Assessing Factors Affecting Purchase Intention of Mobile Application Users

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Abstract

Mobile commerce involves shopping through mobile device especially smartphone while electronic commerce involves shopping online through computer. Due to the changing demand from electronic commerce to mobile commerce, the significance of the research on purchase intention of mobile application users has also increased. The main purpose of this study is to explore the factors influencing purchase intention of mobile application users. The study has drawn on the Technology Acceptance Model, DeLone and McLean IS Success Model and Entertainment & Gratification Theory. The research has utilised both quantitative and cross-sectional approach to test 11 hypotheses. A total of 215 respondents falls under the age group 18-35 years old in Malaysia who used mobile shopping applications in the past six months were recruited for the survey. 209 usable questionnaires were collected and analysed using SmartPLS 3.0. Structural Equation Modeling technique was performed to analyse data. Results show full support for five hypotheses, partial support for four hypotheses and no support for two hypotheses, indicating that ease of use, usefulness, entertainment gratification, information quality, system quality and service quality of mobile applications positively influence purchase intention of mobile application users whereas irritation negatively influences purchase intention of mobile application users. Those beliefs both directly and indirectly affect mobile application users' purchase intention. Current research has proposed and validated a conceptual framework that formulates the essential characteristics of mobile application that will lead users to stronger behavioural purchase intention. Additionally, the study has highlighted the importance of providing a mobile application that will induce purchase intention of users through information quality, system quality and service quality which promote usefulness, entertainment gratification and reduce irritation.

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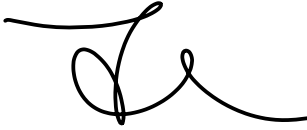
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Declaration

I declare that this thesis entitled "Assessing Factors Affecting Purchase Intention of Mobile Application Users" is the result of my own research except as cited in the references. Current thesis contains no material which has been accepted for the award to the candidate of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person except where due reference is made in the text of the examinable outcome. I declare the work is based on joint research or publications, discloses the relative contributions of the respective workers or authors.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The creation of mobile applications or popularly known as mobile apps is without a doubt, a very lucrative and outstanding achievement in the technological world, of which its usage is not only as a form of communication but also a form of easy access to the Internet by users, as established by Thanaporn and Rapeepat (2015). Groupe Spéciale Mobile Association (2012) states that the growth in consumption of mobile application has influenced the way consumers and businesses operate and communicate and led to a change in the overall country economy (MCMC 2017). The Malaysian Communications and Multimedia Commission (MCMC) (2017) states that there were over 76.9% Internet users in the year of 2016, furthermore, 89.4% of them were accessing the Internet through the use of smartphones.

Apart from that, it has been reported that online purchase intention had doubled since 2011 for many entertainment-related and durable categories, namely toys, e-books, sporting goods, and event tickets (Nielsen 2014). As highlighted by the chief executive of Alibaba, Zhang (2016, cited in Thibaud 2016), mobile application users launched Alibaba's shopping application - Taobao seven times daily for more than 25 minutes usage. Specifically, the key essence of the successful development of Taobao application concludes overall user-friendly interface and search engine, a wide variety of reasonably priced products, and interactive functions.

In the year of 2019, the overall mobile commerce (m-commerce) industry in Malaysia was boosted through the rapid growth of several mobile applications. The Consumer Barometer with Google (2015) identifies the existence of a significant volume of mobile shoppers procuring via the Internet. There are approximately 89.4% of Malaysians who prefer using smartphones to browse the Internet as compared to desktops and laptops. Amongst the leading mobile shopping applications in Malaysia are Taobao, Lazada, Shopee, and Qoo10. In particular, Shopee is well known as the top-ranked online shopping site in Malaysia, consisting of over 22 million monthly estimated traffic, where the average visit duration is up to 9 minutes and 30 seconds. Through recognising the significance of m-commerce, Shopee launched its own mobile application and it had obtained 45% month-on-month growth in 2016. This is the key reason that has made Shopee one of the top mobile applications (Sitegiant 2019).

Hence, the current study establishes an integrated model in explaining the factors inducing purchase intention of mobile application users. Simultaneously, the mediating effects of utilitarian factors (usefulness and ease of use) and hedonic factors (entertainment gratification and irritation) were also tested on the antecedents-to-consequences constructs developed for this study. Hence, this chapter begins with the background study to explain the phenomena under investigation. This is followed by research objectives, research question, research hypotheses, research methodology, summary of key results, research contributions, research limitations, and ethical considerations respectively. This chapter then ends with the structure of all chapters in the thesis.

1.2 Research Objectives

Current study's main focus is to ascertain the factors influencing purchase intention of Malaysian mobile application users. Technology Acceptance Model (TAM), DeLone and McLean Information System (D&M IS) Success Model and Uses and Gratification (U&G) Theory were adapted to provide the theoretical basis for the antecedents-to-consequences constructs. This thesis further explores the areas of the purchase intention that have not been researched in detail within the Malaysian context. Hence, this study aims to analyse factors that have direct and indirect effects towards purchase intention of Malaysian mobile application users. Thus, the current research objectives are further elaborated into two perspectives, consisting of the broad and the specific objectives.

The broad objectives of the thesis are:
1. To develop an in-depth understanding of purchase intention of mobile application users in Malaysia.
2. To ascertain which of the factors are relevant to Malaysian mobile application users so as to understand purchase intention within the context of mobile application.
3. To develop and test an integrated conceptual framework that further explains such relationships and the mediating role of utilitarian and hedonic factors.

The specific objectives of the thesis are:
1. To assess the effects of each construct identified (information quality, system quality, service quality, ease of use, usefulness, entertainment gratification and irritation) on purchase intention of Malaysian mobile application users.

2.   To examine a new integrated model based on TAM, D&M IS Success Model, and U&G Theory in explaining purchase intention of mobile application users in Malaysia.

3.   To test the mediating effects of hedonic and utilitarian factors (ease of use, usefulness, entertainment gratification and irritation) towards IS qualities (information quality, service quality and system quality) and purchase intention of mobile application users.

1.3 Research Question

Despite the growing trends and stronger recognition on m-commerce business opportunities, Forrester Research (2011) discovered that two-thirds of firms selling services/products do not have proper mobile strategies. It is a crucial challenge to integrate existing strategies into a robust mobile marketing strategy due to the costly evolvement of mobile applications (Deloitte 2012; Forrester Research 2011). Thus, the current research intends to assess the factors influencing purchase intention of mobile application users. Ergo, the current research intends to address the following research question:

What are the factors influencing purchase intention of mobile application users?

1.4 Study Background

The Internet is affecting the needs of consumers who are increasingly less loyal to take less time between choosing and consuming a product or service and take more frequent but shorter vacations (Werthnes & Ricci 2004). Information technology accelerates the growth of electronic commerce (e-commerce) by offering benefits beyond the traditional market such as greater efficiency and lower transaction costs (Malone et al. 1987; Radkevitch, Heck & Koppius 2006). Nevertheless, the current trend is shifting from e-commerce to m-commerce. Mobile users can make purchase via mobile applications at any time, from anywhere, through the Internet.

Bearing in mind the rapid increase of Malaysian mobile phone users, the current study intends to assess the various factors that influence these users when they purchase using mobile applications. Past researchers have examined the purchase intention in several contexts (Gefen et al. 2003; Ling et al. 2010; Qiu & Li 2008) but it has rarely been examined in m-commerce

context. Furthermore, there is very little research done in Malaysia on users' purchase intention by means of the mobile applications. Therefore, the current study has solidified two models and one theory into a more comprehensive conceptual framework to explain the antecedents inducing mobile consumers to buy via mobile applications.

The Technology Acceptance Model (TAM) is known as a popular model in technology acceptance studies (Davis, Bagozzi, & Warshaw 1989; Galletta & King 2007; Teo, Wong & Chai 2008). It helps in describing how attitudes and perceptions affect technology use (Teo, Wong & Chai 2008; Sivo & Pan 2005). TAM is ensued from Theory of Reasoned Action (TRA) where it is also known as the core groundwork in developing the hypothetical background to analyse the reasons inducing mobile consumers to buy (Ajzen & Fishbein 1980). The TRA emphasises on connections among subjective norms, attitudes, intentions, and behaviour.

D&M IS Success Model is conceived as according to the Mathematical Theory of Communication (Shannon & Weaver 1949) and Mason's expansion of the influence or effectiveness level (Mason 1978). D&M IS Success Model contains six distinct dimensions of IS success, namely information quality, system quality, use, user satisfaction, individual impact and organisational impact (Urbach & Mueller 2011). Many researchers have explored the potential improvements over the original model, extended D&M IS Success Model, and adapted the exemplary for different applications consisting e-commerce systems and knowledge management (Petter & McLean 2016). The updated model recognises the strong association among success dimensions in a process sense and does not indicate positive or negative signs for those associations through a causal sense (Petter & McLean 2016).

The U&G Theory attempts to understand consumer's impetuses and concerns based on the traditional media framework (Herzog 1944; Luo 2002; McGuire 1974). It provides new insights to the factors that influence buyer's online behaviour such as Internet usage and online purchase (Lim 2015; Luo 2002). U&G Theory speculates that the users are actively interacting with the communication media and highly involved in media usage (Lim 2015; Luo 2002). Ergo, the U&G Theory addresses the significant role of consumers through the usage of the wide range of mass media, concentrating on what they react with the mass media (Klatz 1959; Klapper 1960; Lim 2015).

Purchase intention is often bestowed in ascertaining buying likelihoods of merchandises within certain timeframe (Brown, Pope & Voges 2001; Juster 1966; Morrison 1979; Whitlark et al. 1993). Also, Pavlou (2003) argues that the purchase intention is the circumstance where the user aims to be associated with the online transaction. Therefore, purchase intention is known as desires, wishes or willingness to purchase (Limayem, Khalifa & Frini 2000; Zarrad & Debabi 2012). Consumers who indicate positive purchase intention to buy a merchandise has a greater tangible procuring rate than clients who indicate negative purchase intention (Berkman & Gilson 1978).

Information quality is the ability of the website in giving users useful and resourceful information (Chen & Wells 1999; Ducoffe 1995; Luo 2002). The desirable characteristics of quality information are consiseness, adequacy, comprehensiveness, availability and precision (Bailey & Pearson 1983; Gable et al. 2008; Iivari 2005; McKinney et al.; Rainer & Watson 1995; Sedera & Gable 2004b).

