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Abstract

Purpose: This paper seeks to answer two research questions which are “*What are key factors which influence Chinese to adopt mobile technology?*” and “*Do these key factors differ from factors which are identified from Western context?*”

Design/methodology: The findings from a pilot study with 45 in-depth interviews are used to develop questionnaires and test across 800 residents from the three research cities. The data were analyzed by Structural Equation Modelling together with Multi-group Analysis.

Findings: Our data suggest eight important concepts, i.e. utilitarian expectation, hedonic expectation, status gains, status loss avoidance, normative influence, external influence, cost, and quality concern, are influential factors affecting users’ intentions to adopt 3G mobile technology. Differences are found between the samples in the three research cities in the effect of hedonic expectation, status gains, status loss avoidance, and normative influence on mobile technology adoption intention.

Research limitations/implications: As the stability of intentions may change over time, only measuring intentions might be inadequate in predicting actual adoption behaviors. However, the focus on potential users is thought to be appropriate, given that the development of 3G is still in its infancy in China.

Originality/value: Previous research into Information Technology (IT) adoption among Chinese users has not paid attention to regional diversity. Some research considered China as a large single market and some was conducted in only one province or one city. Culturally, China is a heterogeneous country.

Keywords: technology adoption, mobile technology, rational perception, social influence, and behavioral control

Paper type: Research paper

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Introduction

China's mobile communication market has experienced rapid growth over the past decade, with the number of mobile phone subscribers reaching 720 million and a market penetration rate of about 55% by 2009 (Consulting China Research Centre, 2010). Undoubtedly, this number of subscribers makes China the largest mobile communication market in the world.

The magnitude and momentum of development not only impresses and attracts business practitioners, but also stimulates researchers. This area of research investigates and provides understanding of this market and its consumers in depth, as the market has unique characteristics that may inform both business planning within China and within other big emerging markets, as well as increasing theoretical understanding of mobile technology diffusion and adoption.

The number of IT adoption studies that have been conducted in the Chinese context is somewhat limited and relate to less advanced technologies, such as mobile phone and second generation mobile internet services. Most variables used in prior China-based adoption research studies (see appendix A) were adapted from Western innovation theories and studies. For example, Mao and Palvia (2006) extended the TRA model to investigate Chinese workers' acceptance of email systems in 30 Chinese companies, by adapting factors of perceived characteristics of innovation and the two constructs of TAM to underpin the attitude construct. They found that perceived usefulness had the strongest influence on the intention to use an email system for Chinese office workers and the construct of subjective norm played a more important role than attitude in influencing that intention. In another study, Lu, Liu, Yu and Yao (2003) modified TAM by adding the factors of social influences, trust, facilitating conditions and complexity, to examine the factors associated with simple mobile internet services adoption intentions for work purposes. They found that those four variables, together

with perceived usefulness and perceived ease of use, significantly influence Chinese business managers to adopt the innovation.

It should also be noted that some of these studies demonstrated significant differences in the variables influencing Chinese consumers compared to the variables found by similar studies conducted in Western countries. For example, Mao and Palvia's (2006) study revealed that in China, perceived social pressure had a stronger influence on technological adoption intent than individuals' attitudes, which is different from Western studies (e.g., Bauer, Barnes, Reichardt, & Neumann, 2005; Nysveen, Pederson, & Thorbjornsen, 2005), in which attitude plays a more important role than social institutions. The difference between China and Western countries may be expected due to cross-cultural difference. However, literature also demonstrates the differences within the Chinese context. For example, a study by Lu, Yang, & Yu (2007) was conducted in one eastern province of China, in which the variables of social pressure and perceived control over technology did not significantly affect technological adoption. However, the two factors were supported as adoption determinants in studies conducted in other parts of China (e.g., Park, Yang, & Lehto, 2007). Indeed, this evidence illustrates the heterogeneous nature of China. Many existing studies exploring Chinese consumer behaviors have considered China as a large single market (Sin & Ho, 2001), yet China consists of distinctive regional markets and Chinese consumers' preferences vary across regions (Cui & Liu, 2000). The question remains "*What are key factors which influence Chinese to adopt mobile technology?*" and "*Do these key factors differ from factors which are identified from Western context?*"

Our research contributes to innovation adoption research, specifically to mobile technology and innovation adoption research in three areas. Firstly, it investigates Chinese consumers' mobile technology and innovation adoption behaviours, which is identified as an under-researched topic. Secondly, since our research is conducted in a big emerging market,

its findings would be helpful for understanding mobile technology and innovation adoption in other big emerging markets, as well as increasing theoretical understanding mobile technology and innovation adoption. Thirdly, the findings compliment and extend Western mobile technology and innovation adoption studies.

Further our research contributes to intra-cultural studies by adding knowledge about the similarities and differences between consumers in three regional cities regarding what factors influence their intentions to use advanced mobile technology and innovation. Specifically, it identified that the three groups of regional consumers differed in perceiving social outcomes resulting from mobile technology and innovation adoption and they perceived varied levels of normative social influence from interpersonal networks. Additionally, it supported the findings of previous studies that the three groups of regional consumers can be distinguished into two different types: utilitarianism-driven and hedonism-driven.

Our research also contributes to consumer behavioural theory. Instead of simply applying Western theories, it conducted extensive fieldwork in the Chinese context to investigate the most suitable factors, which were then used to inform the research model. This model was subsequently tested by quantitative research methods. This contributes to the methodology of consumer behaviour research in non- Western contexts. Moreover, the findings contribute to the specification of behavioural models, such as Theory of Planned Behavior, as the identified influential factors can be used to inform their constructs.

