

Investigating adopter categories and determinants affecting the adoption of mobile television in China¹

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Abstract

This study investigates youths' perceived adoption of China Mobile Multimedia Broadcasting (CMMB), the largest mobile TV service (MTVS) in the world, and examines differences among adopter categories (i.e., continuers, potentials, and resisters) in Beijing and Shanghai. The web surveys of 336 young mobile users find the early adopter markets facing challenges of low brand awareness and service dissatisfaction. Showing more interest in conventional TV content, respondents are concerned about CMMB's signal quality, energy use, and cost. Results reveal adopter categories (adopters and non-adopters, and potentials and resisters) vary in perceived characteristics of CMMB MTVS, including complexity, relative advantage, and perceived popularity. The two pairs are also found to be significantly different in innovativeness. Comparing young adults in the two cities, those in the latter expect more diverse content and better signal quality. A model consisting of 3G multimedia service use, disposable allowance, and perceived popularity is proposed to predict future adoption of mobile TV.

Keywords: mobile TV, mobile broadcasting TV, adoption, characteristics of innovation, adopter category, young user

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1. Introduction

Mobile TV, which allows people to watch videos without constraints of time and space, has seen increasing popularity worldwide (Choi, Kim, & McMillan, 2009). The global mobile TV market has witnessed a significant growth in the past few years as a result of advanced mobile technologies and improved service pricing models and quality (RNCOS, 2011). Asia is the powerhouse propelling the market growth of mobile TV as it has more than half of global mobile subscriptions, cutting-edge mobile technologies, and compatible lifestyles (Lin, 2012). Mobile broadcasting TV services (MTVS) that transmit audiovisual content with a scheduled timetable over broadcast networks is developing rapidly in a few countries, especially in China which has developed the largest mobile TV market in the world (Lin, 2013).

China Mobile Multimedia Broadcasting (CMMB), a leading provider of mobile TV services, was launched after the 2008 Beijing Olympics and usage of its services diffused at a stunning speed (Zhong & Zhang, 2010). With the full support of the State Administration of Radio, Film, and Television (SARFT), the TV industry regulator, CMMB's national agent, Chinese Broadcast Corporation (CBC) launched commercialized a MTVS called "JingCai" in August 2009. In late 2011, CMMB MTVS transmission covered more than 336 cities and 850 counties, attracting 37 million Chinese users after three years of commercialization (Communications Weekly, 2012). This fast-growing CMMB MTVS, the only commercialized mobile broadcasting TV in China, leads both domestic and global mobile TV markets. Research reports show that Chinese young people not only make up the largest group in CMMB's user market but also spend much more time on using it than other age groups (Institute of Digital Media Research of CUC, 2010; SARFT.Net, 2011). In geographically extensive Chinese markets, people are influenced by various cultures which may lead to different demands, preferences, usage, and adoption. Based on Roger's (2003) diffusion theory, this study focuses on investigating the perceived adoption and usage of CMMB among young college students in Beijing (the first city where CMMB was launched) and Shanghai (the first city deploying a paid CMMB model) in order to compare their similarities and differences.

Two web surveys which were conducted on students in two universities to investigate their perceived characteristics of CMMB, adoption, and usage (i.e., viewing behavior, preferable content/services and pricing). We also examined the differences among adopter categories. Comparing the two cities, cultural influences in adopting and using CMMB MTVS may be found. As for contributions, this study can shed light on determinants and adopter categories influencing the diffusion of emerging mobile multimedia services as well as provide industry players with insights on markets and users in order to develop desirable mobile content and services.

2. Literature Review

2.1 Mobile TV Adoption and Use

Some who regard mobile TV as a "portable mini television" (Kaasinen et al., 2009; Lu & Liu, 2009) adopt this new media to watch existing TV programming, while others think mobile TV frees

traditional video consumption from the constraints of time and space (O'Hara, Mitchell, & Vorbau, 2007). Instead of passive couch potatoes, mobile TV viewers engage in active TV viewing behavior due to interactive services and applications (Södergård, 2003). Past mobile TV studies show user adoption is affected by motivations, viewing occasions, time spent as well as program duration.

Motivation and User Pattern

There are several main reasons which motivate mobile TV adoption including mobility, convenience, interactivity, fashion and status, and content (Choi et al., 2009; Cui, Chipchase, & Jung, 2007; Lin & Hong, 2011). Song and Tjondronegoro (2010) find that people are motivated to use mobile videos for killing time, waiting and commuting, entertainment, and relaxation. Shared viewing experience among social networks is another key motivation in mobile TV use (Cui et al., 2007; O'Hara et al., 2007). Lin, Jung, and Sim (2011) also find impression management and social norms are positively associated with people's intention to use mobile videos.

The viewing timing of mobile TV may also be related to opportunities for people to sit down and enjoy watching videos comfortably (Miyachi, Sugahara, & Oda, 2009). Mobile TV is frequently used in three spheres: home, work, and public (Kaasinen et al., 2009). Studies in the UK, South Korea, and Australia find home is the most popular place for watching mobile TV (Cui et al., 2007; Song & Tjondronegoro, 2010). Although a CMMB survey reveals 76.2% of users watch it at home (CMMB Media Data Research Center, 2010), another study finds that Chinese use mobile videos more often when they are using public transportation (Lu & Liu, 2009). Most suggest keep mobile videos short because users have a short attention span while viewing videos on small screens (Petrovic, Fallenböck, Kittl, & Langl, 2006). Han and Yang (2010) find that Chinese people watch CMMB less than 60 minutes per day. CMMB Media Data Research Center (2010) shows that people in nine major cities use CMMB MTVS once daily with viewing times varying from 16 minutes (Chengdu) to 71.5 minutes (Shanghai). It finds that peak hours occur in the morning (6:00-8:00am) and evening (19:00-20:00). A different study show that 88% of mobile TV users in China believe the most suitable mobile TV program duration is between 3 to 15 minutes (Lu & Liu, 2009).

