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# Consumers' Awareness, Perceived Ease of Use toward Information Technology Adoption in 3G Mobile Phones' Usages in India

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## ABSTRACT

Mobile phones have grown to be the most widely used portable device in the world. Mobile phones' usage is rapid growth to the public in India. Moreover, the understanding of the people toward adoption of information technology in 3G mobile phones' usage shows relatively low in India. So, it is vital to find out the exact situation among consumers' intention to adopt 3G mobile phones. This study investigates consumers' awareness and perceived ease of use and their influence of information technology adoption in 3G mobile phones. The results show that the two hypotheses are valid. Based upon the research findings, implication, limitations and suggestions for future research are drawn, which include a proposition of a way forward in addressing the consumers' adoption on information technology toward 3G mobile phones' usages in India.

**Key words:** 3G mobile phone, information technology, usage, consumer, awareness, perceived ease of use

## INTRODUCTION

The theory of mobile telephony was discovered in AT and T's Bell labs in 1970's. In 1980's, the first generation (1G) launched with commercial deployment of advanced mobile phone service cellular networks and in 1990's, the second generation (2G) materialized when mobile operators deployed two competing digital voice standards. According to International Telecommunication Union (ITU), third generation (3G) of mobile telephony standards International Mobile Telecommunications 2000 (IMT-2000) to facilitate growth, increase bandwidth and support more diverse applications. 3G mobile technology enabled with speedy data transmission, large network capacity and more advanced network services such as multimedia services, video call, mobile Internet and mobile TV and its spectral efficiency (rate of information transfer) is faster than 2G technologies. The International Telecommunication Union (ITU, 2013), there are 6.8 billion mobile users around the world, i.e. equivalent to 96% among the world population (7 billion) and includes 2.09 billion 3G mobile users who equal to 30.1% in world population shown in Fig. 1-4.

Indian telecommunication industry is one of the world's largest in terms of the number of subscribers and the worlds' fastest growing markets in terms of the number of new subscribers (Ministry of Finance, 2009; Kannan, 2010; IBEF, 2011; Economic Times, 2010). The Indian mobile industry has 2.5 times more customer base than the United States (Wee, 2011). India had 906 million mobile phone subscribers i.e., equivalent to teledensity 73.33% among the India population (1.27 billion) at the end of May 2013 (TRAI, 2013) and includes 70.6 million 3G mobile users.

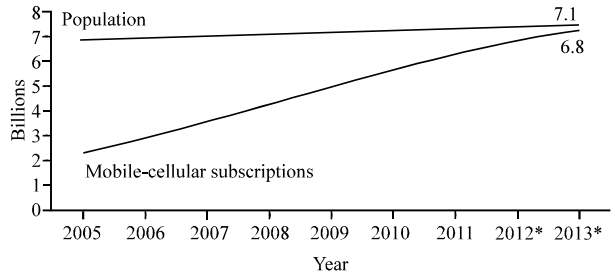


Fig. 1: Global mobile-cellular growth, Source: International Telecommunication Union, 2013

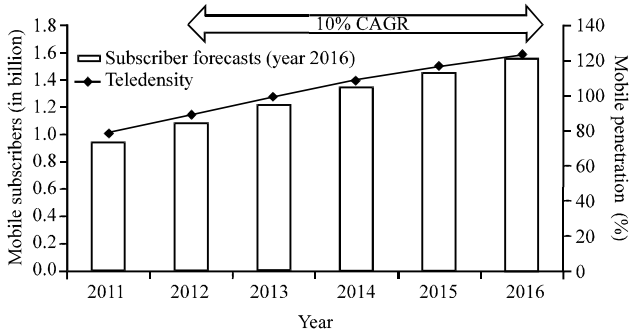


Fig. 2: India's mobile subscriber base forecast (2011-2016), Source: Evalueserve (2012)

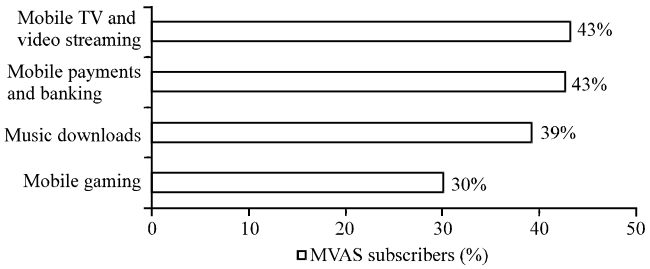


Fig. 3: India's high-growth mobile value-added services (MVAS) compound annual growth rate (2012-16), Source: Evalueserve (2012)

Evalueserve (2012) expected that the momentum to continue and the mobile subscriber base in India to grow at a Compound Annual Growth Rate (CAGR)-Compound Annual Growth Rate of 10% between 2012 and 2016, reaching 1.5 billion by 2016. India launched 3G enabled mobile and 3G services in 2008. 3G Mobile phone penetration is relatively low in India; it is contrasted to huge population within the country. People still lack of knowledge in adoption to use 3G mobile phones due to its high technologies, advanced features, applications and lack of adoption of 3G services in India. 3G phones did not initially perform well in the market (Tseng and Lo, 2011). The availability of 3G handsets will also play a crucial role in determining the success of 3G services (Evalueserve, 2012). Today, 3G technologies have been established over the smart phones (PDA, Blackberries and I-Phones), enhanced high speed web browsing capabilities and distributing information communication technology applications via mobile such as mobile education, mobile banking, mobile health, mobile commerce and so on. Evalueserve (2012) has provided the growth of mobile

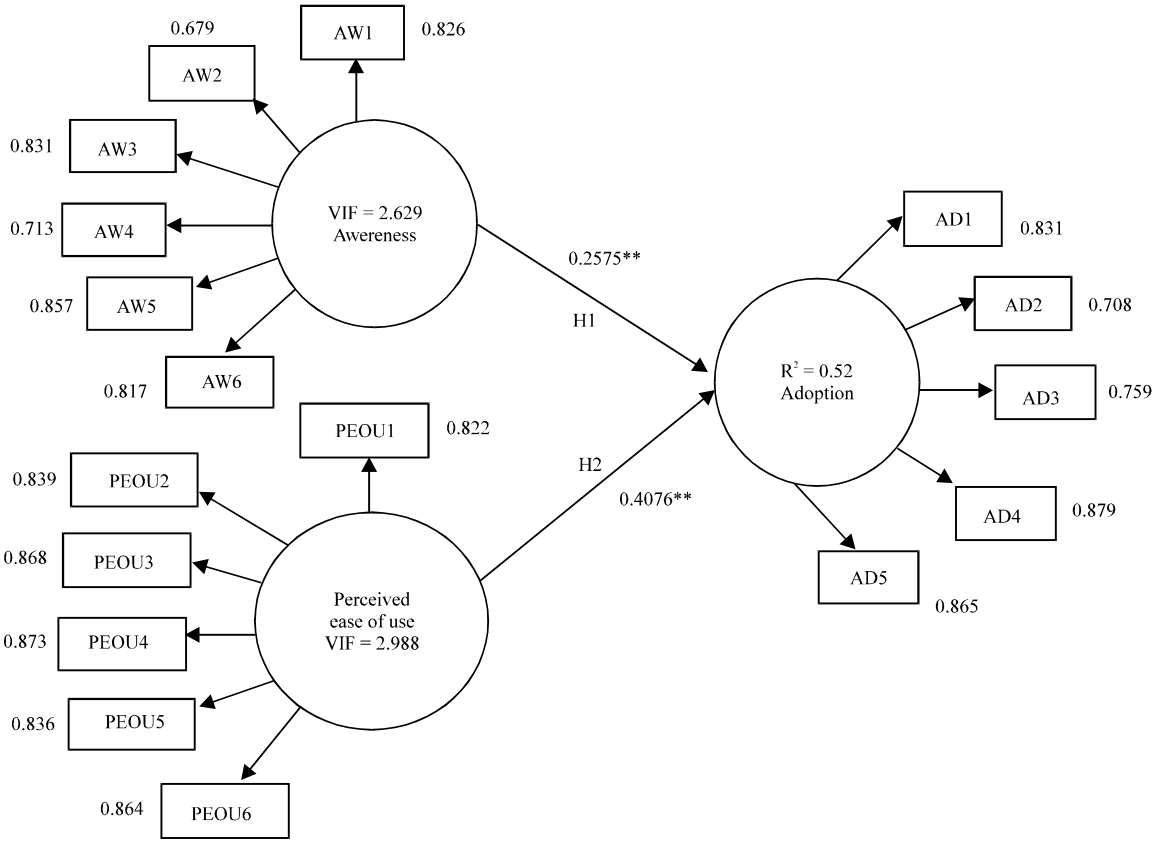


Fig. 4: Results of partial least square (PLS) structural model analysis, *Significant at the 0.01 level, AW: Awareness, PEOU: Perceived ease of use, AD: Adoption, IF: Variance inflation factor

value-added services (MVAS) will also bloom with content services; include mobile video3 streaming, mobile TV, music downloads, mobile payment and banking services and mobile gaming in 3G mobiles in the future. Evalueserve (2012) also believed mobile applications such as m-learning, m-health and m-governance, being offered on the 3G mobile platform and to gain importance as a result of strengthened 3G performance.

Chong *et al.* (2012) also declared that 3G enabled new business models and applications available to users, such as mobile banking, downloading videos and music through their mobile phones and mobile gaming and suggested that conduct a study of 3G growing market in other developing countries.

This study aims to provide a deeper understanding of how usage of mobile phones correlates with individual activity space, which is one of the most important characteristics of technology adoption. The study used two indicators such as awareness, perceived ease of use, which influence on consumers' adoption on information technology in 3G mobile phones in India.