The remainder of this paper is organized as follows. In the next section, we review the major technology adoption frameworks. In the following two sections, we then propose the mobile adoption framework for the Chinese context, discussing the role of rational perception, social influence and behavioral control, which were derived from literatures and

our pilot interviews. Following this, we focus on the data, method, analysis, and results. The final sections conclude the paper with a discussion of the implications of the results.

Proposing key constructs for technology adoption in China

Much of the adoption research describes and explains individuals' adoption decisions by applying cognitive and social theories (Liu, Huang, & Chen, 2008; Pedersen, 2005; Pedersen & Ling, 2003). The most commonly used are Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991), and Technology Acceptance Model (TAM) (Davis, 1989). The application of the three major theories (TRA, TPB, and TAM) in the Chinese context, an Eastern cultural context, might be questionable (Lai, Griffin, & Babin, 2009; Zhao, Flynn, & Roth, 2006), as all the three theories originated from a Western context (United States). Cross-cultural studies have suggested that they need to be adapted and new constructs should be added to the model in non-Western contexts (e.g., Malhotra & McCort, 2001; Sawang, Oei, & Goh, 2006). Therefore, instead of selecting one of these three models, researchers can specify research models that are more relevant to the research purpose.

According to their functions and definitions from TRA, TPB, and TAM, these factors generally can be grouped into three categories as: (a) rational perception, (b) social influence, and (c) behavioral control (Table 1).

Table 1 about here

Rational perception

The first type of rational perception factors is labelled Perceived Characteristics of Innovation (PCI) as described by Moore and Benbasat (1991). PCI consists of voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and

trialability. PCI has been adapted as adoption determinants and proved an essential affective factor on technological adoption (e.g., Bauer et al., 2005; de Marez, Vyncke, Berte, Schuurman, & Moor, 2007). The second type of factors originates in the theory of TAM. This parsimonious model of adoption examines the influence of two constructs, perceived usefulness and perceived ease of use, which are also considered as being adapted from two innovation attributes (Roger, 2003), namely relative advantage and complexity (Davis, 1989). The third type of factors typically comprises those factors related to individuals' perceived expectations or perceived outcomes resulting from the performing of the adoption behavior, such as perceived utilitarian value and perceived hedonic value (e.g., Sullivan Mort & Drennan, 2007), monetary value, emotional value, convenience value, functional value, and social value (Pihlström & Brush, 2008; Yang & Jolly, 2009), perceived enjoyment (Revels, Tojib, & Tsarenko, 2010), perceived image (Revels et al., 2010), and status benefit (Bouwman, Carlsson, Walden, & Molina-Castillo, 2008). These factors put emphasis on individuals' perceived outcomes from using a technology, and are sometimes used to underpin the construct of attitude in models using TRA or TPB (e.g., Nysveen et al., 2005; Yang & Jolly, 2009). The relational perception construct is akin to a recent work such as Park and Kim (2013) who emphasized the important of attitude, which is akin to our relational perception on user acceptance of long-term evolution services. The authors drew from existing western literature and suggested that perceived system and service quality (including speed), perceived usefulness, mobility and adaptability as important factors to user acceptance. Our study took a different approach, rather than drawing from existing literature, we performed qualitative interview (detail will be further explain in pilot study section) to finalise which factors are more influential among Chinese consumer.

Social influence

The factors referring to social influence from interpersonal networks can be classified by normative influence type, such as normative pressure (Nysveen et al., 2005), interpersonal influence (Pedersen, 2005), interpersonal communications (Bauer et al., 2005), and compliance (de Marez et al., 2007). The factors representing external influence from secondary information sources can be classified by informative influence type, such as external influence (Pedersen, 2005). Informative social influence has been examined less than normative influence in innovation adoption research (Pedersen, 2005).

Behavioral control

This type of factor consists of two dimensions, internal and external, both of which may facilitate or hinder one's adoption. The internal dimension refers to individuals' self-confidence in their own abilities and skills over the adoption behavior, mainly related to the recipient's personal characteristics. Factors include knowledge, innovativeness, willingness to pay, behavioral control, and self-efficacy (e.g., Bauer et al., 2005; de Marez et al., 2007; Nysveen et al., 2005; Pedersen, 2005).

The external dimension refers to access to opportunities and resources to execute the adoption behavior, mainly representing situational factors. Many of these factors are considered to be barriers to adoption behaviors; for example cost, risk, price, and security (e.g., Bouwman et al., 2008; de Marez et al., 2007; Revels et al., 2010).

A preliminary examination

Geographically, China is one of the world's largest countries, behind Russia and Canada, and very similar in size to the United States. Culturally, it is a heterogeneous country (Swanson, 1989) – it is a multi-ethnic country consisting of more than 50 ethnic groups. The diverse cultural patterns are exhibited by variations in dialects, values, lifestyles, traditions, and customs. Thus, China cannot be seen as a single homogenous market. It is necessary to

segment China into multiple distinct regional markets for managerial and academic purposes (Cui & Liu, 2000). Further, most of the coastal cities have completed industrialization, but many cities in western China are still isolated from industrialization (Zhang, Grigoriou, & Li, 2008). The income levels of residents in coastal and interior, urban, and rural regions diverged during recent decades.

Thus, exploring sub-cultural differences is theoretically meaningful, particularly if the people within a country are highly heterogeneous, because it seeks to break down a generalized description of a people into more meaningful sub-units (Huo & Randall, 1991). Intra-cultural studies can help researchers to more clearly see people and better understand their consumption cultures and behaviors, and can combine consumer behavior knowledge with meaningful theoretical contributions (Zhou, Arnold, Pereira, & Yu, 2009).