Content

Mobile TV content is a key factor in its adoption (Lin & Liu, 2011). Mobile TV serves as a useful platform to catch live broadcasts of important events when traditional TV is unavailable (Ankeney, 2009). Some studies show that users favor original mobile TV content which allows them to watch short video clips during traveling or commuting (Carlsson & Walden, 2007). Lin and Hong (2011) find Singaporeans prefer existing TV content and information services (e.g., stock market, traffic and weather forecast). It is also important to have local programming in mobile TV content (Kaasinen et al., 2009). Although some studies highlight user-generated content (UGC) as an "important user expectation" in mobile TV content (Buchinger et al., 2009), others show discouraging results (Kaasinen et al., 2009). Lin and Hong (2011) find Singaporeans consider UGC as an enhancement to mobile TV content rather than a must-have.

Currently, CMMB users can watch seven channels: five national channels (CCTV 1, CCTV 5, CCTV

news, Jiangcai Film, Jiangcai Sports) and two local channels (one provincial channel and one municipal channel). Although paid CMMB MTVS includes some original channels (e.g., JingCai Film) and value-added information services (e.g., traffic, stock market, and mobile news), UGC and mobile internet are not part of the content.

Pricing

In a study analyzing Americans' attitudes towards mobile TV, the majority regard cost as a primary consideration in subscribing to MTVS (ComScore, 2007). Users are likely to pay when mobile TV services provide attractive content at a reasonable price (Kaasinen et al., 2009). CMMB MTVS was diffused rapidly when it provided free services initially. The later implementation of a subscription model slowed down its rollout (Lin, 2013). In addition to free videos, CMMB users must pay extra fees for value-added information services like JingCai Finance and Stock/Navigation. Tencent Tech's survey shows that 98.96% of potential users prefer to pay a monthly fixed rate for CMMB MTVS (Guo, 2009). Later, CMMB pricing discrepancies in China's markets have been settled with a standardized monthly subscription fee (US\$ 1.80) nationwide in mid 2010 (Sohu.com IT, 2009).

2.2 Factors Affecting Adoption of Mobile TV

The adoption of innovation like mobile TV is affected by several factors including adopter categories, perceived characteristics of innovation, perceived popularity, and adopters' demographics (Rogers, 2003).

Perceived Characteristics of Innovation

According to Rogers (2003), the adoption of innovation are affected by perceived characteristics of innovation, such as (1) relative advantage perceived to be better than similar products; (2) compatibility perceived as being consistent with existing values, past experiences, and norms of people in the social system; and (3) complexity perceived as relatively difficult to understand and use. Past diffusion studies show that people are more likely to adopt an innovation if it offers relative advantages, appears easy to use, and compatible with adopters' existing values. Using mobile TV is likely to be compatible with experiences of watching traditional TV (Lu & Liu, 2009). According to Pape and Karnowski (2009), if mobile TV services are too complex, they may not be successful. As CMMB MTVS does not provide trials and the small number of early adopters are less likely to demonstrate visible results, this study does not examine triability and observability.

Perceived Popularity

Perceived popularity exerts a greater impact on the adoption and discontinuance of interactive media due to its interdependence among users and interconnectivity (Markus, 1987; Zhou, 2008). This construct is related to perceived critical mass to reach the point at which enough individuals in a system adopt an innovation and cause a self-sustaining rate of adoption (Rogers, 2003, p. 343). Kwon and Chon (2009) consider perceived popularity as one dimension of social influence which predicts the adoption of mobile TV in Korea because adopters anticipate existing or potential popularity of this new media.

Image

This construct is defined as the “degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system” (Moore & Benbasat, 1991, p. 195). Image may be a determinant for people to adopt CMMB MTVS if they relate the usage to their positive impression or improvement of sociability or popularity.

Adopter’s Categories

Mobile TV adoption may be different among the adopter categories. When studying the adoption of online games, Chang, Lee, and Kim (2006) identified four categories of adopters and non-adopters, and labeled them as “Continuers,” “Discontinuers,” “Potentials,” and “Resistors.” Lin, Chiu, and Lim (2011) also used these categories to examine Singapore working adults’ adoption of social networking sites (SNS) as follows:

- (1) Continuers – respondents who are current users within the last three months;
- (2) Discontinuers – respondents who have used the technology before but have not used it within the last three months;
- (3) Potentials – respondents who have not used the technology before but have expressed an interest to use it;
- (4) Resistors – respondents who have not used the technology before and are not interested in using it.

Various factors may affect the four adopter categories in deciding to adopt emerging interactive networked media differently (Chang, Lee, & Kim, 2006; Lin, Chiu, & Lim, 2011). As CMMB MTVS was at the early adopter stage during data collection, there were no Discontinuers identified in the survey. Hence, this study proposes:

H1: Different adopter categories (Continuers, Potentials, and Resistors) differ in their perceived characteristics of CMMB MTVS.

H1a: Adopters (Continuers) and non-adopters (Potentials and Resistors) differ in their perceived characteristics of CMMB MTVS.

