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3G post adoption users experience with telecommunications services: A partial least squares (PLS) path modelling approach

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3G post adoption users experience with telecommunications services

A partial least squares (PLS) path modelling approach

3G post
adoption users
experience

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Abstract

Purpose – The purpose of this study is to examine the impact of service quality, perceived usefulness and users' cognitive satisfaction to determine the third-generation (3G) mobile phone users' behavioural retention in using 3G telecommunications services.

Design/methodology/approach – A total of 243 valid questionnaires were collected from 3G users in the Klang Valley, Malaysia. The combination of partial least squares (PLS) path modelling approach and structural equation modelling (SEM; PLS-SEM) technique was used to analyze the measurement and structural model.

Findings – Our empirical assessment supports the proposed research hypotheses and further suggests that service quality is a second-order reflective construct comprising navigation and visual design, management and customer service and system reliability and connection quality.

Originality/value – Prior studies have examined the impact of service quality, perceived usefulness, overall users' satisfaction and behavioural intention on an information system in general. This study is among the few studies that have attempted to gain insights into 3G users' post-adoption experience with telecommunications services.

Keywords Service quality, Perceived usefulness, 3G mobile phone, Behavioural retention, Cognitive satisfaction

Paper type Research paper



1. Introduction

The importance of service performance, service quality and users' behavioural retention for industries and perceived quality, perceived usefulness and satisfaction for customers has created an issue in the area of marketing management in the industrial

sector, such as telecommunications. Mobile telecommunications have evolved from their original purpose (just as a calling device) and become a significant source and device for both personal and business usage (Kuo *et al.*, 2009; Sun *et al.*, 2009; Chen and Daim, 2008; Zhu *et al.*, 2011). With the development of information and communication technology (ICT), mobile commerce (m-commerce) has reached an advanced point (Kim, 2012; Gómez-Barroso *et al.*, 2012; Liao *et al.*, 2007; Klein and Jakopin, 2014; Srivastava, 2005). As evident, companies continuously adopt mobile strategies to enhance customers' satisfaction with their services (Wu *et al.*, 2014). The uses of mobile devices demonstrate that services are continuously being delivered to individuals. This trend has become a part of life (Doubouya *et al.*, 2014; Hanafizadeh *et al.*, 2014) and has created a unique opportunity for businesses to serve their customers better (Wu *et al.*, 2010). According to Wittig (2010), the critical innovation of mobile technology has driven the penetration rate of mobile devices worldwide. Evidently, even people in the rural areas now use mobile applications and tools in their daily life. Veijalainen *et al.* (2006) refer to m-commerce as electronic transaction related to utilising a cell phone terminal and a wireless access network. ICT has changed and has significantly challenged traditional businesses in different industries (See-To *et al.*, 2012; Chen *et al.*, 2011). The technological development witnesses mobile telecommunications firms offering information goods (Klein and Jakopin, 2014; Zhu *et al.*, 2011). Advancement in ICT has forced businesses to shape the way that they compete with each other. Thus, the mobile telecommunications industry is a critically competitive market in which buyers feel comfortable in moving from one business to another (Keropyan and Gil-Lafuente, 2012; Patrick Rau and Chen, 2006; Runhui *et al.*, 2011). Therefore, this development warrants research concerning the third-generation (3G) mobile technology's post-adoption usage (Zhou, 2011a).

The importance of service performance for industries and the perceived quality for customers has created a gap for marketing managers in the past few years (Nikou and Mezei, 2012; Datta *et al.*, 2013; Du *et al.*, 2012). Industry managers are looking for a rejuvenation of their post-sales services in different industry sectors. The evaluation of service quality has prompted a new research area for academics to create knowledge in response to customers' needs (Lapierre *et al.*, 1996). Accordingly, the fast adoption of products and services, such as m-commerce, has shifted and attracted much attention solely on providing service (Turel and Serenko, 2006). The substantial body of research in the marketing area shows that the success of companies depends very much on customer satisfaction and service quality (Kuo *et al.*, 2009). There is an argument that mobile technology adoption could provide advantages for targeted markets in terms of flexibility and interactivity (Chatterjee *et al.*, 2009; Kim, 2012). Wong (2012) suggested that companies that focus on customer acquisition and forget about customer retention may not achieve positive results. Meanwhile, after customers are acquired and possibly satisfied, the important issue is how to keep those customers with the company in future. Therefore, based on previous literature on mobile marketing, there is a gap in relating mobile marketing and service quality. Based on the stated problem, the cost of achieving a new customer is five to ten times more than that of retaining existing subscribers for telecommunications companies (Chu *et al.*, 2007). According to del Rio-Lanza *et al.* (2009), competition among companies in the telecommunications industry is keen. The importance of mobile satisfaction along with enhanced service quality is becoming an objective for companies to gain more market share (Turel and Serenko, 2006). Thus,

based on the above issues, the following research question is posed: what contributes to 3G users' post-adoption experience with telecommunications services? The purpose of this study is to investigate the impact of perceived usefulness and service quality on satisfaction and behavioural retention among the 3G mobile phone users.

In answering the research question, the present research considers an examination of the antecedents and consequences of individual satisfaction in the mobile telecommunications context in line with the shift from product-focused to service-focused business approaches (Zhao *et al.*, 2012; Elfving and Urquhart, 2013). The focus in this study is to examine mobile marketing in relation to service quality and overall marketing efforts. First, the area of mobile marketing and service is examined based on a review of the related literature. Second, the theories in the area of service quality and mobile customer satisfaction, as well as retention, are investigated. The technology acceptance model (TAM) (Davis, 1989) and SERVQUAL model (Parasuraman *et al.*, 1985, 1988, 1994) are discussed. Third, the research variables, which are the factors that impact customers' retention, are examined based on previously related studies in the area of marketing and mobile marketing. Fourth, the methods undertaken to empirically and statistically examine the relationship between exogenous and endogenous constructs are presented. Last, the research findings, contributions and practical and research implications are discussed.

1.1 Background of study

One of the major challenges confronting both m-commerce developers and practitioners is the need to understand the consumers' perception of m-commerce applications to better design and deliver m-commerce service. However, few studies have examined service quality in enhancing customer retention and loyalty in mobile telecommunications industries (Kuo *et al.*, 2009). This is in light of the many new advances made in wireless technologies over the past few years that could not fulfil customers' expectations (Teng *et al.*, 2009). The issue of retaining acquired customers has become a top agenda for marketers in all telecommunications companies to gain a greater market share. Wong (2012) claimed that the most important issue that mobile marketing managers should recognise is how to maintain a good relationship with the acquired customers and to keep them satisfied by providing better services than their competitors. Moreover, losing an existing customer causes significant losses not only in terms of the income and revenue of the companies but also a loss of potential revenue generated by the more sophisticated services that will become available in the future (Seo *et al.*, 2008).

Although physical products and services have been well explored in academic literature, research concerning customer satisfaction and loyalty factors in the mobile telecommunications services market is lacking (Turel and Serenko, 2006). The mass adoption of the services and products of companies plays a crucial role in indicating whether a business is performing well in the marketplace. In particular, for the service provider companies in the telecommunications market, the survival of their future operations to successfully enhance their technology-based services is dependent on their performance. Mobile telecommunications operators are looking for innovative ways to better enhance and retain their valued subscribers because of the high cost of acquisition and rising churn rate in a rapidly maturing market (Wong, 2012; Sohail and Al-Jabri, 2013). The mobile telecommunications market is in the early stage, and the mode of

competition has changed from acquiring new subscribers to retaining existing customers (Keramati and Ardabili, 2011). Therefore, mobile telecommunications companies are competing with each other to retain their subscribed customers.