**Research problem:** Several new and complex functions have been added in 3G mobile phones to make smooth the consumers' lifestyle and to make consumer life easier. Enhanced functionality and greater levels of 3G mobile and its services require an in-depth understanding of consumer

perceptions and behavior. 3G adoptions are early stage in many developing countries (Chong *et al.*, 2011) and using applications in 3G handsets is more complex than other 2G handsets (Pandit and Upadhyay, 2012). Evalueserve (2012) confirmed that awareness is one of the critical success factors to determine 3G adoption and most of the consumers were unaware of 3G services in India (Octane Research, 2013). It seemed that many consumers have tended to show unaware of the properties and services the new models of the 3G mobile phones. Most importantly, those consumers might not be familiar with new technical properties and their purposes of use. Based on the above, the research questions are summarized as below:

- Do consumers aware in the existing of 3G mobile phone usages?
- How does consumers' convenient to the 3G mobile phone usages?

**Objectives of the research:** Awareness of consumers toward an adoption of information technology is important and is critical in the success of mobile phone teledensity. The success in improving the convenient of 3G mobile phones may enhance the satisfaction of consumers. It improves the trust directly and confidence of people using mobile phones. Hence, the objectives of the research are:

- To find out the relationship between consumers' awareness and information technology adoption in 3G mobile phones' usages
- To find out the relationship between consumers' perceived ease of use and information technology adoption in 3G mobile phones' usages

## LITERATURE REVIEW

The literatures of the current research area was explored in relation to various aspects of 3G mobile phone usages, that were fallen into information technology adoption in 3G mobiles, determinants of 3G adoption, consumers' awareness and perceived ease of use.

**Information technology adoption in 3G mobiles:** The 3G mobile phone industry in India has experienced an astonishing growth since the introduction of mobiles in the country. 3G mobiles are mainly concerned to communication, information and entertainment applications and also support calendar, alarm, appointment reminder, address book, sports, travel service, restaurants and movies. Tseng and Lo (2011) stated that 3G mobile phones offer enhanced functional such as, Global Positioning System navigation; music (MP3) and video (MP4) playback; personal digital assistant functionality; the ability to watch streaming video or to download video for later viewing; video calling; built-in digital cameras and camcorders (for video recording); ringtones; games; memory card readers; USB (2.0); infrared, Bluetooth (2.0) and WiFi connectivity; instant messaging; Internet e-mail and Web browsing; and wireless modem connections. Adoption of 3G mobile phones could be classified as ubiquitous, 3G mobiles bring the people into high speed and convenient value-added services, such as higher wireless bandwidth and more diverse video and audio services, mobile payment, mobile blog, video call, video meeting, mobile Internet access, mobile intranet/extranet access, customized infotainment, Multimedia Message Service (MMS), location-based service, simple voice service and rich voice service, which can be accessed anytime and anywhere (Du *et al.*, 2012). Furthermore, the 3G mobile revolution can be seen in developing countries by delivering ICT applications in banking, business or commerce, education, environment,

government and health. Consequently, information technology adoption in 3G mobile was investigated during this study as the consumers' acceptance towards intention to use 3G mobile phone technologies.

**Determinants of 3G adoption:** The Technology Acceptance Model (TAM) is the most widely accepted framework for studying individual intentions to use or adopt information technology. Investigating users' intentions to accept information technology has always been a crucial area in information systems research (Davis,1989). Several studies have been investigated the factors that influenced consumers' intention to adopt 3G mobiles in various countries such as, China (Chong *et al*., 2012; Du *et al*., 2012), Taiwan (Tseng and Lo, 2011), Malaysia (Chong *et al*., 2011; Suki, 2012), USA (Xudong *et al*., 2010), Bostwana (Garg and Garg, 2011), India (Singh *et al*., 2010a; Evalueserve, 2012; Pandit and Upadhyay, 2012; Kumar, 2013; Mogal, 2012; Octane Research, 2013), Japan (Abu, 2010), Singapore (Trisha, 2010; Agarwal *et al*., 2007). These studies used a slightly modified or extended from Technology Acceptance Model (TAM) with additional variables to examine the consumers' adoption in 3G. According to Indian consumers' low level adoption and their ignorance toward 3G mobile, the current study essentially examined those two vital determinants such as consumers' awareness, perceived ease of use, influenced on information technology adoption in 3G mobile phones. Besides, this study also investigated those demographic profiles for consumers' adoption on 3G applications and features, which also was stressed in the future study (Chong *et al*., 2012).

**Awareness:** Awareness is one of the key determinants to consumers' adoption behavior, which is decided through acquaintance of the particular product. Early researcher, Lionberger (1968) proposed that awareness was one of the best-known acts for utilizing the innovative product. In other words, Islam and Gronlund (2011) stated while awareness is a person's degree of attentiveness and ability to depict beliefs in a certain time and space as an object, influence is the process of creating this awareness. Mobile users' awareness study is still new and emerging one due to introducing new mobile technology such as 3G. Most of the consumers could hesitate to utilize new mobile technology, because they lack of knowledge within the context of mobile phone's design, interface, contents, navigations and its applications. Sudhir *et al*. (2012) also confirmed that lack of awareness was one of the hurdles to the consumers for not using mobile phones.

Consumer usage rate of current 3G value-added services remain low (Kuo and Yen, 2009), in telecommunication services. Awareness is one of the antecedents of consumer brand preference (Alamro and Rowley, 2011), there is needed for research to improve this key drive for adoption of information technology in 3G mobile gadgets. Consumers normally less familiar with new mobile technology, (Lopez-Nicolas *et al*., 2008) found that they are hesitant to use their mobile phones to access them. Most of the consumers expect mobile services to become increasingly complex in the emergence of context-awareness (Reuver and Haaker, 2009), due to up-gradation of its technology. Buchinger *et al*. (2011) confirmed that context-awareness as well as its deployment seems to be an important and growing topic nowadays. Context-awareness was a valuable technique to address these issues, as it enabled to adapt application behavior to each situation Curiel and Lago (2013). Due to grown up of 3G mobile technology, Mahatanankoon and Ruiz (2007) stressed that consumer unawareness occurs when consumers are not aware of what mobile applications are available to them. Many researchers revealed that most of the consumers were low aware of adopt mobile

banking services (Cruz *et al*., 2010; Sangle and Awasthi, 2011; Devi *et al*., 2011). In mobile commerce, (Persaud and Azhar, 2012) stated that consumers were unwilling to engage in mobile shopping due to lack of awareness or uncertainty regarding its benefits. Lack of awareness was one of the major barriers to mobile marketing and showed that the mobile phone users' adoption of mobile shopping was low (Megdadi and Nusair, 2011). Awareness was considered as direct factor and influenced the intention to adopt mobile advertising (Khan and Allil, 2010). Kowalski and Goldstein (2006) examined that the relationship between the consumers' awareness and adoption of security functions in mobile phones among different user categories and found that almost half of the users were unaware of the functions. In the text message technology, Jacucci (2011) identified that awareness involved in designing integration of functionalities such as messaging, media sharing in mobile phones. In mobile education, Canuel and Crichton (2011) raised that awareness was vital to mobile technology for academic libraries and suggested that was needed to address the lack of mobile content and services. Consumers' awareness of mobile phones is also not exempted in the current trends of sustainable development, Li *et al*. (2012) stated that awareness is one of the key factors to construct the sustainable management of retired mobile phones. Finally, Tanakinjal (2012) confirmed that awareness was a very essential component in the innovation and stressed that future research should also include awareness of the innovation in an in-depth matter in the new mobile phones. Mahatanankoon and Ruiz (2007) also suggested that researchers can further investigate unawareness to expand the existing knowledge and theories in new mobile phones. Hence, awareness was examined in this study of the recognition of people towards intentions to use 3G mobile phone technologies.

**Perceived ease of use:** Perceived ease of use is an individual's assessment to the extent to which interaction with a specific information system or technology is free of mental effort (Davis, 1989). It is one of the major behavioral beliefs influencing user intention to technology acceptance in both the original and the revised TAM models. According to changing of mobile technology from time-to-time, it is necessary to study about consumers' perceived ease of use that will impact for intention to use newest mobile devices. In mobile phone context, perceived ease of use, as key determining factor that influenced toward behavioral intention to use the mobile service through mobile application (Vatanparast, 2010; De Silva *et al*., 2011), to adopt advanced mobile phone services.

Islam *et al*. (2013), as a mediating factor to adopt to mobile phone applications and tools (Milena and Ziolkowski, 2010), as an antecedent of electronic customer relationship management performance in mobile phone services industry (Wahab *et al*., 2010) and played as a key role in user attitudes toward mobile adoption (Abad *et al*., 2010). Few researchers, (Liao *et al*., 2007; Suki, 2012) confirmed that perceived ease of use was responsible in determining the consumers' intention to use of 3G mobile service and perceived ease of use was most important factor to increase consumer's behavioral intention to use 3G mobile value-added services and contrary to this, perceived ease of use was not significant with consumers' intention to adopt 3G (Chong *et al*., 2012). Mardikyan *et al*. (2012) and Pandit and Upadhyay (2012) examined that perceived ease of use was one of the factors, which influenced on consumer perception and adoption on 3G mobile technologies. Consumers' adoption in m-commerce is continuous to grow, Kim *et al*. (2009) investigated that the effect of perceived ease of use in mobile phone users' attitude toward mobile communication, mobile commerce and mobile technology use intention for shopping. Ko *et al*. (2009) explored that the potential of a consumer adoption in shopping was factorized with perceived ease