Prior to our survey study, we conducted pilot study with 45 in-depth interviews¹ to unpack key factors influencing advanced mobile technology (3G) adoption. While many developed countries have adopted 4G, the 3G has just been launched in April 2008 in China, covering Beijing, Shanghai, and six other major cities in eastern China for commercial trial. After a few months of testing, the same standard 3G networks were launched in another 28 major cities, including Wuhan, by the end of June 2009. Stewart and colleagues (2011) provided a historical background of 3G in China, and stated that “Ministry of Post and Telecommunications (MPT) experts pointed out that China had ‘lost the G and missed the 2G’ which made the Chinese ‘enslaved’ to ‘Western countries’: China should therefore put forward its own G standard to the International Telecommunications Union”(p.776). Thus, 3G is considered as incremental innovation-an improvement, rather an invention- of an existing product among Chinese consumer.

¹ Eight females and seven males for each city, all aged between 18 and 40, with four interviewees aged 18-24, six aged 25-30, and five aged 31-40. All had tertiary education.

We found eight emergent themes (Table 2). It has been argued in the extant literature that product attributes influence consumer perceptions of using the innovation (Rogers, 2003) and that these attributes are perceived as being linked to the consumer's lifestyle (Zhu, Wang, Yan, & Wu, 2009). The responses from Chinese consumers in our pilot study evidently supported and verified these arguments. The concepts identified may have similar meanings and functions as the factors of effectiveness, usefulness, or utilitarian value identified in Western studies (e.g., de Marez et al., 2007; Nysveen et al., 2005), as they all refer to the perception of mobile technological innovation being useful for users or enhancing their performance.

Besides the utilitarian value, the hedonic value of goods is another important consideration for consumers to take into account for technology adoption (Okada, 2005). According to our interviews, the concept of hedonic expectation was elicited, which was similar to the concept of hedonic value (e.g., Sullivan Mort & Drennan, 2007), or enjoyment (e.g., de Marez et al., 2007; Nysveen et al., 2005; Revels et al., 2010), perceived fun (Okazaki, Skapa, & Grande, 2008), or emotional value in Western literature, as they all refer to the perceived pleasure derived from using the innovation.

In traditional Chinese cultural values, "face" is a concept of central importance. The amount of face a person has is a function of his or her social status (Ho, 1976; Yau, 1988). The action of adopting innovations ahead of peers could be perceived by the Chinese consumer as a means to gain face or to increase their social status (Zhu & He, 2002). On the other hand, if an individual fails to keep pace with their group in innovation adoption, they might feel that they are losing face in front of their peers. Therefore, perceived social outcomes may affect Chinese consumers' intentions to adopt 3G, particularly in the early stages of its diffusion in China. Our interview reviewed individuals' fear of "losing face" due to using obsolescent technology. No concept similar to status loss avoidance was identified in

Western literature. The concept of status gains has its counterparts in Western studies, such as image (Revels et al., 2010), social value (Pihlström & Brush, 2008; Yang & Jolly, 2009), or prestige (de Marez et al., 2007). Only in Venkatesh and Brown's (2001) study, social outcomes were suggested to include two dimensions, status gain and status loss, but they did not conceptualize that avoiding status loss can be a significant factor influencing innovation adoption. Moreover, no similar variable was found in China-based innovation adoption literature. Therefore, the proposed concept of status loss avoidance can be a unique finding of our current study.

Normative influence was adopted to label the concept referring to the social influence perceived from one's social network on the 3G adoption. These findings, with the exception of those regarding parental influence, were consistent with the social influences on mobile technology adoption found in Western studies. Our interviews demonstrate various sources of influence such as family, partner, peer, and media.

Given the evidence from prior marketing research, cost has been shown to significantly affect consumer decisions, especially in the case of expensive goods (Sahni, 1994). The cost of replacing a 3G mobile phone and the high price of using some of the 3G services were perceived as deterrents by our interviewees.

Table 2 about here

Propose technology adoption model for the Chinese context based on the pilot findings

As the prior review of existing technology adoption studies shows, the three components (i.e., rational perception, social influence, and behavioral control) positively predict individuals' adoption decisions. Based on our qualitative pilot study, we adopt the emerging constructs

(i.e. rational perception, social influence, and behavioral control) and develop our proposed hypotheses.

Hypotheses Related to Rational Perceptions

As stated above, *utilitarian expectation*, *hedonic expectation*, *status gains* and *status loss avoidance* are four concepts that have been identified from our pilot study to represent perceived expectation or social outcomes of using 3G. They were manifested in the in-depth interviews and were considered by the interviewees as positive motivations to increase their likelihood of using 3G. According to social behaviour theories, positive perceptions are a strong force guiding individuals' actions (Bandura, 1986). Furthermore, the likely mechanic of perceived outcomes affecting technology adoption has been demonstrated by many studies (e.g. Au & Enderwick, 2000; Venkatesh & Brown, 2001), all of which suggest that rational perceptions of using a technology positively influence adoption intention. Therefore, these four constructs are hypothesized to positively influence adoption intention.

Specifically, utilitarian expectation is defined as using 3G being perceived as providing benefits to the user; it is associated with utility in achieving a valuable goal. Utilitarian value is one of basic needs for consumers and one of important antecedents of consumption (Batra & Ahtola, 1991) and innovation adoption (Sullivan Mort & Drennan, 2005). It is therefore hypothesized that utilitarian expectation will directly affect adoption intention:

Hypothesis 1a: Utilitarian expectation has a positive influence on adoption intention.

Additionally, our pilot study did not identify any significant differences between the three interview groups regarding their utilitarian expectations of using 3G. Nor has any literature

been found to indicate that consumers from the three cities may differ in perceiving utilitarian values. Thus, the following hypothesis is proposed:

Hypothesis 1b: The relationship between utilitarian expectation and adoption intention is not significantly different between Chinese consumers in the three regional cities.