2. Literature review and hypotheses development

2.1 Perceived usefulness

It is important to identify the factors relating to customer satisfaction and loyalty and to investigate the antecedents of these factors (Kondo *et al.*, 2012; Zhou, 2011b). Based on the TAM, the usage behaviour method is affected by the intention to use a system, which, in turn, is settled by the consumer's decision regarding the particular system. TAM was established for organizational settings (Davis, 1989) through which the acceptance of the old type of technology by individual employees was measured, and the cost of compulsory acceptance was borne via the management (Purnima and Preeti, 2011). The theory of reasoned action (TRA) and TAM have been used extensively to explain behaviour adoption. This is despite TRA (Ajzen and Fishbein, 1980) showing a weak productive strength in the implementation of marketing and revealing an intention model focusing on product purchase conditions (Teng *et al.*, 2009). Specific antecedents of TAM related to design aesthetics have not been examined within the technology domain (Cyr *et al.*, 2006; Oh and Yoon, 2013). TAM is based on two major elements that forecast intentions for technology adoption, perceived ease of use and perceived usefulness, which are assumed to affect users' intention (Shin, 2014). Perceived ease of use is when individuals perceive that utilizing a specific system is free of effort, and perceived usefulness is the extent to which an individual decides that by using a specific system, he/she would be able to improve his/her job performance and productivity as the initial determinants of consumer confirmation and utilization of the system (Thirumalai and Sinha, 2011). Although a growing body of literature has pointed out the main value-added elements of m-commerce, the primary drivers for adoption and the intention to adopt mobile services remain unclear. TAM has pointed out that user admittance of a given data system can demonstrate the clients' desire to utilize the system, which, in turn, is decided by the users' perceived notion about the system (Udo *et al.*, 2010). According to former related research, users' acceptance of ICT has been mainly on the TRA, TAM (Davis, 1989), the theory of planned behaviour (Ajzen, 1991) and the innovation diffusion theory. Many researches and commentators believe that consumers' acceptance of mobile phone marketing is impacted by their acceptance of the mobile phone itself (Gemma, 2009). Lin and Sun (2009) argue that factors relating to technology acceptance determine users' e-satisfaction and e-loyalty. ThaeMin and JongKun (2007) investigated the repurchase intention of m-commerce consumers; therefore, a model comprising TAM, satisfaction and contextual perceived value in marketing is proposed as the new m-commerce-specific construct. Originally, TAM was developed to assess the users' acceptance of information technology and system design features (Thirumalai and Sinha, 2011; Amin *et al.*, 2014, 2015). Usefulness is experienced when the users decide that the system has improved their job effort (Landrum *et al.*, 2007) and intensifies the value perception and effect of behavioural intention (Wang and Wu, 2013). For maintaining mobile telecommunications technology, manufacturers basically work towards increasing the usefulness and utilization of the modern handsets (Teng *et al.*, 2009). The usefulness and context of the messages are totally related to consumer adoption of the promotions sent through this modern device (Gemma, 2009).

With respect to adoption behaviour, which is related to ICT, TRA and TAM, could be the most fundamental and powerful theories discussed by researchers (Teng *et al.*, 2009). According to TAM, system usage behaviour is impacted by the intention to use a specific method, which, in turn, is caused through the users' beliefs about the system (ThaeMin and JongKun, 2007; Shen *et al.*, 2010). The TAM suggests that intention is affected by the attitude to usage along with the effect of perceived usefulness (Teng *et al.*, 2009). Studies suggested that perceived usefulness is prominent as a way of assessing users' satisfaction with the information system (Landrum and Prybutok, 2004; Calisir and Calisir, 2004). Usefulness of a mobile device will positively influence behavioural intention (Liao *et al.*, 2007) and mobile loyalty (Cyr *et al.*, 2006). According to Landrum *et al.* (2007) and Zhou (2011b), usefulness is shown to be positively related to satisfaction. Thus, we hypothesize:

- H1. There is a positive relationship between perceived usefulness and satisfaction.
- H2. There is a positive relationship between perceived usefulness and behavioural retention.

2.2 Service quality

Generally, services have three common characteristics:

- (1) produced and consumed at the same time;
- (2) mostly are intangible; and
- (3) highly involved with customers in the process of creating and delivering (Stewart *et al.*, 1998).

Service quality mostly refers to the link between individual expectation and perception of the service performance (Mägi and Julander, 1996; McAllister, 2001). The previous processes on service quality have been built based on the SERVQUAL model. The SERVQUAL model indicates the service quality as a variation among customers' expectation of service proposing and the customers' perception of the service delivered, and, consequently, it can measure consumers' attitude (Sarai and Amini, 2012). There are five isolated dimensions available based on the SERVQUAL model that can consider the customers when estimating the quality of the service provided (Urdang and Howey, 2001). Moreover, service quality is intangible and is summarized as having three unique features to the service delivery – intangibility, heterogeneity and inseparability (Kang and Bradley, 2002). Even though SERVQUAL is broadly used to estimate service quality, no two providers are the same (Gilbert and Wong, 2003). One of the main criticisms of SERVQUAL by researchers concerns the multiplication of service quality (Zhao and Lu, 2012). Urdang and Howey (2001) illustrated that the SERVQUAL model is formulated to estimate consumers' satisfaction. The definition of service quality could be the idea about the way the service has been applied (Caruana *et al.*, 2000). In addition, SERVQUAL examines the intangible facets of providing services, and, although the model is able to estimate tangible aspects, it is not capable of doing so in a profound manner (Roses *et al.*, 2009).

To measure service quality, marketing researchers have accepted that the use of generic models, such as SERVQUAL or SERVPERF, to evaluate service quality across industries is not possible (Martínez Caro and Martínez García, 2008). Service quality dimensionality and measurement plays a vital role in terms of estimating service

performance (Hsu *et al.*, 2012), determining service difficulty, handling service delivery and identifying employee and corporate prizes (DeMoranville and Bienstock, 2003). Parasuraman *et al.* (1985) established the SERVQUAL model comprising five dimensions, namely, tangibles, responsiveness, reliability, assurance and empathy, to determine service quality. This model has received considerable attention from both academics and the practitioners. SERVQUAL has become a logically accepted model to fulfil the customers' expectations (Yeon *et al.*, 2006). Zhang *et al.* (2009) found that service quality is a six-dimensional construct, which consists of resources, outcomes, process, management, image and social responsibility. He and Wei (2009) developed Islamic service quality, which measures general Islamic values, halal/haram, attention to Islamic religious activities, honesty, modesty and humaneness and trustworthiness. Zhao *et al.* (2012) developed a multi-dimensional approach (interaction quality, environment quality and outcome quality) in mobile value-added services in China. There is no universally accepted explanation of service quality (Liou *et al.*, 2011). Bandura (1982) suggested that four dimensions of service loyalty – purchase intentions, word-of-mouth communication, price sensitivity and complaining behaviour – can be identified. In addition, Emerson (1976) suggested that perceived quality is a multi-dimensional construct, which includes Web design, customer service, assurance and order management. Kuo *et al.* (2009) classified service quality elements based on four dimensions – satisfactory quality, navigation and visual design, management and customer service and system reliability and connection quality. In this study, we measure service quality using three dimensions: navigation and visual design, management and customer service and system reliability and connection quality. Figure 1 shows the research model.