of use. Perceived ease of use was a vital predictor for users' behavioral intentions to use mobile commerce (Nassuora, 2013). In mobile banking, Singh *et al.* (2010b), Siddhartha *et al.* (2011), Abadi *et al.* (2013) and Kumar and Ravindran (2012) revealed that perceived ease of use as one of the antecedents to behavioral intention of mobile banking usage. On the contrary, consumers felt difficult to use m-banking due to perceived ease of use not a significant with usage intentions toward m-banking (Wessels and Drennan, 2010). Particularly, text messages (SMS) and multimedia messages (MMS) are very popular in 3G mobile phones. Mobile users' perceived ease of use, as one of the major factors in adoption of SMS (Kim *et al.*, 2008), influenced to use SMS based mobile chatting services (Wel *et al.*, 2013) and in shaping users' attitude and intention to use multimedia messaging services (Kim *et al.*, 2011). Perceived ease of use was a key determinant of consumers' acceptance in mobile payment services (Schierz *et al.*, 2010; Kim *et al.*, 2010). Yan *et al.* (2009) and Viehland and Leong (2010) proved that perceived ease of use influenced the consumers' intention to use the m-payment services. Credit cards also can swipe in android 3G mobile phones for payment processing, (Amin, 2008) indicated that perceived ease of use on mobile phone credit cards were important determinants to predicting the consumers' intention to use it. Mobile wallets are rapidly increasing in android 3G mobile gadgets, Shin (2009) empirically extended the UTAUT model with perceived ease of use was one of the key antecedents to individuals' behavioral intentions toward mobile wallets. Mobile advertising includes video, mobile display ads; banners (MMS) and text messaging (SMS), Bamoriya (2012) proved that consumers' intentions to receive SMS advertising through TAM's belief perceived ease of use. On contrary, Jung *et al.* (2013) identified that consumers perceive as hard to use, is more likely to decrease in determining consumer acceptance of mobile advertising. Mobile learning adoption in perceived ease of use, as a tool (Adeyemo *et al.*, 2013), was hypothesized also in the mobile system acceptance model (MSAM) which influenced mobile student information system (Asif and Krogstie, 2011). Lin (2013) pointed out that impact of perceived ease of use to adopt ubiquitous learning in mobile phones. Thus, perceived ease of use was examined in this study as a component that mobile users think it's important for them in using 3G mobile phone technologies.

## MATERIALS AND METHODS

The research model was proposed with variables derived from the Technology Acceptance Model (TAM) and included the determinants of awareness and perceived ease of use were determined on information technology adoption in 3G mobile phones. The primary source of data is self-completed questionnaires provided by 552 respondents. Employers, homemakers, retired people and students were asked to evaluate their perceptions in relating to information technology adoption in 3G mobile phones' usages by completing the survey. Secondary data was gathered from online journals, periodicals, reports and white-papers published in magazines, databases, web sites and newspapers.

**Hypotheses development:** From the discussion of above, two hypotheses were formulated to compare as independent variables, which were awareness and perceived ease of use while the dependent variable was information technology adoption in 3G mobiles.

**Awareness:** Lack of customer awareness about real measures for judgment was a major constraint (Kumar and Ravindran, 2012). Awareness of mobile phone usages by users in the market is

important for the diffusion of mobile phone adoption. Luo *et al.* (2010) identified that sufficient awareness level has not achieved among mobile users. Consumers who may not be aware of a brand due to they may have little trust in its reliability and integrity in using mobile phones (Persaud and Azhar, 2012). Since 3G mobile phone is a fairly new technology, awareness might contribute to the improved information technology adoption of its use. Thus, the following hypothesis was proposed:

- **H1:** Awareness is positively associated with information technology adoption in 3G mobile phones' usages

**Perceived ease of use:** TAM Davis (1989) predicted people's intentions to use a technology based on their perception of its ease of use. Venkatesh (2000) claimed that for any emerging IT/IS, perceived ease of use is an important determinant of users' intention of acceptance and usage behavior. Current 3G mobile phones have small screens, less spaced with multifunctional key pads, low-resolution and low speed the internet, which make consumers tend to be less confident of use. Since 3G mobile phone is a fairly new technology, ease of use might contribute to the increased perceived value of its use. Thus, the following hypothesis was proposed:

- **H2:** Perceived ease of use is positively associated with information technology adoption in 3G mobile phones' usages

## RESULTS

The primary data 552 were collected through self-completed questionnaires and to measure respondents' attitudes by asking the extent to which they agree or disagree on a five-point Likert scale (i.e., 1 = strongly disagree to 5 = strongly agree) with the factors such as awareness, perceived ease of use and intention to adopt. SPSS 20, Smart PLS2.0M3 and LISREL 8.80 were used for this data analysis such as descriptive analysis; co-variance based structural equation modeling and confirmatory factory analysis, respectively.

**Descriptive analysis:** The descriptive analysis was conducted to get a brief overview on the respondent as a whole and how they respond to the questions by looking at the certain personal information such as gender, age, marital status, educational status, employment status and 3G mobile phone's experience with respect of its features and applications. SPSS 20 used for descriptive analysis of demographic variables for this study.

According to Table 1, the demographic of gender showed that male had the higher percentage of 53.4% (n = 295) compare to the female respondents, which was 46.6% (n = 257) only. In age case, the highest percentage for age was below 25 years old, which was 61.6%, seemed that this group had potential consumers in using information technology in 3G mobile phones because they were familiar with the 3G mobile phones' technologies meanwhile the lowest were the 35-44 years old with 9.1% and age above 45 years old with 8.3%, likely to be they were less familiar to adopt 3G mobile phones. Furthermore, the age between 25-34 years old with 21.0%, showed that they were moderately using information technology in 3G mobile phones. The levels of education attained by respondents, the diploma/degree holders were relatively higher, which was 56.3%. The second largest group was professional degree holders with 25.4% and the post graduates with 15.9% and this was followed by the 2.4% to the schooling education only attained. In employment

Table 1: Demographic information

| Demographic attributes | Frequency | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 295 | 53.40 |
| Female | 257 | 46.60 |
| **Age** | | |
| 18-24 | 340 | 61.60 |
| 25-34 | 116 | 21.00 |
| 35-44 | 50 | 9.10 |
| 45 and above | 46 | 8.30 |
| **Education** | | |
| Schooling | 13 | 2.40 |
| Diploma/degree | 311 | 56.30 |
| Post graduation | 88 | 15.90 |
| Professional degree | 140 | 25.40 |
| **Employment status** | | |
| Student | 257 | 46.60 |
| Salaried | 247 | 44.70 |
| Business | 40 | 7.20 |
| Retired | 8 | 1.50 |

Table 2: Customers' mobile phone experience

| Mobile phone experience | Frequency | Percentage (%) |
|---|---|---|
| **Length of use** | | |
| Less than 1 year | 10 | 1.80 |
| 1-5 years | 136 | 24.60 |
| Above 5 years | 406 | 73.60 |
| **Usage** | | |
| Regularly | 549 | 99.40 |
| Sometimes | 2 | 0.40 |
| Rarely | 1 | 0.20 |

status, most of the respondents were full-time students with 46.6%. The second largest groups were employed, with a total percentage of 44.7%; it was followed by business people with 7.2% and retired people with 1.5%, respectively.

From the Table 2, the length of use of mobile showed that almost 73.6% of the respondents had above five years experience in using the mobile phones. The respondents who had 24.6% of them had 1-5 years experience and followed by 1.8% of 1-2 years experience. In addition, the usage of mobile showed that the almost 99.4% respondents had regularly used and 0.4% respondents had sometimes used and followed by the 0.2% respondent had rarely used. The results indicated that the information technology usage in the mobile phones had been developed since there are many people tend to utilize the mobiles for their needs.

According to use of 3G mobile phone features, Table 3 showed that the users of voice call (99.6%), SMS (76.6%), camera (67.8%), calendar (71.9%), alarm (81.3%), address book (61.4%), ring setting (62.5%), changing ringtone (50.9),volume control (68.8%), games (56.7%), music player (75.2%) and browsing (64.1%) were relatively high and it seemed that they were familiar or interested to use these features in 3G mobiles whereas users of video call (26.6%),MMS (25.9%) and appointment reminder (32.2%) were relatively low because their low adoption level might be reluctant to use these latest feaures in 3G mobiles.

Table 3: Usage of 3G mobile phone's features

| Usage of 3G mobile phone's features | Often use | | Sometime use | | Never use | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Voice call | 550 | 99.6 | 2 | 0.4 | 0 | 0 |
| Video call | 147 | 26.6 | 179 | 32.5 | 226 | 40.9 |
| SMS | 423 | 76.6 | 108 | 19.6 | 21 | 3.8 |
| MMS | 143 | 25.9 | 220 | 39.9 | 189 | 34.2 |
| Camera | 374 | 67.8 | 142 | 25.7 | 36 | 6.5 |
| Calendar | 397 | 71.9 | 135 | 24.5 | 20 | 3.6 |
| Alarm | 449 | 81.3 | 92 | 16.7 | 11 | 2.0 |
| Appointment reminder | 178 | 32.2 | 291 | 52.7 | 83 | 15.1 |
| Address book | 339 | 61.4 | 147 | 26.6 | 66 | 12.0 |
| Ring setting (vibrating, loud) | 345 | 62.5 | 181 | 32.8 | 26 | 4.7 |
| Changing ringtone | 281 | 50.9 | 227 | 41.1 | 44 | 8.0 |
| Volume control | 380 | 68.8 | 144 | 26.1 | 28 | 5.1 |
| Games | 313 | 56.7 | 158 | 28.6 | 81 | 14.7 |
| Music player | 415 | 75.2 | 107 | 19.4 | 30 | 5.4 |
| Browsing | 354 | 64.1 | 119 | 21.6 | 79 | 14.3 |

