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Consumer Acceptance of Third Generation Mobile Value-added Services:
A Survey of Hong Kong Consumer Perceptions

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Abstract

This study empirically explores several variables in relation to consumer acceptance of third generation (3G) mobile value-added services in Hong Kong. The data analysis suggests that perceived usefulness, perceived ease of use, subjective norm and perceived behavioural control considerably influence consumers' behavioural intention to use 3G value-added services. Practically, the promotion of 3G value-added services should provide additional information such as pricing scheme and clear instructions in order to attract more consumers to the services. The present findings have managerial implications for the development of 3G mobile value-added services in different contexts. Theoretically, the paper adds to extant literature on consumer acceptance of mobile services and extends technology adoption theories.

Keywords

Mobile commerce, third generation mobile, value-added services, consumer acceptance

INTRODUCTION

There are considerable challenges for companies that attempt to achieve success in the early stages of mobile commerce (Kannan, Chang and Whinston, 2001). In the past few years, wireless technology has been extensively developed for communications and commercial applications. Such technology demonstrates an important advantage over fixed line technology as consumers can access Internet-based and other networked services at their convenience – at any time, from any location. However, while the recent possibility of innovative mobile services is expected to stimulate the development of diverse services in a wide range of business environments, many challenges remain. Ultimately, consumers may not adopt mobile commerce services effectively because of perceived security concerns, and uncertainty about whether such services will genuinely add value (e.g. Anckar and D'Incau, 2002; Anckar, Carlsson and Walden, 2003). Such negative perceptions may, in the first instance, be associated with constraints imposed by the considerably smaller consumer interfaces of wireless devices, which are unable to display rich information content in effective ways. Further, some mobile devices have quite limited capabilities for data and information processing and storage compared with personal computers. The limited bandwidth of wireless devices is also a critical barrier in the diffusion of mobile commerce in national marketplaces.

Seeking to address current technological challenges, mobile commerce has recently evolved from second generation mobile technology (2G/2.5G) to third generation mobile technology (3G). As the most recent network for wireless communications, 3G enables far greater bandwidths than 2G. It also supports the display of more complex and graphically rich content such as interactive video and multimedia applications. Moreover, 3G network enables the transfer of data in packets. However, apart from providing high capability in bandwidth and data communications, many factors may influence consumer acceptance of 3G value-added services.

Turning to the environment of the present study, the Hong Kong Office of Telecommunication Authority offered four 3G licences in order to support the development and diffusion of mobile commerce (OTA, 2001). Currently, 3G mobile value-added services offered by 3G service providers include live video streaming, online multiplayer game, video call, information displays, betting services, music download, e-mail and multimedia messaging. However, despite the advances of 3G mobile technology, consumers may be reluctant to use 3G services and may not trust transactions that are conducted through wireless networks. Therefore, it is necessary to explore key

factors in relation to consumer use of 3G value-added services. An understanding of consumer perceptions of 3G mobile services should help 3G service providers and application developers to capture emerging business opportunities. The present paper therefore aims to examine the determinants of 3G mobile value-added services from the consumer perspective.

RESEARCH MODEL AND HYPOTHESES

Numerous studies have been conducted to explore the acceptance of information technology and systems. Davis (1989) developed the technology acceptance model (TAM) and theorises that perceived usefulness and perceived ease of use determine intention and actual usage behaviour. The TAM indicates that perceived usefulness and perceived ease of use influence an individual's intention to use information systems and ultimately influence the actual usage behaviour. Existing studies show that the TAM provides a reasonable explanation of the acceptance of information systems by end-users (e.g. Taylor and Todd, 1995b; Venkatesh and Davis, 1996; 2000). Venkatesh and Davis (2000) extend the TAM to TAM2 by incorporating image, job relevance and output quality. TAM2 also incorporates additional constructs that span social influence processes and cognitive instrumental processes. For instance, subjective norm is included to show a direct effect on usage intention, because it influences individual behaviour. Although previous studies were conducted in volitional environments, the explanatory power of TAM2 appears parsimonious without the mediating attitude construct (Venkatesh and Davis, 2000).