2.2.1 *Navigation and visual design.* Navigation issues have been studied in connection with database systems, and, more recently, in hypertext and hypermedia

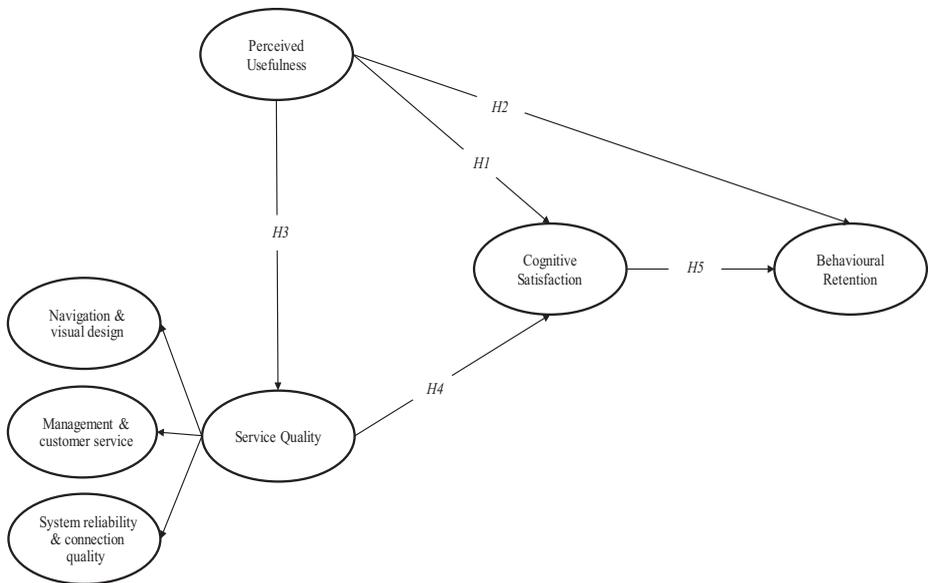


Figure 1.
Research model

environments, including the World Wide Web. An understanding of the general architecture of human information processing, especially how it differs from computer information processing, is essential for the improvement of computer–human interfaces (Strong *et al.*, 1991). Navigation is the process of moving around an environment and deciding at each step where to go (Sayers, 2004). Visual navigation has become a source of countless research contributions, as navigation strategies, which are based on vision, can expand the scope of the applications of mobile robots (He *et al.*, 2012). A visual system is essential for achieving safe and efficient travel, as evidenced by the reduction in the mobility performance of people who are visually impaired (Hassan *et al.*, 2007). Therefore, the designs of navigation systems may be viewed as assisting users with their natural behaviours and movement strategies.

Firms realize that it would be more useful to give clear service and build a new strategy for the customers who prefer to have dissimilar importance or benefit for the organization, rather than treat them similarly (Keropyan and Gil-Lafuente, 2012; Parasuraman *et al.*, 1985). System quality pertains to the type and characteristic of the information system, as well as the procedure of the system, elasticity offered by the system and characteristics of the information system or resource that are accessible to the system (Chatterjee *et al.*, 2009). Similarly, pertinent research has shown that service quality is a focal factor for the survival and improvement of the current rivals; hence, the significance and attention in service quality has been changed considerably (Lin, 2010). Various researchers have dedicated their time to develop generic instruments that would be able to accurately measure the service quality among the different service divisions, thus, service quality is considered to be significant in terms of the survival, success and growth of the service industry (Lin, 2010).

Furthermore, navigation in virtual environments is often facilitated by spatial information that users perceive visually (van Oostendorp and Juvina, 2007). Studies concerning service quality are based on an overall customer judgment of the product or service (Yu and Chu, 2007). A well-designed interface is essential for finding everything necessary and meeting the requirements of both the average user and users with special needs (Mátrai *et al.*, 2008). The differences between the Web and closed systems are most pronounced with respect to inter-site navigation in which the potential for variety among the encountered hyperspace structures and designs is quite high (Danielson, 2002). According to Li and Yeh (2010), aesthetically designed websites can influence loyalty in the mobile service domains. As mobile computing power and other hardware resources are improving rapidly, operations that were typically performed on a server can now be performed directly on the mobile device.

2.2.2 Management and customer service. Service quality is a key driver of consumer loyalty (Parasuraman and Grewal, 2000) and firm performance (Zeithaml, 1988). With the rapidly changing technologies, customer needs and increased customer awareness, it is imperative that a review of the quality of service parameters for cellular mobile communication is conducted (Kothari *et al.*, 2011). Despite the potency of mobile services, providers still lack an understanding about how consumers perceive their value (Gummerus and Pihlström, 2011). The telecom players need to gain a good understanding of the customers' perceptions of and aspirations for service quality (Kothari *et al.*, 2011). Modern organizations are becoming increasingly customer-centric and are embracing customer-driven initiatives that seek to understand, attract, retain and build intimate long-term relationships with profitable customers (Nimako, 2012).

Although the mobile service market indicates noticeable and continuous growth and has impacted on the variety of services on offer, it does not specifically characterize the market size (Keramati and Ardabili, 2011). It is constantly being reported in the news that among the world's economies, especially the USA, the services sector is continuing to grow, particularly the electronic business environment, whereas other industries are experiencing a contraction (Udo *et al.*, 2010). Service quality evaluation takes place at different levels, from specific attribute levels to a more abstract level of evaluation linking to a perception of an overall perceived quality. In general, satisfaction is developed on the information from all prior experiences with the service supplier and is considered as a function of all prior transactions and information (Paulrajan and Rajkumar, 2011).

2.2.3 System reliability and connection quality. The attainment of high reliability and availability is very difficult to be achieved in very complex wireless infrastructureless networks (Mavromoustakis and Karatza, 2008). Reliability is one of the most important performance measures for emerging technologies, and shortcomings are often overlooked in early releases as cutting edge technology overshadows a fragile design. The findings indicate that technical quality is the most important in the service quality dimension to the customers (Nimako, 2012). In the cellular mobile market, customers have higher expectations for communication from its service providers, and if the companies are not able to meet these expectations, the customers will take their business elsewhere (Paulrajan and Rajkumar, 2011). The reliability concept essentially describes the transmission characteristics of infrastructureless networks, such as packet loss probability, packet duplication, data misinsertion and corruption of packets (Mavromoustakis and Karatza, 2008). Kimura *et al.* (2006) considered the reliability of a mobile communication system with network congestion by adopting the recovery schemes of checkpoint and rollback. Therefore, the mobile host carrying its recovery information to its current mobile support station can instantly recover in case of a failure (Park *et al.*, 2003).

Service quality impacts customer satisfaction (Kuo *et al.*, 2009; Kim and Moon, 2012; de Ruyter *et al.*, 1997; He and Wei, 2009; Boer *et al.*, 2011; Badulescu-Buga, 2013). Gil *et al.* (2008) claimed that perceived service value mediates the effects of understanding of mutual action on the overall customer satisfaction. Marketing scholars have been particularly involved in the conceptualization and assessment of service quality that may lead to customer satisfaction (Bai *et al.*, 2008). Excellent service quality can create an advantage over rivals for the companies through customer satisfaction and loyalty (Landrum and Prybutok, 2004; Tsai and Lu, 2006). Several studies regarding satisfaction have indicated that there is a positive relationship between customer satisfaction and post-purchase intention (Kuo *et al.*, 2009; Kim and Moon, 2012). Basically, in m-commerce, customer satisfaction will occur during the post-purchase assessment and the emotional sense concerning the product or services experienced and the skill in the m-commerce environment (Kuo *et al.*, 2009). The consequences of this are formed by trust, satisfaction and image (Kim *et al.*, 2011). Seo *et al.* (2008) argued that satisfaction depends on how customers perceive service quality. Accordingly, studies have shown direct relationships among service quality and customer satisfaction, customer loyalty, retention and profitability (Kothari *et al.*, 2011). Therefore, we hypothesize:

H3. There is a positive relationship between perceived usefulness and service quality.

H4. There is a positive relationship between service quality and satisfaction.

2.3 Satisfaction and behavioural retention

A firm must be knowledgeable about customer behaviour so that it can increase customer satisfaction (Keropyan and Gil-Lafuente, 2012) and, hence, lead to its success (Anderson and Sullivan, 1993; Hauser *et al.*, 1994; Maxham and Netemeyer, 2002). Satisfaction is defined as “the consumer’s sense that consumption provides outcomes against a standard of pleasure versus displeasure” (Oliver, 1999, p. 34). In m-commerce, Kuo *et al.* (2009) defined customer satisfaction as the total utilized image of clients when consuming mobile value-attached services. Because service quality has a considerable influence on the service industry, several researchers have dedicated their time to measuring service quality and satisfaction in various service divisions (Carrasco *et al.*, 2012). Satisfaction is an experience by the customers of how extensively expectations have been fulfilled (Gerpott *et al.*, 2001). Ultimately, satisfaction is considered as the gathered feeling or attitude towards a different type of element that impacts the adoption model (Yeon *et al.*, 2006). Customer satisfaction is the result of the product or service surpassing the customer’s expectations (Landrum *et al.*, 2007). Satisfying customers’ needs is one of the major issues in marketing literature (Gil *et al.*, 2008). Satisfaction is generally presumed to be a post-consumption assessment, which depends on the perceived quality or value (Yeon *et al.*, 2006). Thus, several studies have suggested that some sort of website electronic service can positively impact customer satisfaction through a suitable website and online purchasing in the long term (Zavareh *et al.*, 2012).