H1b: Potentials and Resistors differ in their perceived characteristics of CMMB MTVS.

Adopter Characteristics

Prior studies find that demographic profiles and user innovativeness are both strong predictive variables regarding mobile TV adoption (Chang, Lee, & Kim, 2006). Adopters, particularly early adopters, tend to be younger, more educated, and more affluent than non-adopters (Rogers, 2003). This study focuses on the adoption and use of CMMB MTVS among young college students because they are more likely to watch mobile TV for relative advantages like mobility, convenience, and interactivity (Lee et al., 2010; Lin & Hong, 2011). They also tend to use mobile technology to fulfill needs for self-expression, to develop self identity, connect with peers, and obtain validation from others

(Axelsson, 2010; Si & Zhu, 2011; Walsh, Katz, & Sugiyama, 2006). Some youths create temporary private spaces in public sphere by immersing themselves in mobile TV watching (Lei & Wang, 2009). Also, males are more likely than females to adopt new technologies (Leung, 1998; Leung & Wei, 1998; Rogers, 2003). 65% of mobile TV subscribers in US are males who show stronger interest in this new media than females (comScore, 2007). According to CMMB Media Data Research Center (2010), more males in China adopt CMMB MTVS. Males are motivated by status and fashion while females tend to adopt mobile TV for entertainment and social interaction (Choi et al., 2009; Lee et al., 2010).

Innovativeness, referring to an individual's tendency to seek novelty and to be receptive to new ideas (Rogers, 2003), is found to be a key predictor of adoption of new technologies (Li, 2004; Lin, 2006). Vishwanath's study (2006) finds technological opinion leaders tend to be significantly more innovative. Usually early adopters of mobile TV serve as a role model for other members in the same social system (Trefzger, 2005). With regard to mobile TV adoption, the more innovative youths are likely to become earlier adopters of CMMB MTVS. Hence, this study proposes the hypotheses:

H2. Different adopter categories (Continuers, Potentials, and Resistors) of CMMB MTVS vary in adopter characteristics (demographics, innovativeness, adoption of 3G multimedia services).

H2a. Adopters and non-adopters of CMMB MTVS vary in adopter characteristics (demographics, innovativeness, adoption of 3G multimedia services).

H2b. Potentials and Resistors of CMMB MTVS vary in adopter characteristics (demographics, innovativeness, adoption of 3G multimedia services).

Culture

Buchinger et al. (2009) argue that the use of mobile TV is strongly influenced by different cultures and lifestyles which influence one's perceived value of mobile TV and thus affect adoption. Culture is also found as a key factor affecting European youths' preferences of mobile TV services (Constantiou, Papazafeiropoulou, & Vendelø, 2009). According to Lin and Liu (2010), culture is an underlying factor in shaping the mobile TV market and industry in Singapore and Taiwan. Also, when Lin (2012) and Lin (2013) examined the development of CMMB MTVS in Beijing and Shanghai, they found that business models, adoption, and user behavior in two major Chinese cities differed. Beijing, China's capital city, where the regulatory agent SARFT and national broadcaster CCTV are located, utilizes a broadcaster-led mobile TV operation. The first commercial launch of CMMB took place in Shanghai where CMMB is operated by a broadcaster-mobile operator consortium (Lin, 2013). Market cultural differences between the two cities may affect the adoption of CMMB.

H3: Young adults in Beijing and Shanghai differ in perceived characteristics of CMMB MTVS, its value factors, and adopter characteristics (age, gender, disposable allowance, use of 3G multimedia services, and innovativeness).

3. Method

This survey study investigated how young adults in Beijing and Shanghai perceived their adoption and use CMMB MTVS. It also examined factors (perceived characteristics of innovation, adopter characteristics, and culture) affecting youth's adoption of CMMB MTVS among adopter categories. This study also proposed a model to predict the adoption of CMMB. From March to April 2011, the researchers sent out several rounds of email invitations with the survey questionnaire and posted the link to the questionnaire on popular Chinese BBS forum and SNSs (e.g., Ren Ren) to recruit college students who are mobile phone users in two comprehensive universities. In total, we obtained 336 respondents in a Beijing's University (156 valid samples) and in a Shanghai's University (180 valid samples).

3.1 Measures of Key Variables

Demographics. This study referred to similar surveys to make demographic categories to better measure college students in mainland China, including gender, age, graduate level, and monthly disposable allowance. The age groups were divided into "below 20," "21-25," "26-30," and "Above 31" and the categories of graduate levels were divided by China's formal school system, including "Freshman," "Sophomore," "Junior Student," "Senior Student," and "Graduated Students." The monthly allowance categories encompassed "below RMB\$1,000," "RMB\$1,001 - \$1,500," "RMB\$1,501 - \$2,000," "RMB \$2,001 - \$3,000," and "RMB \$3,001 and above."

CMMB Use. This survey asked questions about CMMB use in various aspects. First, it identified adopter categories (adopter (Continuers²) and non-adopter (Potentials and Resistors) by asking respondents whether they used CMMB MTVS and to what extent they planned to adopt CMMB in the future. We categorized the respondents who answered "very likely," "likely," and "neutral" to use CMMB MTVS in the future as Potentials, but those who answered "very unlikely," and "unlikely" to use CMMB MTVS in the future as Resistors.