Table 4: Usage of 3G mobile phone's browsing services

| Usage of 3G mobile phone's browsing services | Often use | | Sometime use | | Never use | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Emails | 351 | 63.6 | 105 | 19.0 | 96 | 17.4 |
| Chatting | 255 | 46.2 | 162 | 29.3 | 135 | 24.5 |
| News (BBC,CNN,etc) | 261 | 47.3 | 172 | 31.2 | 119 | 21.5 |
| Sports (BBC, ESPN,etc) | 199 | 36.1 | 147 | 26.6 | 206 | 37.3 |
| Restaurants (KFC, Pizza, etc) | 90 | 16.3 | 260 | 47.1 | 202 | 36.6 |
| Travel service (booking, scheduling) | 99 | 17.9 | 216 | 39.2 | 237 | 42.9 |
| Mobile TV | 233 | 42.2 | 150 | 27.2 | 169 | 30.6 |
| Mobile shopping (m-commerce) | 190 | 34.4 | 165 | 29.9 | 197 | 35.7 |
| Search engine (Google) | 312 | 56.5 | 93 | 16.8 | 147 | 26.7 |
| Weather | 192 | 34.7 | 188 | 34.1 | 172 | 31.2 |
| GPS services | 210 | 38.1 | 148 | 26.8 | 194 | 35.1 |
| Health care | 221 | 40.0 | 156 | 28.3 | 175 | 31.7 |
| Banking services (check balance, transfer) | 170 | 30.8 | 189 | 34.2 | 193 | 35.0 |
| Social websites (Facebook, Twitter, etc) | 215 | 39.0 | 263 | 47.6 | 74 | 13.4 |

According to use of 3G mobile phone's browsing services, Table 4 showed that the users of emails (63.6%), search engine (56.5%) were relatively high because they were comfortable to use them while users of chatting (46.2%), news (47.3%), sports(36.1%), mobile TV (42.2%), m-commerce (34.4%), weather (34.7%), GPS services (38.1%), health care (40.0%), banking services (30.8%) and social websites (39%) were relatively moderate because they were fewer concerns to use these services and it was followed by users of travel service (17.9%), restaurants (16.3%) were relatively low; it seemed that they might not be familiar or interested in these features in 3G mobiles.

## Data analysis

**Structural equation model:** The study used partial least squares (Smart PLS 2.0M3) to validate the data and test the hypotheses. Partial Lease Square (PLS) techniques in the recent years have gained popularity for testing structural models (Urbach and Ahlemann, 2010) and most suitable for covariance-based structural equation modeling. Since predominantly covariance-based SEM techniques have been used to estimate models in marketing, PLS-SEM use often requires a more detailed explanation of the rationale for selecting this method (Chin, 2010). This study adopted two- step assess, which are evaluated of the outer model and the evaluated of the inner model. There are two benefits for using PLS, PLS would be assessed for both formative, reflective measurements and doesn't make any assumptions or impose for normality conditions on independent variables. This study assessed both formative and reflective measurements; it is important to see that the terms "formative" and "reflective", as well as the connotation which is associated with the classification of "causal" and "effect", point at a difference between the characterization of the latent variable measurement models' mode (Henseler *et al.*, 2009).

From the Table 5, reliability analysis showed that both Cronbach's alpha and composite reliability were computed for each variable to test for reliability. According to Nunnally (1967), the Cronbach's alpha score for each of the constructs should be greater than 0.6 to ensure it is reliability and composite reliability is considered as a stronger test for reliability, a composite score higher than 0.70 is acceptable to support the reliability of the data model (Werts *et al.*, 1974). Hayes (1998) confirmed that an alpha value around 0.9 can be considered as "excellent", 0.8 as "good", 0.6 and 0.7 as "adequate" and below 0.5 is unreliable reliability. The Cronbach's alpha and composite reliability scores are greater than 0.80, which is significant to consider that data model of this study is reliable for both formative and reflective measurements. For convergent validity, a stronger internal consistency among the data models an Average Variance Extracted (AVE) score of 0.5 is acceptable (Fornell and Larcker,1981; Dillon *et al.*, 1984; Chau, 1997) with loadings of the respective constructs above 0.70. The AVE and factor loadings are greater than 0.7, respectively. Therefore, convergent validity parameters are satisfactory for both formative and reflective measurements and the measurement model is absolutely reliable in this study. In discriminant validity, the extent to which the measures for the model are unique from other measures in the same model. In PLS context, the criterion for discriminant validity is that a construct should share more variance with its measures than it shares with other constructs in the given model (Hulland, 1999). The discriminant validity was examined by testing the correlations between the measures of potentially overlapping constructs and must be different from unity (Anderson and

Table 5: Structural model specification: Cronbach's alpha, composite reliability and AVE and loadings of latent constructs for both formative and reflective measurements

| Measures | Constructs | Cronbach's alpha | Composite reliability | AVE | Loadings |
|---|---|---|---|---|---|
| Formative | Adoption | 0.8707 | 0.9052 | 0.8579 | 0.8086 |
| | Awareness | 0.8783 | 0.9081 | 0.8243 | 0.7873 |
| | Perceived ease of use | 0.9236 | 0.9402 | 0.9637 | 0.8504 |
| Reflective | Adoption | 0.8707 | 0.9045 | 0.8582 | 0.8087 |
| | Awareness | 0.8783 | 0.9082 | 0.8242 | 0.7872 |
| | Perceived ease of use | 0.9236 | 0.9401 | 0.9635 | 0.8503 |

Table 6: Reliability and correlations for latent constructs

| Constructs | Composite reliability | Adoption | Awareness | Perceived ease of use |
|---|---|---|---|---|
| Adoption | 0.9052 | 1.0000 | | |
| Awareness | 0.9081 | 0.6321 | 1.0000 | |
| Perceived ease of use | 0.9402 | 0.6974 | 0.7455 | 1.0000 |

Table 7: Item to construct correlation vs. correlations with other constructs

| Constructs | Items | Adoption | Awareness | Perceived ease of use | Composite reliability |
|---|---|---|---|---|---|
| Adoption | AD1 | 0.8314 | 0.3553 | 0.3699 | 0.9052 |
| | AD2 | 0.7083 | 0.4631 | 0.4541 | |
| | AD3 | 0.7588 | 0.4223 | 0.3687 | |
| | AD4 | 0.8795 | 0.3712 | 0.4400 | |
| | AD5 | 0.8650 | 0.4570 | 0.3857 | |
| Awareness | AW1 | 0.4063 | 0.8257 | 0.3716 | 0.9081 |
| | AW2 | 0.3293 | 0.6788 | 0.3774 | |
| | AW3 | 0.4399 | 0.8313 | 0.3345 | |
| | AW4 | 0.3926 | 0.7134 | 0.3792 | |
| | AW5 | 0.4288 | 0.8575 | 0.3882 | |
| | AW6 | 0.4126 | 0.8171 | 0.3775 | |
| Perceived ease of use | PEOU1 | 0.4214 | 0.3579 | 0.8222 | 0.9402 |
| | PEOU2 | 0.4350 | 0.3575 | 0.8395 | |
| | PEOU3 | 0.4574 | 0.3688 | 0.8681 | |
| | PEOU4 | 0.4835 | 0.3518 | 0.8727 | |
| | PEOU5 | 0.4943 | 0.3265 | 0.8364 | |
| | PEOU6 | 0.4727 | 0.3125 | 0.8637 | |

*All intermeasure and item to construct correlations are significant at the 0.01 level

Gerbing, 1988). Gefen and Straub (2005) proved that the square root of the AVE of each constructs should be larger than all the cross-correlations between the construct and items should load more strongly on their related construct than on other constructs.

As shown in Table 6, the square root of AVE for each constructs surpassed the correlations between that and all other constructs and all items load more strongly on their own construct than on other constructs. Furthermore, composite reliability was evaluated and all constructs were greater than 0.70 (Fornell and Larcker, 1981). The results confirmed that discriminant validity is satisfactory. Cross-loadings offer another check for discriminant validity. If an indicator has a higher correlation with another latent variable than with its respective latent variable, the appropriateness of the model should be reconsidered (Henseler *et al*., 2009). Patnayakuni *et al*. (2006) stressed that each item's correlation with its intended to construct represents a "loading," whereas its correlations with other constructs represent the "cross-loadings". Cross-loading items represented that prime candidates for removal from subsequent analysis of the goal of improving a model fit (Farrell and Rudd, 2009).

The above Table 7, indicated that the correlation of every single item with other constructs and can be clearly established that every single latent construct represents it own construct and is not loading into another constructs. Hence, another evidence of discriminant validity is proven in this study. This study also analyzed for multicollinearity within the formative scales.Researchers should assess the degree of multicollinearity among the formative indicators (Diamantopoulos and Winklhofer, 2001; Cassel *et al*., 2000; Grewal *et al*., 2004), for instance, by calculating the Variance

Inflation Factor (VIF) or the tolerance values (Henseler *et al.*, 2009). For regression analysis, Hair *et al.* (2011) depicted that $R^2$ values of 0.75, 0.50, or 0.25 for endogenous latent variables in the PLS structural model can, as a rule of thumb, be described as substantial, moderate, or weak, respectively and each Indicator's Variance Inflation Factor (VIF) value should be less than 5. As seen in Fig. 3, the $R^2$ value = 0.52, which can be considered as moderate in PLS path model and all the Variance Inflation Factors (VIF) were less than 3, which is less than 10 indicated that there were no multicollinearity problems found in the formative measurements.