One of the well-known marketing approaches is loyalty marketing, in that a company focuses on improving and retaining its existing customers (Keropyan and Gil-Lafuente, 2012). In the field of mobile services, loyalty is described as a positive attitude for a specific service provider that leads to a joining of repurchase feasibility (Turel and Serenko, 2006). The relationship between the customer and manufacturer or service provider can have notion on two of the independent factors, loyalty and retention (Turel and Serenko, 2006). Wong (2012) found that in terms of financial perspective, loyal customers can be considered to be an asset for the organization. Research has indicated that service quality will lead to customer loyalty and attract fresh customers, enhance the corporate image of the company, allow for a reduction in prices and improve business performance (Zhao and Lu, 2012). Thus, the past experience of customers affects the decision-making process of consumers, which is well recognized in the marketing literature (Jessica, 2003; Chanaka *et al.*, 2009) and in which the unexampled growth in the rivalry in the wireless telecommunications market has raised the benefit of keeping the existing customers (Seo *et al.*, 2008).

Previous research suggests that there is a positive link between customer satisfaction and customer retention, as well as profitability (Kim and Moon, 2012; Oliver, 1999). Customer service is the main element for creating loyal customers and, thus, ensuring the future success of the business (Paulins, 2005; Hsu *et al.*, 2012). It is possible to determine two comprehensive types of customer loyalty – behavioural and attitudinal. Behaviourally, loyal customers act loyally; however, there is no emotional link with the supplier/brand. In the case of attitudinal loyalty, there is an emotional link between the

customer and the brand. The identical or intermediary influence of satisfaction on the Web, service quality and behavioural intentions is more powerful than the direct influence of Web service and quality on behavioural intentions (Udo *et al.*, 2010). Although numerous studies have considered the concept of satisfaction when examining loyalty programmes (Vesel and Zabkar, 2009), previous studies have identified a linear relationship between satisfaction and behavioural retention (Seo *et al.*, 2008). Customer satisfaction has been considered as one of the significant positive factors of behavioural retention (Shin and Kim, 2008; Kim and Moon, 2012; Haverila, 2011). According to Turel and Serenko (2006), customers who are extremely satisfied are likely to present a top-level probability in terms of repurchase and a higher tolerance to price increase by their providers or reduction in prices by their rivals. Therefore, we hypothesize:

H5. There is a positive relationship between satisfaction and behavioural retention.

3. Methodology

3.1 Data collection approach

To test the proposed research model (Figure 1) and the hypothesized relationships, a cross-sectional data collection approach was used. Using the survey methodology, in particular, population and sampling and instrumentation, a strategy for data collection and data analysis approach were undertaken. Accordingly, the target respondents in this study were the 3G smartphone users of telecommunications services; in particular, smartphone users who have used mobile voice chat, mobile voice mail, mobile internet, mobile TV and mobile video calls were considered as the target population in this study. The total number of mobile phone subscribers in Malaysia is approximately 34.5 million with a penetration rate of around 121 per cent because of multiple subscriptions (Balakrishnan and Raj, 2012). According to the Malaysian Communication and Multimedia Commission, Malaysia ranks second in Southeast Asia for internet penetration, behind Singapore, which is a developed nation (Chong *et al.*, 2012a). To draw an adequate sample size to test the model (Figure 1) by using partial least squares (PLS) path modelling approach and structural equation modelling (SEM; PLS-SEM) analysis, power analysis was used (Chin, 2010), which recommends a minimum sample size of between 100 and 130 cases according to the model with the largest number of predictors. As PLS-SEM is less affected by small sample sizes, the rule of thumb (Gefen *et al.*, 2000) was performed in this study to set an appropriate sample size. Thus, at least ten times the number of items of the most complex construct (service quality with 16 items and three dimensional arrows), as the rule of thumb, was considered to be an adequate sample size. Therefore, 190 responses were determined as being the minimum requirement to conduct statistical analysis using PLS-SEM.

Accordingly, prior to main data collection, we conducted a pre-test – 26 questionnaires were collected from respondents in 3G stores in Mid Valley City in Malaysia – to ensure the consistency of the research questionnaire. Upon pre-test assessment, the questionnaire was amended and revised based on the feedback received from the respondents. All the indicators were retained with some revision to the wording and formatting of the questionnaire. After the pre-test was completed, 310 questionnaires were distributed among 3G smartphone users in shopping malls and students in two public universities and a private university in Malaysia; 243 valid questionnaires were returned (78.38 per cent response rate). The aim of the survey was

to capture users' experience with telecommunications service providers in using 3G applications. Table I depicts the demographic profile of the respondents. Following Johansson *et al.* (2012), we focused on selecting the relevant customer groups (i.e. iPhone, Nokia and other Android users). In Malaysia, the popular brands in the local market include the likes of Nokia, Samsung, Motorola, Siemens, Ericsson and, more recently, HTC and Apple's iPhone (Balakrishnan and Raj, 2012).

3.2 Questionnaire and measurement items

The questionnaire was divided into two sections. The first section captured information regarding the demographic profile of the respondents, as explained above. The second section included information pertaining to the exogenous and endogenous constructs

Serial no.	Profile	Category	(%)
1	Age (years)	18-24	24.7
		25-34	41.8
		35-44	25.8
		45 and above	7.7
2	Gender	Male	41.8
		Female	58.2
3	Ethnicity	Malay	40.7
		Chinese	36.3
		Indians	15.9
		Other	7.1
4	Education level	PhD	13.2
		Master	41.2
		Bachelor	33.5
		Diploma	12.1
5	Occupation	Business owners	3.8
		CEO/MD	6.6
		Professional (Dr/Lawyer/Engineer)	9.9
		Senior employee	14.3
		Managerial level	18.7
		Student	29.7
		Executive	7.7
6	Location	Others	9.3
		Klang Valley	58.2
7	Income per month	Outside Klang Valley	41.8
		Below RM3,000 ^a	43.4
		RM3,100-5,000	32.4
		RM5,100-10,000	19.2
8	Type of mobile service operator used by respondents	More than RM10,000	4.9
		Maxis	23.6
		Celcom	25.3
		DiGi	20.9
		U-Mobile	16.5
		Tune-Talk	12.6
Others	0.5		

Table I.
Demographic profile
of respondents

Note: ^aRM4.25 = USD1

adopted from previous studies. Service quality was measured using three dimensions – navigation and visual design (four items), management and customer service (seven items) and system reliability (seven items) (Kuo *et al.*, 2009). To measure satisfaction (cognitive aspect), four items were adopted according to previous studies (Chang and Chen, 2009; Oliver, 1997; Kang and Park-Poaps, 2011; Lam *et al.*, 2011; Terpstra and Verbeeten, 2013; Zopiatis *et al.*, 2014). To measure behavioural retention, four items were adopted from previous studies (Bai *et al.*, 2008; Chao-Min *et al.*, 2009; Aron and Jamie, 2010) and to measure perceived usefulness, four items were adopted from previous research (Davis, 1989; Ajzen and Fishbein, 1980). Appendix shows the measurement items and sources. A five-point Likert scale, anchored from 1: strongly disagree to 5: strongly agree, was applied to assess the items for exogenous and endogenous constructs.