Hedonic expectation refers to perceived pleasure derived from using 3G. Seeking pleasant and joyful experiences has been long recognized as one of the basic personal desires (Rokeach, 1973), and the hedonic consideration also has been identified as an important factor influencing consumer choices (Dhar & Wertenbroch, 2000). Because of 3G's entertainment capability, apart from expecting utilitarian performance, being entertained by using 3G can be anticipated. Most of the interviewees from our pilot study expressed their interest in using some 3G entertainment services or considered using 3G would be fun. Consequently, hedonic expectation may exert influence on the intention to use 3G. The following hypothesis is proposed to address this rationale:

Hypothesis 2a: Hedonic expectation has a positive influence on adoption intention.

Regarding hedonic expectation on consumption, several studies have found that Chinese consumers from different regions place different degrees of importance on such benefits. For example, eastern coastal consumers are more likely to pursue hedonic values compared with the consumers from inland regions (Zhou et al., 2009), that may be because that they are more sophisticated and more likely to be hedonism-driven consumers (Varia Fram et al., 2004;); while consumers from inland regions are relatively conservative and more likely to be utilitarian-driven consumers (Li, Nicholls, Zhuang, & Kranendonk, 2004). Consequently,

differences in the relationship between hedonic expectation and adoption intention can be hypothesized to exist between Chinese consumers in the three regional cities being examined:

Hypothesis 2b: The relationship between hedonic expectation and adoption intention is significantly different between Chinese consumers in the three regional cities.

Additionally, studies on innovation adoption have found that hedonic expectation may have an impact on utilitarian expectation (e.g. Hong & Tam, 2006), and it has been suggested that the perceived hedonic outcomes can contribute to extrinsic utilitarian outcomes (Starbuck & Webster, 1991). Taking the research context into account, the entertainment services provided by 3G can be instrumental, such as when they are used to kill waiting time or boring time. This kind of hedonic expectation therefore can be perceived as useful. Hedonic expectation is hypothesized to exert an influence on utilitarian expectation:

Hypothesis 2c: Hedonic expectation positively affects utilitarian expectation.

Status gains are defined as the extent to which using 3G is perceived as increasing users' status in their society. The *Innovation Diffusion Theory* points out that the desire to gain status is an important reason for innovation adoption (Rogers, 2003). Many studies have identified that individuals may perceive their social image as enhanced if their innovation adoption behaviours are considered socially desirable (e.g. Karahanna et al., 1999; Venkatesh & Brown, 2001). Zhu and He (2002) also argued that to improve status is a motivator for Chinese consumers to adopt technological innovation. In our pilot study, interviewees from Wuhan articulated their expectations of social status improvement by using 3G in front of their peers. Therefore, perceived status gains are hypothesized to directly affect adoption intention:

Hypothesis 3a: Status gains have a positive influence on adoption intention.

Our pilot study has identified that interviewees from different regions perceived different levels of status gains by using 3G. Unlike interviewees from Wuhan, the Beijing and Shanghai interviewees placed limited importance on gaining status through using 3G. Accordingly, the relationship between status gains and adoption intention is hypothesized to be different between the three groups of Chinese consumers:

Hypothesis 3b: The relationship between status gains and adoption intention is significantly different between Chinese consumers in the three regional cities.

Additionally, status gains are perceived as a valued outcome in traditional Chinese culture (Ho, 1976). As a result of status gains, one's social image would be improved in his/her interpersonal network (Hwang, 1987). Status gains can be therefore considered as instrumental since they bring such benefits to the individuals (Yau, 1988). Furthermore, status gains also may result in intrinsic satisfaction since varying degrees of pleasure would be derived from the social image improvement (Bao, Zhou, & Su, 2003). Thus, status gains may exert influence on utilitarian expectation and hedonic expectation. The following hypotheses are proposed:

Hypothesis 3c: Status gains positively affect utilitarian expectations.

Hypothesis 3d: Status gains positively affect hedonic expectations.

Status loss avoidance is defined as the extent to which using 3G is perceived as avoiding the user's status loss. It is a distinct concept from the concept of *status gains*, but not opposite to it. The amount of face represents one's social status in Chinese culture (Ho, 1976; Yau, 1987). Losing face, equivalent to status loss, can be a very serious matter and may affect one's ability to function effectively in society (Ho, 1976).

Avoiding status loss thus becomes one of the key concerns for Chinese consumers (Bao et al., 2003). In order to save face from using obsolescent technology, Chinese consumers may feel forced to adopt updated mobile technology. All the three interviewee groups in our pilot study identified this rationale. Accordingly, the direct and positive relationship between status loss avoidance and adoption intention can be hypothesized:

Hypothesis 4a: Social loss avoidance has a positive influence on adoption intention.

Additionally, our pilot study did not identify any significant differences between the three interview groups regarding the concept of *status loss avoidance*. No literature has been found either, indicating that consumers from the three cities may differ in addressing perceiving status loss avoidance affecting behaviours. Thus, a null hypothesis addressing this issue is proposed:

Hypothesis 4b: The relationship between status loss avoidance and adoption intention is not significantly different between Chinese consumers in the three regional cities.

In turn, if face is saved through using updated mobile technology, it can be considered as a functional way of maintaining one's social status to significant others in one's social network (Hwang, 1987). Correspondingly, avoiding status loss through adopting updated mobile technology would be considered as being useful to the user. Avoiding status loss is thus hypothesized to be positively related to utilitarian expectation:

Hypothesis 4c: Status loss avoidance positively affects utilitarian expectations.

