate the value of the choice object by considering all relevant benefit and sacrifice factors [31,40,52,61]. Value represents an overall estimation of the choice object. Based on this overall estimation, consumers decide their choice behavior.

In contrast, TAM has no construct which represents an overall estimation of the adoption object. It explains adoption behavior only with two factors: *usefulness* and *ease of use*. There have been some attempts to incorporate *attitude* into TAM. Attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of “favor or disfavor” [24]. However, Davis et al. [16] omitted *attitude* in the final TAM due to its weak mediation of beliefs on adoption intention. Empirical studies have found that *attitude* does not influence intention directly [56], and that TAM retains its robustness even without including *attitude* [16,55]. Venkatesh et al. [56] concluded in their review of IT acceptance re-

search that attitudinal constructs are significant only when specific cognitions (performance and effort expectancies) are not included in the model.

3. Research model and hypotheses

Taking into account our previous arguments, we develop a Value-based Adoption Model (VAM) of M-Internet, as shown in Fig. 1. We strive to achieve parsimony by capturing a small number of factors that account for most of the variance in adoption intention, so that it would be easy and straightforward to predict M-Internet adoption.

3.1. Perceived benefits

The Cognitive Evaluation Theory [18] classifies motivations into extrinsic and intrinsic subsystems. Extrinsic motivation refers to the performance of an activity to achieve a specific goal (e.g., rewards) while intrinsic motivation refers to the performance of an activity for no apparent reinforcement other than the process of performing the activity per se [16]. Both extrinsic and intrinsic factors have been found to influence perceived value and behavioral intention [43], and these findings also apply to information systems [38]. It has also been suggested that customers’ evaluation of a product includes both cognitive and affective elements [23], and that products are purchased for their utilitarian and hedonic benefits [4]. For this reason, we propose *usefulness* and *enjoyment* as the benefit components of perceived value.

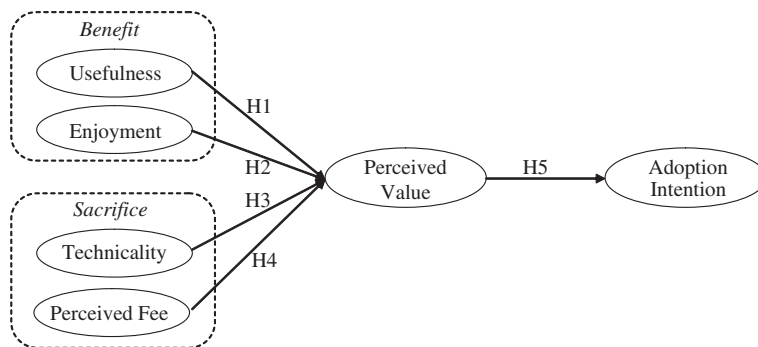


Fig. 1. Value based adoption model of technology.

3.1.1. Extrinsic and cognitive benefit: usefulness

Usefulness is defined as the total value a user perceives from using a new technology [43]. The motivation-oriented perspective of TAM views *perceived usefulness* as outcome expectancy and a measure of extrinsic motivation [55]. Individuals evaluate the consequences of their behavior in terms of *perceived usefulness* and base their choice of behavior on the desirability of the usefulness. Performance expectancies such as *perceived usefulness*, which focuses on task accomplishment [56], reflect the desire of an individual to engage in an activity because of external rewards.

The construct of *usefulness* is akin to the marketing concept of *product quality*, which is defined as the customer's cognitive assessment of the excellence or superiority of a product [61]. The customer believes that the product's attributes denote some desirable functions that it can perform. Steenkamp [47] defines product quality as fitness for consumption, i.e., the product's usefulness in serving the consumer's needs. Researchers have proven that product quality has a positive effect on perceived value [22], and we expect *usefulness* to affect *perceived value* in the same way.

The *usefulness* construct has been used extensively in information systems and technology research, and has strong empirical support as an important predictor of technology adoption (e.g., [36,50]). According to Pedersen et al. [41], the *usefulness* of M-Internet services affects their adoption, underlining the factor as a key one in M-Internet adoption. We therefore hypothesize:

H1. Usefulness is positively related to perceived value.

3.1.2. Intrinsic and affective benefit: enjoyment

Individuals, who experience immediate pleasure or joy from using a technology and perceive any activity involving the technology to be personally enjoyable in its own right aside from the instrumental value of the technology, are more likely to adopt the technology and use it more extensively than others [16]. This notion is in line with popular definitions of emotional value. Sweeney and Soutar [48] defined *emotional value* as the utility derived from feelings or affective states that a product generates. Enjoyment refers to the extent to which the activity of using a product is

perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated [17]. Enjoyment thus represents an affective and intrinsic benefit.

Petrick [42] characterized what customers “receive” as *emotional response/joy* received from purchase and *product quality*. Past researches have also shown that the *benefit* component comprises *perceived enjoyment*, in addition to *perceived usefulness* [48], and that *enjoyment* and *fun* have a significant effect on technology acceptance beyond *usefulness* [16]. We therefore hypothesize:

H2. Enjoyment is positively related to perceived value.

3.2. Perceived sacrifices

Perceived sacrifices are both monetary and non-monetary [52,61]. Monetary spending includes the actual price of the product, and it is generally measured based on customers' perceptions of the actual price paid. Non-monetary costs usually include time, effort and other unsatisfactory spending for the purchase and consumption of the product. Several exploratory surveys have identified technical factors and price as the most significant barrier to M-Internet adoption [3,59]. For this reason, we propose the *technicality* of M-Internet and *perceived fee* to be the sacrifice components of *perceived value*.