Behavioural intention refers to the strength of individual intention on usage and performing behaviour, which is based on a cognitive appraisal of how the behaviour improves one's performance (e.g. Fishbein and Ajzen, 1975; Ajzen and Madden, 1986). There is a well-reported linkage between behavioural intention and actual usage (Davis, Bagozzi and Warshaw, 1989). Considering that the implementation of 3G mobile services is in its early stages, the choice of behavioural intention as the measure for actual usage is theoretically justifiable and pragmatically adequate. With respect to behavioural intention, the present study is comprised of several variables such as perceived usefulness, perceived ease of use, subjective norm, perceived behavioural control, perceived convenience, perceived image, perceived enjoyment, information service, service promotion by service providers, and perceived security.

Perceived Usefulness

Perceived usefulness refers to the degree to which a person believes that the use of a particular system would improve performance (Davis, 1989). The TAM and TAM2 suggest that perceived usefulness is a direct and indirect predictor of behavioural intention. Perceived usefulness is a motivating factor affecting usage because of the reinforcement value of outcome (e.g. Igbaria, Parasuraman and Baroudi, 1996).

H1.1: Perceived usefulness positively influences consumers' behavioural intention to use.

Perceived Ease of Use

Perceived ease of use refers to the degree to which the prospective user expects the target system to be effortless (Davis, 1989). It has been found that perceived ease of use positively affects perceived usefulness and contributes to behaviour (e.g. Davis, 1989; Szajna, 1996; Venkatesh, 2000; Venkatesh, and Davis, 2000). Perceived ease of use is generally regarded as an attribute associated with computer-based information systems as they can lead individuals to experience enjoyment or frustration depending on usability (Davis, 1989). Consumers of technology-based self-services may be concerned about the effort required to use such options and the complexity of the process of service delivery (Dabholkar, 1996). Existing studies demonstrate that perceived ease of use significantly affects consumer acceptance of electronic commerce (e.g. Liao and Cheung, 2001; Liao and Cheung, 2002).

H1.2: Perceived ease of use positively influences consumers' behavioural intention to use.

H2.1: Perceived ease of use is positively related to perceived usefulness.

Subjective Norm

The rationale for a direct effect of subjective norm on behaviour intention is that people may choose to perform a behaviour even if they are not favourably inclined to that behaviour if they believe that one or more of their key referents support that behaviour (e.g. Fishbein and Ajzen, 1975; Ajzen, 1991). Such a norm can be viewed as deriving from an individual's key referents such as supervisors, peers or friends (Igbaria, Parasuraman, and Baroudi, 1996). The relative influence of subjective norm is expected to be stronger for potential users with no prior experience as they are more likely to rely on the reactions of others in forming their intentions. It has also been found that subjective norm has a significant effect on behavioural intention (e.g. Taylor and Todd, 1995a; Venkatesh and Davis, 2000).

H1.3: Subjective norm positively influences consumers' behavioural intention to use.

Service Promotion

Individual attitudes are not based solely on beliefs and cognition, but rather on feelings and emotions (Dube, Chattopadhyay and Letarte (1996). In addition, mass media channels are relatively important at the knowledge stage of adoption and interpersonal channels are important at the persuasion stage (Rogers, 1995). Wansink, Kent and Hoch (1998) suggest that advertising tends to have a favourable impact on attitudes towards a brand for three reasons: enhancing perceptions of the new brand, enhancing perceptions of product versatility, and emphasising favourable product attributes. Consumers might be likely to buy a product or service if they were informed by an advertisement.

H1.4: Promotion of the service providers positively influences consumers' behavioural intention to use.

Perceived Behavioural Control

Perceived behavioural control accounts for a situation in which an individual lacks substantial control over the targeted behaviour (Ajzen, 1991). It has a direct effect on behavioural intention and also refers to an individual's perception of a presence or absence of requisite resources or opportunities necessary for performing a behaviour (Ajzen and Madden, 1986). A control belief is a perception of the availability of skills, resources, and opportunities necessary for performing the behaviour under discussion. A control belief might be a potential barrier to technology-based application as if a user perceives low behavioural control.

H1.5: Perceived behavioural control positively influences consumers' behavioural intention to use.