System quality is termed as the performance of the IS through convenience functionality, reliability and ease of use (Peter & McLean 2009). It is recognised as the important feature of an information system (Peter, DeLone & McLean 2008). Usability, reliability, response time, flexibility and availability are the characteristics of system quality that are highly prized by online shoppers (DeLone & McLean 2003).

The support that consumers received from the Information System service provider is coined as service quality, and it is regularly determined according to the reliability, receptiveness and understanding of the IS service provider (Peter & McLean 2009). Per the rising prevalence in contracting out the systems development and support, service quality is usually outsourced to an external IS service provider.

As according to Davis (1989), ease of use is coined as the level whereby an individual considers that using a specific technology will be effortless (Davis et al. 1989). Furthermore, it represents an user's perception regarding the sum of struggle needed to make use of the system. Ease of use is also linked with the user-friendliness of the mobile applications (Ali, Ouda & Capretz 2014).

Usefulness indicate the level in which the individual believes that using a particular system would enhance the job performance (Davis 1989). Researchers have applied this definition in online shopping context, explaining usefulness as the degree to which consumers believe using the Internet could generate productivity or performance, thus enhancing the outcome of their shopping experience (Cho 2015 ; Monsuwe, Dellaert & Ruyter (2004). Usefulness also means decreased time needed to complete a task yet achieving higher accuracy and efficiency at the same time (Phillips, Calantone & Lee 1994).

Entertainment gratification is the degree to which users find the Internet media as enjoyable and pleasurable (Eighmey 1997; Eighmey & McCord 1998; Lim 2015). The entertainment gratification also takes into account the positive attitude and the desirable experience towards the contents and its medium (Fagerlind & Kihlman 2000; Lim 2015).

Irritation is the feelings of being disorder, distracted and confused while using the Internet (Chen & Wells, 1999; Hausman & Siekpe 2009). Irritation also leads to feelings of discomfort, annoyance and displeasure that is caused by annoying messages or interactions (Ducoffe 1996). It is often due to website characteristics that consumers find irritating and offensive (Ducoffe 1996; Hausman & Siekpe 2009).

1.5 Hypotheses Development

Studies on the relationship between system quality and ease of use produce varied results. Quality of information does not influence ease of use. Furthermore, there is a dearth of research being done regarding the relationship between ease of use and information quality (Petter, Delone & McLean 2008). Thus, this study would like to further discover whether information quality is positively associated to ease of use from the mobile application users' perspective.

When using the mobile application, mobile users are able to obtain larger amount of information that delivers comprehensive features of the services or products. Through sophisticated systems such as feedback system and collaborative filtering system, mobile application users may have access to extra information about the desired items and informative reviews. The information quality provided via mobile application is a key element in leading users to believe in the usefulness of that mobile application (Lin & Lu 2000). Hence, the

information quality on mobile application would positively affect mobile application's usefulness.

Internet's powerful features could offer mobile application users up-to-date and comprehensive content (Luo 2002). Positive attitudes toward a website is linked with entertainment and information quality (Chen & Wells 1999; Chen et al. 2002; Kim & Stoel 2004). While comparing the level of influence on positive perception towards a website, information quality has the highest influence on attitudes whereas entertainment has the least influence. Since information quality helps to attract online users, it is then expected that the influence of information quality on mobile users' entertainment gratification while using the mobile applications is positive.

Even though prior studies indicate significant relationship between continued internet use and playfulness (Lim 2015; Stafford & Stafford 2001; Wolfinbarger & Gilly 2001), such studies however, repeatedly disregard some adverse factors, such as irritation (Lim 2015; Stafford 2003). Subsequently, Konrad (2002) and (Lim 2015) conclude that mobile application with unwanted pop-up banners frequently lead to e-shoppers being irritated as these pop-ups cause distractions when they are going about surfing on the Internet. It is expected that perceived information quality of the mobile applications to negatively influence mobile users' perceptions of irritation of mobile applications.

It has been discovered that there are mixed results presented towards the link between ease of use and system quality. Myriad studies have discovered strong relationships between system quality and ease of use (Adams et al. 1992; Agarwal & Prasad 1999; Devaraj et al. 2002; Gefen & Keil 1998; Hong et al. 2001/2002; Hsieh & Wang 2007; Lucas & Spitler 1999; Peter, DeLone & McLean 2008; Venkatesh & Davis 2000; Venkatesh & Morris 2000; Wixom & Todd 2005; Yang & Yoo 2004), while other researchers debate that there is no significant connection (Chau & Hu 2002; Kulkarni et al. 2006; Subramanian 1994; Wu & Wang 2006). For that reason, this study would like to further examine whether system quality is positively associated with ease of use from the viewpoint of mobile users.

Generally, system quality shows positive impact on perceived usefulness and thus individual performance. Nonetheless, there are diverse results on the relationship between system quality

and usefulness. Past studies have discovered strong relationship between system quality and usefulness (Adams et al. 1992; Agarwal & Prasad 1999; Devaraj et al. 2002; Gefen & Keil 1998; Hong et al. 2001/2002; Hsieh & Wang 2007; Lucas & Spitler 1999) while other academics debate there is no significant relationship between them (Chau & Hu 2002; Kulkarni et al. 2006). Therefore, the current study would like to further investigate whether system quality is positively related to usefulness in the m-commerce context.

E-retailers providing entertainment in the form of three-dimensional rotations of multiple products, visualization proxies or virtual try-ons (Kim & Forsythe 2010; Lim 2015). For instance, Mckinney (2004) further reveals that ability to view shopping carts, wish lists, site maps, navigation features are important as they make shopping easier (Griffiths 2008; Lim 2015). Additionally, shopping websites with smooth interface encourage more interaction are perceived as entertaining to online shoppers (Lim 2015; Wang et al. 2007). Hence, there is a potential association between system quality and entertainment gratification.

The mobile application's interface design has influential effects on consumers' perceived irritation (Wells et al. 2011). Internet that are visually appealing, easy to use, and informative shall enhance users' involvement with the site and potentially reduce irritation (Gao & Wu 2010). In contrast, a poorly-designed and messy website negatively influences users' attention, generates negative feelings, and requires more effort that may potentially cause irritation as they are unable to search products, navigate the website, and complete a purchase task (Azeem 2012; Chen & Wells 1999; Gao & Wu 2010). As a result, this study would like to further examine whether system quality is negatively related to irritation from the viewpoint of mobile users.

Service quality is a key factor to be pondered when the consumers are making purchase decisions (Brucks, Zeithaml & Naylor 2000, cited in Bei & Chiao 2001). Nevertheless, it is challenging to determine service quality in the Internet environment (Figueiredo 2000), thus mobile application users excessively depend on word of mouth (Shen et al. 2012) and online reviews (Jensen et al. 2013) to assess service quality. Consequently, more investigations have to be done to determine the positive relationship between service quality and ease of use.

Service support rendered by external parties is linked to system usefulness, yet the service support rendered internally is not linked to usefulness (Igbaria et al. 1997). The provision of the user training by internal IT department and responsiveness of external IT developer are greatly linked with system usefulness (Agarwal & Prasad 1999; Igbaria et al. 1997). Blanton et al.'s (1992) case study on improving service quality has discovered that tailored IT service support is more efficacious than generalised IT service support. Gefen (2000) also indicates that the more cooperative external IT provider is, the more useful is the IT system. Subsequently, more research has to be done to confirm that service quality is positively linked to usefulness.

In the traditional service context, the recognition of emotions in quality models is needed (Liljander & Strandvik 1997; Pihlström 2008). However, e-retailers tend to ignore experiential features such as fun or pleasure (Parasuraman, Zeithaml & Malhotra 2005: Pihlström 2008) as strong indicators of service quality. Researchers discovered that most e-shoppers find interactive features like comment functions and chat (Lim 2015; Wolfinbarger & Gilly 2001) as well as customisation tools (Dixon 2005; Lim 2015) are fun to use. Hence, when mobile users enjoy the services provided by the mobile applications, it is likely that they perceive the mobile applications as enjoyable to them.

Waiting in services is one of the indicators of service quality (Weinberg 2000). Precisely, online users do not like to wait (Weinberg 2000). The negative reaction may include a negative feeling of frustration and annoyance as well as a perception of poor service quality (Davis & Heineke 1994; Katz et al. 1991; Taylor 1994). Taking into consideration the significance of service quality, the current study anticipates that service quality of the mobile application providers is negatively associated with irritation.

Although the shopping environment is usually known to have beneficial outcomes, the challenges of engaging in the mobile application could be discouraging for some mobile application users. The barriers that can possibly reduce the perceived ease of use of mobile application are long download times and poorly designed mobile application which cause mobile application users unwilling to engage in the mobile application (Adak & Yumusak 2014). For instance, if the mobile application is easy to use, mobile users would prefer to

purchase through the mobile application. Therefore, a lower level of ease of use is expected to be less likely to induce strong purchase intention in the context of mobile application.

Users are inclined in using an application where they are confident it will boost their work delivery (Davis et al. 1989). Academicians conclude that usefulness influences purchase intention through studies that investigate factors affecting mobile consumers' product buying decision (Cho 2015; Shah et al. 2012). Thus, it is hypothesised that usefulness positively affects purchase intention of mobile application users.

The significance of shopping is not primarily motivated by the purpose to buy but also influenced by other personal motives such as entertainment, release, and emotions (Kim, Lee & Kim 2004; Yoo & Chung 2002). Consumers highly value entertainment (Anckar & D'Incau 2002; Basheer & Ibrahim 2010). Media users who perceive a banner advertisement on the Internet as entertaining leads to higher chance of buying the advertised product (Lim 2015). Hence, entertainment gratification generates positive impact towards purchase intention of mobile application users.

Past research contains several arguments that cues made available through online marketing environment could alter buyers' sentiments, which also affect shopping behaviour (Demangeot & Broderick 2006; Lim 2015). Dennis et al. (2009) explore that cues such as visuals, audio, colour, graphics, video, and three-dimensional displays are the prevailing stimulation made available in e-shopping sites (Lim 2015). E-retailers manipulate the Internet design in order to generate entertainment gratification which leads to favourable purchase intention toward its offerings (Alba et al. 1997; Childers et al. 2001; Lim 2015).

Irritating banner advertisement may stimulate human anxiety by distracting Internet users' attention thus leading to negative usage (Ducoffe 1996). Moreover, researchers state that mobile users tend to be affected by advertisements on the Internet more as compared to advertisements on other media such as TV (Huang 2008). Irritation does create negative impact on online consumers' purchase behaviour, intention to return, and attitude (Hausman & Siekpe 2009; Huang 2008; Jere & Davis 2011; Thota 2012). Therefore, it is expected that irritation will negatively sway the purchase intention of mobile application users.