The questionnaire also asked about motivations to adopt CMMB MTVS (killing time, recreation, fashion, socialization, receiving information, socio-economic status, mobility convenience, and others). When asked about occasions for using CMMB MTVS, we listed six items (commuting, waiting, work/study, resting, before sleep, and other). Time spent per day on CMMB MTVS included "less than 30 min," "31 min-1 hr," "1-2 hrs," and "above 2hrs." Their gratification level of using CMMB MTVS was measured by a five-point Likert scale ranging from "highly satisfied" to "strongly unsatisfied." In addition to affordable cost, the respondents were asked to select and rank their preferred content and services for CMMB MTVS. To assess brand awareness, the respondents were asked whether they heard about CMMB MTVS and its brand name, "JingCai."

Variables for Factors Affecting Adoption. The independent variables for factors affecting adoption (compatibility, image, perceived popularity, relative advantage, complexity, and innovativeness) were measured on a five-point Likert scale ranging from "strongly agree" to "strongly

²As CMMB was at the early adopter stage during data collection, we did not find any discontinuers in the dataset. Therefore, there were only continuers in the adopter category.

disagree.” The questions were modified from instruments used in previous studies (Choi et al., 2009; Kaasinen et al., 2009; Kwon & Chon, 2009; Lee et al., 2010; Pape & Karnowski, 2009; Li, 2004).

The respondents were asked to rank their concerns about CMMB MTVS (signal quality, energy saving, service fee, hand phone price, content variety, interactive features, and interactive content and services). Two other multiple selection and ranking questions were related to preferred mobile TV content genres (news, sports, drama, entertainment, comedy, variety show, and others) and preferred mobile TV services (conventional TV content, downloaded videos, original mobile TV content, user-generated content, information service, interactive content, and electronic program guide (EPG)).

Scale Reliability

Cronbach's Alpha was used to measure the reliability of the scales used for measuring the factors in the research framework. Most of the scales generated Alpha coefficients above or close to the cut-off of 0.55. The Cronbach's Alpha of perceived characteristic of CMMB MTVS is 0.81, which generally indicates high reliability.

<Table 1 about here>

3.2 Data Analysis Method

Chi-square and t-test were used to verify the differences between adopters and non-adopters of CMMB MTVS. Chi-square was used to test relations between two nominal variables such as age and educational and gender differences between adopters and non-adopters. Independent sample t-tests were used to test for differences between adopters and non-adopters in terms of compatibility, image, perceived popularity, relative advantage, complexity, and innovativeness. Regression analysis examined aforementioned factors and their relation on the level of CMMB future adoption. Finally, a model was established to predict CMMB MTVS' adoption.

4. Findings

4.1 Descriptive Statistics

In the sample, males (52.7%) slightly outnumbered females (47.3%). 59.2% of the respondents were between 21 and 25 years old, and 35.7% were below 20 years old. 73.2% of them were university students, and 26.8% were graduated students. Over 60% belonged to five schools: “School of Journalism and Communication (14.6%),” “School of Management (14.3%),” “School of Government and International Studies (12.8%),” “School of Computer Science & Technology (12.5%),” and “School of Economics (9.5%).” Most of their monthly allowances were under \$1,000 (47.3%) or between \$1,001 – \$1,500 (35.4%).

<Table 2 about here>

4.2 CMMB MTVS Adoption and Use

In terms of adopter categories, most of the respondents (88.1%) in this study were non-adopters

and only 9.52% adopted this new technology, which indicated that the CMMB MTVS was still at the early adopter stage (Rogers, 2003). There were more males (60%) in the adopter (continuer) category than females (40%). CMMB adopters mainly were 21–25 years old (50%) and most of them were graduated students (46.7%) and freshmen (33.3%). 70% of adopters' monthly allowance ranged under \$1,500. In the two cities, adopters were far less than non-adopters and the majority of non-adopters showed willingness to adopt CMMB MTVS in future (potentials). Respondents in Shanghai had more adopters and potentials than those in Beijing.

<Table 3 about here>

The results showed the reasons which motivated the respondents to adopt the emerging CMMB MTVS most were Leisure (28%), Information Seeking (18.7%), and Killing Time (16%). 77.4% of adopters used CMMB less than 60 minutes per day. They used this service when resting (35.6%), waiting (32.2%), and commuting (20.3%). The adopters seldom used CMMB MTVS when they stayed with family/friends or in class.

Similar to prior studies, respondents who had short attention spans preferred to watch short mobile videos. 74.9% of the respondents felt the appropriate time for watching mobile videos was less than 15 minutes. 57.8% preferred watching short mobile videos (<10 minutes). Only 8.7% could bear longer videos (> 21 minutes). Pricing is found as a key factor in adoption. 79.8% of the respondents would pay less than USD \$1.60 monthly for CMMB MTVS and only 1.8% of them would pay more than USD\$ 3.2 for this new media.

Value factors which young college students were most concerned about were signal quality (Mean=4.44), service fee (Mean=4.2) and energy use (Mean=4.02). Comparatively, they placed less emphasis on interactivity (Mean=3.21).

In terms of preferred content and services, these youth respondents preferred CMMB MTVS to provide conventional TV programming (Mean=4.03), and information services (weather, traffic, and stock market) rank second (Mean=3.81). Online user-generated videos, downloaded videos, original mobile TV content, and EPG were of medium interest. The respondents showed least interest in interactive services (Mean=3.02). To rank favorite content genres, the respondents favored drama (Mean=2.35) most and news least (Mean=4.29). The rest of the genres shared similar findings: variety show (Mean=3.46), entertainment (Mean=3.45), comedy (Mean=3.43), and sport (Mean=3.34). The open-ended question asked what kinds of CMMB content/services would stimulate users' adoption or usage, and the answers showed movies and foreign TV channels as two desirable content and services in addition to existing TV programming.