Perceived Convenience

Perceived convenience derives from the mobility and flexible choice of services available to mobile consumers (Anckar and D'Incau, 2002). Tang and Veijalainen (2001) suggest that the main influences in mobile commerce leading to rapid consumer acceptance will be increased convenience and efficiency. Therefore, convenience may be a catalyst for mobile services adoption because mobile technology is upgraded by 3G with greater bandwidth in order to facilitate and accelerate data transmission.

H2.2: Perceived convenience is positively related to perceived usefulness.

Information Service

Job relevance refers to an individual's perception of the degree to which a target system is applicable to her job, and is one of the key components of TAM2 (Venkatesh and Davis, 2000). If the information provided by a mobile service provider and related information service fits a user's needs, it may help enhance performance (Zwass, 2003). With respect to 3G, effective information service should be one of the key factors influencing mobile commerce application. At present, information service mainly derives from the provision of relevant news, entertainment, and financial information.

H2.3: Information service is positively related to perceived usefulness.

Perceived Image

Individual image refers to the degree to which use of an innovation is perceived to enhance one's status in a social system (Moore and Benbasat, 1991). Pfeffer (1982) suggests that by performing behaviours that are consistent with group norms, an individual can achieve membership and the social support that such membership affords, as well as possible goal attainment which can occur only through group action or group membership. Therefore, an individual may perceive that using 3G may lead to the enhancement of individual image.

H2.4: Perceived image is positively related to perceived usefulness.

Perceived Enjoyment

Anandarajan, Igbaria and Anakwe (2000) suggest that enjoyment is the intrinsic psychological reward for a person. Individuals who experience immediate pleasure and joy from using a machine and perceive any activity involving the use of a computer as enjoyable, apart from any anticipated improvement and performance, are likely to use it more extensively than others (Davis, 1992). Dabholkar (1996) also indicates that consumers would be likely to use a technology-based self-service option if it appears enjoyable.

H2.5: Perceived enjoyment is positively related to perceived usefulness.

Perceived Security

Perceived security of e-commerce influences consumer behavior in different contexts (e.g. Vijayasarathy and Jones, 2002; Cunningham, Gerlach, Harper, and Young, 2005). It is essential to minimise unauthorised use of electronic transactions and maximise the safety of financial information (Liao and Cheung, 2002). Privacy is an issue of increasing concern in e-commerce, with individuals often reluctant to engage in e-commerce for fear of unauthorised or illegal duplication and/or distribution of their personal information (Keeney, 1999) and potential identity theft (Smith, 2005). Mobile service providers should protect user privacy by implementing substantial security procedures in order to better protect consumer privacy and help alleviate consumer privacy concerns.

H2.6: Perceived security is positively related to perceived usefulness.

RESEARCH METHODS

This study focuses on the variables that may affect consumer acceptance of 3G mobile services. The research methods used comprise literature review, survey and statistical analysis. First, the literature review enabled the development of our research model and hypotheses. Second, a questionnaire was designed to collect empirical data. The survey questionnaire commences by asking respondents whether they currently use 3G services. 3G users were requested to relate their experience with different 3G mobile value-added services, while non-3G users were asked whether they wished to use similar 3G mobile services. All respondents were asked to convey their perceptions using a seven-point Likert-scale. The respondents possessed a cellular phone, even though they may not have been 3G users at the time. 2G users can be considered potential 3G users in the rapidly growing mobile market. Understanding current and potential consumer perceptions of 3G applications is useful for analysing 3G mobile commerce.

Other methodological information concerns content validity, number of responses and data testing approach. First, to ensure the content validity of the scales adopted in this study, the items used in the questionnaire were mainly adopted and modified from prior research. Second, at the time of writing (November 2006), two hundred and fifty-five useful responses had been collected from individual consumers. Third, the Statistical Package for Social Science (SPSS) was employed to test the survey data. In particular, two multiple regression models have been suggested to examine the hypotheses proposed in the previous section. Model 1 explores the impact of several variables on consumers' behavioural intention, while Model 2 examines the hypotheses in relation to perceived usefulness.

$$\text{Model 1:} \quad y_1 = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + \varepsilon_1$$