Literature review has publicised the significant influences exerted by information quality, system quality, and service quality on the purchase intention of mobile application users. Davis (1989) has emphasised in Technology Acceptance Model (TAM) the mediating roles of utilitarian factors (ease of use and usefulness) on the relationships between external variables and e-loyal attitudes, intentions and behaviours. Past researchers have studied the mediating impact of ease of use and usefulness on the relationship between system quality, service quality and user performance (Linus, Daniel & Wilson 2019). Moreover, Massoud et al. (2018) recommended ease of use and usefulness to be the potential mediators between conscientiousness and online purchase intention.

In terms of hedonic factors, Hackbarth et al. (2003) have shown that hedonic needs (playfulness) is a significant mediator of the result that system experience has on ease of use. Hackbarth, Grover and Yi (2003) found that perceived website quality will influence ease of use and these effects will be mediated by hedonic needs positively and system anxiety negatively. Therefore, it is plausible to consider the mediating role of utilitarian (ease of use and usefulness) and hedonic (entertainment gratification and irritation) factors on the relationships between perceived IS qualities and purchase intention.

Based on the earlier research, 11 hypotheses have been developed as follows:

H_1:   Information quality is related to antecedents of purchase intention.

   H_{1a}:   Information quality is positively related to ease of use.

   H_{1b}:   Information quality is positively related to usefulness.

   H_{1c}:   Information quality is positively related to entertainment gratification.

   H_{1d}:   Information quality is negatively related to irritation

H_2:   System quality is related to antecedents of purchase intention.

   H_{2a}:   System quality is positively related to ease of use.

   H_{2b}:   System quality is positively related to usefulness.

   H_{2c}:   System quality is positively related to entertainment gratification.

   H_{2d}:   System quality is negatively related to irritation

H$_3$:   Service quality is related to antecedents of purchase intention.

     H$_{3a}$:   Service quality is positively related to ease of use.

     H$_{3b}$:   Service quality is positively related to usefulness.

     H$_{3c}$:   Service quality is positively related to entertainment gratification.

     H$_{3d}$:   Service quality is negatively related to irritation

H$_4$:   Ease of use is positively related to purchase intention.

H$_5$:   Usefulness is positively related to purchase intention.

H$_6$:   Entertainment gratification is positively related to purchase intention.

H$_7$:   Irritation is negatively related to purchase intention.

H$_8$:   Information quality, system quality and service quality are related to purchase intention through the mediation of ease of use.

     H$_{8a}$:   Information quality is positively related to purchase intention through the mediation of ease of use.

     H$_{8b}$:   System quality is positively related to purchase intention through the mediation of ease of use.

     H$_{8c}$:   Service quality is positively related to purchase intention through the mediation of ease of use.

H$_9$:   Information quality, system quality and service quality are related to purchase intention through the mediation of usefulness.

     H$_{9a}$:   Information quality is positively related to purchase intention through the mediation of usefulness.

     H$_{9b}$:   System quality is positively related to purchase intention through the mediation of usefulness.

     H$_{9c}$:   Service quality is positively related to purchase intention through the mediation of usefulness.

H_{10}: Information quality, system quality and service quality are related to purchase intention through the mediation of entertainment gratification.

$\quad$ H_{10a}: Information quality is positively related to purchase intention through the mediation of entertainment gratification.

$\quad$ H_{10b}: System quality is positively related to purchase intention through the mediation of entertainment gratification.

$\quad$ H_{10c}: Service quality is positively related to purchase intention through the mediation of entertainment gratification.

H_{11}: Information quality, system quality and service quality are related to purchase intention through the mediation of irritation.

$\quad$ H_{11a}: Information quality is negatively related to purchase intention through the mediation of irritation.

$\quad$ H_{11b}: System quality is negatively related to purchase intention through the mediation of irritation.

$\quad$ H_{11c}: Service quality is negatively related to purchase intention through the mediation of irritation.

1.6 Research Methodology

The research methodology of this study has been established by looking into research paradigm, qualitative/quantitative research, research design, instrumentation, data collection, and data analyses. First of all, since past literature has provided the background information on existing theories and findings, the approaches of the studies are subsequently adapted to develop the hypotheses of the current thesis (Hair, Money, Samouel & Page 2000). Based on the theories, the research philosophy of positivism and a quantitative research approach are adopted to test the hypotheses. The purpose of the present research is to investigate factors influencing purchase intention of mobile application users. The current study has utilised self-administered survey technique to collect data from 18-35 years old young adults in Malaysia.

As Malaysia has a diverse population, it is essential to know the reasons influencing purchase intention of mobile application users in the m-commerce. Therefore, the targeted respondents in the current study were sourced from different major ethnic groups available in all major cities and towns in each state and the Federal Territory (Johor, Kedah, Kelantan, Malacca,

Negeri Sembilan, Pahang, Perak, Perlis, Penang, Sabah, Sarawak, Selangor, Terengganu, Federal Territory of Kuala Lumpur, Federal Territory of Labuan, Federal Territory of Putrajaya). In year 2016, the Internet Users Survey by Malaysian Communications and Multimedia Commission (2017) states that the age group of 20-34 represented the user category of the Internet at 53.6%, with an Internet adoption rate of 83.1%. Hair et al (2014) propose the minimum sample size of 150 cases when structural models contain many constructs with each having more than three items and/or modest communalities (about 0.5) (Hair, Hult, Ringle & Sarstedt 2014). Therefore, 215 young adults in Malaysia is deemed to be a suitable sample size for this study.

The study instrument used was a structured questionnaire, which utilised dichotomous, multiple choice, single-response scale, and Likert scale (Cooper & Schindler 2008) as response categories. A balanced five-point Likert scale format consisting "strongly agree", "agree", "neither agree nor disagree", "disagree" and "strongly disagree" was employed in the questionnaire. Besides, all study constructs were subjectively calculated using multi-item scales modified from similar works. Upon receipt of approval from the Human Research Ethics Committee of Swinburne University of Technology, the questionnaire was distributed through Vase (market surveyor) during a five-day data collection period.

The scope of the work is to assess the factors influencing purchase intention of mobile application users in Malaysia. This is done through examining the direct and mediated antecedents-to-consequences constructs identified through several assessment measurement model. In order to enrich the explanatory competency of each antecedent identified, the independent constructs which includes information quality, system quality, service quality, ease of use, usefulness, entertainment gratification and irritation are encompassed in the integrated model. As the study aims to establish an integrated model with extended dimensions, the technique of Structural Equation Modeling (SEM) was used to perform data analysis and provide results to explain the phenomena under study. Thus, 209 usable questionnaires were collected and analysed using SmartPLS 3.0.

1.7 Summary of Key Results

The testing of the relationships among factors influencing purchase intention of mobile application users has significant contributions. In total, eleven hypothesised relationships were tested. Firstly, the results found that the direct effect of IS qualities (information quality, system quality, service quality) influencing the direct antecedents (ease of use, usefulness, entertainment gratification, irritation) of the purchase intention of mobile application users were partially positive and significant. The findings highlight that together system quality and service quality have a stronger affirmative and noteworthy association with the direct antecedents (ease of use, usefulness, entertainment gratification and irritation) of purchase intention of mobile application users through stronger threshold values. The findings also indicate that ease of use, usefulness plus entertainment gratification have generated a strong influence towards the purchase intention of mobile application users. Moreover, the findings also confirm that utilitarian factors (ease of use and usefulness) is a perfect mediator for the association between information quality, system quality and service quality towards purchase intention of mobile application users in H_8 and H_9.

1.8 Research Contributions

This research will address the gap in literature by determining the validity of various models and theory tested in the context of this thesis namely, TAM, D&M IS Success Model and U&G Theory. Such models have been primarily tested in the Western context. The results from the existing study will likewise allow the researcher to examine the effectiveness of the models and theory applied in this thesis, specifically from Malaysian mobile application users' perspective. This research will also address the practicability of applying the integrated model on Malaysian mobile application users. It could also serve as a good catalyst to replicate this mobile applications research on other countries for cross-cultural comparison of results.

The managerial viewpoint is that purchase intention serves as a basis to segregate mobile application users into meaningful segments, signifying the similarities or differences from their purchase intention that may occur. In other words, the reliance on behavioural differentiation and the assumption that mobile application users are universally similar are refutable. It is important to comprehend the specific factors that influence Malaysian mobile application users due the cultural differences in the Western and Malaysian context. For instance, mobile application users in the Western segment may find other factors as a strong indicator whereas

Malaysians may find different factors that positively induce their mobile application purchase intention.

This study also provides a whole new dimension on how factors inducing purchase intention of mobile application users are viewed across different ambivalent groups. This is accomplished through the use of Partial Least Square-Structural Equation Modeling (PLS-SEM) which allows the researcher to investigate the direct and indirect connections between constructs suggested in this thesis. Likewise, through the use of Multi-Group Analysis (MGA), it also assesses the mediating effect of each path relationship between different constructs in the model. Therefore, the findings on the mediating effect between the constructs create a deeper understanding on how these models and theory can be explained from a different perspective. Such extension of knowledge supports the use of mediation effect as another potential approach to know and track mobile application users and their purchase intention on mobile application. The new insights also serve as a platform for marketers to look into while targeting and positioning mobile market segments and subsequently reassessing the implementation of mobile marketing strategies in the marketplace within a marketing mix and communication.

Through comprehending the reasons that induce mobile application buyers to buy, it will accelerate effective mobile marketing campaigns and strategies by various retailers and marketers alike in Malaysia. Such promotional tactics can be enhanced with the inclusion of positive indicators whereas failure to understand such purchase intention will likely see the mobile application marketing strategies being less effective, wasteful or even offensive in the Malaysian m-commerce industry. The empirical findings will allow marketers and practitioners to establish a more effective mobile application marketing strategy and communication tactic to promote products and services and this will more likely increase purchase intention. Such findings will also let marketers and retailers gain better understanding of mobile application users, through targeting the market using the right marketing techniques by better designing their mobile application. Therefore, it is necessary to study the recurring mystery pertaining to the factors influencing purchase intention of mobile application users.

1.9 Research Limitations

The current research addresses several study limitations to be further dealt with in future research. The following limitations will provide the basis for future studies to continuously improve the proposed conceptual framework so as to have a better comprehension of the purchase intention of mobile application users.

First of all, even though the researcher had taken the precautionary steps to collect representative samples from different states in Malaysia, the unequal development between urban and rural areas in each state are not being addressed in the thesis and thus may lead to random errors. Respondents from the cities may have a higher probability to access information on various products and services made available on the mobile application. In contrast, respondents from rural areas most probably have limited usage of mobile applications due to poor network coverage and connection.