3.2.1. Non-monetary sacrifice: technicality

We adapted DeLone and McLean's [19] definition of system quality and define *technicality* as **the degree to which M-Internet is perceived as being technically excellent in the process of providing services**. The technicality of M-Internet is determined by users' perceptions of ease of use (whether using the system is free of physical, mental and learning effort [15]), system reliability (whether the system is error-free, consistently available and secure), connectivity (whether connection is instant and straightforward) and efficiency (whether loading and response time is short).

Ease of use has been widely used as an element of technicality. It is defined as “the degree to which an individual believes that using a particular system would be free of physical and mental effort” [15]. In

this study, ease of use refers to the overall user-friendliness of using mobile devices to access the Internet. In expectancy value models such as TAM, effort is considered a component of cost; it therefore follows that ease of use is a sacrifice in M-Internet adoption. Cronin et al. [14] found that excessive mental cost affects perceived overall cost to the user. Ease of use is an important issue for M-Internet. This is because M-Internet runs on limited resources compared to other systems, especially for users of mobile phone where screen size and manipulation difficulty demand mental and physical efforts. Additionally, ease of use has been found to be a more significant factor for new adopters than experienced users [56]. Specifically, it has been shown that the complexity of the innovation has a significant negative relationship with the adoption of the new application (e.g., [43]).

As the characteristics of M-Internet have not been fully modeled in existing information systems research, other elements of technicality have to be considered as the entire experience will contribute to customers' evaluation of the technology. This is very true in today's context as customers are increasingly demanding in terms of system and service excellence. Non-monetary costs include time costs, search/effort costs, convenience costs and psychological costs [61]. In an M-Internet environment, loading and response time can be considered time costs while ease of use and connectivity are considered effort and convenience cost, respectively. Psychological factors include inner conflict, frustration, depression, discomfort, anxiety, tension, annoyance, mental fatigue, etc. [9]. Technicality of the system is a combination of all the non-monetary costs. We therefore hypothesize:

H3. Technicality is negatively related to perceived value.

3.2.2. Monetary sacrifice: perceived fee

Perceived price symbolizes the encoding or internalization of the objective selling price of a product/service [29]. The fee structure of M-Internet consists of the *pay-as-you-use* scheme and subscription-based pricing. Without any experience with new technologies such as M-Internet, customers cannot judge whether the fee quoted to them is high or low. According to the Adaptation Level theory, instead of having perfect information about prices, customers possess

internal reference prices and make comparison with these prices [25]. In the case of M-Internet, customers would probably compare the fee of M-Internet usage with previously encoded prices of mobile phone calls and stationary Internet access. The result of this comparison forms the customers' perception of the fee.

Complementing the Adaptation Level theory, the Assimilation-Contrast theory suggests that a stimulus value close to the internal reference price is assimilated with that price while one too far from the reference is contrasted. Andersson and Heinonen [3] found that young customers' perceptions of M-Internet are affected when they compare mobile services with stationary Internet services, which are mostly provided free.

It has been proposed that perceived fee directly influences *perceived value* [11,22,52,61]. Studies in marketing show that perceived monetary price and *perceived value* are negatively related [11]. Therefore, we propose a negative *perceived fee-overall perceived value* relationship, i.e., higher fee perceptions are associated with lower value perceptions. We therefore hypothesize:

H4. Perceived fee is negatively related to perceived value.

3.3. Adoption intention

According to the economic theory of utility, customers try to achieve maximum utility or satisfaction, given their resource limitations. Our definition of *perceived value* reflects this by comparing benefits with sacrifices and is therefore an indicator of adoption intention. On the other hand, Thaler's [52] model of consumer choice is a combination of economic reasoning and cognitive psychology. The value function is psychologically based and replaces the utility function from economics theory. The central principle of value function is that it is defined over perceived gains and losses relative to some natural reference point, suggesting that people tend to respond to cognitive comparisons rather than absolute levels, and that it is steeper for losses than for gains, signifying that sacrifices hurt more than the pleasure given by the benefits. Urbany et al. [54] proved that transaction utility is a predictor of purchase intention and behavior. The relationship between *perceived value* and

adoption intention has never been examined before, but there is strong empirical support that *perceived value* affects perceptual intention to use [49]. We therefore hypothesize:

H5. Perceived value is positively related to adoption intention.

4. Research methodology

This study has either adopted or adapted extant validated scales and experimental procedures wherever possible. Where items have been developed, we have followed strict procedures. All measurements have been further checked for reliability and validity, as we will report later. We adopted the construct of *adoption intention* from Agarwal and Karahanna [1]. For *perceived value*, we adapted the construct from Sirdeshmukh et al. [46]. Since *perceived value* means the comparison between cost and benefit, our construct compares (1) fee and value, (2) effort and benefit, and (3) time spent being worthwhile and overall good value. *Usefulness* was adopted from Davis [15] and *enjoyment* was adopted from Agarwal and Karahanna [1]. *Perceived fee* was adapted from Voss et al. [58]. In developing the new construct, *technicality*, we followed standard psychometric scale development procedures [5]. First, the domain of the construct was specified. Second, the items were developed based on the conceptual definition. Third, the items were refined on the basis of extensive pretests of the survey instrument. Thus, *technicality* was developed by considering the items of system quality from DeLone and McLean [19]: “connected instantly”, “takes a short time to respond”, “easy to get the M-Internet to do what I want to do”, and “reliable”. All items were measured on a seven-point Likert scale.

Two information systems researchers and one marketing scholar reviewed the instrument. As a pre-test, the questionnaires were discussed in focus-group interviews of 15 people (some of them had used M-Internet before and others had not). Feedback was obtained about the length of the instrument, the format of the scales, content, and question ambiguity. In addition, the respondents were asked to identify factors not in the questionnaire that they considered important and to describe their judgment related to

the use of M-Internet. The final list of items for each construct reflects the feedback received, and it is provided in Appendix A.