Hypotheses Related to Social Influences

Two concepts have been examined in our pilot study representing the social influence perceived by Chinese consumers on 3G adoption, namely *normative influence* and *external influence*. According to psychological and behavioural theories, one of the pervasive determinants of individual behaviours is the social influence around him/her (Burnkrant & Cousineau, 1975). Social influence impacting on mobile technology adoption have been investigated by many studies (e.g. Bauer et al., 2005; Nysveen et al., 2005) and social influence has been considered as one of major influential factors. Hypotheses about these two constructs are discussed below.

Normative influence refers to the extent to which members from one's social network influence an individual to use 3G. It emphasizes the social influence perceived to confirm the expectations of significant others, which is one of the important principles in the theories of TRA and TPB (Fishbein & Ajzen, 1975; Ajzen, 1991). In our pilot, interviewees suggested many significant others who might exert influence on their 3G adoption decision, such as friends, spouse, parents, colleagues.

Also, studies have postulated that normative influence positively affects consumption decisions (e.g. Bearden & Etzel, 1982; Childers & Rao, 1992), as well as the adoption of mobile technology (e.g. Bauer et al., 2005; Nysveen et al., 2005). Consequently, normative influence is hypothesized to have a direct influence on adoption intention:

Hypothesis 5a: Normative influence has a positive influence on adoption intention.

Research has also demonstrated that normative influence affects consumers from different cultures differently (Childers & Rao, 1992) and its effects on mobile technology adoption differ in various cultural contexts (Yang & Jolly, 2009). It has been discussed previously that

there are various sub-cultures among regions in China and differences regarding normative influence affecting 3G adoption were identified between the three interview groups in our pilot study. Accordingly, the relationship between normative influence and adoption intention is hypothesized to be different between the three groups of Chinese consumers:

Hypothesis 5b: The relationship between normative influence and adoption intention is significantly different between Chinese consumers in the three regional cities.

External influence is defined as the extent to which information from secondary sources influences an individual to 3G. The secondary sources refer to mass media, such as advertising, TV, radio, newspaper and the internet. Research has discussed that mass media may exert influence on new product adoption and diffusion (Lee et al, 2002), especially in the early stage of the product's lifecycle (Andrews & Boyle, 2008), which is the case with 3G in China. However, the findings of our pilot study identified that Chinese consumers were not easily influenced by mass media and they felt limited external influence on their 3G adoption decision. Therefore, it is hypothesized that external influence does not significantly impact adoption intention in this research context and there is no significant difference between the three groups of Chinese consumers in this relationship.

Hypothesis 6a: External influence does not significantly influence adoption intention.

Hypothesis 6b: The relationship between external influence and adoption intention is not significantly different between Chinese consumers in the three regional cities.

Hypotheses Related to Behavioural Control

Cost and quality concerns are the two concepts identified to indicate perceived barriers to 3G adoption by the interviewees in our pilot study. These two factors were found to hinder Chinese consumers' adoption of mobile technological innovation. The relationships between each of these constructs with adoption intention are discussed in detail as follows.

Cost is defined as the extent to which one perceives the financial amount involved to inhibit him/her using 3G. The cost or price of an innovation adoption had been identified as a significant factor that may constrain adoption decision (Revels et al., 2010). Studies on Chinese consumers have also demonstrated their price conscious attribute (e.g. Li et al., 2004; Tai, 2005). The three interviewee groups in our pilot study regarded the expense of using 3G as a factor influencing 3G adoption. Therefore, cost is hypothesized to have a direct negative influence on adoption intention:

Hypothesis 7a: Cost has a negative influence on adoption intention.

Additionally, our pilot study did not identify any significant differences between the three interview groups regarding this constraint to use of 3G. No literature has been found either, to indicate that consumers from the three cities may differ in perceiving the cost as a constraint inhibiting consumption behaviours. Thus, a null hypothesis addressing this issue is proposed:

Hypothesis 7b: The relationship between cost and adoption intention is not significantly different between Chinese consumers in the three regional cities.

Quality concern is defined as the extent to which one perceives poor quality to inhibit him/her using mobile technological innovation. Interviewees from our pilot study expressed their concerns about 3G, such as geographic network coverage, compatibility of different 3G standard networks, and the quality of 3G mobile devices and 3G services. Those worries may stop them from trying this new technology. Studies suggest that Chinese consumers are very

quality conscious (e.g. Sun & Collins, 2002; Wang et al., 2004) and that, for them the quality of a product is relatively more important than the product's other attributes (Lai et al., 2009). Accordingly, quality concern is hypothesized to negatively influence adoption intention:

Hypothesis 8a: Quality concern has a negative influence on adoption intention.

Additionally, our pilot study did not identify any significant differences between the three interview groups regarding quality concerns as a constraint to use 3G. No literature has been found either, to indicate that consumers from the three cities may differ in perceiving quality concerns as a constraint inhibiting consumption behaviours. Thus, the following hypothesis addressing this issue is proposed:

Hypothesis 8b: The relationship between quality concern and adoption intention is not significantly different between Chinese consumers in the three regional cities.

In summary, hypotheses about the relationships between the nine constructs of the research model have been addressed and are summarized in Figure 1

Figure 1 about here

Method

Participants and procedure

The total sample of 800 consists of 270 cases from Beijing, 265 cases from Shanghai, and 265 cases from Wuhan. As China is a geographically vast country, it would be difficult to conduct research in every region. Three regional cities, Beijing, Shanghai, and Wuhan, have 3G available and were chosen as research sites for our study. The three metropolitan cities are considered to be representative cities for North China, East China, and Central China

respectively and, as such, represent sites with sufficient cultural and economic diversity and disparity (Veeck, Pannell, Smith, & Huang, 2007)

Beijing is the capital city of China and the political, educational, and cultural centre. Shanghai is the biggest city in China in terms of population and economy, and is regarded as the trade, commercial, and financial centre. Both are municipalities, which are equivalent to provinces in China's administrative structure. They are the most developed cities in China. Wuhan is the capital city of Hubei province and is the most populous city in central China. Demographic information on the three participant groups is summarized in Table 3.