Next, even though random and systematic sampling techniques are generally known as being superior in addressing generalisability of findings, they are still not considered as the perfect approaches for a study when the entire population is large and difficult to access. This issue may jeopardise the findings. Moreover, employing non-probability sampling technique in data collection may also run the risk of compromising the validity of the findings.

1.10 Ethical Considerations

Several ethical issues were taken into consideration while collecting data from the respondents. The conduct of the study was in line with the National Statement on Ethical Conduct in Human Research. Moreover, Vase (the market surveyor) is in compliance with Personal Data Protection Act implemented in Malaysia.

Structured questionnaire and participant information statement were distributed to respondents who voluntarily and anonymously partook in the survey. The registered survey respondents from Vase have agreed in writing to have their non-identifiable responses published in return for a small token of appreciation for their time and effort. The participant information statement and consent cover stated clearly that the researcher intended to understand their consumption values and behaviours and that they were under no obligation to participate. If participants choose to undertake the survey, they could opt out at any time and none of their responses

would be recorded. As a result, they would not receive any token of appreciation if they opt out. This participation rule is spelled out in the standard agreement when they sign up as survey participants with Vase.

The questionnaire was distributed to two persons beforehand for pre-testing. It took the participants roughly 30 minutes, averagely, to finish up the survey. As such, the estimated duration to complete the survey is considered as adequate. If the respondents voluntarily participate, they would be told that the survey may take up to 30 minutes and that their responses would not be identifiable in any way and may be published by the researcher. In addition, the participants have the option to save and return to continue with the online survey anytime at their convenience.

Since the targeted respondents fall under the age group of 18-35 years old, they are considered to be mature enough to read and understand the content of information statement before participating in the study. Implied consent is assumed once respondents complete and submit their responses through Vase.

Over and above, the data collected will be stored in the laptop of the student researcher, chief investigator, and co-investigators and will be password protected. The data will be stored for a duration of six months and then disposed once the student researcher has completed Masters by Research.

1.11 Organisation of the Thesis

This thesis comprises a total of five chapters. Firstly, chapter one provides the introduction of the thesis, study background, research questions, research hypotheses, research objectives, research methodology, summary of key results, study contributions, study limitations and ethical considerations.

The following chapter two critically highlights the relevant literature that research on factors influencing purchase intention of mobile application users, grounded on TAM, D&M IS Success Model and U&G Theory. A conceptual framework is proposed in this chapter along with 11 hypotheses.

Chapter three will scrutinise research methodology by covering research paradigm, research approach, sampling design, instrumentation, and data analysis. The research methodology procedure is carried out in two phases whereby phase one examines the pre-test and pilot study and phase two assesses the study design together with the methodology to be used. The research procedure for both phases are also presented in the chapter which includes population, sampling method, sample size and the instrumentation that will provide a detailed explanation on questionnaire design, source of items, and response scale.

Chapter four will firstly explore steps involved in preliminary data analysis to screen data and assess normality of data distribution. The current study will also perform Common Method Variance (CMV) to test the mutual process predisposition. Descriptive data analysis is then utilised to ascertain sample characteristics and representativeness. Assessment of measurement model is done via confirmatory factor analysis, correlation analysis, computation and threshold comparisons. Composite reliability (CR) and Cronbach's alpha are used to investigate the validity plus reliability of the path connection between constructs. The chapter then continues to present the findings to depict the relationships between various antecedents-to-consequences constructs of the purchase intention of mobile application users before moving onto the next chapter for further discussion.

Finally, chapter five discusses the findings in the light of context, research objectives plus methods that are used. The theoretical and managerial implications are reviewed beside the recommendations, then by research limitations and lastly forthcoming research directions.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Previously, chapter one provides the current thesis brief outline as well as states the research problems and research questions to be analysed further. A short summary of contributions of the current study is also provided. Moving on, this chapter further explains purchase intention in the context of m-commerce in Malaysia and the various factors that affect purchase intention of mobile users. This chapter also presents the underlying theories and models which are formulated in different fields and utilised to construct the current research's conceptual framework and the research hypotheses.

2.2 Background

In recent decade, information technology accelerates the growth of online market by offering benefits beyond traditional market such as greater efficiency and lower transaction costs (Malone et al. 1987; Radkevitch, Heck & Koppius 2006). The Internet provides great potentials and advantages as a medium or marketing tool (Cook & Coupey 1998; Luo 2002) that supports high interactivity with high user involvement. The Internet also influences customer decision-making behaviours in all three phases that is pre-purchase, purchase, and post-purchase (Sheth & Mittal 2004). The features of online market such as efficiency, convenience, competitive pricing and broader selections have allowed e-commerce to grow rapidly worldwide and shifted to m-commerce (Wu & Wang 2004). Nevertheless, according to a research in United States (U.S.), mobile phone users reflected that they got annoyed while shopping through their mobile devices and ended up quitting the entire purchase process. Many mobile application users choose not to shop online due to their concerns about personal information and privacy (George 2004). U.S. adults spent 41% of their time on desktop and 59% on mobile but 85% of their dollars are spent on desktop and 15% on mobile in the second quarter of 2015 (Meola 2016).

The factors causing poor mobile shopping experiences are slower speed, less security, and smaller size of the mobile devices (Meola 2016). In particular, smaller screen size of mobile devices has caused users' frustration while reading product details and they also experience difficulties in entering payment information (Meola 2016). These problems would negatively

influence the mobile shopping experience since the mobile shopping environment determines the level of a consumer's intention to purchase via Internet (Salisbury et al. 2001). As such, the ability to enhance mobile purchase intention becomes the key success factor in building sustainable competitive advantage and increasing market share for mobile application providers (Kim, Kim & Kang 2016). Consumers who indicate positive purchase intention to purchase products has higher actual buying rate compared to consumers who indicate negative purchase intention (Berkman & Gilson 1978).

There are two main categories of Internet shoppers. The first category is problem solvers while the second category is Internet shoppers who seek for fantasy, arousal, fun, sensory stimulation and enjoyment (Hirschman & Holbrook 1982; Monsuwe, Dellaert & Ruyter 2004). Problem solvers consider online shopping to acquire products or services as an errand or work (Monsuwe, Dellaert & Ruyter 2004). Obtaining the said products or services in a more efficient way within specific time constraint with minimal irritation is considered to be their main concern. Conversely, the second type of Internet shoppers perceive online shopping as enjoyment and seek for entertainment results through the Internet shopping experience (Holbrook 1994; Monsuwe, Dellaert & Ruyter 2004).

The overall experience of online shopping consists of consumers' perceptions of functional and utilitarian dimensions (usefulness and ease of use) as well as perceptions of emotional and hedonic dimensions (enjoyment) (Childers et al. 2001; Dellaert & Ruyter 2004; Mathwick et al. 2001; Monsuwe, Menon & Kahn 2002). Most investigations ignore the importance of information systems (IS) in influencing online users' beliefs and thus purchase intention (Yang 2018). Studies have shown that successful mobile IS impacts purchase intention through usefulness, ease of use, and entertainment (Cho & Sagynov 2015). If mobile users are satisfied with the IS of a mobile application, they are more likely to shop and purchase using the mobile devices (Alshurideh 2014). Although past studies have investigated purchase intention and IS in online context, purchase intention and IS have rarely been examined in the mobile shopping applications such as Zalora, Taobao, 11Street, Shopee, Lazada, Carousell, and Ezbuy.

Even though TAM has been extensively used for investigating consumers' acceptance of latest technologies and systems, this model is mostly been tested within the context of information systems. Hence, there is less research in the mobile applications. Nonetheless, due to the rapid

transition from e-commerce to m-commerce, TAM alone is deemed to be insufficient to fully understand the factors affecting purchase intention of mobile application users. In addition, the motivation for using the Internet plus its relationship with online consumer behaviour are less researched (Chen & Wells 1999; Korgaonkar & Wolin 1999; Luo 2002). Only several scholars have studied the U&G Theory in the Internet context (Chen & Wells 1999; Eighmey & McCord 1998; Korgaonkar & Wolin 1999; Luo 2002). Furthermore, even though many studies have researched on the outcomes of irritation (Lim 2013; Lim & Ting 2012; Luo 2002; Xu, Oh, & Teo 2009), there is a lack of research study to investigate the determinants of irritation among mobile shoppers. In view of that, the current research has adapted and integrated TAM (Davis 1989), D&M IS Success Model (DeLone & McLean 1992) and U&G Theory (Eighmey & McCord 1998; Lim 2015; Luo 2002) to address an important research question: what are the factors influencing purchase intention of mobile application users.

The study contributes to inter-disciplinary literature, namely psychology, online consumer behaviour, human-computer interaction, and user acceptance of information system by depicting relationships between mobile IS and mobile purchase intention. The proposed conceptual framework can be used by the mobile shopping application providers to assess their consumer purchase intention and evaluate alternative ways for managing consumer purchase intention through improvement in mobile IS. As the literature in the realm of websites is more established, this study would look at the studies done in those websites before delving into the area of mobile applications. To answer the abovementioned research question, young adults in Malaysia are handed a structured questionnaire from which the quantitative data is compiled. Participation in this study is on a voluntary and anonymous basis. A target sample of 215 is expected. The data of this study is analysed using SmartPLS 3.0.

M-commerce is known as a new type of e-commerce transactions that is done via mobile devices such as handheld or palm-sized computers, cellular phones or even vehicle-mounted interfaces. It is defined as any direct or indirect transactions with a monetary value that are executed through a wireless telecommunication network, for instance, online shopping and mobile banking (Wu & Wang 2005). Although many issues are encountered by mobile users, mobile applications have already become the most successful invention in the world (Thanaporn & Rapeepat 2015). Most people use mobile phone as a mean of communication channel to access the Internet via mobile application for various purposes.

In the United States of America, 57% of consumers use mobile applications to search for information about products or services. It is predicted that in 2021, the m-commerce sales in the United States of America would surpass USD345 billion, from USD148 billion in 2018 (Clement 2019). Nielsen (2014) reports that purchase intention has increased since 2011 for products and services such as event tickets, e-books, sporting goods and toys. Respondents are found to plan engaging in online purchases within the next six months in high prominence categories including clothing (46%), airline (48%), and hotel reservation (44%). Moreover, m-commerce features unlimited entertainment and information as well as provides users the capability to access the mobile application anytime anywhere (Siau, Lim & Sheng 2001).