**Structural model:** The hypotheses were examined through the structural model, used Smart PLS 2.0M3. The PLS-SEM is to encourage in analyzing the model's strengths simultaneously emphasizing possibly problematic issues. The structural model includes estimating the path coefficients, which indicates the strength of the relationships between the independent and dependent variables. The bootstrapping procedure was used to determine the significance of each path coefficient within a structural model because the data are not normally distributed in PLS-SEM. So, PLS relies on a nonparametric bootstrap procedure (Davison and Hinkley, 1997; Efron and Tibshirani, 1993), which involves repeated random sampling with replacement from the original sample to create a bootstrap sample, to obtain standard errors for hypothesis testing. The process assumed that the sample distribution is a reasonable representation of the intended population distribution. Henseler *et al.* (2009) also stressed that bootstrap facilitated the assessment of path coefficients' significance level in PLS-SEM. Theoretical t-values for a two-tailed significance testing are 1.65 (significance level of 10%; i.e., $p<0.1$ and 90% confidence), 1.96 (significance level = 5%, i.e., $p<0.05$ and 95% confidence) and 2.58 (significance level = 1%, i.e., $p<0.01$ and 99% confidence) respectively.

As shown in Table 8, the study used 552 samples in bootstrapping and all the hypotheses' path coefficients are extremely significant ($p<0.01$) at two-tailed level. In bootstrapping analysis, the large number of identified bootstrap samples is drawn from the original sample with replacement, which stated that each time an observation was drawn at random from the sampling population, it is returned to the sampling population before the next observation is drawn. Thus, an observation for a certain subsample can be selected more than once, or may not be selected at all for another subsample. The number of bootstrap samples should be high but must be at least equal in the number of valid observations in the dataset. The recommended number of bootstrap samples is 5,000.

As shown in Table 9, the study also used 5000 samples in bootstrapping analysis and all the indicators' path coefficients are extremely significant ($p<0.01$) at two-tailed level.

**Assessment of fit:** Assessment of fit determined how perfectly the research model fits the sample data (McDonald and Ho, 2002) and also validated, which recommended model has the most superior fit. PLS Path modeling was assessed by conducting goodness-of-fit (GoF) measure (Tenenhaus *et al.*, 2004).

Table 8: Significance of structural model path coefficients (Results based on cases = 200 and samples = 552)

| No. | Hypotheses | Path coefficient | Mean | Standard deviation (STDEV) | Std. error (STERR) | T statistics (\|O/STERR\|) | Significance (two-tailed) | Supported |
|---|---|---|---|---|---|---|---|---|
| H1 | AW AD | 0.2575 | 0.2583 | 0.0550 | 0.0550 | 4.6828 | p<0.01 | Yes |
| H2 | PEOU AD | 0.4076 | 0.4084 | 0.0494 | 0.0494 | 10.2790 | p<0.01 | Yes |

AD: Adoption, AW: Awareness, PEOU: Perceived ease of use

Table 9: Significance of structural model path coefficients (Results based on cases = 552 and samples = 5,000)

| Variable | Constructs | Path coefficient | Mean | Standard deviation (STDEV) | Std. error (STERR) | T statistics (\|O/STERR\|) | Sign. (two-tailed) | Supported |
|---|---|---|---|---|---|---|---|---|
| Formative | AW AD | 0.2575 | 0.2607 | 0.0765 | 0.0765 | 3.3643 | p<0.01 | Yes |
| | PEOU AD | 0.5076 | 0.5061 | 0.0668 | 0.0668 | 7.5892 | p<0.01 | Yes |

AD: Adoption, AW: Awareness, PEOU: Perceived ease of use

The GoF refers to the geometric mean of the average communality and average R2 for all endogenous constructs. The recommended GoF value ranges between small (GoF = 0.1), medium (GoF = 0.25) and large (GoF = 0.36) (Wetzels *et al*., 2009):

$$GoF = \sqrt{\overline{AVE} * \overline{R}^2}$$

The GoF value for our model is 0.676 (average of $R^2$ was 0.52 and geometric mean of AVE was 0.880). This study obtained a GoF value of 0.676, which exceeded the cut-off value of 0.36 for large effect sizes of $R^2$ (Cohen, 1988). The GoF value provides adequate support to validate the PLS model.

**Confirmatory factor analysis:** The study also used LInear Structural Relations (LISREL 8.8) to assess the goodness of fit for the factor structure on the research model. Factor structure can be analyzed and stated into zero and nonzero factor loadings, which is one of the major advantages using Lisrel. Confirmatory factor analysis was used to assess the factorial validity of the models through Lisrel is more user-friendly (Joreskog, 1973; Sorbom, 1974).

**Goodness-of-fit:** This study used three factors and evaluated for goodness-of-fit indices to fit the data surely in a given research model. The model fit is evaluated with following fit indices such as Chi square normed index ($\chi^2$/df), p-value of the model, Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), standardized root mean square residual (SRMR) and root mean square error of approximation (RMSEA). The recommended thresholds of these fit indices are, $\chi^2$/df<3 (Byrne,1998), p-value<0.05, CFI = 0.95 (Hu and Bentler, 1999; Kline, 2005), GFI>0.95 to >0.80 (Shevlin and Miles, 1998; Hooper *et al*., 2008; Saris and Stronkhorst, 1984), AGFI>0.80 (Saris and Stronkhorst, 1984; Gefen *et al*., 2000), SRMR<0.08 (Hu and Bentler, 1999) and RMSEA = 0.05 to = 0.08 (Hu and Bentler, 1999; MacCallum *et al*., 1996; Browne and Cudeck, 1993). The results of CFA in the first measurement model depicted that the following fit indices, $\chi^2$/df = 3.77, p-value = 0.0031, CFI = 0.75, GFI = 0.81, AGFI =0.75, SRMR = 0.085 and RMSEA = 0.072. After removal of several unfair data in the dataset, the model was refined and involved CFA again. On contrary with prior measurement model, the new model showed that the following improved fit indices, $\chi^2$/df = 1.16, p-value = 0.0000, CFI = 0.97, GFI = 0.90, AGFI = 0.87, SRMR = 0.068 and RMSEA = 0.052. Hence, the fit indices indicated that research model of this study is acceptable to fit.

Checchi and Giannini (2000) and Cudeck (1989) emphasized that Lisrel used for calculating the correlation matrix properly and this study can also be explored the following correlation matrix as confirmatory factor investigation.

As shown in the Table 10, the diagonal of a correlation matrix, which is always consisting ones. Hence, the correlation between every single variable and a variable is always perfectly correlated with itself.

Table 10: Correlation matrix of manifest variables

| Construct | AD1 | AD2 | AD3 | AD4 | AD5 | AW1 | AW2 | AW3 | AW4 | AW5 | AW6 | PEOU1 | PEOU2 | PEOU3 | PEOU4 | PEOU5 | PEOU6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AD1 | 1.000 | | | | | | | | | | | | | | | | |
| AD2 | 0.510 | 1.000 | | | | | | | | | | | | | | | |
| AD3 | 0.488 | 0.582 | 1.000 | | | | | | | | | | | | | | |
| AD4 | 0.648 | 0.527 | 0.554 | 1.000 | | | | | | | | | | | | | |
| AD5 | 0.620 | 0.463 | 0.581 | 0.765 | 1.000 | | | | | | | | | | | | |
| AW1 | 0.536 | 0.263 | 0.346 | 0.487 | 0.462 | 1.000 | | | | | | | | | | | |
| AW2 | 0.383 | 0.494 | 0.390 | 0.309 | 0.321 | 0.503 | 1.000 | | | | | | | | | | |
| AW3 | 0.474 | 0.170 | 0.287 | 0.460 | 0.451 | 0.654 | 0.429 | 1.000 | | | | | | | | | |
| AW4 | 0.316 | 0.232 | 0.366 | 0.298 | 0.345 | 0.446 | 0.478 | 0.593 | 1.000 | | | | | | | | |
| AW5 | 0.579 | 0.313 | 0.359 | 0.514 | 0.507 | 0.661 | 0.463 | 0.649 | 0.511 | 1.000 | | | | | | | |
| AW6 | 0.508 | 0.270 | 0.376 | 0.513 | 0.462 | 0.587 | 0.416 | 0.619 | 0.489 | 0.691 | 1.000 | | | | | | |
| PEOU1 | 0.576 | 0.217 | 0.348 | 0.499 | 0.505 | 0.624 | 0.330 | 0.589 | 0.405 | 0.666 | 0.571 | 1.000 | | | | | |
| PEOU2 | 0.528 | 0.235 | 0.337 | 0.541 | 0.510 | 0.562 | 0.308 | 0.597 | 0.432 | 0.612 | 0.532 | 0.679 | 1.000 | | | | |
| PEOU3 | 0.590 | 0.254 | 0.367 | 0.517 | 0.536 | 0.528 | 0.313 | 0.545 | 0.375 | 0.595 | 0.476 | 0.716 | 0.706 | 1.000 | | | |
| PEOU4 | 0.617 | 0.393 | 0.427 | 0.565 | 0.523 | 0.573 | 0.385 | 0.527 | 0.394 | 0.623 | 0.498 | 0.615 | 0.675 | 0.674 | 1.000 | | |
| PEOU5 | 0.542 | 0.307 | 0.368 | 0.546 | 0.481 | 0.493 | 0.306 | 0.502 | 0.355 | 0.542 | 0.462 | 0.611 | 0.640 | 0.656 | 0.688 | 1.000 | |
| PEOU6 | 0.613 | 0.387 | 0.442 | 0.554 | 0.596 | 0.541 | 0.412 | 0.507 | 0.393 | 0.578 | 0.521 | 0.610 | 0.615 | 0.690 | 0.769 | 0.681 | 1.000 |

AD1 to AD 5: Adoption items 1 to 5, AW1 to AW5: Awareness items 1 to 5, PEOU1 to PEOU5: Perceived ease of use items 1 to 5