$where,$ y_1 : Behavioural intention
x_1 : Perceived usefulness
x_2 : Perceived ease of use
x_3 : Subjective norm
x_4 : Service promotion
x_5 : Perceived behavioural control

ε_1 : Random error

$$\text{Model 2:} \quad y_2 = b_0' + b_1' x_1' + b_2' x_2' + b_3' x_3' + b_4' x_4' + b_5' x_5' + b_6' x_6' + \varepsilon_2$$

$where,$ y_2 : Perceived usefulness

x_1' : Perceived ease of use

x_2' : Perceived convenience

x_3' : Information service

x_4' : Perceived image

x_5' : Perceived enjoyment

x_6' : Perceived security

ε_2 : Random error

RESULTS

The empirical data collected from 3G users and non 3G users were tested respectively. Key results are as follows. Table 1 shows the regression analysis of the data from present 3G users. First, the result of Model 1 suggests that perceived usefulness, subjective norm, service promotion and perceived behavioural control significantly affect 3G users' intention to continuously use the value-added services. Therefore, H1.1, H1.3, H1.4 and H1.5 are

supported, while H1.2 receives limited support. The adjusted R^2 (.760) represents that 76% of the variation in (y_1) is explained by the model. Second, the result of Model 2 shows that perceived ease of use, perceived convenience, information service and perceived image significantly influence perceived usefulness. Therefore, H2.1, H2.2, H2.3 and H2.4 are supported, while H2.5 and H2.6 receive limited support. The adjusted R^2 (.727) indicates that 72.7% of the variation in (y_2) is explained by the model.

	Standardized Coefficients	t	Sig.
Model 1			
(Constant)		-1.362	.179
Perceived usefulness	.246	2.215	.031
Perceived ease of use	.056	.604	.548
Subjective norm	.243	2.570	.013
Service promotion	.213	2.392	.020
Perceived behavioural control	.270	2.432	.018
Model 2			
(Constant)		-.853	.398
Perceived ease of use	.427	5.205	.000
Perceived convenience	.337	3.353	.001
Information service	.261	2.291	.026
Perceived image	.183	2.223	.030
Perceived enjoyment	-.081	-.759	.451
Perceived security	-.131	-1.794	.078

Notes: Model 1: $F = 40.275$, d.f. = 5,57, Sig. < .001, Adjusted $R^2 = .760$
Model 2: $F = 28.496$, d.f. = 6,56, Sig. < .001, Adjusted $R^2 = .727$

Table 1   Regression Analysis (3G Users)

Table 2 shows the regression analysis of the data from non 3G users. The result of Model 1 suggests that perceived usefulness, perceived ease of use, subjective norm and perceived behavioural control significantly affect non 3G users' intention to use the value-added services. Therefore, in the case of non 3G users, H1.1, H1.2, H1.3 and H1.5 are supported, while H1.4 receives limited support. The adjusted R^2 (.575) represents that 57.5% of the variation in (y_1) is explained by the model. In addition, the result of Model 2 shows that perceived ease of use, perceived convenience, information service, perceived image and perceived security significantly influence perceived usefulness. Therefore, H2.1, H2.2, H2.3, H2.4 and H2.6 are supported, while H2.5 receives limited support. The adjusted R^2 (.816) suggests that 81.6% of the variation in (y_2) is explained by the model.

	Standardized Coefficients	t	Sig.
Model 1			
(Constant)		-.869	.386
Perceived usefulness	.225	3.042	.003
Perceived ease of use	.340	4.901	.000
Subjective norm	.150	2.248	.026
Service promotion	.101	1.463	.145
Perceived behavioural control	.130	2.155	.032
Model 2			
(Constant)		-.709	.479
Perceived ease of use	.159	3.400	.001
Perceived convenience	.127	2.233	.027
Information service	.389	6.854	.000
Perceived image	.247	5.528	.000
Perceived enjoyment	.070	1.376	.170
Perceived security	.086	2.216	.028

Notes: Model 1: $F = 53.025$, d.f. = 5, 187, Sig. < .001, Adjusted $R^2 = .575$
Model 2: $F = 142.908$, d.f. = 6, 186, Sig. < .001, Adjusted $R^2 = .816$

Table 2   Regression Analysis (Non 3G Users)

DISCUSSION

This study empirically evaluates the impact of several variables on Hong Kong consumers' intention to use 3G value-added services. The following findings are of particular interest.