Furthermore, a case study in China shows that mobile shoppers launched Alibaba's shopping application that is Taobao seven times every day for more than 25-minute usage (Zhang 2016). The key essence of the successful development of Taobao mobile application concludes its overall user-friendly interface and search engine, wide variety of products with reasonable price, interactive function plus reliability and safe procurement. With m-commerce devices, all kinds of transactions and business entities can reach targeted customers anytime and anywhere. Essentially, as compared to e-commerce technologies, the technological advancement in m-commerce has a more flexible way to deliver customised service (Lee 2015). All in all, m-commerce has a strong potential to be a significant channel for online shopping and thereby changed consumer shopping behaviour.

In Malaysia, the development of mobile application has led to a change in the country's economy (MCMC 2017). The Malaysian Communications and Multimedia Commission (MCMC) (2017) states that there were over 76.9% Internet users in 2016 and 89.4% of them were accessing Internet through smartphone. As stated by Groupe Spéciale Mobile Association (2012), the growth in consumption of mobile data had positively influenced the way consumers and businesses operate and communicate. In 2015, the overall e-commerce industry in Malaysia was boosted through the rapid growth of several mobile applications. According to the Consumer Barometer with Google (2015), there is a significant number of online shoppers who purchase online. Lazada was known as the top ranked online shopping site in Malaysia, consisting of over 9 million visits, followed by Lelong and 11street (Wong 2015). These data showcase the growing significance of m-commerce in Malaysia over the years.

2.3 Theories and Models

What are the drivers of purchase intention of mobile application users? In an attempt to determine factors influencing purchase intention of mobile application users, it is important to know why mobile application users intend to make purchases via mobile applications. Two models and one theory, namely the Technology Acceptance Model (Davis 1989), DeLone and McLean IS Success Model (DeLone & McLean 1992) and the Uses and Gratifications Theory (Eighmey & McCord 1998; Lim 2015; Luo 2002) are employed to explain why mobile application users plan to purchase via mobile applications.

2.3.1 Technology Acceptance Model

TAM (Davis, Bagozzi, & Warshaw 1989) as portrayed in Figure 2.1 is one of the most popular models in technology acceptance studies (Galletta & King 2007; Teo, Wong & Chai 2008). TAM has been widely recognised as an effective model in predicting the system use in the past research (Legris et al. 2003; Teo, Wong & Chai 2008). It helps in explaining how attitudes and perceptions affect technology use (Teo, Wong & Chai 2008; Sivo & Pan 2005). TAM is derived from Theory of Reasoned Action (TRA) (Ajzen & Fishbein 1980).

TRA is the core foundation developing the theoretical framework to evaluate factors influencing purchase intention of mobile application users. It is being used as a model to explain the elements of consciously intended behaviours (Fishbein & Ajzen 1975; Lim 2015). The TRA emphasises on connections among subjective norms, attitudes, intentions and behaviour. The theory proposes that social behaviour is driven by an individual's attitude while performing that behaviour. There is a relationship between attitude and belief with individual's intention to perform (Ajzen & Fishbein 1980). The theory predicts behaviour and intention and helps to distinguish how and where to target users' behavioural change attempts (Lim 2015; Ng & Paladino 2009).

Based on TRA, behaviour is determined by the intention to perform within the available context and time. TRA further demonstrates behavioural beliefs about the consequences of the behaviour and the affective evaluation of those consequences on the individual's part and clarifies attitude towards a behaviour. The use of TRA is to explain factors influencing attitudes on intentions to user behaviour. Hence, in the online shopping context, TRA argues that user's

attitude toward purchasing is actually affected through value-seeking considerations (Broekhuizen 2006; Lim 2015; Swait & Sweeney 2000) whereby the attitudes affect the consumers' intention to purchase with e-retailers (Al-Rafee & Cronan 2006; Lim 2015). These phenomena may lead to actual online shopping activities (Ajzen 1991; Cheung et al. 2005; Lim 2015).

Davis (1989) highlights the issue of user acceptance towards technology use by using the TAM. TAM adopts TRA's causal link to describe the individual's information technology acceptance behaviours. TAM proposes that external constructs influence beliefs which are known as the individual's estimated probability that executing certain behaviour will result in a given situation. Researchers have examined many external constructs, namely experience, end-user support, enjoyment, accessibility, anxiety attitude, managerial support, personal innovativeness, job relevance, playfulness, relative advantage, social influence, self-efficacy, subjective norms, and social pressure (Lee et al 2003). Davis (1989) stresses the theoretical importance of perceived ease of use and perceived usefulness of information technology as the major components of attitudes towards using information technology (Moon & Kim 2000). Users' attitude towards technology affects behavioural intentions which will then influence actual technology acceptance.

As explained by TRA, user's beliefs determine the attitudes toward using the system and behavioural intentions to use are influenced by attitudes toward using the system. Subsequently, behavioural intentions to use lead to the actual system use. Though TAM is formerly known as a model developed to study the implementation of computer-based technologies at the workplace, it is later found to be suitable as a theoretical foundation for the adoption of e-commerce (Chen et al. 2002; Lederer et al. 2000; Monsuwe, Dellaert & Ruyter 2004; Moon & Kim 2001). Past research has confirmed the validity of this model across a wide variety of corporate information technologies.

According to past studies, the beliefs (ease of use and usefulness) from TAM have a positive impact on an individual's intention while using a system. For instance, in the e-commerce context, the Internet which offers useful information and ease to use generate a positive influence on purchase intention (Chen & Ching 2013). Ergo, TAM (Davis 1989) explains the cognitive responses of usefulness and ease of use that mediate the impacts of mobile

environmental stimuli on individuals' behavioural responses. In other words, the two beliefs of ease of use and usefulness from TAM (Davis 1989) provide cognitive responses that explain the direct and mediating roles of beliefs on the relationships between external variables from both D&M IS Success Model and U&G Theory, and mobile purchase intention.

Figure 2.1 : Technology Acceptance Model
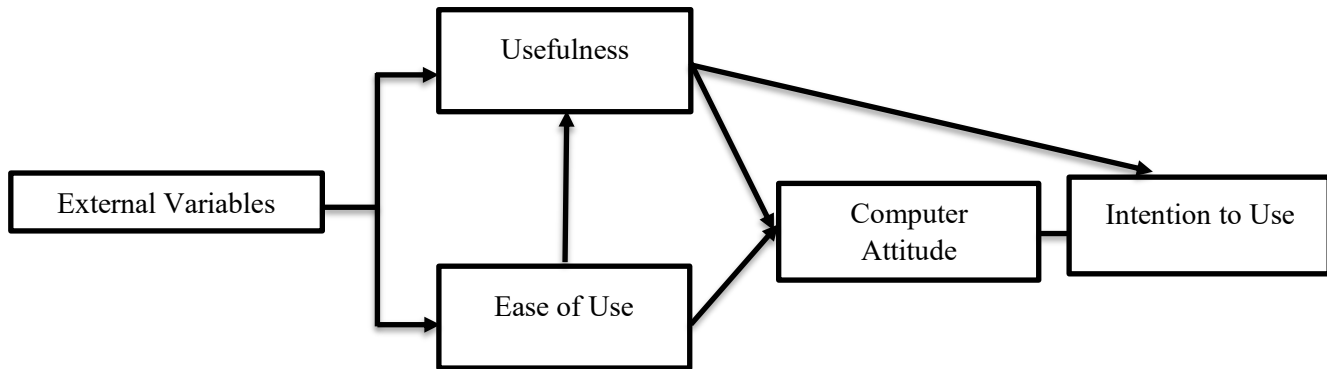
(Davis, Bagozzi & Warshaw 1989)

2.3.2 DeLone & McLean Information Systems Success Model

DeLone and McLean (1992) consolidated past research related to IS into a solid content of knowledge and proposed the D&M IS Success Model. They created the model in order to achieve information system use and user satisfaction in the management information systems perspective (Ibrahim 2009). Based on the theory of Mathematical Theory of Communication by Shannon and Weaver (1949) and Mason's expansion of the influence or effectiveness level (Mason 1978), DeLone and McLean created six distinct dimensions of IS success: information quality, system quality, use, user satisfaction, individual impact and organisational impact (Urbach & Mueller 2011).

According to Figure 2.2, the D&M IS Success Model explains the information success through six dimensions of IS success consisting of information quality which measures semantic success; organisational impacts, use, user satisfaction, individual impacts, and systems quality which measures technical success. These six IS success dimensions jointly measure effectiveness success (DeLone & McLean 2003). Each dimension measurement is to determine

its impact on success to one another. D&M IS Success Model suggests two things: (i) the interdependence between these dimensions and (ii) the time sequence or causal ordering of these dimensions (Almutairi & Subramanian 2005).

Figure 2.2: The Original DeLone & McLean IS Success Model
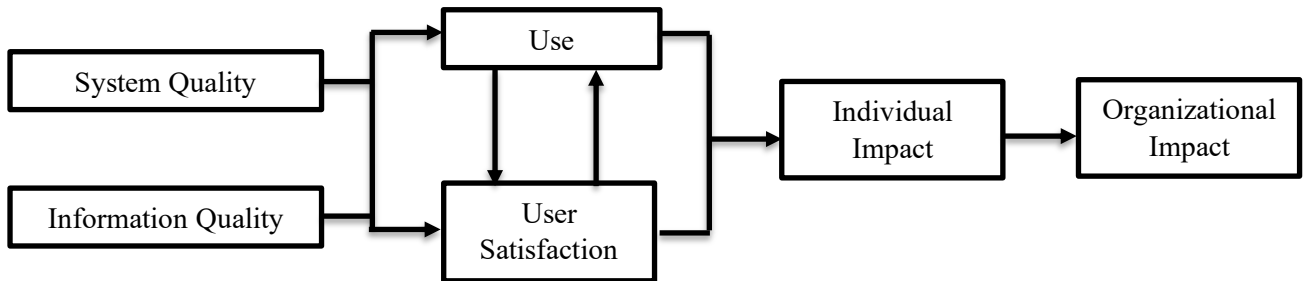
(DeLone & McLean 1992)

The D&M IS Success Model is constantly tested and the research adoption of the model has exceeded the initial expectation (Ibrahim 2009). Within ten years after the initial publication of the D&M IS Success Model, based on the research implications from the original paper together with the changes in the role and management of information systems, many researchers have identified the potential improvements over the original model, extended D&M IS Success Model, and adapted the model for different applications like e-commerce systems and knowledge management (Petter & McLean 2016).