Table 3 about here

The data collection was done through a web-based survey as the internet has been available in China for more than two decades, its access increasingly widening to include a more representative cross-section of the adult population. We recruited our sample from the online panel database who were mobile phone users, aware of 3G, and being second generation residents of Beijing, Shanghai, or Wuhan; that is, they were born, educated, and work in that city. We used Shanghai iPanel, the company's online panels had nearly one million members who were adult Chinese consumers from major cities in China, including Beijing, Shanghai and Wuhan and whose demographic characteristics are correlated closely to these major cities' adult population in terms of age, gender, educational background and other demographics. Therefore, using these online panels as a sampling frame was likely to yield three samples that were representative of the population in the three research cities.

Eight hundred participants based on iPanel database², who were mobile phone users and being the second generation of residents of Beijing, Shanghai, or Wuhan, i.e. they were

² All available samples from iPanel database, and all of them responses, thus it yielded 100% response rate

born, educated and work in that city, were invited and all participants responded to the survey. Each participant received a token to claim a prize from iPanel after survey completion. The company gives members who voluntarily participated in the survey point reward, but without any inducement. Points can be used to redeem goods, gifts and coupons.

Measures

All independent measures were adapted from existing literature (Table 4) using a seven-point Likert scale. The measures were first translated from English into the local language and then back translated into English by a qualified translator, ensuring accuracy and literal translation (Sawang, Goh, & Oei, 2006). First, the instrument was translated into Chinese by two individuals independently, who experienced in translating between Chinese and English. Then the two translated Chinese research instruments were reviewed by both translators. The differences between the two translations were discussed and agreed changes were made. Afterwards, the two translations were combined into one single Chinese research instrument. This Chinese instrument was sent to five native-Chinese-speaking postgraduate students, who aided in examining the wording and any ambiguous meanings identified in the items. Then, the Chinese instrument was then back-translated into English by another expert in both Chinese and English. The original English instrument and the back-translated English one were then compared by the researcher and the research assistant. There were no discrepancies in translation in the final version.

Confirmatory Factor Analysis (CFA) was employed to examine construct validity and test for common method bias³. We employed the Common method bias using common latent factor analysis (see further details in Billiet & McClendon, 2000) prior to examine our proposed research model. All constructs' Cronbach α coefficients across the three samples

³ Full results can be obtained from the first author

are greater than 0.70, which indicates a good reliability. We employed multi-group analysis to control demographic information which is different between three cities. Its multi-group analysis function can test the overall fit of a model simultaneously for multiple research samples and can create cross-group constraints to test measurement invariance (Byrne, 2001). This analysis allows research to examine if individual demography of each group differs from each other and how it influences the research model. The details of multi-group analysis are discussed in result section.

Table 4 about here

Results

In order to test the variance of relationships in the structural model across the Beijing, Shanghai, and Wuhan samples, multi-group SEM analysis was applied, in which two nested models were examined, namely the measurement weights model and the structural weights model (Byrne, 2001). The fit indices of the two nested model are summarized in Table 5.

Table 5 about here

From Table 5, it can be noted that there were differences between the two nested models in their fit indices. To test the significance of the differences, a Chi-square test was applied. According to the results of Chi-square test, the differences were significant ($p = 0.00 < 0.05$), indicating there were significant differences in the regression weights of hypothesized constructs in the three research samples.

To locate the relationships of two constructs with significant differences between groups, AMOS 17.0 provides a powerful and quite unique exploratory mechanism for this purpose, termed the critical ratio difference (CRDIFF) method (Byrne, 2001). It produces a

listing of critical ratios for the pair-wise differences among all parameters estimated in both single group analysis and multi-group analysis. If the value (CRDIFF) is greater than 1.96 (or 2.58, or 3.29), it indicates that the relationship posited by that path is significantly different between groups

The influence of utilitarian expectation, hedonic expectation, and status gains-loss on 3G adoption intent

The results showed that this relationship was supported by Beijing, Shanghai, and Wuhan samples ($\beta = 0.43^*$, 0.51^* , 0.42^{**} respectively), indicating the effect of utilitarian expectation on adoption intent is positive and strong. However, the critical ratios for differences between this path's parameters of the three samples were all less than 1.96, which indicates that the factor of utilitarian expectation had a similar level of influence on adoption intent across the three samples.

We found that hedonic expectation positively influenced on adoption intent in the Beijing, Shanghai, and Wuhan samples ($\beta = 0.40^{**}$, 0.64^{**} , 0.33^* , respectively). By examining the critical ratio for differences of this path's parameters between the three samples, it was shown that the influence of hedonic expectation was much stronger on the Shanghai sample than on the Wuhan and Beijing samples.

Status gains positively predicted adoption intent in the Beijing and Wuhan samples ($\beta = 0.34^*$, 0.35^* , respectively) but not among Shanghai sample. The critical ratio also supported this difference. Unlike status gains, status loss avoidance positively influenced adoption intent in the Beijing, Shanghai, and Wuhan samples ($\beta = 0.23^*$, 0.45^* , 0.41^{**} , respectively). Examining the critical ratio for differences of this path's parameters between the three samples showed that the influence of status loss avoidance was much stronger in the Wuhan sample than in the Shanghai and Beijing samples.