## DISCUSSION

The study showed that consumers' adoption of information technology in mobile phone usages was determined by awareness, perceived ease of use. In PLS-SEM analysis, the results of reliability analysis indicated that Cronbach's alpha and composite reliability values of both formative and reflective measurements of constructs can be considered as "excellent" and "satisfactory". In convergent and discriminant validities, AVE values of constructs were satisfactory and the square root of AVE for each constructs outshined the correlations between that and all other constructs, all items load more strongly on their own construct than on other constructs, which supported both convergence and discrimination; it seemed that construct's validities were agreeable. For cross-loadings, the every single latent construct represents it own construct and is not loading into another constructs with greater than 0.7, which also proved the good model fit. In regression analysis, $R^2$ value (0.52) can be considered as moderate and there were no multicollinearity problems. For hypothesis's testing, both hypotheses were extremely significant at ($p<0.01$ and 99% confidence) two-tailed and that were also proven in 5000 samples in bootstrapping analysis. Furthermore, the assessment of fit (GoF = 0.676) value provided sufficient support to validate the PLS model. In confirmatory factor analysis by Lisrel, diagonal of a correlation matrix was divulged, i.e. these were the correlations between each variable and perfectly correlated. Goodness of fit analysis also showed that (RMSEA = 0.052) research model of this study was acceptable to fit. Both hypotheses were supported in this study. The results of H1 also supported with Kaul (2011) who showed that awareness levels in 3G services have risen from 64% in November 2010 to 80% in July 2011, which seemed that will increase in future and revealed that upgrade in mobile handset for consumers are largely driven by them seeking more advanced features on their phones such as 3G services. The findings implied that consumers were liable in understanding of functionality concepts must be taken into consideration during adoption of information technology in 3G mobile phone. Besides, the results of H2 contrary with Chong *et al.* (2012) who found that perceived ease of use was not found to have a significant with consumers' intention to adopt 3G and consistent with Suki (2012) who proved that the positive intention to use 3G mobile service is due to the

reasons that subscriber's learned to use 3G services quickly and unearth that it is easy to use it. The findings illustrated that consumers could adopt information technology in mobile phone when they found it easy to use those technologies and they felt that mobile phone applications would accomplish things more quickly. Therefore, the findings confirmed that 3G mobile phone applications have been developed well in India and many people intended to use 3G mobile phone service in their daily routine life.

**Practical implications:** Based on the results, the study proposed for mobile phone manufacturers and consumers should absolutely take several adequate measures to enhance utilization of information technology in latest 3G mobile phones, with respect to further significant improvement of awareness, perceived ease of use influenced on consumers' adoption. Manufacturers should conduct the awareness campaign or training program to the customers for making better understanding and knowledge in utilization of information technology in the 3G mobile phones by providing sufficient information about the benefits of its features, applications. Manufacturers should be testing the usability of branded new 3G phones with consumers as a trial, or before it is purchased and providing mentoring, advice in creative ways, which ensuring consumers' confident in utilization of them. Manufacturers should provide with instruction's booklet or guideline of all phones should be written in simple English or consumers' mother tongue or their national language. Mobile phone companies offer comprehensive support, including customer care through an online FAQ page, chat and email contacts in order to boost awareness of 3G mobile phone usages. Consumers must find themselves which 3G mobile phone is the best suit for their needs and should compare different types of provisions and functionalities. Mobile phone vendors should design an effective marketing campaign to potential consumers for upcoming mobile phone technologies as well as promote through word-of-mouth communication. Lee (2011) stressed that promotion campaigns should be designed to increase brand awareness and image and an effective advertising should be able to raise the awareness of the brand among consumers and encourage their association with it. Marketers must distribute the appropriate instruction leaflets and manuals to potential consumers during marketing the latest 3G mobiles with welcoming helpdesk should be available. Consumers should inquire about latest mobile phones' features and its applications through their friends who earns on awareness of mobile phones. Thus, the study suggested that it is necessary for the manufacturers should make awareness strategies to the mobile users and customers understand themselves about the availability of latest 3G mobile phone technologies and its value-added features would have a greater impact on awareness in adoption of 3G mobile phones. Perceived ease of use is one of the key's behavioral factors that influenced consumers' intention toward adoption of specific information technologies. Manufacturers should be taken into consideration while designing the 3G mobile phones' applications, features that would be clear; understandable to use; consumers feel very comfortable with those to accomplish things more quickly with voice call, video call, text messaging, camera, alarm, calendar, address book and browsing services via fulfill their basic needs. Consumers are looking for phones that are easier to use because of the growing complexity, mobile specialists must make the simplest design of the 3G mobile devices to make calls and texts, offer large screens with bigger fonts, high-resolution displays, well spaced keypads, loud vibrant and easy navigating menus that make easy to use and very attractive for all age group of customers. Today most of the latest 3G mobile phones with internet facility, GPS and complicated features are intentionally frustrated in order to avoid this; mobile specialists should make simplified browsing services with large, bright and color fonts, which

make consumers easily read the emails, surfing the web, access mobile banking and using GPS software. Mobile companies should educate or train the consumers to appreciate about convenient to adoption of information technology in mobile phones that can be fitted into their daily routines. Currently, touch screens are becoming more popular in 3G and in upcoming 4G mobile phones. So, mobile specialists must be taken into consideration in designing of these phones with the larger display screen, that should be logically organized display contents such as menu, contacts, settings and so on, presents clearly and uncluttered screens in order to reduce the time consumption for searching options. Manufacturers should promote the dissemination of mobile value-added features such as high-speed data connectivity, high streaming multimedia applications and high-speed internet bandwidth in 3G mobile phones will facilitate watching movie, play interactive games and download data (magazines, ring tones, icons, music), it would enhance consumers' ease of use. Latest 3G mobiles should be enabled with GPRS (General Packet Radio Services) and EDGE (Enhanced Data for Global Evolution) compatible, which provides the consumers connect internet directly and stays connected at high-speed that will make easier to interact with. Hence, the study suggested that latest 3G mobile phones need to be provided with enhanced user-friendly applications, features, which are easily accessible and convenient to use.

**Limitations and future studies:** The limitations in this study, firstly, 3G mobile phone adoption is still relatively new in India and is the lack of relevant literature review in the area of study. The information that is collected for this study is mostly based on the other countries, which might not accurately reflect the adoption of information technology in 3G mobile phones, due to the differences in culture and situation. Secondly, this research has been conducted in India. However, it would be interesting to conduct this research in other countries and compare the results with this study. Finally, people adoption of 3G mobile technology is still under development in India and sampling all the practical users of the 3G mobiles was not feasible. In addition, the questionnaire was used the LikertScale method which did not give any freedom to the respondents to provide their own opinions. Therefore, it can be biased in the survey responses. For future research, firstly, to identify under what condition consumers' adoption of newest 3G mobiles may or may not be affected by their experiences with the previously adopted mobile gadgets. Secondly, additional factors such as trust, perceived mobility, perceived cost, perceived risk, satisfaction and those other relevant factors which should be considered and it could improve the ability to predict intention to adopt more accurately. Thirdly, the study focused on information technology adoption in mobile phones in general and future study should be focused it on branded wise such as Nokia, Samsung, SonyEricsson, etc., which would be given beneficial insights for manufacturer side.

## CONCLUSION

The current trend of adoption in 3G mobile phones in India is slowly growing up towards for consumers' trustworthy. This study provides some new empirical evidence that stresses the factors which influenced consumers' adoption on information technology in 3G mobile phones in India. On hand, there were two hypotheses, which were tested by using structural equation modeling and confirmatory factory analysis respectively. The results showed that, both hypotheses were valid and confirmed to fit in this study. As latest mobile phone such as 3G is relatively new in India, an understanding about the factors affecting consumers' intention to use latest 3G mobile phones may influence its acceptance. In this case, it would increase the consumers' confidence towards information technology adoption in 3G mobile phones. Firstly, to increase the awareness among the

consumers, the consumers need to be educated to increase the 3G mobile phone's self-efficiency and also to promote the newest 3G mobile's features by launching direct awareness to the consumers. While perceived ease of use was strongly influenced in this study, mobile specialists should be designing a straightforward way for consumers to utilize 3G mobile phone's technology and should also endeavor to maximize the convenience on newest 3G mobile gadgets. Finally, there is a strong potential for people who are using information technology effectively in 3G mobile phones in India and mobile industry should be co-operating with governments, regulators and consumer groups to offer a wide range of tools to assist mobile phone users to manage their daily routines. The mobile telecommunications industry and mobile content providers are members of a scheme that would introduce user-friendly 3G mobile gadgets in all respects.

## REFERENCES

Abad, M., I. Diaz and M. Vigo, 2010. Acceptance of mobile technology in hedonic scenarios. Proceedings of the 24th BCS Interaction Specialist Group Conference, September 6-10, 2010, Dundee, UK., pp: 250-258.

Abadi, H.R.D., N. Kabiry and M.H. Forghani, 2013. Factors affecting isfahanian mobile banking adoption based on the technology acceptance model. Int. J. Acad. Res. Bus. Soc. Sci., 3: 611-623.

Abu, S.T., 2010. Technological innovations and 3G mobile phone diffusion: Lessons learned from Japan. Telematics Inform., 27: 418-432.

Adeyemo, S.A., G.O. Adedoja and O. Adelore, 2013. Mobile technology: Implications of its application on learning. Open Praxis, 5: 249-254.

Agarwal, N.K., Z. Wang, Y. Xu and D.C.C. Poo, 2007. Factors affecting 3G adoption: An empirical study. Proceedings of the Pacific Asia Conference on Information Systems, July 3-6, 2007, Auckland, New Zealand.

Alamro, A. and J. Rowley, 2011. Antecedents of brand preference for mobile telecommunications services. J. Prod. Brand Manage., 20: 475-486.

Amin, H., 2008. Factors affecting the intentions of customers in Malaysia to use mobile phone credit cards. Manage. Res. News, 31: 493-503.

Anderson, J. and W. Gerbing, 1988. Structural equation modelling in practice: A review and recommended two-step approach. Psychol. Bull., 103: 411-423.