As shown in Figure 2.3, the updated D&M IS Success Model shows that DeLone and McLean (2003) have modified their model in order to address several limitations of the original model. Service quality is added as a new variable which serves as an additional aspect of IS success to indicate the importance of support and service in e-commerce systems (Urbach & Mueller 2011). Intention to use is added as an alternative measure of use to assess user attitude. Individual impact and organisational impact are merged into a more comprehensive construct - net benefits. Thus, the updated D&M IS Success Model consists of information quality, system quality, service quality, intention to use, use, user satisfaction, and net benefits. The updated model recognises the strong association among success dimensions in a process sense and does not indicate positive or negative signs for those relationships through a causal sense (Petter & McLean 2016). Although the D&M IS Success Model has been widely used by past

researchers in information system, it is rarely applied in m-commerce context (Markun & Freddy 2019).

Figure 2.3: The Updated DeLone & McLean IS Success Model
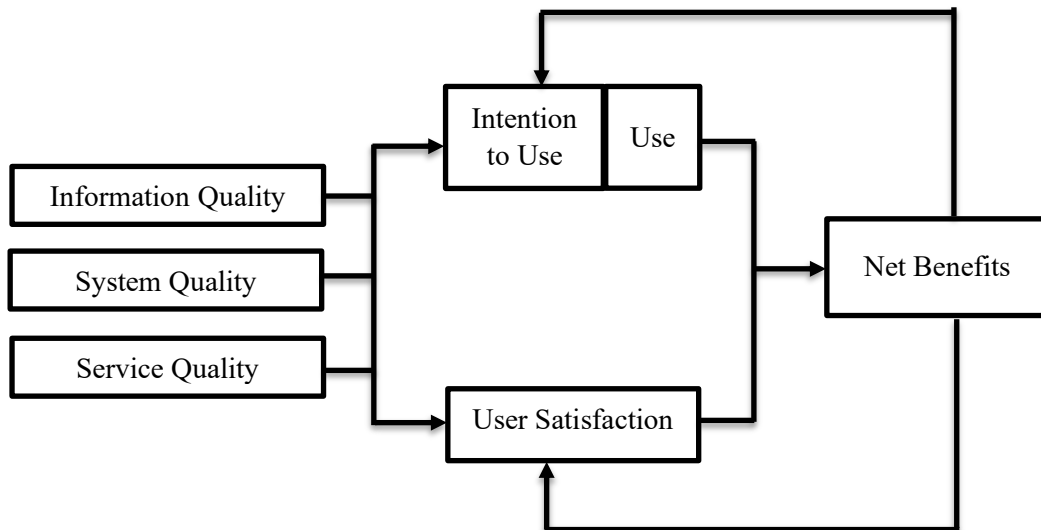
(DeLone & McLean 2003)

2.3.3 Uses and Gratifications Theory

The Uses and Gratifications (U&G) Theory was originally founded from the functionalist perspective through mass media communication. The theory attempts to understand consumer's concerns and motivations based on the context of traditional media (Herzog 1944; McGuire 1974; Luo 2002). Past studies have also applied U&G Theories to further research the behaviour of e-shoppers (Eighmey & McCord 1998; Korgaonkar & Wolin 1999; Luo 2002). E-shoppers who browse commercial websites show U&G behaviours which are similar to those who use other media (Eighmey & McCord 1998; Luo 2002). Motivation is used to portray customers' concerns and motivations when using new technology (Korgaonkar 1999; Pihlström 2008). The theory explores what values and needs can be fulfilled by using new mediums such as TV, radio, and Internet (Pihlström 2008; Stafford & Schkade 2004). Henceforth, the better the product and brand can fulfil the users' motives, the higher is the likelihood that the consumers will prefer that product and brand (Mahatoo 1989; Pihlström 2008).

U&G Theory is based on the notion where media is unable to influence a user (Mondi, Woods & Rafi 2008; Rubin 2002). In education field, there is a previous study that investigated how e-learning resources influenced the students' perceived e-learning experience. The results show that the students' motives and their perceived learning needs can be illustrated using limited-media-effects theory (Mondi, Woods & Rafi 2008). This theory is concerned with what students do with education media and it is compatible with the constructive learning philosophy which highlights that learning is an active process that happens to be most effective when the student is engaged in authentic tasks related to meaningful contexts. It is not something done to the student but rather something that a student does actively (Heinich et al. 1996). In contrast, powerful-media-effects theory assumes that a user is easily manipulated by media influences and being passive. The theory is concerned with what media do to people (Chandler 1994; Littlejohn 1996). On top of that, based on the same study by Mondi, Woods and Rafi (2008), the U&G Theory suggests that students consciously select the medium that could fulfil their learning needs and that they are able to distinguish their justifications when deciding media choice (Mondi, Woods & Rafi 2008).

U&G Theory provides new insights to the determinants of consumer online behaviours such as Internet usage, satisfaction, and online shopping (Lim 2015; Luo 2002). The theory assumes that the users are actively interacting with the communication media and highly involved in media usage (Lim 2015; Luo 2002). As such, the U&G Theory addresses the significant role of consumers through mass media usage, concerning what they do with mass media (Klatz 1959; Klapper 1960; Lim 2015). The constructs used in this theory include information quality, entertainment gratification, and irritation (Chen & Wells 1999; Eighmey & McCord 1998; Eighmey 1997; Herzog 1944; Korgaonkar & Wolin 1999; Luo 2002; Plummer 1971; Rubin 1994).

2.3.4 Purchase Intention Conceptualisation

Purchase intention can be explained as a situation where a consumer intends to make transactions (Pavlou 2003). Academics (Limayem, Khalifa & Frini 2000; Zarrad & Debabi 2012) also attempt to define purchase intention as desires, wishes or willingness to make the purchase. Purchase intention is often used to measure buying likelihood for products within a certain timeframe (Brown, Pope & Voges 2001; Juster 1966; Morrison 1979; Whitlark et al. 1993). In particular, Pavlou (2003) pinpoints that online purchase intention is the situation

where customer intends to be involved in online transaction (Kwek, Lau & Tan 2010; Pavlou 2003). The strength of a consumer's intention to carry out purchasing behaviour via Internet is measured by the online purchase intention in online shopping environment (Kwek, Lau & Tan 2010; Salisbury, Pearson, Pearson & Miller 2001).

2.4 Hypothesis Development

There are four sections of research hypotheses in the current thesis. The first section consists of three hypotheses (H_{1a}, H_{1b}, H_{1c}, H_{1d}, H_{2a}, H_{2b}, H_{2c}, H_{2d}, H_{3a}, H_{3b}, H_{3c}, H_{3d}) which test the direct path relationship of each independent construct (information quality, system quality and service quality) towards the antecendents of purchase intention in the conceptual framework. The second section consists of four hypotheses (H_4, H_5, H_6, and H_7) which test every extended path relationship between ease of use, usefulness, entertainment gratification, and irritation towards purchase intention. The last section consists of four hypotheses (H_{8a}, H_{8b}, H_{8c}, H_{9a}, H_{9b}, H_{9c}, H_{10a}, H_{10b}, H_{10c}, H_{11a}, H_{11b} and H_{11c}) which test the indirect relationships between information quality, service quality, and system quality towards purchase intention through the mediation of utilitarian (ease of use and usefulness) and hedonic (entertainment gratification and irritation) factors.

Information Quality

Information quality is explained as the ability of the website in providing users with helpful and resourceful information (Chen & Wells 1999; Ducoffe 1995; Luo 2002). The desirable characteristics of quality information are accuracy, adequacy, availability, completeness, and conciseness (Bailey & Pearson 1983; Gable et al. 2008; Iivari 2005; McKinney et al.; Rainer & Watson 1995; Sedera & Gable 2004b). Information quality is often known as a major component that leads to user satisfaction (Urbach & Müller 2012).

Ease of Use

Ease of use is a desirable property of a technology (Wallace & Sheetz 2012). Ease of use is explained as the level to which a person believes that using a particular technology will be free of effort (Davis et al. 1989). Ease of use also clarifies users' perception regarding the amount of effort required to utilise the system and it is linked with the user-friendliness of the mobile applications (Ali, Ouda & Capretz 2014).

2.4.1 Relationship between Information Quality and Ease of Use

There is no direct positive effect of information quality on ease of use in m-commerce context. Studies on the relationship between information quality and ease of use produce mixed results. According to Richard and Diane (1996), ease of use is considered to be one of the attributes developed for information quality. This is apparent in Goodhue's (1995, cited in Yang, Diane, Beverly & Richard 2002) study, where the importance of information quality is attributed to the accessibility of information. Aside from that, there is less research being done regarding the relationship between ease of use and information quality (Petter, Delone & McLean 2008). Consequently, this study would like to further explore whether information quality is positively related to ease of use from the mobile application users' perspective.

Usefulness

As explained by Davis (1989), usefulness refers to the level to which individual believes that utilising a particular system would enhance his or her job performance. Monsuwe, Dellaert and Ruyter (2004) have applied this definition in online shopping context, explaining usefulness as the level to which consumers believe using the Internet as a medium could generate positive productivity or performance, thus enhance their shopping outcome (Cho 2015). Usefulness also means decreased time needed to complete a task, yet achieving higher efficiency and accuracy at the same time and therefore utilising the new technology will be favourable to the user's organisation's well-being (Phillips, Calantone & Lee 1994). Tools provided by e-retailers in the form of virtual try-on, visualisation proxy or three-dimensional rotation of multiple products are perceived as useful by shoppers (Huang 2008; Kim & Forsythe 2010; Lim 2015).

2.4.2 Relationship between Information Quality and Usefulness

One of the key variances pertaining to online stores and brick-and-mortar stores is the information made available throughout the shopping pursuits. Customers are often exposed to marketing promotions offered by salespersons and in different forms of media in a traditional store. Merchants tend to prioritise individual target sales over customers' loyalty whereby the sales assistant attempts persistently to get the customers to procure the product, overstressing the product attributes like quality and ease of use of the product. Conversely, when shopping on the mobile application, users are able to obtain greater volume of information about the products or services due to the comprehensive descriptions provided. Through advanced

systems such as collaborative filtering system and feedback system, mobile application users may have access to informative reviews and extra information about the items.

In the mobile application, users' perception of online product information relies on how easy the product quality can be determined as they cannot feel, see, touch or smell the products (Figueiredo 2000). The information quality provided through mobile application is a significant element in leading users to believe in the usefulness of that mobile application (Lin & Lu 2000). For instance, comprehensive product information provided on mobile shopping application will reduce the search duration since mobile users find it easy to accomplish their shopping goals. Hence, the information quality on mobile application will positively affect mobile application's usefulness. This outcome is consistent with past studies which identify that information quality and usefulness of a system are greatly related with each other (DeLone & McLean 1992; Seddon 1997). If websites that provide greater quality of information would cause the users to perceive that the websites are more useful to them, it is thus anticipated that when the mobile applications have higher information quality, then users will believe that the mobile applications are useful to them.