Empirical data for this study was collected via an Internet survey. Messages advertising the survey were posted for 2 weeks at public forums. At the same time, emails were sent out via the university emailing list to all the undergraduates and graduates of a major university in Singapore. In Singapore, there are 78 mobile phone subscribers per 100 inhabitants [37]. About 60% of M-Internet users are between 20 and 34 years old [13]. For this reason, Singapore is a good context for M-Internet study. Each of the respondents was paid \$5 as an incentive. Potential respondents were reminded not to take the survey if they had no experience in using M-Internet or were regular users of M-Internet. The respondents were also requested to enter their mobile phone numbers for accessing M-Internet, so that we could check if they had M-Internet experience. In total, 161 responses were usable. Most of the participants had only trial experiences (1 to 4 times in total). With only limited M-Internet experience, these respondents were appropriate for adoption study. Detailed descriptive statistics of the respondents' characteristics are shown in Table 2. Out of the three services offered by M-Internet, contents (i.e.,

Table 2
Descriptive statistics of the respondents' characteristics

Measure	Items	Subjects	
		Frequency	Percentage
Gender	Female	40	24.8
	Male	121	75.2
Age	20–29	142	88.2
	30–39	19	11.8
Job	Student	87	54.0
	Professional	62	38.5
	Self-employed	3	1.9
	Others	9	5.6
Usage experience	1–2 times	71	27.2
	3–4 times	63	39.1
	≥5 times	27	16.7
Mobile device	Mobile phone	148	91.9
	PDA	13	18.1
M-Internet services ^a	Communications	36	22.4
	Contents	64	39.7
	Commerce	61	37.9
Total		161	100.0

^a Most frequently tried.

games and news) and commerce (i.e., ticketing and shopping) services emerged as the two most frequently tried services followed by communication (i.e., mobile email) services.

5. Data analysis and results

5.1. Reliability and validity of instruments

The means, standard deviations and reliabilities of all perceptual research variables are summarized in Table 3. The scales show good **reliability** with Cronbach's alphas >0.7 . We also conducted principal component factor analysis on the four independent variables and one dependent variable (*perceived value*) with VARIMAX rotation as in Appendix B. A total of five factors with eigenvalue greater than 1.0 were identified. All items of the variables loaded on each distinct factor and explained 72.7% of the total variance. Most variables showed **convergent validity** with factor loadings above 0.6 except the fourth item of technicality (TECH4). Because of the low factor loading (0.357), TECH4 was excluded from further analysis. When compared across factors, the items were loaded highest on their own factors. Therefore, with the exception of TECH4, the results of the factor analysis indicate that the conditions of **convergent and discriminate validity** were satisfactorily met.

5.2. Hypothesis test

We conducted a Pearson correlation analysis. Pearson correlation was calculated for the variables measured by interval or ratio scales. The simple correlations among all the research variables are shown in Table 4. The regression model was further

Table 4

Correlation analysis between the variables

	INT	VAL	USE	ENJ	TECH
VAL	0.599**				
USE	0.342**	0.402**			
ENJ	0.357**	0.418**	.502**		
TECH	0.311**	0.406**	.489**	0.519**	
FEE	−0.271**	−0.406**	−.114	−0.116	−0.108

INT: adoption intention, VAL: perceived value, USE: usefulness, ENJ: enjoyment, TECH: technicality, FEE: perceived fee.

** $p \leq 0.01$.

tested for multicollinearity by examination of the collinearity statistics, the variance inflation factor (VIF) and tolerance. As a rule of thumb, if the VIF of a variable exceeds 10, that variable is said to be highly collinear and will pose a problem to regression analysis [26]. Although several variables showed significant correlations, their tolerance values ranged from 0.624 to 0.833 and VIF values ranged from 1.201 to 1.600, indicating that multicollinearity is not a likely threat to the parameter estimates in our study.

Fig. 2 shows the results of the multiple regression analyses. First, *perceived value* ($\beta=0.599$, $p<0.001$) is significantly related to *adoption intention* ($R^2=0.359$). Thus, H1 is supported. Next, the four factors are found to be significantly related to *perceived value* ($R^2=0.365$): *usefulness* ($\beta=0.176$, $p<0.05$), *enjoyment* ($\beta=0.196$, $p<0.05$), *technicality* ($\beta=0.181$, $p<0.05$), and *perceived fee* ($\beta=-0.343$, $p<0.001$). Thus, H2, H3, H4 and H5 are all supported.

An additional test was conducted to examine the direct effects of the five antecedents including *perceived value* on *adoption intention*. The result indicates perceived value is significant at $p<0.001$ level ($\beta=0.410$). However, all the other four antecedents are not significant: *usefulness* ($\beta=0.080$, $p=0.309$), *enjoyment* ($\beta=0.094$, $p=0.243$), *technicality* ($\beta=0.014$, $p=0.864$), and *perceived fee* ($\beta=-0.045$, $p=0.309522$). Further, we had expected that *perceived value* might mediate the relationship between the antecedents and *adoption intention* because perceived value reflects the overall comparison between cost and benefit in the use of M-Internet. We tested the mediating relationship additionally using the mediating-effect test method [8,10] as in Table 5. The results support our expectation that *per-*

Table 3
Reliability and descriptive statistics

Variable	Reliability	Mean	Standard deviation
Adoption intention	0.83	4.37	1.11
Perceived value	0.87	4.23	1.03
Usefulness	0.95	4.38	1.05
Enjoyment	0.84	4.53	1.02
Technicality	0.76	4.25	0.95
Perceived fee	0.89	4.63	1.23