The influence of normative pressure, cost, and quality concern on 3G adoption intent

Normative influence also positively predicted adoption intent across the Beijing, Shanghai, and Wuhan samples ($\beta = 0.15^*$, 0.10^* , 0.39^{**} , respectively). However, the difference in the relationship between the Beijing and Shanghai samples was not significant. On the other hand, we did not find significant effects of external influence (secondary information) on adoption intent.

Cost was found to negatively predict adoption intent across the Beijing, Shanghai, and Wuhan samples ($\beta = -0.42^{***}$, -0.37^{***} , -0.32^* , respectively). However, the group difference test was not significant. Similarly, quality concern positively predicted adoption intent across the Beijing, Shanghai, and Wuhan samples ($\beta = -0.18^*$, -0.19^* , -0.16^{**} , respectively), but there were no group differences.

The influence of hedonic expectation and status loss avoidance on utilitarian expectation

Hedonic expectation was found to positively predict utilitarian expectation across the Beijing, Shanghai, and Wuhan samples ($\beta = 0.83^{***}$, 0.81^{***} , 0.66^{**} , respectively). Examining the multi-group analysis results, however, showed that the differences in this relationship between samples were not significant. We also found that status loss avoidance positively affected utilitarian expectations across the Beijing, Shanghai, and Wuhan samples ($\beta = 0.11^*$, 0.12^{***} , 0.19^* , respectively), in that avoiding loss of status by using advanced mobile technology influences utilitarian expectations.

The influence of status gain on utilitarian expectation and hedonic expectation

We found that perceived social status gains from using 3G would positively significantly affect hedonic expectation across the Beijing, Shanghai, and Wuhan samples ($\beta = 0.55^{***}$,

0.67***, 0.72**, respectively). However, there was no significant difference in this relationship between samples according to the CRDIFF values. Although we hypothesized the relationship between status gain and utilitarian expectation, this hypothesis was not supported due to non-significant paths. Figure 2 summarized the findings.

Figure 2 about here

Discussion

Our study aimed to propose a 3G adoption model in the Chinese context. Previous research into IT adoption by Chinese consumers has not paid attention to regional diversity. Some research took China as a large single market (e.g., Mao & Palvia, 2006; Zhu & He, 2002); some was conducted in only one province or one city (e.g., Lu et al., 2007). Our study extended existing knowledge by examining three major regional cities, Beijing, Shanghai, and Wuhan.

Rational perceptions affecting adoption intention

Four constructs in the research model were classified as rational perceptions, namely utilitarian expectation, hedonic expectation, status gains, and status loss avoidance. We found that utilitarian expectation and hedonic expectation directly and significantly influence the three groups of Chinese consumers' intentions to adopt 3G. Moreover, according to the two constructs' regression weights (β values) on adoption intention, utilitarian expectation is the most important influential factor for Beijing and Wuhan consumers, and hedonic expectation is the most important factor for Shanghai consumers influencing their intentions to adopt 3G. It supports the findings in consumer behavior studies that Chinese consumers have different consumption preferences in regional markets, which suggest that residents in Shanghai are more likely to be hedonism-driven consumers, while people from inland China, such as

Wuhan and Beijing, are more likely to be utilitarian-driven consumers (Zhou et al., 2009). Shanghai are more hedonism-driven consumers because its' cultural nucleus of the eastern region, representing the "Hai-Pai" culture, well known for having the best amenities and products for enhancing the quality of life, and significantly influenced by Western culture (Cui & Liu, 2000; Veeck et al., 2007). Thus, Shanghai consumers are more desire for pleasure and cosmopolitan, setting trends in fashion and lifestyles. Swanson (1998) described Shanghai consumers as brand-wise consumers: very brand and quality conscious, more loyal to goods made in Shanghai, with shopping and consumption habits that change quickly and they engage in relatively more brand switching than others.

That status gains have a directly positive influence on adoption intention was supported by the Beijing and Wuhan samples, but not supported by the Shanghai sample. Therefore, status gains is another important factor directly influencing 3G adoption intentions for Beijing and Wuhan consumers, but not for Shanghai consumers. This result was akin to our pilot interviews where Shanghai respondents, compared to the other samples, did not express status gaining motivations for the adoption of 3G. However, Shanghai respondents focused more on status loss avoidance.

Social influences affecting adoption intention

The relationship of normative influence positively affecting adoption intention was cross-validated by all the three samples. However, the concept of external influence was not an influential factor affecting intentions to adopt 3G in any of the three research cities. Research has discussed that mass media tries to exert influence on new product adoption and diffusion (Lee, Lee, & Schumann, 2002), especially in the early stage of the product's lifecycle (Andrews & Boyle, 2008), which was the case with 3G in China. However, our findings were aligned with our pilot interviews that Chinese consumers did not consider advertising and the general information retrieved from secondary sources as direct influences on their adoption

decision-making. An example of direct quote was, *“You can see a lot of advertisements on the streets in Beijing, they tell you how good 3G is, how life would become easier if you used 3G. But I am not that sure if it is that good, and I won’t go to buy a 3G mobile phone, just because I saw those appealing advertisements”*

Behavioral control affecting adoption intention

The negative relationship between cost and adoption intention was fully supported by the three samples. Based on the β values, it can be seen that cost had a significant influence on Chinese consumers in the three research cities, which proved the concept of cost was an important factor in 3G adoption. Specifically, it was the second important influential factor for Beijing consumers, but less for Wuhan, its importance being very close to the factor of utilitarian expectation, which may reveal that Beijing consumers are relatively more cost conscious compared to those of the other cities.