Entertainment Gratification

Entertainment gratification is known as the degree to which online media is entertaining and fun to users (Eighmey 1997; Eighmey & McCord 1998; Lim 2015). Within the context of U&G Theory, the entertainment gratification considers not only the pleasurable experience but also the positive attitude towards its contents and medium (Fagerlind & Kihlman 2000; Lim 2015).

2.4.3 Relationship between Information Quality and Entertainment Gratification

Users visit the Internet to gather all kinds of information (Luo 2002; Maddox 1998). Internet's powerful features could offer mobile application users up-to-date and comprehensive content (Luo 2002). Positive attitudes toward a website is related to entertainment and information quality (Chen & Wells 1999; Chen et al. 2002; Kim & Stoel 2004). The entertainment gratification is one the elements that helps to keep the mobile application users using the mobile application. Therefore, information quality plays a vital role by providing latest and complete information which in turn produces higher entertainment value towards the users. However, when comparing the level of influence on positive attitudes towards a website, information quality has the highest influence on positive attitudes whereas entertainment has the least

influence. Since information quality helps to attract online users, it is then expected that the influence of information quality on mobile users' entertainment gratification while using the mobile applications is positive as well.

Irritation

Irritation is an unintentional outcome of a website (Koufaris cited in Hausman & Siekpe 2009). Eighmey and McCord (1998) describe irritation as the level to which online users perceive the website surface as irritating and messy. Irritation is feelings of messiness, distraction, and confusion while using the website (Chen & Wells 1999; Hausman & Siekpe 2009). Irritation also means feelings of displeasure, discomfort, and annoyance that is caused by annoyance like messages, incidents or interaction that is in opposition from what the mobile application users expect (Ducoffe 1996). Advertisers often irritate and annoy users with their professional stunts to attract users (Adetunji & Yazam 2012). Irritation is typically caused by Internet features that users find offensive and annoying (Ducoffe 1996; Hausman & Siekpe 2009). For example, inappropriate use of colour on the mobile application's surface as well as disorganised contents containing broken links, low quality graphics, and flashy animation are the website characteristics that may irritate the mobile application users.

2.4.4 Relationship between Information Quality and Irritation

E-commerce tends to practice tactics that come with big-sized and flashy graphics, inappropriate images as well as tracking consumers' behaviour and information online. Online users may treat that information as offences (Luo 2002). Apart from that, information that is poorly presented, outdated and incorrect will cause irritation to the mobile application users, leading to negative user experience. Excessive amount of mobile notifications will also bring frustration to mobile shoppers. These irritating information cause users' anxieties, ruin shopping experiences, distract e-shoppers' attention and lead to negative attitudes (Ducoffe 1996; Lim 2015). Konrad (2002) and Lim (2015) even pinpoint that mobile application with unwanted pop-up banners often frustrate e-shoppers as it causes distractions towards shoppers' browsing activity. Moreover, e-shoppers whom experience irritation while shopping online also have experienced difficulty in using the mobile application (Huang 2008; Lim 2015). A poorly designed mobile application, for instance, messy contents plus small fonts for images and texts could lead to difficulties in browsing mobile application (Baraggioli & Adam 2008; Lim 2015; Manganari et al. 2009). It is anticipated that perceived information quality of the

mobile applications to negatively influence mobile users' perceptions of irritation of mobile applications.

System Quality

System quality is explained as the performance of the IS through functionality, ease of use, reliability, convenience, and more (Peter & McLean 2009). System quality is an important feature of an IS (Peter, DeLone & McLean 2008). Sophistication, system flexibility, system reliability, ease of use, ease of learning intuitiveness and response time are all the positive features of system quality. In the Internet environment, system quality is measured using the characteristics of an e-commerce system. Adaptability, usability, availability, reliability and response time (such as download time) are examples of system qualities that are highly valued by users of an e-commerce system (DeLone & McLean 2003).

2.4.5 Relationship between System Quality and Ease of Use

Ease of use has been widely used as a measure of system quality in studies of IS success (Seddon 1997). Perceived ease of use has been considered as a major component of a website's system quality (Liu & Arnett 2000). However, there are also mixed results on the relationship between system quality and ease of use. Many studies have identified strong relationship between system quality and ease of use (Peter, DeLone & McLean 2008; Venkatesh & Davis 2000; Venkatesh & Morris 2000; Wixom & Todd 2005; Yang & Yoo 2004) while other researchers found no significant relationship between them (Subramanian 1994; Wu & Wang 2006). For that reason, this study would like to further examine whether system quality is positively related to ease of use from the viewpoint of mobile users.

2.4.6 Relationship between System Quality and Usefulness

Research on IS has used several approach to assess system quality. Due to the popularity of TAM in IS research, usefulness is generally used as a measurement of system quality (Davis 1989). Generally, system quality shows positive impact on perceived usefulness and thus individual performance. Nonetheless, there are mixed results on the relationship between system quality and usefulness. Past studies have detected strong relationship between system quality and usefulness (Adams et al. 1992; Agarwal & Prasad 1999; Devaraj et al. 2002; Gefen & Keil 1998; Hong et al. 2001/2002; Hsieh & Wang 2007; Lucas & Spitler 1999) while other academics argue there is no significant relationship between them (Chau & Hu 2002; Kulkarni

et al. 2006). As a result, the current study would like to further investigate whether system quality is positively related to usefulness in the context of m-commerce.

2.4.7 Relationship between System Quality and Entertainment Gratification

Media entertainment is capable in fulfilling users' requirements for hedonistic pleasure, escapism, emotional release and aesthetic enjoyment (Lim 2015; McQuail 1983). As such, e-shoppers tend to expect such entertainment pleasure while shopping online (Hooff et al. 2010; Kim & Forsythe 2007; Lim 2015). Site maps, navigation features, wish lists, and ability to view shopping carts are significant stimulations since they make shopping easier (Griffiths 2008; Lim 2015; Mckinney 2004). E-shopping sites which have facilitating interface that encourage more interaction are perceived as entertaining to e-shoppers (Lim 2015; Wang et al. 2007). Taking into consideration the significance of website quality, it is thus reasonable to anticipate that system quality of the mobile applications positively influences the entertainment gratification of mobile users.

2.4.8 Relationship between System Quality and Irritation

The mobile application interface works as the online storefront which users interact and establish their initial impressions about the virtual store (McKnight, Choudhury & Kacmar 2002). Likewise, the mobile application's interface characteristics have substantial effects on consumers' perceived irritation (Wells et al. 2011). Mobile application users encounter irritation predominantly through unfavourable experiences when interacting with the shopping applications (Aaker & Bruzzone 1985). Internet that are easy to use, informative, and visually appealing shall enhance users' involvement with the site and potentially reduce irritation (Gao & Wu 2010). Conversely, a poorly-designed and messy website negatively influences users' attention, generates negative feelings, and requires more effort that may potentially cause annoyance as they are unable to search products, complete a purchase task, and navigate the website (Azeem 2012; Chen & Wells 1999; Gao & Wu 2010). Hence, this study would like to further examine whether system quality is having a negative reletionship with irritation from the viewpoint of mobile users.

Service Quality

Service quality is explained as the support that users received from the IS service provider and it is often being assessed using reliability, empathy of the support organisation and

responsiveness (Peter & McLean 2009). Service quality is deemed to be an attitude or global judgement pertaining to the superiority of a service (Theodorakis & Alexandris 2008; Zeithaml & Bitner 2003). It is one of the main success factors for the service organisations as it is related to higher profits for organisations and increased consumer loyalty (Backman & Veldkamp 1995; Baker & Crompton 2000; Dagger & Sweeney 2006; Mittal & Kamakura 2001; Rust et al. 2000; Verhoef 2003; Theodorakis & Alexandris 2008; Zeithaml & Bitner 2003). With the rising popularity of outsourcing for system development and support, service quality usually incorporates an external IS service provider. Somehow, IS effectiveness is always measured by focusing on the products rather than the services of the IS function (Pitt et al. 1995). Neglecting the service quality may lead to inaccurate measurement of IS effectiveness. On the basis of the available evidence, it is generally agreed by researchers on the necessity of citing service quality measure as part of IS success (DeLone & McLean 2003).

2.4.9 Relationship between Service Quality and Ease of Use

Service quality is a major factor to be considered when the consumers are making purchase decisions (Brucks, Zeithaml & Naylor 2000, cited in Bei & Chiao 2001). Nevertheless, it is difficult to assess service quality in the Internet environment (Figueiredo 2000), thus mobile application users heavily rely on word of mouth (Shen, Li & DeMoss, 2012) and online reviews (Jensen, Averbeck, Zhang & Wright 2013) to measure service quality. Thus far, there is hardly any research been carried out to study the correlation between service quality and ease of use. Consequently, more investigations have to be done to determine whether there is a positive relationship between service quality and ease of use.

2.4.10 Relationship between Service Quality and Usefulness

External IT service support is associated to system usefulness whereas the internal IT service support is not related to usefulness (Igbaria et al. 1997). In spite of that, the user training provided by the internal IT department is strongly associated with system usefulness (Agarwal & Prasad 1999; Igbaria et al. 1997). On top of that, the responsiveness of external IT developers to problems is positively related to efficiency improvement and thus usefulness (Leonard-Barton & Sinha 1993). A case study on service quality found that personalised IT service support is more effective than generalised IT service support (Blanton et al. 1992). Gefen (2000) also indicates that the greater the perception that the external IT provider is cooperative, the

greater the usefulness of IT system. As a result, more research has to be performed to confirm the positive association between service quality and usefulness.

2.4.11 Relationship between Service Quality and Entertainment Gratification

In the traditional service context, the recognition of emotions in service quality models is needed (Liljander & Strandvik 1997; Pihlström 2008). Service quality tends to overlook experiential perspective such as pleasure or fun (Parasuraman et al. 2005). In spite of this, most e-shoppers find the customisation tools (Dixon 2005; Lim 2015) and interactive features such as instant chat boxes, live customer consultants chat, and comment functions (Lim 2015; Machlis 1998; Westhorpe 2008; Wolfinbarger & Gilly 2001) are fun to use. Hence, when mobile users enjoy the services provided by the mobile applications, it is likely that they perceive the mobile applications as enjoyable to them.