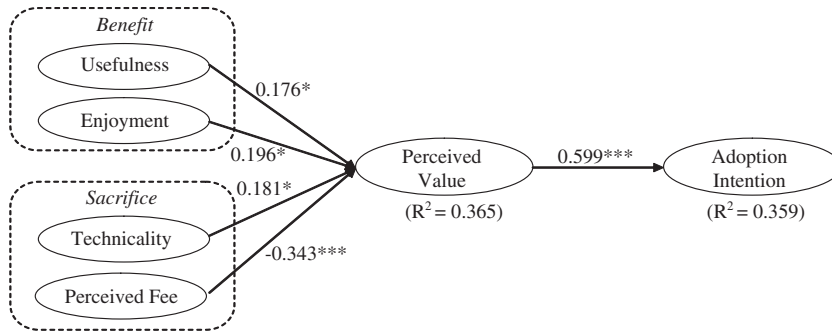


Fig. 2. Hypothesis testing results.

ceived value fully mediates the relationship between the four antecedents (*usefulness*, *enjoyment*, *technicality*, and *perceived fee*) and adoption intention.

6. Discussion

The results support the validity of our research model, VAM. VAM asserts that M-Internet adoption is determined by perceptions of the value of M-Internet and these in turn are determined by the perceptions of the *usefulness*, *enjoyment*, *fee* and *technicality* of M-Internet. The results support all five hypotheses,

suggesting that extrinsic and intrinsic benefits prompt customers' intention to adopt M-Internet while monetary costs and non-monetary costs serve as barriers to adoption. The results also suggest that the *perceived value* of M-Internet is not only inferred by cognitive elements such as usefulness and fee, but also enjoyment, an affective element.

Perceived sacrifices (*perceived fee* and *technicality*) seem to have greater impact than perceived benefits (*usefulness*, *enjoyment*) on perceived value. A regression of perceived value with benefit constructs alone shows an R^2 of 0.224, while a regression with sacrifice constructs alone shows a higher R^2 of 0.297. (Each construct alone shows lower R^2 , ranging from 0.162 to 0.175.) **This is consistent with the endowment effect of the prospect theory [31], which means "losses loom larger than gains". Customers are deterred more by costs than they are attracted by benefits. Since M-Internet is a fairly new technology, customers will not risk committing time, effort and money to it without having some assurance of its benefits. Even if customers recognize that M-Internet is beneficial, they may still not find it valuable unless they perceive the sacrifices to be less than the benefits they receive.**

In line with previous studies [22,25], our finding suggests that perceived fee exerts a strongly significant effect on *perceived value*. Investing money in an unfamiliar technology entails risk such as in performance failure, and the higher the perceived fee and hence risk, the more reluctant customers are to adopt the technology. Similarly, consumer surveys have found that a high price or having to pay a price at all keeps many new customers from trying services they are not sure about [3]. Monetary

Table 5
Testing the mediating effect of perceived value

Step	Dependent variables	Independent variables		F	R^2
		Variable	β		
1.1	VAL	USE	0.402***	30.376***	0.161
1.2	INT	USE	0.341***	20.819***	0.116
1.3	INT	USE	0.120	46.229***	0.371
		VAL	0.551***		
2.1	VAL	ENJ	0.418***	33.668***	0.175
2.2	INT	ENJ	0.357***	23.252***	0.128
2.3	INT	ENJ	0.129	46.973***	0.373
		VAL	0.545***		
3.1	VAL	TECH	0.436***	37.316***	0.190
3.2	INT	TECH	0.299***	15.563***	0.089
3.3	INT	TECH	0.046	44.594***	0.361
		VAL	0.579***		
4.1	VAL	FEE	-0.406***	31.356***	0.165
4.2	INT	FEE	-0.271***	12.576**	0.073
4.3	INT	FEE	-0.033	44.437***	0.360
		VAL	0.586***		

** $p \leq 0.01$.

*** $p \leq 0.001$.

sacrifice therefore reduces the perceived value of mobile services.

Technicality is a construct specific to M-Internet and introduced in VAM. New users are concerned about the technicality of M-Internet because it translates into the amount of time and effort required to learn and use the system. The major advantage offered by M-Internet is convenience, creation of new freedom, and ubiquity [2]. However, if its use involves complex manipulation, navigation, slow response, elaborate connection procedures and/or, inconsistent availability, then its advantage would be weakened. Under such conditions, customers would take into account the technicality of M-Internet when forming opinions of its value. Our finding is consistent with the research of Venkatesh et al. [56], which found that effort-oriented constructs are more salient in the early stages of adoption when process issues represent hurdles to be overcome.

In accordance with motivation research, we have established that customers are extrinsically and intrinsically motivated to adopt M-Internet. Enjoyment is, as expected, an intrinsic motivator and an affective determinant of perceived value. Like previous studies on adoption, usefulness has emerged as one of the major factors determining adoption, and in our case, through perceived value. What distinguishes our results from related prior studies (e.g., [15,16,32]) is that usefulness is not the top concern for M-Internet adopters. One possible reason is that customers could perceive M-Internet as a substitute for stationary Internet when they are on the move, using it primarily for convenience or due to a lack of alternatives. Customers do consider the usefulness of M-Internet because they would not adopt a technology that does not fulfill their needs nor qualify as an alternative to stationary Internet; M-Internet must therefore provide many services that are provided by stationary Internet. However, when choosing between stationary Internet and M-Internet to access a particular service available on both channels, the consumer would already have deemed the service useful, and other factors such as technical service quality and usage fee therefore become significant.