Awareness of CMMB MTVS and its brand name "JingCai" was found to be low. 58.6% of the respondents never heard about CMMB MTVS, while 88.7% never heard about JingCai. Service satisfaction also showed much room for improvement. 40.6% of adopters felt dissatisfied or strongly dissatisfied with CMMB MTVS. However, future adoption seemed promising as 57% of respondents

were likely or very likely to use it in future.

4.3 Factors Affecting Adoption of CMMB MTVS among Adopter Categories

Perceived Characteristics of CMMB MTVS

The findings showed users' perception of CMMB's "Complexity" scored highest (Mean=3.43), followed by "Compatibility" (Mean=3.38), while "Perceived Popularity" (Mean=2.41) scored the lowest. If this emerging medium is perceived as easy to use or it fits existing lifestyle and past experiences, youths tend to adopt it. However, in a nascent market, the small number of adopters creates little hype or popularity. That is why perceived popularity showed less influence on CMMB adoption. "Relative advantage" (M=3.21) and "Image" (M=2.59) were average.

Perceived Characteristics of Innovativeness among Adopter Categories

In terms of perceived characteristics of innovation, compared with non-adopters, adopters were more likely to perceive CMMB MTVS as popular ($t=3.61$, $df=334$, $p<.001$), easy to use ($t=-2.82$, $df=334$, $p<.01$), and offering relative advantage ($t=2.5$, $df=334$, $p<.05$). However, there is no difference between adopters and non-adopters in aspects of compatibility and image.

When compared with potentials, resisters were more likely to perceive CMMB MTVS as compatible ($t=-5.9$, $df=288$, $p<.001$), enhancing image ($t=-3.65$, $df=288$, $p<.001$), popular ($t=-4.79$, $df=288$, $p<.001$), less complex to use ($t=-2.54$, $df=288$, $p<.05$) and offering relative advantage ($t=-5.08$, $df=288$, $p<.001$) H2b is supported, and H1a and H1b are partially supported.

<Table 4 about here>

Comparing Adopter Characteristics among Adopter Categories

As for adopters' characteristics, the chi-square test results show that adopters and non-adopters differ significantly in innovativeness ($\chi^2=10.882$, $df=4$, $p<.05$). In terms of demographics, age ($\chi^2=25.141$, $df=3$, $p<.001$), disposable allowance ($\chi^2=15.341$, $df=4$, $p<.001$), and 3G multimedia service adoption ($\chi^2=46$, $df=1$, $p<.01$) also showed differences in the two categories. Adopters were likely to be younger and more innovative, with less disposable allowance, and used more 3G multimedia service users than non-adopters. There was no significant difference in terms of educational background (discipline) ($\chi^2=15.586$, $df=12$, $p>.05$) and gender ($\chi^2=1.369$, $df=1$, $p>.05$).

The results also show the adopter characteristics of potentials and resisters differ significantly only in innovativeness ($\chi^2=22.252$, $df=4$, $p<.001$). There was no significant difference in terms of age ($\chi^2=1.148$, $df=2$, $p>.05$), gender ($\chi^2=0.741$, $df=1$, $p>.05$), disposable allowance ($\chi^2=9.284$, $df=4$, $p>.05$), 3G multimedia services adoption ($\chi^2=9.136$, $df=4$, $p>.05$), educational background ($\chi^2=9.352$, $df=12$, $p>.05$). Hence, H2a and H2b are partially supported.

<Table 5 about here>

Comparisons between Adopter Cultures in Beijing and Shanghai

H3 examines how young adults in Beijing and Shanghai differ in their perception, use, and adoption of CMMB MTVS. The results showed 18% more of respondents in Beijing were satisfied with CMMB MTVS than those in Shanghai. "Relaxing" and "information seeking" are the top two reasons for youths using CMMB in both two cities. "Convenience" is the third reason for using CMMB in Shanghai, while Beijing's students selected "killing time." "Break" and "waiting time" are the top two occasions for youngsters to use CMMB MTVS in the two cities. The majority of respondents in Beijing (70%) and in Shanghai (81.9%) indicated that they used CMMB MTVS less than 1 hour per day. We also found in both cities that a cost of less than RMB 10 to use CMMB appealed to the majority in Beijing (76.97%) and in Shanghai (81.61%). It showed that the more it cost to use CMMB services, the less likely youths are to adopt it.

With respect to CMMB's favorite content/services, respondents in both cities showed homogenous preferences in selecting "existing TV content," "information service," "user-generated videos" and "EPG" as the top four choices. As for favorite content genres, both Beijing's and Shanghai's students selected "news" as their first choice and "drama" as the last perhaps due to the shorter length and "live" and timely nature of news. Comparatively, Beijing respondents, who experienced the launch of CMMB for during the 2008 Olympics, preferred having "sports" in the content much more than Shanghai's respondents, while Shanghai's respondents liked "variety show" a lot better than those in Beijing. Lastly, most respondents in Beijing (56.3%) and in Shanghai (57.8%) preferred mobile videos that were under 10 minutes in length. Young people in both cities were less likely to watch long mobile videos.

Table 6 shows the comparisons of perceived characteristics of innovation and value factors of CMMB MTVS between youths in the two cities. The analysis shows no significant difference in how young people in Beijing and Shanghai perceived characteristics (compatibility, image, perceived popularity, relative advantage, complexity, and innovativeness) of CMMB MTVS. However, Shanghai students were more likely to value CMMB MTVS for content variety ($t=-2.846$, $df=334$, $p<.01$) and better signal quality ($t=-2.192$, $df=334$, $p<.05$).