First, perceived usefulness has an impact on consumers' behavioural intention to use 3G value-added services. Actually, existing users have prior experience with mobile applications. They are already familiar with the configuration of mobile applications and may therefore have little difficulty in the use of 3G, although there are certainly differences in the configurations.

Second, subjective norm has a significant effect on consumers' behavioural intention to use 3G value-added services. In particular, subjective norm is the most important determinant for existing users, though it is the second determinant for non-users. This is consistent with the findings of Taylor and Todd (1995) who suggest that the link between subjective norm and behavioural intention may be because of perceptions of the real consequences associated with use or non-use. Video conferencing, for example, requires at least one other person to use the service simultaneously. Therefore, consumers are likely to be affected by other peoples' behaviours.

Third, perceived behavioural control significantly affects consumer behavioural intention to use 3G. It appears that the greater consumers' perceptions of their abilities to overcome barriers related to usage of 3G, the greater is their intention to use. In particular, reasonable service cost and affordability are desirable. This suggests that in order to promote 3G, efforts should be made to develop less expensive value-added services.

The promotion of service providers has a different impact on the behavioural intention of users cf. non-users. In the users' case, advertising appears to have a significant effect on behavioural intention, whereas in the non-users' case, advertising has little impact on behavioural intention. A possible explanation for this interesting phenomenon is that current 3G advertisements do not provide sufficient information to potential consumers. 3G advertisements should therefore be better used as one of the key marketing channels to attract potential users by informing them of current and emerging services. Most advertisements tend to emphasise consumer image rather than providing key information such as the capability and pricing of 3G services, and pre-sales support knowledge such as how to get started. Therefore, some consumers may not be motivated to use value-added 3G services.

The impact of perceived ease of use on perceived usefulness suggests that 3G service providers should further reduce the application complexity and provide consumers with improved support and knowledge for various value-added services. For example, one of the 3G pioneering companies in Hong Kong has a support-oriented section on its website, which provides useful information and knowledge for individuals who wish to learn how to use 3G services. A variety of information services also considerably affects the perceived usefulness of value-added services. To provide better information services, we suggest that 3G service providers develop additional applications that enhance communications and offer more attractive entertainment programs. At present, video conferencing, short message service and online games appear to be relatively popular value-added services. Moreover, the significant relationship between perceived convenience and usefulness suggests that 3G is convenient and offers significant benefits. However, perceived enjoyment has relatively little influence on perceived usefulness. Given that 3G remains a fairly new development, consumers may not yet be focused on enjoying the services offered, at this early stage.

Finally, perceived security affects perceived usefulness of the value-added services. In particular, non 3G users are concerned about security risk as they lack experience with 3G services. By contrast, for current 3G users, perceived reliability has little impact on behavioural intention. This finding may be a result of 3G users knowing that popular services such as information display and video conferencing do not request personal information, and thus have limited privacy implications. It may also partly explain why transactions-based services such as mobile banking have not been extensively used at this stage.

CONCLUSION

This study has empirically examined consumer perceptions of 3G mobile value-added services in the context of Hong Kong. In doing so, it has developed preliminary theory in this area which may be useful as a foundation for future research. The present study has also explored key differences between existing 3G users and non-3G users in terms of their perceptions of the variables associated with the acceptance of the current value-added services. In conclusion, our findings have two main managerial implications for the development and management of the 3G mobile value-added services in Hong Kong and other contexts:

- While users and non-users have different experience and knowledge concerning 3G services, the promotion and marketing of such services should feature information such as the pricing scheme and clear instructions, together with other types of service-product knowledge and support, in order to attract future users.

- The use of 3G by family members and friends, in conjunction with their positive recommendations, may influence consumer behavioural intention to use 3G services.

We note that the present study is limited to testing the variables and hypotheses in the context of Hong Kong. Future studies could examine pricing, compatibility, appearance, security and other deeper issues involved consumer choices associated with different value-added services in different contexts.

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