3.3 Missing values treatment

A researcher should consider missing data from data set (Schafer and Olsen, 1998; Acuna and Rodriguez, 2004; Graham *et al.*, 1997), as missing values or missing data are “a pervasive problem in sample surveys” (Little, 1988, p. 287) that leads to concern in the analysis of multivariate data in social and behavioural sciences (Schafer and Olsen, 1998; Rezaei and Ghodsi, 2014). The expectation maximization method is an iterative processing through which all other variables relevant to the construct of interest are used to predict the values of the missing variables (Graham *et al.*, 1997). Therefore, before the data were analyzed in SEM, we performed an expectation maximization algorithm (Little, 1988) to impute missing values and handle missing values by means of SPSS software.

3.4 Non-response bias

Survey methods are criticized for non-response bias (Armstrong and Overton, 1977). If the respondents respond differently from the respondents who do not respond, the issue of non-respondents should be considered to ensure the validity of the findings. Lewis *et al.* (2013) defined non-response bias “as a systematic and significant difference between those who respond to a survey and those who do not in terms of characteristics central to the research focus” (pp. 240-241). In this study, according to the continuum of resistance theory (Lin and Schaeffer, 1995), we first performed an analysis of known demographic characteristics, such as age, and then conducted a wave analysis and, finally, compared the key constructs of the study, such as service quality, perceived usefulness and satisfaction; no significant differences were shown between groups using the *t*-test. The late responders were considered as almost non-responders and used as a proxy for the non-response group, then, the relevant variables were compared between the early and late responders. Our empirical assessment shows that the study sample is free of non-respondent bias.

3.5 Common method variance

Furthermore, Common method variance (CMV), which occurs because of a single survey method being used to collect responses (Podsakoff *et al.*, 2003), is considered in this research. CMV, which is a variance that is attributable to the measurement method, is problematic in behavioural studies. CMV contributes to item covariation between the latent constructs (MacKenzie and Podsakoff, 2012) that influence the structural relationship (Kline *et al.*, 2000). According to Reio (2010), procedural design of the questionnaire design and statistical

control are solutions to reduce the probability of CMV. This study addressed the CMV concerning its potential threat by following the guidelines proposed by Podsakoff *et al.* (2003). At the survey design stage and data analysis, statistical techniques including the Harman's one-factor test in the partial correlation procedures and the structural model marker-variable technique were conducted. Furthermore, followed by Scarpello and Carragher (2008), the modified process of Harman's one-factor test that is using pairs of indicators from "hypothetically independent scales" to be entered into a single factor was conducted. The result from modified process of Harman's one-factor test also indicate that CMV is not a problem as the single factor solution was not obtained. Thus, our statistical findings confirm that CMV is not a concern in this study.

3.6 Partial least squares-structural equation modelling

We performed PLS-SEM to analyze the data using SmartPLS software (Ringle *et al.*, 2005). PLS-SEM is, however, advantageous compared to the covariance-based SEM when analyzing predictive research models that are in the early stages of theory development (Gimbert *et al.*, 2010; Henseler *et al.*, 2016; Dijkstra and Henseler, 2015; Henseler, 2010; Rezaei and Ismail, 2014). The statistical objective of PLS-SEM is to maximize the explained variance of the endogenous latent constructs (Hair *et al.*, 2011). The common approach is to present results in two phases (Chin, 2010); first is the focus on the reliability and validity of the item measures used, and, the second stage involves the structural model assessment (Hair *et al.*, 2013). The assessment of the validity of the reflective measurement models focuses on the convergent validity and discriminant validity (Hair *et al.*, 2011). Table II depicts the construct validity, which assesses the measurement models, and Table III depicts the weights of the first-order on the designated second-order constructs. Outer model assessment involves examining individual indicator reliabilities, the reliabilities for each construct's composite of measures (i.e. internal consistency reliability) and the convergent and discriminant validities of the measures (Hair *et al.*, 2012; Rezaei and Ghodsi, 2014).

4. Results

4.1 Content, construct and convergent validity

Cronbach and Meehl (1955) distinguished four types of validity in research, namely, predictive validity, concurrent validity, content validity and construct validity. In this study, we conduct content and construct validities to make sure the findings are highly reliable. According to Zuckerman (2008), content validity cannot substitute for construct validity, which is measured by the relationships between a scale and external criteria. Content validity determines whether the test samples the meanings implicit in the construct the test constructor is trying to assess (Zuckerman, 2008). Based on the research patterns and proposed framework in this study, the questionnaire items were adopted based on previous related studies. Construct validity was also used, which is to "assess whether the measures chosen are true constructs describing the event or merely artefacts of the methodology itself" (Straub, 1989, p. 150). In addition to Table IV, from Table II, we can observe that all the items measuring a particular construct loaded highly on that construct and loaded lower on the other constructs, thus confirming construct validity.

As shown in Table II, all the outer loadings of the reflective constructs' behavioural retention, service quality, satisfaction and perceived usefulness are well above the minimum threshold value of 0.70, as proposed by (Hair *et al.*, 2011), except M&S7 and

Second-order construct	First-order construct	Item	Loading	AVE ^a	CR ^b	Cronbach's alpha	
BR	NA	BR1	0.902	0.865	0.962	0.947	
		BR2	0.963				
		BR3	0.888				
		BR4	0.963				
CSAT	NA	CSAT1	0.844	0.814	0.946	0.923	
		CSAT2	0.880				
		CSAT3	0.938				
		CSAT4	0.942				
PU	NA	PU1	0.815	0.737	0.933	0.910	
		PU2	0.898				
		PU3	0.852				
		PU4	0.903				
		PU5	0.822				
SQ	SQMS	SQMS1	0.776	0.639	0.914	0.887	
		SQMS2	0.788				
		SQMS3	0.762				
		SQMS4	0.823				
		SQMS5	0.848				
		SQMS6	0.798				
	SQND	SQND	SQND1	0.926	0.881	0.967	0.955
			SQND2	0.956			
			SQND3	0.933			
			SQND4	0.939			
	SQSC	SQSC	SQSC1	0.867	0.781	0.955	0.944
			SQSC2	0.861			
			SQSC3	0.925			
			SQSC4	0.858			
SQSC5			0.914				
SQSC6			0.876				
SQSC7			0.876				

Notes: ^aAverage variance extracted (AVE) = (summation of the square of the factor loadings)/{(summation of the square of the factor loadings) + (summation of the error variances)}; ^b composite reliability (CR) = (square of the summation of the factor loadings)/{(square of the summation of the factor loadings) + (square of the summation of the error variances)}; acronyms: service quality (SQ), perceived usefulness (PU), cognitive satisfaction (CSAT), behavioural retention (BR), navigation and visual design (SQND), management and customer service (SQMS) and system reliability and connection quality (SQSC); * M&S7 was deleted because of low loading; ** S&C6 was deleted because of low loading

Table II.
Construct validity

S&C6, which were deleted because of low loading. Table II shows that all the reflective constructs have high levels of internal consistency reliability, as demonstrated by the above composite reliability values. Composite reliability should be higher than 0.70 (Hair *et al.*, 2011). The average variance extracted (AVE) values (convergent validity) are well above the minimum required level of 0.50, therefore showing convergent validity for all the three constructs. The AVE of each latent construct should be higher than the construct's highest squared correlation with any other latent construct (Hair *et al.*, 2011) for which our study confirms the convergent validity.