That quality concern negatively affects adoption intention was fully supported by the three samples as well. The effect of quality concern on intention to adopt 3G was also significant, but much less than the effect of cost. Specifically, for Wuhan consumers, quality concern was the least important factor affecting their 3G adoption intentions. Wuhan is relatively closed to the foreign world. Compared to the other two cities, its residents have less Western influence and retain more traditional cultural values (Ralston et al., 1996; Zhang, Grigoriou, & Li, 2008). Therefore, they placed more importance on the factors related to social status change in their innovation adoption and still perceived using advanced mobile technology as a status symbol. As a result, Wuhan consumers may be less cost sensitive, comparing to other cities.

Conclusion and implication: same but different?

Our study has identified and developed concepts that are important to Chinese consumers' 3G adoption. Five concepts were generated and confirmed as influential factors affecting their likelihood of adopting the innovation. These factors identified the roles of utilitarianism, hedonism, and social outcomes in advanced mobile adoption, as well as the roles of normative social influence and perceived control of mobile technology adoption. Further, China is a substantial and complex market, and regional Chinese consumers have different consumption preferences that are ideal for intra-cultural comparative research. By comparing and contrasting the three groups of regional consumers, our study contributes to intra-cultural studies by adding to the knowledge of regional Chinese consumers' characteristics in consumption, particularly in mobile technology adoption. For example, Wuhan consumers maintain more traditional and collective cultural values, since they are more likely to be affected by normative influence from important others, whereas Shanghai and Beijing consumers are becoming more individualistic and cosmopolitan. Consumers from Eastern coastal areas in China such as Shanghai, who have been long influenced by Western culture, are more likely to be hedonism-driven consumers. Those consumers from inland areas, such as Beijing and Wuhan, are relatively conservative and more likely to be utilitarianism-driven consumers.

There are some limitations to our study that should be acknowledged. The web-based survey excluded potential 3G users who are non-computer-literate segments of the population, such as the elderly. While this limitation is noted, it should not undermine the study results because, according to Rogers (2003), early adopters tend to be young and educated, which has been supported by IT adoption studies (e.g., Hong & Tam, 2006; Okazaki, 2005). In terms of the findings regarding regional variations identified in our study, these may only present the variations among indigenous local residents of the three cities; they may not be representative of the immigrant population from other provinces or rural

regions who live in these cities. The population of immigrants in Chinese cities has substantially increased every year since the 1980s (Veeck et al., 2007). Such variations should be taken into account when considering the extent to which the findings can be generalized to such regional populations. Lastly, our study focused on potential users' intentions rather than current users' actual behavior. Even if it is notionally implied that intentions lead to actions, it is beyond the scope of the research program to measure actual adoption behavior in a longitudinal fashion. As the stability of intentions may change over time (Ajzen, 2005), only measuring intentions might be inadequate in predicting actual adoption behaviors. However, the focus on potential users is thought to be appropriate, given that the development of 3G is still in its infancy in China.

Nonetheless, future research can re-examine our model in a new context such as long-term evolution (LTE) services. Although the LTE is only available in limited geographical areas, but telecommunication providers, such as China Telecom, have been actively expanding their LTE services. Thus, in the future, Chinese mobile users will gradually migrate from 3G to LTE. It is thus useful to replicate our research model to the LTE context. Further, future research can apply UTAUT model and examine the mediation effects to the LTE context as well.

For practitioners our findings have substantial implications for future marketing strategy and campaigns, particularly for international companies operating in China, but are also of importance to domestic companies. When planning to implement marketing programs to encourage the take up of G technology and the resulting G services to be offered to consumers, marketers need to ensure that they are positioning their offerings in ways that take into account these important influential factors.

Furthermore, the research program also identified variations among Chinese regional consumers regarding 3G adoption, by examining similarities and differences in the influential

factors affecting consumers from three regional cities, which provides a better understanding of Chinese consumers. Those variations showed significant regional differences in the relative importance of particular factors in determining their adoption intentions. Practitioners should therefore be aware of these similarities and differences, in order to adapt their marketing strategies to suit consumers in regional Chinese markets

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Appendix A: Summary of China-Based ICT Adoption Research Studies

Reference	Research context	Sample	Variable examined
Zhu & He (2002)	City residents' use of internet.	2664 residents from Beijing city and Guangzhou city.	Perceived popularity. Perceived characteristics. Perceived need.
Pavlou & Chai (2002)	Internet users' adoption intention of e-commerce.	58 internet users in China.	Attitude. Subjective norm. Perceived behavioural control. Trust.
Lu et al. (2003)	Business managers' intention to adopt mobile internet services.	128 MBA students in Beijing city.	Perceived usefulness. Perceived ease of use. Social influence. Facilitating conditions. Trust. Complexity.
Mao & Palvia (2006)	Company workers' adoption of email system in organizational context.	533 workers from 30 Chinese companies.	Attitude. Subjective norm. Perceived usefulness. Perceived ease of use. Compatibility. Visibility. Triability. Result demonstrability. Image.
Park et al. (2007)	College students' adoption of mobile devices.	121 Internet users in China.	Performance expectation. Effort expectation. Social influence. Facilitating condition. Attitude.
Lu et al. (2007)	College students' intention to adopt mobile internet services.	620 college students in Zhejiang province.	Long-term/Near-term performance expectancy. Effort expectancy. Personal innovativeness. Social influence. Trust.
Shen & Chen (2008)	College students' intention to adopt mobile advertising	238 college students in Hefei city	Entertainment. Informativeness. Irritation. Credibility. Perceived usefulness. Perceived ease of use. Perceived risk. Existing knowledge. Attitude. Subjective norm. Perceived behavioural control.