<Table 6 about here>

Moreover, the results show no significant difference in terms of the two cities' respondents toward CMMB MTVS adoption ($\chi^2=0.102$, $df=1$, $p>.05$) and future adoption ($\chi^2=4.794$, $df=5$, $p>.05$).

Logistic Regression Result

The Forward Method was used in the Multinomial Logistic Regression model which aims to establish a model to predict the adoption of CMMB. This study used 13 independent variables (age, gender, grade, city, monthly disposable allowance, 3G multimedia service adoption, 3G multimedia services satisfaction, compatibility, image, perceived popularity, relative advantage, complexity, and

innovativeness) to trial run. The results reveal three most important independent variables: 3G multimedia services adoption, monthly disposable allowance, and perceived popularity. Because the case numbers 4, 9, 48, 131, 158, 165, 251, 313, 318, and 335 have overly high standardized Residual (-3.626, -3.150, -3.150, -3.245, -3.245, -3.442, -3.823, -3.442, -3.062 and -3.442) in Casewise Diagnostics, these items were deleted.

According to the coefficients results (Table 7), the analysis of odds ratio are as follows:

1. 3G Multimedia Services Adoption

On average, "3G Multimedia Services Adoption" results in 87.407 times the ratio of CMMB adoption. That is, 3G multimedia services adopters has 87.407 times odds ratio than non-3G multimedia services adopters to use CMMB.

2. Monthly Disposable Allowance

On average, one unit increase in "Monthly Disposable Allowance" results in 2.587 times the ratio of CMMB adoption. In this study, the monthly allowance categories encompassed "Below \$1,000," "\$1,001 - \$1,500," "\$1,501 - \$2,000," "\$2,001 - \$3,000," and "\$3,001 and above." That means a person who has "\$1,001 - \$1,500" monthly disposable allowance has 2.587 times odds ratio compared to a person who only has "Below \$1,000" monthly disposable allowance.

3. Perceived Popularity

On average, one degree increase in "Perceived Popularity" results in 2.382 times the ratio of CMMB adoption. In this study, the degree of perceived popularity was measured on a five-point Likert scale ranging from "Strongly agree", "Agree," "Neither agree nor disagree," "Disagree" to "Strongly disagree". In other words, the person select "Strongly agree" about CMMB MTVS's characteristic of perceived popularity has 2.382 times odds ratio than the person select "Agree."

Based on the results, the m Nagelkerke $R^2 = 0.539$ (multiple determination coefficient) which is most appropriate for this study. It can explain the highest rate of adoption of CMMB (53.9%). As its P values of all variables are significant, the model is accepted.

<Table 7 about here>

5. Discussion and Conclusion

This study found that CMMB MTVS, the leading mobile TV in China, was still at the early adopter stage in Beijing and Shanghai in early 2011. There were more non-adopters (88.1%) than adopters (9.52%) and potentials (74.11%) outnumbered resisters (13.99%). In Shanghai, there were slightly more adopters and potentials of CMMB MTVS than in Beijing. The results signified the likely growing take-up of CMMB MTVS among young adults. However, CMMB operators must strengthen publicity to boost its brand awareness as only 41.4 % and 11.3% of respondents heard about CMMB and JingCai respectively. Besides, 40.6% of adopters (continuers) felt unsatisfied or very unsatisfied about the current service, indicating the need for improvement for its future widespread rollout.

This study showed that Chinese young adults tended to regard this new media as a "portable mini television" or an extension of screens for video viewing as they preferred having conventional TV

programming in the content. They would use mobile TV more in public when they had no access to the TV or PC screen. Their motivations to use mobile videos included killing time, waiting, commuting, information seeking, resting, and leisure. The respondents were concerned most about signal quality, battery life, and costs (service fee and mobile device price).

As for favorite mobile TV content, urban youths in China preferred existing TV programming and information services. This result may be caused by the initial CMMB MTVS lineup which only contained free national channels, free local channels and limited information services. The findings showed news, which by nature requires immediacy, was the most favored genre while drama was the least popular. Due to short attention spans on mobile phone screens, most young adults (74.9%) preferred short content, which suggests that mobile content creators should develop videos less than 15 minutes in length. Additionally, in the media-saturated metropolitan cities, the majority of young college students were only willing to pay a cheap monthly flat fee (less than USD \$1.60) for this new media.

This study found when Chinese young people perceived CMMB as easy to use, more popular, and relatively advantageous, they tended to adopt the new media. When comparing adopters and non-adopters as well as potentials and resisters with respect to CMMB MTVS, they varied in perceived popularity, complexity, and relative advantage of CMMB MTVS (perceived characteristics of innovation) and innovativeness (adopter characteristics).

<Table 8 about here>

Perceived popularity plays an important role in affecting the adoption of interactive new media (Rogers, 2003). Many mobile TV studies found young people tend to adopt mobile TV to develop self identity and obtain validation from others (Axelsson, 2010; Walsh, Katz, & Sugiyama, 2006; Si & Zhu, 2011; White & Young, 2010). As CMMB MTVS was still at its infancy in early 2011, there was not enough hype. That was why perceived popularity in this study scored lowest among the perceived characteristics of CMMB MTVS. However, perceived popularity was found to be positively associated with the adoption of CMMB MTVS which differentiates non-adopters from adopters (continuers) as well as potentials from resisters. In the proposed model, perceived popularity is identified as one crucial variable to predict CMMB MTVS' future adoption.