Second-order construct	First-order construct	Item	Outer weights	AVE	CR	<i>t</i> -statistic of first-order construct	<i>t</i> -statistic of item	
SQ	SQMS	SQMS1	0.205	0.811	0.928	156.812*	35.047*	
		SQMS2	0.202				35.556*	
		SQMS3	0.199				29.987*	
		SQMS4	0.212				51.651*	
		SQMS5	0.220				46.380*	
		SQMS6	0.213				36.824*	
	SQND	SQND1	0.264				49.689*	113.592*
		SQND2	0.265				223.162*	
		SQND3	0.279				146.693*	
		SQND4	0.258				70.073*	
	SQSC	SQSC1	0.184				66.158*	58.492*
		SQSC2	0.188				67.534*	
		SQSC3	0.193				135.961*	
		SQSC4	0.183				62.573*	
		SQSC5	0.192				104.231*	
		SQSC6	0.191				51.310*	
		SQSC7	0.191				51.310*	

Notes: **t*-value = 2.58 (significance level = 1%); acronyms: service quality (SQ), navigation and visual design (SQND), management and customer service (SQMS) and system reliability and connection quality (SQSC)

Table III.
Weights of first-order
on designated
second-order
constructs

Constructs	BR	SQMS	SQND	PU	CSAT	SQSC
BR	0.865 ^a					
SQMS	0.529	0.639				
SQND	0.468	0.569	0.881			
PU	0.542	0.463	0.531	0.737		
CSAT	0.464	0.407	0.485	0.588	0.814	
SQSC	0.590	0.405	0.569	0.572	0.435	0.781

Notes: ^aThe off-diagonal values in the above matrix are the square correlations between the latent constructs, and diagonal are AVEs; acronyms: service quality (SQ), perceived usefulness (PU), cognitive satisfaction (CSAT), behavioural retention (BR), navigation and visual design (SQND), management and customer service (SQMS) and system reliability and connection quality (SQSC)

Table IV.
Discriminant
validity – Fornell –
Larcker criterion

Furthermore, to empirically test the first-order construct on designated second-order construct, hierarchical component model (Chin *et al.*, 2003) or repeated indicators approach (Lohmoller, 1988), which is a popular approach in estimating higher-order constructs with PLS (Wilson and Henseler, 2007), was undertaken. Table III shows the weights of first-order on designated second-order constructs, indicating that service quality empirically comprises the proposed three dimensions (visual design, management and customer service and system reliability). Therefore, outer weights, AVE, CR, *t*-statistic of first-order construct and *t*-statistic of items indicate that the proposed three dimensions empirically construct the

service quality of 3G users' post-adoption experience with telecommunications services.

4.2 Discriminant validity

Tables IV and V show the discriminant validity of research constructs. According to Table IV, diagonals (numbers in bold) represent the AVE, whereas the other entries represent the squared correlations. The off-diagonal values in the matrix are the correlations between the latent constructs that are less than AVEs values. In addition, a comparison of the loadings across the columns in the above matrix (loadings and cross-loadings of items) implies that an indicator's loadings on its own construct are in all cases higher than all of its cross-loadings with other constructs. The results, thus, indicate that there is discriminant validity between all the constructs based on Fornell–Larcker criterion and cross-loadings criterion.

Construct	Item	BR	CSAT	SQMS	SQND	PU	SQSC
BR	BR1	<i>0.902^a</i>	0.426	0.512	0.536	0.485	0.465
	BR2	<i>0.963</i>	0.532	0.598	0.644	0.524	0.467
	BR3	<i>0.888</i>	0.616	0.530	0.558	0.618	0.424
	BR4	<i>0.963</i>	0.632	0.595	0.641	0.524	0.464
CSAT	CSAT1	0.663	<i>0.844</i>	0.614	0.596	0.517	0.444
	CSAT2	0.670	<i>0.880</i>	0.628	0.602	0.501	0.500
	CSAT3	0.590	<i>0.938</i>	0.549	0.629	0.694	0.496
	CSAT4	0.692	<i>0.942</i>	0.657	0.444	0.429	0.489
SQMS	SQMS1	0.533	0.676	<i>0.776</i>	0.478	0.558	0.489
	SQMS2	0.612	0.662	<i>0.788</i>	0.543	0.692	0.482
	SQMS3	0.575	0.626	<i>0.762</i>	0.687	0.694	0.520
	SQMS4	0.381	0.451	<i>0.823</i>	0.512	0.506	0.451
	SQMS5	0.430	0.511	<i>0.848</i>	0.529	0.524	0.577
	SQMS6	0.406	0.482	<i>0.798</i>	0.463	0.508	0.521
SQND	SQND1	0.522	0.644	0.519	<i>0.926</i>	0.502	0.523
	SQND2	0.505	0.614	0.505	<i>0.956</i>	0.656	0.530
	SQND3	0.656	0.681	0.577	<i>0.933</i>	0.551	0.573
	SQND4	0.626	0.633	0.683	<i>0.939</i>	0.632	0.507
PU	PU1	0.611	0.663	0.689	0.650	<i>0.815</i>	0.537
	PU2	0.611	0.555	0.630	0.595	<i>0.898</i>	0.509
	PU3	0.621	0.666	0.670	0.622	<i>0.852</i>	0.456
	UP4	0.635	0.674	0.654	0.624	<i>0.903</i>	0.526
	PU5	0.699	0.517	0.630	0.642	<i>0.822</i>	0.425
SQSC	SQSC1	0.355	0.428	0.511	0.466	0.461	<i>0.867</i>
	SQSC2	0.423	0.468	0.633	0.501	0.534	<i>0.861</i>
	SQSC3	0.436	0.490	0.509	0.517	0.498	<i>0.925</i>
	SQSC4	0.426	0.457	0.693	0.481	0.514	<i>0.858</i>
	SQSC5	0.475	0.484	0.704	0.520	0.500	<i>0.914</i>
	SQSC6	0.481	0.507	0.721	0.528	0.526	<i>0.876</i>
	SQSC7	0.481	0.507	0.721	0.528	0.526	<i>0.876</i>

Table V. Discriminant validity – loading and cross-loading criterion

Notes: ^aItalic values are loadings for items, which are above the recommended value of 0.5; acronyms: service quality (SQ), perceived usefulness (PU), cognitive satisfaction (CSAT), behavioural retention (BR), navigation and visual design (SQND), management and customer service (SQMS) and system reliability and connection quality (SQSC)

4.3 Structural model

To test the hypotheses of this study, we deployed the SEM approach to estimate simultaneously a series of interrelated dependence relationships. SEM has achieved popularity in several fields, including marketing, psychology, social science and information systems (Li and Yeh, 2010; Rezaei, 2015). PLS-SEM has enjoyed increasing popularity in recent years (Becker *et al.*, 2012). Applications and research into the use of hierarchical construct models using PLS path modelling are still limited (Wetzels *et al.*, 2009). PLS path modelling allows for the conceptualization of a hierarchical model through the repeated use of manifest variables (Wetzels *et al.*, 2009). Hierarchical latent variable models with reflective relationships are the most appropriate if the objective of the study is to find the common factor of several related, yet distinct reflective constructs (Becker *et al.*, 2012; Rezaei and Ghodsi, 2014). Bootstrapping analysis allows for the statistical testing of the hypothesis that a coefficient equals zero, as opposed to the alternative hypothesis that the coefficient does not equal zero (one-tailed test) (Hair *et al.*, 2011). Table VI presents the summary of hypothesis testing.

The primary criteria for inner model evolution is R^2 , which represents the amount of explained variance of each endogenous latent variable (Hair *et al.*, 2012). R^2 values of 0.75, 0.50 or 0.25 for the endogenous latent construct, as a rule of thumb, are considered as substantial, moderate or weak, respectively (Hair *et al.*, 2011). Table VI shows that the R^2 for the entire model is 0.757, which presents a substantial explanation of the model. In addition to evaluating the magnitude of the R^2 values as a criterion of predictive accuracy, researchers should also examine the Q^2 value, which is an indicator of the model's predictive relevance (Hair *et al.*, 2013). The blindfolding procedure is only applied to endogenous latent constructs that have a reflective measurement model specification (Hair *et al.*, 2011). When blindfolding is run for all endogenous latent constructs in the model, they all have Q^2 values considerably above zero. Table VII shows that all Q^2 values are considerably above zero, thus providing support for predictive relevance for the four endogenous constructs (Hair *et al.*, 2013; Rezaei, 2015). Table VII shows the results of R^2 and Q^2 values.