The crux of VAM is the value construct, which is postulated to predict adoption intention. Our results show that *perceived value* has a significant

effect ($\beta=0.539$, $p<0.001$) on adoption intention, evidently supporting our VAM concept. Furthermore, it fully mediates the effects of *usefulness*, *enjoyment*, *technicality* and *perceived fee* on *adoption intention*. This is consistent with the prior research on perceived value which has recurrently verified *perceived value* as a predictor of *intention* (e.g. [11]). This result also justifies our classification of each antecedent of *perceived value* as a benefit or sacrifice component, i.e., it is reasonable that *perceived usefulness* and *enjoyment* are benefit components while *technicality* and *perceived fee* are sacrifice components.

The proposed VAM can also be compared with TAM. TAM has two independent variables (usefulness and ease of use) and one dependent variable (adoption intention). To make this comparison, we collected additional data from the subjects. While the two variables, *usefulness* and *adoption intention*, are common both for VAM and TAM, *ease of use* needs different measurement items. We adapted the items from Davis [15] as in Appendix A. While VAM could explain 35.9% of the variance in adoption intention, TAM could explain a much lower 13.1% of the variance (Fig. 3).

Nevertheless, there are limitations in this study which may restrict the generalizability of the findings, and these could be addressed in future studies. First, about 50% of our subjects were undergraduate and graduate students. Although these respondents were between 20 and 30 years old—the range with the most potential M-Internet adopters—they might be constrained by monetary and cost issues more than those holding jobs and drawing a steady income. Second, data collection was geographically limited to Singapore. As M-Internet adoption is a worldwide phenomenon, replication of the findings across different geographical contexts is necessary. Future studies could perhaps be cross-national.

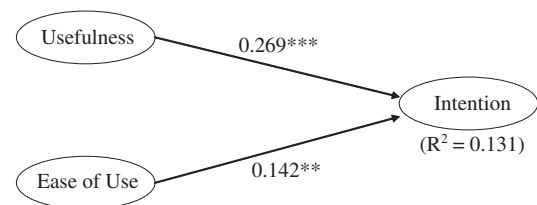


Fig. 3. Testing results of TAM.

7. Implications

From a theoretical point of view, this research has served to broaden our understanding of the factors influencing new technology adoption from the perspective of customers; it is a response to the call for more in-depth, customer-oriented research in M-Internet services. The main theoretical contribution of this research is the development of the Value-based Adoption Model of Technology (VAM). VAM is particularly useful for understanding the adoption of M-Internet in comparison with TAM as it examines the adoption of M-Internet as a new ICT by individuals playing the double roles of service consumer and technology user. As discussed in Introduction, adoption of traditional technologies for work purposes in organizational settings is different from the adoption of new ICT for personal purposes in non-organizational settings. While TAM could explain the adoption of traditional technologies by users in organizational settings, it has its limitations in explaining the adoption of new ICT like M-Internet by customers because customer choice and behavior are mainly determined by value of the choice object, as exemplified in economics [31,40] and marketing research [52,61]. Our comparison between TAM and VAM shows that VAM is more effective than TAM in explaining customer adoption of M-Internet.

In addition, this study has shown the importance of *perceived value* in explaining the adoption of M-Internet by customers. *Perceived value* fully mediates the effects of customers' beliefs on adoption intention, which conforms to value research in the economics and marketing literature. Prior to our study, technology adoption models have not investigated the role of *perceived value* in determining adoption. This study is the first empirical effort to examine the impact of *perceived value* in concert with technology adoption. Meanwhile, the marketing literature has focused on the value of a product (goods and/or services) in relation to purchase intention. Our research serves to bridge this gap and expand the *perceived value* literature.

This study also provides a different view of the two major determinants of technology adoption: *usefulness* and *ease of use* (closely related to *technicality* in this study). Contrary to prior research findings [15,16], the effect of *perceived usefulness*

on adoption intention is not direct but operates indirectly through *perceived value*. *Technicality* also operates indirectly through *perceived value* on adoption intention. Moreover, the impact of *perceived usefulness* on *perceived value* is also not the strongest among the four antecedents. Sacrifice components (*perceived fee* and *technicality*) seem to have greater effects on *perceived value* than benefit components (*usefulness* and *enjoyment*) do. In turn, *perceived value* dominantly determines adoption intention.

This study further provides practical implications for the development, design and marketing of M-Internet. Since potential adopters are concerned about both costs and benefits when assessing the value of M-Internet, effort has to be put into creating an impression of low costs and desirable benefits so that customers will consequently place a higher value on M-Internet. As has been illustrated in our research, higher *perceived value* indicates greater willingness to adopt the technology. We have also gained important insights on the relative importance of costs and benefits in determining value. Consistent with previous research [31,52], the results of this study imply that perceived costs affect customers' evaluation of the value of M-Internet more than the benefits to be derived. Improvement in customers' perception of costs would be the most important driver of M-Internet adoption.

Costs can be minimized by lowering usage fee and/or improving the technical quality of M-Internet. Potential adopters of M-Internet are found to be sensitive to cost, given that their adoption decision is largely dependent on *perceived value*. M-Internet providers may want to offer customers free trials of the service to allow them to familiarize themselves with it since customers would not pay for something that they know little about. Also, M-Internet providers may want to review the fee structure for service utilization. In terms of *technical quality*, customers have the highest expectations for reliability, connectivity, response time and ease of use. It is imperative for developers to put in further effort to address these issues.

The appeal of benefits also plays a part in increasing the value perceived by customers and should not be neglected in the development of new functions and

the enhancement of design features. Customers are motivated not only by **extrinsic benefits** but also the **intrinsic** outcomes of using M-Internet. Rather than creating services **based on experts' perception of usefulness and demand**, developers should conduct regular market research to discover consumer needs and wants and **transform the findings into services useful to consumers**. Although enjoyment seems to have the least influence on perceived value, developers should **nonetheless** strive to include the fun element into services because customers would still prefer enjoyable and entertaining services.