With respect to adopter characteristics, the results revealed significant differences in innovativeness when comparing the two pairs (adopters and non-adopters, potentials and resisters). In other words, adopters tend to be more innovative than non-adopter, and potentials more than resisters. Besides, age, disposable allowance, and 3G multimedia service adoption were found to be only related to adopters and non-adopters. That is, adopters (continuers) were likely to be younger with more disposable allowance, and tended to use 3G multimedia services than non-adopters.

The adoption and usage of mobile TV is influenced by different cultures and lifestyles (Buchinger et al., 2009; Lin & Liu, 2011; Lin, 2012; Lin, 2013). The findings show no difference when examining how young people in Beijing and Shanghai perceived characteristics of CMMB MTVS.

Nonetheless, we found Shanghai's young people valued diverse mobile TV content and good viewing quality more than those in Beijing. Finally, based on the result of coefficients, the model which contains 3G multimedia service adoption, monthly disposable allowance, and perceived popularity can better predict the adoption of CMMB MTVS.

Theoretically, this research shed light on the understanding of factors (characteristics of innovation and adopter characteristics) affecting the adoption of emerging mobile media and variations among adopter categories (continuers, potentials, and resistors). Empirical findings reveal CMMB MTVS user behavior, value factors, content preferences, pricing and cultural differences which can provide insight to industry players on developing and improving similar mobile video services. However, the small sample size might weaken generalization across the broad Chinese markets.

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Table 1. Analysis of Scale Reliability

| Variable | No. of items | Cronbach's Alpha, α |
|--|--------------|----------------------------|
| Perceived Characteristics of CMMB | 8 | 0.811 |
| Compatibility | 1 | - |
| Image | 1 | - |
| Perceived Popularity | 1 | - |
| Relative Advantage | 2 | 0.777 |
| Complexity | 2 | 0.593 |
| Innovativeness | 1 | - |

Table 2. Descriptive Statistics

| | | Beijing | Shanghai | SUM |
|------------------|---|-------------|--------------|-----------------|
| Gender | Female | 86 (56.6%) | 69 (39.66%) | 155 (47.55%) |
| | Male | 66 (43.4%) | 105 (60.34%) | 171 (52.45%) |
| Age | Below 20 | 70 (46.05%) | 47 (27.01%) | 117 (35.89%) |
| | 21~25 | 82 (53.95%) | 111 (63.79%) | 193 (59.2%) |
| | 26~30 | 0 (0%) | 15 (8.62%) | 15 (4.6%) |
| | 31~35 | 0 (0%) | 1 (0.57%) | 1 (0.31%) |
| School | Journalism and Communication | 12 (7.95%) | 36 (21.05%) | 48 (14.91%) |
| | Management | 35 (23.18%) | 12 (7.02%) | 47 (14.6%) |
| | Government and International Studies | 21 (13.91%) | 22 (12.87%) | 43 (13.35%) |
| | Computer Science & Technology | 30 (19.87%) | 9 (5.26%) | 39 (12.11%) |
| | Economics | 17 (11.26%) | 14 (8.19%) | 31 (9.63%) |
| | Law | 8 (5.3%) | 12 (7.02%) | 20 (6.21%) |
| | Philosophy | 8 (5.3%) | 11 (6.43%) | 19 (5.9%) |
| | Foreign Languages | 4 (2.65%) | 12 (7.02%) | 16 (4.97%) |
| | Medicine | 7 (4.64%) | 5 (2.92%) | 12 (3.73%) |
| | Chinese Language and Literature | 3 (1.99%) | 7 (4.09%) | 10 (3.11%) |
| | History | 3 (1.99%) | 0 (0%) | 3 (0.93%) |
| | Arts | 0 (0%) | 3 (1.75%) | 3 (0.93%) |
| | Others | 3 (1.99%) | 28 (16.37%) | 31 (9.63%) |
| Allowance | Below RMB 1000 | 78 (51.32%) | 77 (44.25%) | 155 (47.55%) |
| | RMB 1001~1500 | 49 (32.24%) | 65 (37.36%) | 114 (34.97%) |
| | RMB 1501~2000 | 19 (12.5%) | 20 (11.49%) | 39 (11.96%) |
| | RMB 2001~3000 | 1 (0.66%) | 7 (4.02%) | 8 (2.45%) |
| | Above RMB 3001 | 5 (3.29%) | 5 (2.87%) | 10 (3.07%) |

Table 3. Adopters Categories in Two Cities

| | Beijing | Shanghai | SUM |
|----------------------|----------------|-----------------|--------------|
| Adopters | 14 (8.97%) | 18 (10%) | 32 (9.52%) |
| Non-adopters | 138 (88.5%) | 158 (87.78%) | 296 (88.1%) |
| Potentials | 113 (72.44%) | 136 (75.56%) | 249 (74.11%) |
| Resistors | 25 (16.03%) | 22 (12.22%) | 47 (13.99%) |
| Missing Value | 4 (2.56%) | 4 (2.56%) | 8 (2.38%) |