5. Discussions

The objectives of this study were to examine the impact of service quality on the behavioural retention of the 3G users and to determine the impact of perceived

Hypothesis	Path	Path coefficient	Standard error	t -value	Decision
H1	Perceived usefulness → cognitive satisfaction	0.587	0.076	7.773**	Supported
H2	Perceived usefulness → behavioural retention	0.161	0.070	2.309*	Supported
H3	Perceived usefulness → service quality	0.762	0.033	23.318**	Supported
H4	Service quality → cognitive satisfaction	0.263	0.079	3.322**	Supported
H5	Cognitive satisfaction → behavioural retention	0.738	0.063	11.631**	Supported

Note: Critical t -values for one-tailed test: *1.65 and **2.326

Table VI.
Hypothesis testing

usefulness on satisfaction and behavioural retention among 3G mobile phone users. Drawing from the data analysis and discussion and the attainment of the research objectives, the contribution of the study and implications for mobile operators, as well as for marketers, are discussed. The research findings were consistent and inconsistent with previous literature in examining the relationship between perceived usefulness, service quality, satisfaction and behavioural retention. Consistent with our findings, [Chen \(2008\)](#) found a positive relationship between satisfaction and behavioural intention and relative satisfaction and service quality among Taiwanese air passengers. [Joo *et al.* \(2011\)](#) found that perceived usefulness is a significant predictor of learner satisfaction. [Rezaei and Amin \(2013\)](#) found a positive relationship between perceived usefulness, satisfaction and intention among Malaysian online shoppers. According to [Calisir and Calisir \(2004\)](#), perceived usefulness determines end-users' satisfaction with ERP systems. [Liaw and Huang \(2013\)](#) found that satisfaction influences perceived usefulness in the e-learning context. Surprisingly, in the context of mobile services and applications, [Kim \(2012\)](#) found that perceived usefulness does not cause satisfaction, which is inconsistent with our results. In addition, [Terzis *et al.* \(2012\)](#) found that there is no positive relationship between perceived usefulness and behavioural intention. In examining the intentions of passengers to use technology-based self-check-in services, [Lu *et al.* \(2009\)](#) found that perceived usefulness of the kiosk does not positively and significantly influence passengers' intentions to adopt the self-check-in kiosk. An evaluation of users' intent, [Amoako-Gyampah \(2007\)](#) found that perceived usefulness impacts behavioural intention. [Wang *et al.* \(2013\)](#) found that perceived usefulness positively impacts purchase intention among online shoppers. In the Malaysian context, [Sin *et al.* \(2012\)](#) revealed that perceived usefulness is the most dominant factor that influences the online purchase intention of young consumers through social media. [Purnawirawan *et al.* \(2012\)](#) found a strong relationship between perceived usefulness and behavioural intention. In understanding the driver of mobile services in Australia, [Revels *et al.* \(2010\)](#) found that perceived usefulness positively affects satisfaction. [Pan and Jordan-Marsh \(2010\)](#) found that perceived usefulness strongly impacts the intention to use and the adoption of the internet among Chinese users.

Consistent with our findings, [Kuo *et al.* \(2009\)](#) found a positive relationship between service quality and satisfaction in mobile services. Service quality affects satisfaction in general ([Mao and Oppewal, 2010](#); [Kuo *et al.*, 2009](#); [de Ruyter *et al.*, 1997](#)) and behavioural intention ([Rezaei and Amin, 2013](#)). [Theodorakis *et al.* \(2013\)](#) confirmed positive relationships between service quality and satisfaction and behavioural intention in a sporting context. [Brady and Robertson \(2001\)](#) found that service quality explains satisfaction and behavioural intention, and that satisfaction explains service quality and behavioural intention in the service context. In an assessment of customer perception of service quality, [Udo *et al.* \(2010\)](#) identified three dimensions of Web service

Endogenous latent variables	R^2	Q^2
Service quality	0.581	0.343
Cognitive satisfaction	0.649	0.516
Behavioural retention	0.757	0.641

Table VII.
Results of R^2 and Q^2
values*

Notes: * Q^2 value = effect size: 0.02 = small; 0.15 = medium; 0.35 = large

quality – perceived risk, web content and service and convenience in relationship with satisfaction. In understanding tourist behaviour, [González et al. \(2007\)](#) empirically confirmed that service quality perceptions and customer satisfaction influence behavioural intention. [Zhao et al. \(2012\)](#) found that all three dimensions of service quality – interaction quality, environment quality and outcome quality – have a significant and positive effect on satisfaction and continued intention. Another study ([Lee et al., 2011](#)) showed that tangibles and empathy were significant contributors to the service quality dimensions in determining the satisfaction of both males and females. In a workforce environment, [Snipes et al. \(2005\)](#) and [Yee et al. \(2008\)](#) found that employee satisfaction is significantly related to service quality and to customer satisfaction. In examining the behavioural intentions of public transit passengers, ([Lai and Chen, 2011](#)) found that there is a positive relationship between satisfaction and service quality and between satisfaction and behavioural retention. [Kuo et al. \(2011\)](#) argued that service team competence and service performance reliability are two primary quality dimensions that relate to condominium management and that both the constructs significantly and positively affect resident satisfaction with condominium service businesses.

Furthermore, the study findings are consistent with previous empirical assessment undertaken in China. [Zhou and Lu \(2011\)](#) found that perceived usefulness significantly influence 3G mobile communication technologies loyalty, which is similar with the finding of this study. This supports previous study ([Chen et al., 2011](#)), which suggest that the success of m-commerce in China is related to operation performance and perceived usage. [Lu et al. \(2008\)](#) found that intention to accept and adoption of wireless mobile data service in China is highly related to perceived usefulness. In addition, [Kuo and Yen \(2009\)](#) and [Kuo et al. \(2009\)](#) found that consumer's behavioural intention to use 3G is highly related to perceived services and perceived usefulness. In examining Chinese consumers' intention to adopt 3G, [Chong et al. \(2012b\)](#) applied TAM as the grounded theory found that perceived usefulness is an important key factor towards adoption of telecommunication services. [Zhao et al. \(2012\)](#) found that service quality significantly influences customer satisfaction and the continuance intention of 3G mobile services in China.

Despite the fact that the mobile phone market is a relatively new industry, the competition is very high, and mobile service providers are competing earnestly to retain their acquired customers ([Haverila, 2011](#)). On the other hand, as wireless networks have achieved popularity and feature in almost everyone's lives, it has become an issue to subscribe to the best mobile wireless network provider ([Jayanthi and Vishal, 2009](#); [Sørensen and Al-Taitoon, 2008](#)). Some factors may enhance the shifting of mobile users from one operator to another. The low cost and promotion and free service are important strategies for companies to attract customers who are already subscribed to another vendor ([Keropyan and Gil-Lafuente, 2012](#)). The focus of all companies in different industries is to gain customer satisfaction and retention ([Vesel and Zabkar, 2009](#)). In the mature telecommunications industry, it is very difficult for a company to retain its customers because the technology is always changing ([Ahn et al., 2006](#)). Satisfaction and service quality are important goals for the telecommunications network operators that wish to achieve superior economic success. According to [Wittig \(2010\)](#), the density of mobile phones in many countries, particularly developing countries, is much higher than the fixed phone installations. Therefore, it is highly significant to study and examine the mobile service provider companies in Malaysia.

In this current study, it is suggested that perceived usefulness, service quality and satisfaction are predictor variables of the behavioural retention of the 3G mobile phone users. This study is unique and is among the few studies that have explored the behavioural retention of 3G mobile phone users with respect to the mobile and service providers in Malaysia. Certainly, it has examined the behavioural retention of mobile phone users according to their skills with the specific mobile phone services and the 3G mobile phone. Therefore, this particular study contributes new knowledge and understanding to the existing literature in the marketing and information technology field. This study is among the few attempts to detect the satisfaction of mobile phone users by a mixture of TAM constructs and the new models on service quality. Consequently, the study contributes to understanding the industrial marketing and mobile marketing research. In a mature telecommunications industry, it is difficult for a company to retain its customers because of the constant technological development (Ahn *et al.*, 2006). Satisfaction and behavioural retention are important (intermediate) objectives for the telecommunications network operators whose aim is to achieve superior economic success (Gerpott *et al.*, 2001).