8. Conclusion

This study has discussed the difficulties in explaining the adoption of new ICT by individuals who play the dual roles of service consumer and technology user for personal purposes with the well known Technology Adoption Model (TAM). By adopting the theory of consumer choice in the economics and marketing traditions, we have developed the Value-based Adoption Model (VAM) to explain technology adoption where the users are also playing as consumers. The model is applied to study the adoption of M-Internet by individual customers. VAM offers a clear understanding of what factors influence value perception and **how value perception leads to adoption** from the value maximization perspective. This study has found that value perception is a major determinant of M-Internet adoption by testing the mediating effect of *perceived value* on the relationship between a customer's benefit and sacrifice related beliefs and the customer's adoption intention. **As perceived value is a prominent factor in understanding M-Internet adoption, a suitably packaged M-Internet service which maximizes perceived value from the benefit and sacrifice perspective will accelerate M-Internet adoption.** Adoption of M-Internet is a prerequisite for the adoption and proliferation of M-Commerce. Thus, our study on M-Internet adoption is an initial step toward understanding customer behavior in M-Commerce. We hope our findings will encourage further research and more in-depth and extensive analyses to demystify the driving forces of M-Commerce. This will be beneficial to academic researchers, practitioners and users alike.

Appendix A. Operationalization of the model variables

Variable	Item	Description	Reference
Adoption intention	INT1	I plan to use M-Internet in the future	Davis et al. [16]
	INT2	I intend to use M-Internet in the future	
	INT3	I predict I would use M-Internet in the future	
Perceived value	VAL1	Compared to the fee I need to pay, the use of M-Internet offers value for money	Sirdeshmukh et al. [46]
	VAL2	Compared to the effort I need to put in, the use of M-Internet is beneficial to me	
	VAL3	Compared to the time I need to spend, the use of M-Internet is worthwhile to me	
	VAL4	Overall, the use of M-Internet delivers me good value	
Usefulness	USE1	Using M-Internet enables me to accomplish tasks more quickly	Davis [15]
	USE2	Using M-Internet enhances my task effectiveness	
	USE3	Using M-Internet makes it easier to do my task	
	USE4	Using M-Internet improves my task performance	
	USE5	Using M-Internet saves me time and effort in performing tasks	
	USE6	M-Internet is useful in performing my task	
Enjoyment	ENJ1	I have fun interacting with M-Internet	Agarwal and Karahanna [1]
	ENJ2	Using M-Internet provides me with a lot of enjoyment	
	ENJ3	I enjoy using M-Internet	
	ENJ4	Using M-Internet bores me (reversed)	
Perceived fee	FEE1	The fee that I have to pay for the use of M-Internet is too high	Voss et al. [58]
	FEE2	The fee that I have to pay for the use of M-Internet is reasonable (reversed)	

(continued on next page)

Appendix A (continued)

Variable	Item	Description	Reference
Perceived fee	FEE3	I am pleased with the fee that I have to pay for the use of M-Internet (reversed)	
Technicality	TECH1	It is easy to use M-Internet	Davis [15]; DeLone and McLean [19]
	TECH2	M-Internet can be connected instantly	
	TECH3	M-Internet takes a short time to respond	
	TECH4	It is easy to get M-Internet to do what I want it to do	
	TECH5	The system of M-Internet is reliable	
Ease of use	EOU1	It is easy to use M-Internet	Davis [15]
	EOU2	It is easy to get M-Internet to do what I want it to do	
	EOU3	It is convenient to access M-Internet	

Appendix B. Factor analysis results

	1	2	3	4	5
VAL1	0.032	0.628	−0.047	0.208	0.429
VAL2	0.173	0.856	0.177	0.051	0.091
VAL3	0.194	0.759	0.271	0.199	0.129
VAL4	0.267	0.825	0.107	0.163	0.203
USE1	0.819	0.054	0.237	0.171	0.061
USE2	0.872	0.111	0.199	0.180	0.012
USE3	0.903	0.169	0.090	0.118	0.018
USE4	0.883	0.073	0.104	0.186	0.064
USE5	0.795	0.190	0.199	0.204	0.063
USE6	0.794	0.236	0.133	0.164	−0.005
ENJ1	0.231	0.130	0.302	0.779	0.037
ENJ2	0.246	0.030	0.200	0.820	0.097
ENJ3	0.347	0.113	0.300	0.761	0.028
ENJ4	−0.103	−0.349	0.029	−0.602	0.038
FEE1	−0.009	−0.230	0.061	0.067	−0.856
FEE2	0.028	0.097	0.098	−0.002	0.922
FEE3	0.087	0.125	0.010	0.124	0.888
TECH1	0.270	0.041	0.730	0.166	−0.012
TECH2	0.207	0.214	0.727	0.214	0.014
TECH3	0.006	−0.003	0.757	0.143	0.024
TECH4	0.321	0.291	0.357	−0.225	0.047
TECH5	0.280	0.240	0.662	0.138	−0.001
Eigenvalue	8.117	3.008	1.945	1.513	1.409
% of variance	36.895	13.672	8.843	6.899	6.405
Cumulative %	36.895	50.566	59.409	66.289	72.694