Table 4. Characteristics of Innovation among Adopter Categories

| Variable | N | Mean | <i>t</i> | <i>p</i> |
|-----------------------------|----------|-------------|-----------------|-----------------|
| Relative Advantage | | | | |
| Adopter | 32 | 3.53 | 2.5 | 0.013* |
| Non-adopter | 304 | 3.18 | | |
| Compatibility | | | | |
| Adopter | 32 | 3.5 | 0.826 | 0.409 |
| Non-adopter | 304 | 3.37 | | |
| Complexity | | | | |
| Adopter | 32 | 3.75 | -2.82 | 0.005 ** |
| Non-adopter | 304 | 3.39 | | |
| Perceived Popularity | | | | |
| Adopter | 32 | 2.94 | 3.610 | .000 *** |
| Non-adopter | 304 | 2.36 | | |
| Image | | | | |
| Adopter | 32 | 2.66 | 0.433 | 0.666 |
| Non-adopter | 304 | 2.58 | | |

Note: *** $p < .001$ ** $p < .01$ * $p < .05$

Table 5. Comparing Characteristics among Four Categories

| | χ^2 | <i>df</i> | <i>p</i> |
|-------------------------------|----------|-----------|----------|
| Age | | | |
| Adopters vs. Non-adopters | 25.141 | 3 | .000 *** |
| Potentials and Resistors | 1.148 | 2 | 0.275 |
| Gender | | | |
| Adopters vs. Non-adopters | 1.369 | 1 | 0.362 |
| Potentials and Resistors | 0.741 | 1 | 0.282 |
| Disposable Allowance | | | |
| Adopters vs. Non-adopters | 15.341 | 4 | .000 *** |
| Potentials and Resistors | 9.284 | 4 | 0.198 |
| Educational Background | | | |
| Adopters vs. Non-adopters | 15.586 | 12 | 0.421 |
| Potentials and Resistors | 9.352 | 12 | 0.632 |
| Innovativeness | | | |
| Adopters vs. Non-adopters | 10.882 | 4 | 0.043* |
| Potentials and Resistors | 22.252 | 4 | .000 *** |
| 3G Multimedia Adoption | | | |
| Adopters vs. Non-adopters | 46 | 1 | 0.007** |
| Potentials and Resistors | 9.136 | 4 | 0.157 |

Note: *** $p < .001$ ** $p < .01$ * $p < .05$

Table 6. Differences of CMMB MTVS in Beijing & Shanghai

| Variable | N | Mean | <i>t</i> | <i>p</i> |
|---|----------|-------------|-----------------|-----------------|
| Perceived Characteristics of CMMB MTVS | | | | |
| Compatibility | | | | |
| Beijing | 156 | 3.3 | -1.694 | 0.091 |
| Shanghai | 180 | 3.46 | | |
| Perceived Popularity | | | | |
| Beijing | 156 | 2.37 | -0.751 | 0.453 |
| Shanghai | 180 | 2.44 | | |
| Relative Advantage | | | | |
| Beijing | 156 | 3.20 | -0.175 | 0.861 |
| Shanghai | 180 | 3.22 | | |
| Complexity | | | | |
| Beijing | 156 | 3.45 | 0.457 | 0.648 |
| Shanghai | 180 | 3.41 | | |
| Image | | | | |
| Beijing | 156 | 2.57 | -0.348 | 0.728 |
| Shanghai | 180 | 2.61 | | |
| Adopter Characteristics | | | | |
| Innovativeness | | | | |
| Beijing | 156 | 3.8 | 0.921 | 0.358 |
| Shanghai | 180 | 3.71 | | |
| Value Factor of CMMB | | | | |
| Signal Quality | | | | |
| Beijing | 156 | 4.33 | -2.192 | 0.029* |
| Shanghai | 180 | 4.54 | | |
| Content Variety | | | | |
| Beijing | 156 | 3.74 | -2.846 | 0.005 ** |
| Shanghai | 180 | 4.04 | | |
| Service Fee | | | | |
| Beijing | 156 | 4.12 | -1.494 | 0.136 |
| Shanghai | 180 | 4.27 | | |
| Mobile Phone Price | | | | |
| Beijing | 156 | 3.88 | -1.052 | 0.294 |
| Shanghai | 180 | 4 | | |

| | | | | | |
|---------------|---------|-----|------|-------|-------|
| Shanghai | | | | | |
| Interactivity | | 156 | 3.22 | 0.438 | 0.663 |
| | Beijing | 180 | 3.16 | | |
| Shanghai | | | | | |
| Energy Saving | | 156 | 4.11 | 0.518 | 0.605 |
| | Beijing | 180 | 3.94 | | |
| Shanghai | | | | | |

Note: *** $p < .001$ ** $p < .01$ * $p < .05$

Table 7. Coefficients of CMMB Adoption Model

| Independent Variables | B | Std. Error | Wald | df | Sig. | Exp(B) |
|---------------------------------|--------|------------|--------|----|---------|--------|
| (Constant) | -9.919 | 1.742 | 32.433 | 1 | .000*** | |
| 3G Multimedia Services Adoption | 4.471 | 1.070 | 17.468 | 1 | .000*** | 87.407 |
| Monthly Disposable Allowance | .950 | .273 | 12.115 | 1 | .001*** | 2.587 |
| Perceived Popularity | .868 | .324 | 7.187 | 1 | .007*** | 2.382 |

Note: *** $p < .001$ ** $p < .01$ * $p < .05$
 (-2 log likelihood ratio test = 84.135, $p = .000$)

Table 8. Comparisons of CMMB Adopter Categories

| Comparison | Perceived characteristic of CMMB | Adopter categories |
|---------------------------|---|---|
| Adopters vs. Non-adopters | perceived popularity; complexity; relative advantage; | innovativeness, age, disposable allowance, 3G multimedia service adoption |
| Potentials vs. Resisters | compatibility; perceived popularity; relative advantage ;image; complexity; | innovativeness |