5.1 Managerial implications and recommendations

Service managers need to understand how the perceptions of their performance with respect to service quality dimensions influence the level of customer satisfaction (Finn, 2011). The speed with which users are cancelling their contracts with their current mobile service provider is a cause for concern and is forcing the service providers to concentrate on customer retention instead of customer acquisition. From the industry's point of view, there is a dispute that mobile technology adoption could provide benefits for a targeted market in terms of elasticity, interactivity and flexibility (Chatterjee *et al.*, 2009). Moreover, mobile marketers and telecommunications service providers should comprehend the usability of conveyed value to assist customer retention behaviour. This study found that perceived usefulness and usability is very important for all mobile users. Telecommunications companies are highly aware and understand the value of speed, flexibility and mutuality of their service in contrast with brand image and subscription fees. On the other hand, the mobile phone industries, such as Apple, Samsung and Blackberry, are well positioned to ensure the usability of their product instead of the after sales service and phone design. Hence, the results of the study indicate that the clearest value for the customer in using 3G mobile phones is usability and functionality.

The simple justification that the integrated advantages of mobile marketing management are not available via any other tools in marketing makes it a very critical tool for marketers (Chanaka *et al.*, 2009). In that, all managers understand the importance of being in the information age, especially in the communications industry; clearly, the competition and advancement of new business strategy is relatively high (Keramati and Ardabili, 2011). Most of the marketing managers in the telecommunications industry are changing their core strategy based on new advanced technology. On the other hand, the fast and critical positive economic impact of the telecommunications industry on the prosperity of a society has inspired scholars and researchers to conduct their research on this sector (Gerpott *et al.*, 2001). There is some agreement that understanding how users navigate through the natural world is becoming increasingly important to designers of computer interfaces (Strong *et al.*, 1991), especially among experienced users (Law *et al.*, 2014). A navigation strategy can

only be discovered when the task is relatively simple (Mátrai *et al.*, 2008). One of the main challenges to designers of electronic information spaces is to create an experience for navigators that is conducive to quickly feeling in command of the space or, in essence, to feel as though they have that particular world in the palm of their hand (Danielson, 2002). Marketing communications and, specifically, advertising may be delivered as an m-service and are termed m-services advertising, which forms part of the broader category of m-services (Mort and Drennan, 2007). Service activities have become the essential and significant elements of the economic system over the past three decades, and the significance and influence of service quality have been recognized via the considerable impact on customer satisfaction and customer loyalty (Lin, 2010). Although the service sector is increasingly important and quality is a rivalry factor, the concept of service quality is not yet well established (Zhao and Lu, 2012). In essence, we verify the impact of service quality on customer satisfaction and retention among the 3G mobile users.

The way that customers are cancelling their contracts with their current mobile service providers has become an issue and has forced the service providers to focus on customer retention rather than customer acquisition (Chu *et al.*, 2007; Kim and Moon, 2012). From the company's perspective, the degree of retention of customers and their loyalty index depends very much on the overall perception of service quality (Turel and Serenko, 2006). It has been documented that for businesses, the ultimate satisfaction and loyalty outcome would be stockholders' satisfaction. In the mobile market and information telecommunications market, the industry players should change significant strategies to look for solutions to keep their customers satisfied and, thus, gain their loyalty (Keropyan and Gil-Lafuente, 2012). M-commerce developers and practitioners must understand consumers' perception of m-commerce applications to better design and deliver m-commerce service. Therefore, customer retention management has become a major issue for mobile telecommunications organizations.

5.2 Limitations and directions for future studies

This study has limitations and proposes further investigation to generalize its findings. The target respondents of this study were 3G users in Malaysia. Future research should examine the proposed research framework (Figure 1) in other countries. Second, considering the technology advancement worldwide, further research should focus on fourth- and fifth-generation telecommunications services. Last, the data collection procedure used a cross-sectional approach; future research should apply a longitudinal data collection approach for testing the proposed model.

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Appendix. Measurement items

Serial no.	Construct	Scale*	Source
1	Perceived usefulness	Based on my experience with a telecom company <i>PU1</i> : using (third generation (3G) mobile phones improves my performance <i>PU2</i> : Using 3G mobile phones improves my productivity <i>PU3</i> : Using 3G mobile phones enhances my effectiveness <i>PU4</i> : I find 3G mobile phones to be useful <i>PU5</i> : Totally, by using this telecom company, my 3G usage improves my performance and productivity	Ajzen and Fishbein (1980), Davis (1989)
2	Service quality	<i>Navigation and visual design (SQND)</i> Based on my experience with a telecom company <i>SQND1</i> : I can easily use the 3G service provided by this telecom company <i>SQND2</i> : This 3G service is displayed in a harmonious way <i>SQND3</i> : I can clearly understand the position of the screen I am currently browsing in the navigation layout <i>SQND4</i> : The homepage of this 3G service can clearly present the location of information <i>Management and customer service (SQMS)</i> Based on my experience with my chosen telecom company <i>SQMS1</i> : This telecom company provides diversified 3G services <i>SQMS2</i> : This telecom company provides multiple tariff options <i>SQMS3</i> : This telecom company provides good post-services <i>SQMS4</i> : I can easily alter the contract of 3G services <i>SQMS5</i> : When I have my contract altered, the telecom company still maintains a friendly attitude <i>SQMS6</i> : When any problem occurs, the telecom company can instantly cope with 3G issues <i>SQMS7</i> : This telecom company provides a FAQ for 3G services** <i>System reliability and connection quality (SQSC)</i> Based on my experience with my chosen telecom company <i>SQSC1</i> : This 3G service system is stable <i>SQSC2</i> : Errors seldom occur with this 3G service system <i>SQSC3</i> : This 3G service provides effective links <i>SQSC4</i> : I can easily return to the screen previously browsed <i>SQSC5</i> : It does not take too much time to download the information I need <i>SQSC6</i> : It does not take too much time to load the links I click on*** <i>SQSC7</i> : This 3G service system can instantly react to the data I input	Kuo <i>et al.</i> (2009)

(continued)

3G post
adoption users
experience

Table AI.

Serial no.	Construct	Scale*	Source
5	Cognitive satisfaction	<p><i>CSAT1</i>: I am satisfied with the services provided by this telecom company in using 3G services</p> <p><i>CSAT2</i>: I think this telecom company has successfully provided 3G services</p> <p><i>CSAT3</i>: This telecom company provides 3G services better than I expected</p> <p><i>CSAT4</i>: This telecom company satisfies my needs in using 3G devices (Shin and Kim, 2008)</p>	<p>Oliver (1997), Chang and Chen (2009), Kang and Park-Poaps (2011), Lam <i>et al.</i> (2011), Terpstra and Verbeeten (2013), Zoppiatis <i>et al.</i> (2014)</p> <p>Bai <i>et al.</i> (2008), Chao-Min <i>et al.</i> (2009), Aron and Jamie (2010)</p>
6	Behavioural retention	<p>Based on my experience with a telecom company</p> <p><i>BR1</i>: In the future, I will use the 3G services provided by this telecom company again</p> <p><i>BR2</i>: In the future, I will recommend the 3G services provided by this telecom company to my relatives and friends</p> <p><i>BR3</i>: In the future, I will continue to use the 3G services provided by this telecom company</p> <p><i>BR4</i>: I seldom consider switching to another telecom company</p>	

Notes: * Five-point Likert scale anchored from 1: strongly disagree to 5: strongly agree; ** M&S7 was deleted because of low loading; *** S&C6 was deleted because of low loading