References

- [1] R. Agarwal, E. Karahanna, Time flies when you're having fun: cognitive absorption and beliefs about Information Technology Usage, *MIS Quarterly* 24 (4) (2000 (Dec.)).
- [2] B. Anckar, D. D'Incau, Value creation in Mobile Commerce: findings from a consumer survey, *Journal of Information Technology Theory & Application* 4 (1) (2002).
- [3] P. Andersson, K. Heinonen, Acceptance of mobile services: insights from the Swedish market for mobile telephony, *SSE/EFI Working Paper Series in Business Administration*, No. 2002:16 (Oct. 2002).
- [4] B.J. Babin, W.R. Darden, M. Griffin, Work and/or fun: measuring hedonic and utilitarian shopping value, *Journal of Consumer Research* 20 (1994 (Mar.)).
- [5] R.P. Bagozzi, L.W. Phillips, Representing and testing organizational theories: a holistic construal, *Administrative Science Quarterly* 27 (3) (1982 (Sep.)).
- [6] B. Baker, A. Parasuraman, D. Grewal, G. Voss, The influence of multiple store environmental cues on perceived merchandise value and patronage intentions, *Journal of Marketing* 66 (2) (2002 (Apr.)).
- [7] S.J. Barnes, The Mobile Commerce value chain: analysis and future developments, *International Journal of Information Management* 22 (2) (2002 (Apr.)).
- [8] R.M. Baron, D.A. Kenny, The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations, *Journal of Personality and Social Psychology* 51 (6) (1986 (Dec.)).
- [9] W. Bender, Consumer purchase—costs—do retailers recognize them? *Journal of Retailing* 40 (1) (1964 (Spring)).
- [10] T.A. Carte, C.J. Russell, In pursuit of moderation: nine common errors and their solutions, *MIS Quarterly* 27 (3) (2003 (Sep.)).
- [11] T.Z. Chang, A.R. Wildt, Price, product information, and purchase intention: an empirical study, *Journal of the Academy of Marketing Science* 22 (1) (1994 (Winter)).
- [12] Z. Chen, A.J. Dubinsky, A conceptual model of perceived customer value in e-commerce: a preliminary investigation, *Psychology & Marketing* 23 (4) (2003 (Apr.)).
- [13] Coleago Consulting, Age distribution of M-Internet users, <http://www.coleago.co.uk>, 2001.
- [14] J.J. Cronin, M.K. Brady, R.R. Brand, R. Hightower, D.J. Shemwell, A cross-sectional test of the effect and conceptualization of service value, *Journal of Services Marketing* 11 (6) (1997).
- [15] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly* 13 (3) (1989 (Sep.)).
- [16] F.D. Davis, R. Bagozzi, P.R. Warshaw, User acceptance of computer technology: a comparison of two theoretical models, *Management Science* 35 (8) (1989 (Aug.)).
- [17] F.D. Davis, R. Bagozzi, P.R. Warshaw, Extrinsic and intrinsic motivation to use computers in the workplace, *Journal of Applied Social Psychology* 22 (14) (1992 (Jul.)).
- [18] E. Deci, Effects of externally mediated rewards on intrinsic motivation, *Journal of Personality and Social Psychology* 18 (1) (1971 (Jan.)).