Asif, M. and J. Krogstie, 2011. Mobile student information system. Campus-Wide Inform. Syst., 28: 5-15.

Bamoriya, H., 2012. SMS advertising in India: Is TAM a robust model for explaining intention? Economica, 8: 17-27.

Browne, M.W. and R. Cudeck, 1993. Alternative Ways of Assessing Model Fit. In: Testing Structural Equation Models, Bollen, K.A. and J.S. Long (Eds.). SAGE Publication, Newbury Park, USA., pp: 136-162.

Buchinger, S., S. Kriglstein, S. Brandt and H. Hlavacs, 2011. A survey on user studies and technical aspects of mobile multimedia applications. Entertainment Comput., 2: 175-190.

Canuel, R. and C. Crichton, 2011. Canadian academic libraries and the mobile web. New Library World, 112: 107-120.

Cassel, C.M., P. Hackl and A.H. Westlund, 2000. On measurement of intangible assets: A study of robustness of partial least squares. Total Qual. Manage., 11: 897-907.

Chau, P.Y.K., 1997. Reexamining a model for evaluating information center success using a structural equation modeling approach. Decis. Sci., 28: 309-334.

Checchi, D. and M. Giannini, 2000. What is behind bargaining at firm level? An empirical investigation using LISREL techniques. Rivista Di Politica Economica, 90: 57-100.

Chin, W.W., 2010. How to Write Up and Report PLS Analyses. In: Handbook of Partial Least Squares: Concepts, Methods and Application, Vinzi, V.E., W.W. Chin, J. Henseler and H. Wang (Eds.). Springer, New York, USA., ISBN-13: 9783540328254, pp: 655-690.

Chong, A.Y.L., K.B. Ooi, B. Lin and H.J. Bao, 2012. An empirical analysis of the determinants of 3G adoption in China. Comput. Hum. Behav., 28: 360-369.

Chong, A.Y.L., N. Darmawan, K.B. Ooi and V.H. Lee, 2011. Determinants of 3G adoption in Malaysia: A structural analysis. J. Comput. Inform. Syst., 51: 71-80.

Cohen, J., 1988. Statistical Power Analysis for the Behavioral Sciences. 2nd Edn., Lawrence Erlbaum, Hillsdale, New Jersey, USA., ISBN: 0-8058-6283-5, Pages: 128.

Cruz, P., L.B.F. Neto, P. Munoz-Gallego and T. Laukkanen, 2010. Mobile banking rollout in emerging markets: Evidence from Brazil. Int. J. Bank Marketing, 28: 342-371.

Cudeck, R., 1989. Analysis of correlation matrices using covariance structure models. Psychol. Bull., 105: 317-327.

Curiel, P. and A.B. Lago, 2013. An infrastructure to enable lightweight context-awareness for mobile user. Sensors, 13: 9635-9652.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use and user acceptance of information technology. MIS Q., 13: 319-340.

Davison, A.C. and D.V. Hinkley, 1997. Bootstrap Methods and Their Application. 1st Edn., Cambridge University Press, Cambridge, UK., ISBN: 0-521-57391-2.

De Silva, H., D. Ratnadiwakara and A. Zainudeen, 2011. Social influence in mobile phone adoption: Evidence from the bottom of the pyramid in emerging Asia. Inform. Technol. Int. Dev., 7: 1-18.

Devi, Y., J.N. Sebastina and V.S. Kanchana, 2011. A study on customer awareness, opinion, reasons for opting mobile banking. Int. J. Multidisciplinary Res., 1: 218-233.

Diamantopoulos, A. and H. Winklhofer, 2001. Index construction with formative indicators: An alternative to scale development. J. Marketing Res., 38: 269-277.

Dillon, R.O., J.A. Woollam and V. Katkanant, 1984. Use of Raman scattering to investigate disorder and crystallite formation in as-deposited and annealed carbon films. Phys. Rev. B, 29: 3482-3489.

Du, H., G. Zhu, T. Lv and X. Sun, 2012. Factors affecting purchase intention on 3G value-added services. Jindal J. Bus. Res., 1: 139-152.

Economic Times, 2010. Telecom companies revive value of the Indian paisa. The Economic Times, India. http://archive.is/ap1gp.

Efron, B. and R.J. Tibshirani, 1993. An Introduction to the Bootstrap. 1st Edn., Chapman and Hall Inc., New York, USA.

Evalueserve, 2012. The growth phase of 3G in India. Uptake of 3G Services in India (2012-16). http://sandhill.com/wp-content/files_mf/evalueservewhitepaperthegrowthphaseof3ginindia.pdf

Farrell, A.M. and J.M. Rudd, 2009. Factor analysis and discriminant validity: A brief review of some practical issues. Proceedings of the Australia-New Zealand Marketing Academy Conference, November 30-December 2, 2009, Melbourne, Australia, pp: 1-9.

Fornell, C. and D.F. Larcker, 1981. Evaluating structural equation models with unobservable variables and measurement error. J. Marketing Res., 18: 39-50.

Garg, D. and A.K. Garg, 2011. An assessment of awareness, usage pattern and adoption of 3G mobile services in Botswana. Int. J. Comput. Theor. Eng., 3: 547-551.

Gefen, D. and D. Straub, 2005. A practical guide to factorial validity using PLS-graph: Tutorial and annotated example. Commun. Assoc. Inform. Syst., 16: 91-109.

Gefen, D., D.W. Straub and M.C. Boudreau, 2000. Structural equation modeling and regression: Guidelines for research practice. Commun. Assoc. Inform. Syst., 4: 1-79.

Grewal, R., J.A. Cote and H. Baumgartner, 2004. Multicollinearity and measurement error in structural equation models: Implications for theory testing. Marketing Sci., 23: 519-529.

Hair, J.F., C.M. Ringle and M. Sarstedt, 2011. PLS-SEM: Indeed a silver bullet. J. Marketing Theor. Pract., 19: 139-151.

Hayes, B.E., 1998. Measuring Customer Satisfaction: Survey Design, Use and Statistical Analysis Methods. 2nd Edn., American Society for Quality Press, USA.

Henseler, J., C.M. Ringle and R.R. Sinkovics, 2009. The Use of Partial Least Squares Path Modeling in International Marketing. In: New Challenges to International Marketing, Sinkovics, R.R. and P.N. Ghauri (Ed.). Vol. 20, Emerald Group Publishing Ltd., Bingley, UK., ISBN: 978-1-84855-469-6, pp: 277-319.

Hooper, D., J. Coughlan and M.R. Mullen, 2008. Structural equation modeling: Guidelines for determining model fit. Elect. J. Bus. Res. Methods, 6: 53-60.

Hu, L.T. and P.M. Bentler, 1999. Cutoff criteria for fit indexes in covariance structural analysis: Conventional criteria versus new alternatives. Struct. Equ. Model., 6: 1-55.

Hulland, J., 1999. Use of Partial Least Squares (PLS) in strategic management research: A review of four recent studies. Strategic Manage. J., 20: 195-204.

IBEF, 2011. Telecommunication: Indian telecommunications industry is one of the fastest growing in the world. India Brand Equity Foundation. http://www.ibef.org/Archives/ ViewArticles. aspx?art_id=28389&cat_id=466.

ITU, 2013. The World in 2013, ICT facts and figures. International Telecommunication Union. http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx.

Islam, M.Z., P.K.C. Low and I. Hasan, 2013. Intention to use advanced mobile phone services (AMPS). Manage. Decis., 51: 824-838.

Islam, S.M. and A. Gronlund, 2011. Factors influencing the adoption of mobile phones among the farmers in Bangladesh: Theories and practices. Int. J. Adv. ICT Emerg. Regions, 4: 4-14.

Jacucci, G., 2011. Designing integration of sharing, messaging and awareness for mobile users. PsychNology J., 9: 123-135.

Joreskog, K.G., 1973. A General Method for Estimating a Linear Structural Equation System. In: Structural Equation Models in the Social Sciences, Goldberger, A.S. and O.D. Duncan (Eds.). Seminar Press, New York, USA.

Jung, J.H., Y. Sung and W.N. Lee, 2013. Smart choice: Smartphone user's intentions to accept mobile advertising. Online J. Commun. Media Technol., 3: 187-202.

Kannan, S., 2010. India's 3G license bidders bank on big changes. India is One of the World's Fastest Growing and Biggest Mobile Phone Markets, India Business Report, BBC News, Mumbai, India.

Kaul, T.M., 2011. Telecom operators build consumer awareness of 3G through advertising but consumer intent to adopt stays the same. Nielsen Press Room. http://www.nielsen.com/ca/en/ nielsen-pressroom/2011/telecom-3g-advertising.html

Khan, N.M. and K. Allil, 2010. Determinants of mobile advertising adoption: A cross-country comparison of India and Syria. Int. J. Mobile Marketing, 5: 41-59.

Kim, C., M. Mirusmonov and I. Lee, 2010. An empirical examination of factors influencing the intention to use mobile payment. Comput. Human Behav., 26: 310-322.

Kim, G.S., S.B. Park and J. Oh, 2008. An examination of factors influencing consumer adoption of short message service (SMS). Psychol. Market., 25: 769-786.

Kim, J., Y.J. Ma and J. Park, 2009. Are US consumers ready to adopt mobile technology for fashion goods?: An integrated theoretical approach. J. Fashion Marketing Manage., 13: 215-230.

Kim, K.K., H.K. Shin and B. Kim, 2011. The role of psychological traits and social factors in using new mobile communication services. Electron. Commerce Res. Appl., 10: 408-417.

Kline, R., 2005. Principles and Practice of Structural Equation Modeling. 2nd Edn., Guilford Press, New York, USA., ISBN-13: 9781593850753, Pages: 366.

Ko, E., E.Y. Kim and E.K. Lee, 2009. Modeling consumer adoption of mobile shopping for fashion products in Korea. Psychol. Marketing, 26: 669-687.