- [19] W.H. DeLone, E.R. McLean, Information systems success: the quest for the dependent variable, *Information Systems Research* 3 (1) (1992 (Mar.)).
- [20] W.S. DeSarbo, K. Jedidi, I. Sinha, Customer value analysis in a heterogeneous market, *Strategic Management Journal* 22 (9) (2001 (Sep.)).
- [21] W.B. Dodds, K.B. Monroe, The effect of brand and price information on subjective product evaluations, *Advances in Consumer Research* 12 (1) (1985).
- [22] W.B. Dodds, K.B. Monroe, D. Grewal, The effects of price, brand and store information on buyers' product evaluations, *Journal of Marketing Research* 28 (3) (1991 (Aug.)).
- [23] L. Dube-Rioux, The power of affective reports in predicting satisfaction judgments, *Advances in Consumer Research* 17 (1) (1990).
- [24] A. Eagly, S. Chaiken, *Psychology of Attitudes*, Harcourt Brace Jovanovich, New York, 1993.
- [25] D. Grewal, K.B. Monroe, R. Krishnan, The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value and behavioral intentions, *Journal of Marketing* 62 (2) (1998 (Apr.)).
- [26] J.G. Hair, R.E. Anderson, R.L. Tatham, W.C. Black, *Multivariate Data Analysis*, 5th ed., Prentice-Hall International, Inc., 1998.
- [27] M.B. Holbrook, Introduction to consumer value, in: M.B. Holbrook (Ed.), *Consumer Value: A Framework for Analysis and Research*, Routledge, New York, 1999.
- [28] P.J. Hu, P.Y.K. Chau, O.R. Lui Sheng, K. Yan Tam, Examining the technology acceptance model using physicians acceptance of telemedicine technology, *Journal of Management Information Systems* 16 (2) (1999 (Fall)).
- [29] J. Jacobby, J.C. Olson, Consumer response to price: an attitudinal, information processing perspective, in: Y. Wind, M. Greenberg (Eds.), *Moving Ahead With Attitude Research*, American Marketing Association, Chicago, 1977.
- [30] E. Johnson, J.L. Payne, Effort and accuracy in choice, *Management Science* 31 (4) (1985 (Apr.)).
- [31] D. Kahneman, A. Tversky, Prospect theory: an analysis of decision under risk, *Econometrica* 47 (2) (1979 (Mar.)).
- [32] M. Keil, P.M. Beranek, B.R. Konsynski, Usefulness and ease of use: field study evidence regarding task considerations, *Decision Support Systems* 13 (1) (1995 (Jan.)).
- [33] R.A. Kerin, A. Jain, D.J. Howard, Store shopping experience and consumers price-quality-value perceptions, *Journal of Retailing* 68 (4) (1992 (Winter)).
- [34] S. Kristoffersen, F. Ljungberg, Making place to make it work: empirical explorations of HCI for mobile CSCW, *Proceedings of the International ACM SIGGROUP conference on supporting group work*, Nov. 14–17, 1999, Phoenix, Arizona, United States.
- [35] H.S. Kwon, L. Chidambaram, A test of the technology acceptance model: the case of cellular telephone adoption, *Proceedings of the 33rd Hawaii International Conference on System Sciences* (Jan. 4–7, 2000), Maui, Island of Hawaii.
- [36] K. Mathieson, Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior, *Information Systems Research* 2 (3) (1991 (Sep.)).
- [37] M. Mings, Is the internet mobile? Measurements from Asia-Pacific, *International Telecommunications Society—Asia—Australian Regional Conference* (Jun 22–24, 2003), Perth, Australia.
- [38] G.C. Moore, I. Benbasat, Development of an instrument to measure the perceptions of adopting an information technology innovation, *Information Systems Research* 2 (3) (1991 (Sep.)).
- [39] Y. Mori, M-Commerce takes flight in Japan, *Global Wireless* 4 (2) (2001 (Mar/Apr)).
- [40] V.J. Neuman, O. Morgenstern, *Theory of Games and Economic Behavior*, Princeton University Press, Princeton, NJ, 1953.
- [41] P.E. Pedersen, L.B. Methlie, H. Thorbjørnsen, Understanding Mobile Commerce end-user adoption: a triangulation perspective and suggestions for an exploratory service evaluation framework, *Proceedings of the 35th Hawaii International Conference on System Sciences*, (Jan. 7–10, 2002), Hilton Waikola Village, Island of Hawaii.
- [42] J.F. Petrick, Development of a multi-dimensional scale for measuring the perceived value of a service, *Journal of Leisure Research* 34 (2) (2002 (2nd Qtr.)).
- [43] E.M. Rogers, *Diffusion of Innovations*, 4th ed., The Free Press, New York, 1995.
- [44] J.N. Sheth, B.I. Newman, B.L. Gross, *Consumption Values and Market Choices: Theory and Applications*, Southwestern Publishing, Cincinnati, OH, 1991.
- [45] K. Siau, E. Lim, Z. Shen, Mobile Commerce: promises, challenges, and research agenda, *Journal of Database Management* 12 (3) (2001 (Jul–Sep.)).
- [46] D. Sirdeshmukh, J. Singh, B. Sabol, Consumer trust, value, and loyalty in relational exchanges, *Journal of Marketing* 66 (1) (2002 (Jan.)).
- [47] J.E.M. Steenkamp, Conceptual models of the quality perception process, *Journal of Business Research* 21 (4) (1990 (Dec.)).
- [48] J.C. Sweeney, G.N. Soutar, Consumer perceived value: the development of a multiple item scale, *Journal of Retailing* 77 (2) (2001 (Summer)).
- [49] J.C. Sweeney, G.N. Soutar, L.W. Johnson, Retail service quality and perceived value, *Journal of Retailing and Consumer Services* 4 (1) (1997 (Jan.)).
- [50] B. Szajna, Empirical evaluation of the revised technology acceptance model, *Management Science* 42 (1) (1996 (Jan.)).
- [51] D.H.M. Tan, S.C. Hui, C.T. Lau, Wireless messaging services for mobile users, *Journal of Network and Computer Applications* 24 (2) (2001 (Apr.)).
- [52] R. Thaler, Mental accounting and consumer choice, *Marketing Science* 4 (3) (1985 (Mar.)).
- [53] E. Turban, D. King, *Introduction to E-Commerce*, Prentice Hall, New Jersey, 2003.
- [54] J.E. Urbany, W.O. Bearden, A. Kaicker, M. Smith-de Borrero, Transaction utility effects when quality is uncertain, *Journal of the Academy of Marketing Science* 25 (1) (1997 (Winter)).
- [55] V. Venkatesh, Creating favorable user perceptions: exploring the role of intrinsic motivation, *MIS Quarterly* 23 (2) (1999 (Jun.)).

- [56] V. Venkatesh, M.G. Morris, G.B. Davis, F.D. Davis, User acceptance of information technology: toward a unified view, *MIS Quarterly* 27 (3) (2003 (Sep.)).
- [57] R. Vetter, The wireless web, *Communications of the ACM* 44 (3) (2001 (Mar.)).
- [58] G. Voss, A. Parasuraman, D. Grewal, The role of price and quality perceptions in prepurchase and postpurchase evaluation of services, *Journal of Marketing* 62 (4) (1998 (Oct.)).
- [59] A.P. Vrechopoulos, I.D. Constantiou, N. Mylonopoulos, I. Sideris, Critical success factors for accelerating Mobile Commerce diffusion in Europe, 15th Bled Electronic Commerce Conference, e-Reality: Constructing the e-Economy Bled, Slovenia, (June 17–19, 2002).
- [60] R.B. Woodruff, Customer value: the next source for competitive edge, *Journal of the Academy of Marketing Science* 25 (2) (1997 (Spring)).
- [61] V.A. Zeithaml, Consumer perceptions of price, quality and value: a means-end model and synthesis of evidence, *Journal of Marketing* 52 (3) (1988 (Jul.)).

Hee-Woong Kim is an assistant professor in the School of Computing at the National University of Singapore. He was invited to the ICIS doctoral consortium (1997) and worked as a post-doctoral fellow in the Sloan School of Management at Massachusetts Institute of Technology. His current research focuses on value-driven customer behavior and post-adoption of IT.

Hock Chuan Chan is an associate professor at the Department of Information Systems, National University of Singapore. He has a BA from the University of Cambridge and a PhD from the University of British Columbia, Canada. His current research focuses on user–database interaction, information systems acceptance and spreadsheet model visualization.

Sumeet Gupta is currently a PhD Student at the Department of Information Systems (School of Computing) in the National University of Singapore. He graduated with an MBA at the NUS Business School from the National University of Singapore. His research interests are in e-commerce with specific focus on IT post-adoption, Internet Shopping and Virtual Communities. He has published in conferences, namely ICIS and AMCIS.