Kowalski, S. and M. Goldstein, 2006. Consumers awareness of, attitudes towards and adoption of mobile phone security. Proceedings of the 20th International Symposium on Human Factors in Telecommunication, March 20-23, 2006, France.

Kumar, G.R. and D.S. Ravindran, 2012. An empirical study on service quality perceptions and continuance intention in mobile banking context in India. J. Internet Banking Commerce, 17: 1-22.

Kumar, S., 2013. The moderating factors of 3G user acceptance technology in Shimla (India) using UTAUT model. Int. J. Comput. Sci. Eng. Technol., 4: 670-674.

Kuo, Y.F. and S.N. Yen, 2009. Towards an understanding of the behavioral intention to use 3G mobile value-added services. Comput. Hum. Behav., 25: 103-110.

Lee, Y.C., 2011. m-Brand loyalty and post-adoption variations for the mobile data services: Gender differences. Comput. Hum. Behav., 27: 2364-2371.

Li, B., J. Yang, X. Song and B. Lu, 2012. Survey on disposal behaviour and awareness of mobile phones in Chinese university students. Proc. Environ. Sci., 16: 469-476.

Liao, C.H., C.W. Tsou and M.F. Huang, 2007. Factors influencing the usage of 3G mobile services in Taiwan. Online Inform. Rev., 31: 759-774.

Lin, H.F., 2013. The effect of absorptive capacity perceptions on the context-aware ubiquitous learning acceptance. Campus-Wide Inform. Syst., 30: 249-265.

Lionberger, H.F., 1968. Adoption of New Ideas and Practices. Iowa State University Press, Ames, IA., USA.

Lopez-Nicolas, C., F. Molina-Castillo and H. Bouwman, 2008. An assessment of advanced mobile services acceptance: Contributions from TAM and diffusion theory models. Inform. Manage., 45: 359-364.

Luo, X., H. Li, J. Zhang and J.P. Shim, 2010. Examining multi-dimensional trust and multi-faceted risk in initial acceptance of emerging technologies: An empirical study of mobile banking services. Decis. Support Syst., 49: 222-234.

MacCallum, R.C., M.W. Browne and H.M. Sugawara, 1996. Power analysis and determination of sample size for covariance structure modeling. Psychol. Methods, 1: 130-149.

Mahatanankoon, P. and J.V. Ruiz, 2007. Why won't consumers adopt M-commerce? An exploratory study. J. Internet Commerce, 6: 113-128.

Mardikyan, S., B. Besiroglu and G. Uzmaya, 2012. Behavioral intention towards the use of 3G technology. Commun. IBIMA, Vol. 2012. 10.5171/2012.622123

McDonald, R.P. and M.H. Ho, 2002. Principles and practice in reporting structural equation analysis. Psychol. Methods, 7: 64-82.

Megdadi, Y.A.A. and T.T. Nusair, 2011. Shopping consumer attitudes toward mobile marketing: A case study among Jordanian user's. Int. J. Marketing Stud., 3: 53-63.

Milena, H. and N. Ziolkowski, 2010. Understanding student attitudes of mobile phone applications and tools: A study using conjoint, cluster and SEM analyses. Proceedings of the 18th European Conference on Information Systems, June 7-9, 2010, Pretoria, South Africa.

Ministry of Finance, 2009. Union budget and economic survey. Government of India. http://indiabudget.nic.in/ub2009-10/ubmain.htm.

Mogal, A.K., 2012. Wireless mobile communication-a study of 3G technology. Int. J. Adv. Network. Appl., 3: 1-6.

Nassuora, A.B., 2013. Understanding factors affecting the adoption of M-commerce by consumers. J. Applied Sci., 13: 913-918.

Nunnally, J.C., 1967. Psychometric Theory. 1st Edn., McGraw Hill, New York, Pages: 640.

Octane Research, 2013. India mobile users experience monitor 2013. Octane Marketing. http://www.octane.in/research/pdf-report/India_Mobile_Users_Experience_Monitor_2013.pdf

Pandit, R. and D. Upadhyay, 2012. Consumer perception towards 3G mobile technologies. Management, 1: 43-44.

Patnayakuni, R., A. Rai and N. Seth, 2006. Relational antecedents of information flow integration for supply chain coordination. J. Manage. Inform. Syst., 23: 13-49.

Persaud, A. and I. Azhar, 2012. Innovative mobile marketing via smart phones: Are consumers ready? Marketing Intell. Plann., 30: 418-443.

Reuver, M.D. and T. Haaker, 2009. Designing viable business models for context-aware mobile services. Telematics Inform., 26: 240-248.

Sangle, P.S. and P. Awasthi, 2011. Consumer's expectations from mobile CRM services: A banking context. Bus. Process Manage. J., 17: 898-918.

Saris, W. and H. Stronkhorst, 1984. Causal Modelling in Non experimental Research. Sociometric Research Foundation, Amsterdam, Netherlands.

Schierz, P.G., O. Schilke and B.W. Wirtz, 2010. Understanding consumer acceptance of mobile payment services: An empirical analysis. Electron. Commerce Res. Appl., 9: 209-216.

Shevlin, M. and J.N.V. Miles, 1998. Effects of sample size, model specification and factor loadings on the GFI in confirmatory factor analysis. Personality Individual Differences, 25: 85-90.

Shin, D.H., 2009. Towards an understanding of the consumer acceptance of mobile wallet. Comput. Hum. Behav., 25: 1343-1354.

Siddhartha, D., P. Rik and F. Sanjay, 2011. Factors affecting behavioral intentions towards mobile banking usage: Empirical evidence from India. Rom. J. Marketing, 6: 6-28.

Singh, S., D.K. Singh, M.K. Singh and S.K. Singh, 2010a. The forecasting of 3G market in India based on revised technology acceptance model. Int. J. Next-Generation Networks, 2: 61-68.

Singh, S., V. Srivastava and R.K. Srivastava, 2010b. Customer acceptance of mobile banking: A conceptual framework. SIES J. Manage., 7: 55-64.

Sorbom, D., 1974. A general method for studying differences in factor means and factor structure between groups. Br. J. Math. Stat. Psychol., 27: 229-239.

Sudhir, K., M. Pandey and I. Tewari, 2012. Mobile banking in India: Barriers and adoption triggers. Mobile Banking Experience the Freedom. http://som.yale.edu/sites/default/files/files/Mbanking%20report-Final.pdf

Suki, N.M., 2012. Third generation (3G) mobile service acceptance: Evidence from Malaysia. Afr. J. Bus. Manage., 6: 5165-5171.

TRAI, 2013. Highlights on telecom subscription data as on 31st May 2013. Press Release No. 60/2013, Telecom Regulatory Authority of India. http://www.trai.gov.in/WriteReadData/WhatsNew/Documents/PR-TSD-May13(60).pdf

Tanakinjal, G.H., 2012. Exploring technical knowledge, perceived risk and the innovative characteristics in the adoption of mobile marketing. Am. Int. J. Contemporary Res., 2: 69-80.

Tenenhaus, M., S. Amato and V. Vinzi, 2004. A global goodness of fit index for PLS structural equation modeling. Proceedings of the 42th SIS Scientific Meeting, June, 9-11 2004, Padova, Italy, pp: 739-742.

Trisha, L.T.C., 2010. The gordian knot of mobile TV policy in Singapore. J. Int. Commer. Law Technol., 5: 11-21.

Tseng, F.M. and H.Y. Lo, 2011. Antecedents of consumer's intentions to upgrade their mobile phones. Telecommun. Policy, 35: 74-86.

Urbach, N. and F. Ahlemann, 2010. Structural equation modeling in information systems research using partial least squares. J. Inform. Technol. Theor. Appl., 11: 5-40.

Vatanparast, R., 2010. Mobile service adoption optimization: A case study. Int. J. Mobile Marketing, 5: 57-74.

Venkatesh, V., 2000. Determinants of perceived ease of use: Integrating control, intrinsic motivation and emotion into the technology acceptance model. Inform. Syst. Res., 11: 342-365.

Viehland, D. and R.S.Y. Leong, 2010. Consumer willingness to use and pay for mobile payment services. Int. J. Principles Appl. Inform. Sci. Technol., 3: 35-46.

Wahab, S., K. Al-Momani and N.A.M. Noor, 2010. The relationship between E- service quality and ease of use on customer relationship management (CRM) Performance: An empirical investigation in Jordan mobile phone services. J. Internet Bank. Commerce, 15: 1-15.

Wee, W., 2011. The mobile industry in India. http://www.techinasia.com/india-mobile-industry-infographic/.

Wel, C.A.B.C., S.S.S.S. Alam, N.A. Omar and S.M. Noor, 2013. Students intention to use mobile chatting services in Malaysia. Int. Proc. Econ. Dev. Res., 57: 128-132.

Werts, C.E., R.L. Linn and K.G. Joreskog, 1974. Intraclass reliability estimates: Testing structural assumptions. Educ. Psychol. Meas., 34: 25-33.

Wessels, L. and J. Drennan, 2010. An investigation of consumer acceptance of M-banking. Int. J. Bank Marketing, 28: 547-568.

Wetzels, M., G. Odekerken-Schroder and C. van Oppen, 2009. Using PLS path modelling for assessing hierarchical construct models: Guidelines and empirical illustration. MIS Q., 33: 177-195.

Xudong, M., P. Deal, L. Li, C. Griffin and W. Barnett, 2010. 3G mobile phone adoption and continued use: A pilot study. Issues Inform. Syst., 11: 247-255.

Yan, A., K. MD-Nor, E. Abushanab and J. Sutanonpaiboon, 2009. Factors that affect mobile telephone users to use mobile payment solution. J. Econ. Manage., 3: 37-49.