2.4.12 Relationship between Service quality and Irritation

Waiting in services is one of the indicators of service quality (Weinberg 2000). Specifically, online users do not like to wait (Weinberg 2000). Although there is little attention drawn upon the negative outcome of long waiting on the Internet, waiting in services has been one of the research focus for over 20 years (Hornik 1984; Maister 1985) in a range of traditional service environment including restaurants (Davis & Vollmann 1990), supermarkets (East et al. 1994), telephone services (Antonides et al. 2002), and retail banking (Sarel & Marmorstein 1998). The longer the consumer has to wait, the more negative reaction will occur (Davis & Heineke 1998; Durrande-Moreau 1999; Tom & Lucey 1995). The negative reaction may include a negative feeling of frustration and irritation as well as a perception of poor service quality (Davis & Heineke 1994; Katz et al. 1991; Taylor 1994).

In offline environment, there are several factors that influence consumer's reactions after long waiting time such as the significance of the service encountered (Davis & Heineke 1994; Jones & Peppiatt 1996), consumer's expected waiting time (Chebat & Filiatrault 1993; East et al. 1991), and the consumer's mood (Chebat et al. 1995; Davis & Heineke 1994; Hui et al. 1997). Taking into consideration the significance of service quality, the current study anticipates that service quality of the mobile application providers is negatively associated with irritation.

2.4.13 Relationship between Ease of use and Purchase Intention

It is possible that a high level of ease of use may generate positive attitudes (Teo, Luan & Sing 2008). Therefore, the easier it is to use the website, the more customers will choose to use the website (Gefen et al. 2003) and lead to positive purchase intention (Ling et al. 2010). Positive ease of use perception could generate mobile shoppers' favourable impression of e-retailers at initial usage and further extend mobile shoppers' willingness to conduct future buyer-seller relationship (Qiu & Li 2008). Even though the shopping environment is commonly known to have beneficial results, the difficulty of engaging with the mobile application could be discouraging for some mobile application users. The barriers that can possibly reduce the perceived ease of use of mobile application are long download times and poorly designed mobile application which cause mobile application users unwilling to engage in the mobile application (Adak & Yumusak 2014). If the mobile application is easy to use, mobile users would prefer to purchase through the mobile application. Likewise, poorly designed mobile application may cause mobile users to lose interest towards their purchases (Adak & Yumusak 2014). Therefore, a lower level of ease of use is expected to be less likely to induce strong purchase intention in the context of mobile application.

2.4.14 Relationship between Usefulness and Purchase Intention

Users tend to use an application which they believe will enhance their job performance (Davis et al. 1989). Many scholars have ascertained that usefulness has significantly influenced the behavioural intent of users (Agarwal & Prasad 1999; Chau & Hu 2002; Davis, et al. 1989; Hu et al. 1999; Igbaria et al. 1995; Igbaria 1993; Mathieson 1991; Mathieson et al. 2001; Moon & Kim 2001; Ramayah et al. 2002; Venkatesh & Davis 2000). Hence, usefulness is deemed to have strong influence towards the buying decision of mobile shoppers (Cho 2015; Koufaris 2002; Shah et al. 2012). As such, it is hypothesised that usefulness is positively associated with purchase intention of mobile application users.

2.4.15 Relationship between Entertainment Gratification and Purchase Intention

The scholars of environmental psychology propose that a person's primary response in any environment is affective and the emotion impacts subsequent relations with the environment (Lim 2015; Machleit & Eroglu 2000; Wakefield & Baker 1998). E-retailers manipulate the website design so as to generate positive entertainment gratification which leads to favourable behaviours and attitudes towards the retailer and its offerings (Alba et al. 1997; Childers et al.

2001; Lim 2015). Furthermore, cues made available through online retail environment could influence shoppers' emotions and thus shopping behaviour (Demangeot & Broderick 2006; Lim 2015). Cues such as visuals, graphics, colour, audio, product presentation through video, and three-dimensional displays are the general stimulations made available in online shopping sites (Dennis et al. 2009; Lim 2015). Cues can be controlled by mobile retailers in order to enhance users' shopping experience, which lead to arousal and pleasure as well as bring in positive intention to shop further (Mehrabian & Russell 1974; Lim 2015).

Aside from that, consumers highly treasure entertainment (Anckar & D'Incau 2002; Basheer & Ibrahim 2010) because shopping is not primarily driven by the objective to purchase but also influenced by other personal motives such as emotions, entertainment, and release (Kim, Lee & Kim 2004; Yoo & Chung 2002). Computer-based media provides marketers huge opportunity to influence consumers' perception due to interactive involvement and pleasure (Basheer & Ibrahim 2010; Hoffman & Novak 1996). Media users who view an advertisement on the website as entertaining leads to higher chance of purchasing the advertised product (Lim 2015). There is a positive relationship between entertainment gratification and purchase intention (Cheung & Lee 2009; Huang 2008). Henceforth, perceived entertainment gratification of mobile application positively influence mobile users' purchase intention.

2.4.16 Relationship between Irritation and Purchase Intention

The techniques that advertisers apply to obtain consumers' attention can be annoying to the online users (Saadeghvaziri, Dehdashti & Askarabad 2013) and cause irritation which then could negatively influence the effectiveness of advertisement and the value of an advertised product (Huang 2008; Luo 2002). Irritating banner advertisement may stimulate human anxiety through distracting Internet users' attention thus leading to negative usage (Ducoffe 1996). Clearly, there is a negative relationship between irritation and attitude towards advertisements (James & Kover 1992). Moreover, mobile users tend to be affected by advertisements on the website more as compared to advertisements on other media such as TV (Huang 2008). Past research also showcases unsystematic websites are associated with lower advertising effectiveness which lead to strong negative perception of advertising value and subsquently lower revisiting intention (Forrester Research, Inc. 2001; Hausman & Siekpe 2009). Irritation does generate negative impact on online consumers' attitude and intention to return (Hausman

& Siekpe 2009; Huang 2008; Jere & Davis 2011; Thota 2012). Therefore, it is anticipated that irritation negatively influences the purchase intention of mobile application users.

2.4.17 Mediating Effect of Utilitarian and Hedonic Factors on Relationships between IS Qualities and Purchase Intention

Literature review indicates that information quality, system quality and service quality have significant influences on the purchase intention of mobile application users. These relationships have been demonstrated by Hackbarth et al. (2003) in the context of website. Hedonic needs (playfulness) is an important mediator of the effect that system experience has on ease of use (Hackbarth et al. 2003). Perceived website quality is found to influence ease of use and these effects are mediated by hedonic needs positively and system anxiety negatively (Hackbarth, Grover & Yi 2003). Several researchers also highlight that the perceived information quality of the website mediates the impact of the retailer's online presence towards the purchase intention on the website (Holzwarth et al. 2006; Shukla, Sharma & Swami 2010). The above findings show that the utilitarian and hedonic factors could be mediators for information quality, system quality, service quality and purchase intention of mobile application users. Therefore, it is important to consider the mediating role of utilitarian (ease of use and usefulness) and hedonic (entertainment gratification and irritation) factors on the relationships between perceived IS qualities and purchase intention.

2.5 Conceptual Framework

A conceptual framework is proposed (see Figure 2.4). In an attempt to enhance the existing research, the current study intends to study how mobile application providers utilise the constructs from TAM, D&M IS Success Model, and U&G Theory to influence the purchase intention of mobile application users. Seven constructs which influence purchase intention are proposed. Information quality, system quality, service quality, usefulness, ease of use, entertainment gratification, and irritation are the dependent constructs whereas purchase intention is the independent construct.

Figure 2.1: Proposed Conceptual Framework
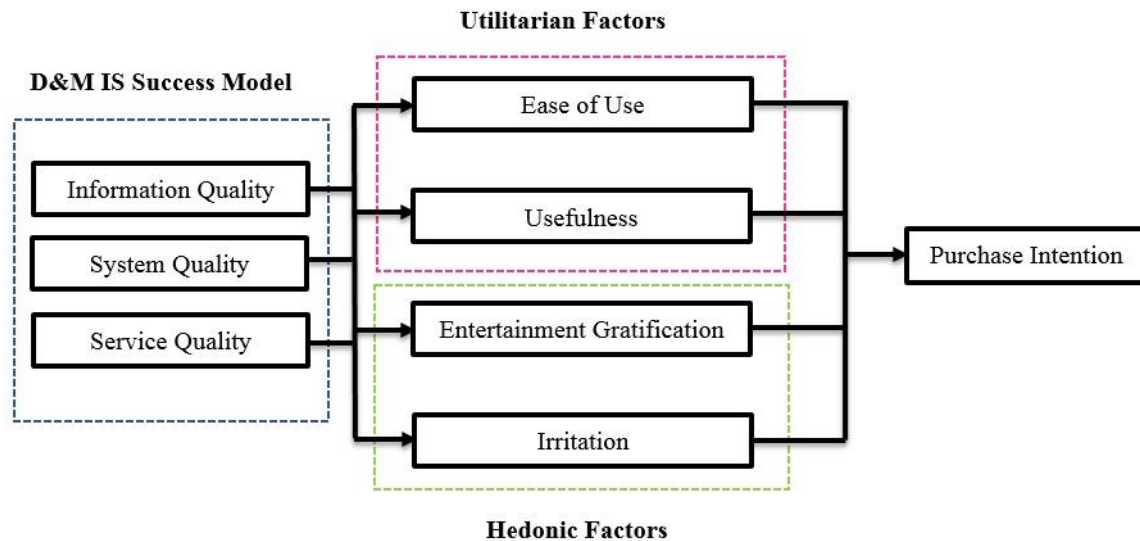
(Davis, Bagozzi & Warshaw 1989; DeLone & McLean 2002)

2.6 Research Hypotheses

On the basis of the eight constructs presented in the conceptual framework, 16 hypotheses are generated from these relationships. In line with prior studies using TAM, D&M IS Success Model, and Uses & Gratification Theory, it is thus hypothesised that there exist both positive and negative as well as direct and mediating relationships among information quality, system quality, service quality, ease of use, usefulness, entertainment gratification, irritation and purchase intention. The rationale for each hypothesis has already been discussed in the preceding sections. Based on the earlier posited research question and the conceptual framework, 16 hypotheses have been formulated as follows:

H_1: Information quality is related to antecedents of purchase intention.

   H_{1a}: Information quality is positively related to ease of use.

   H_{1b}: Information quality is positively related to usefulness.

   H_{1c}: Information quality is positively related to entertainment gratification.

   H_{1d}: Information quality is negatively related to irritation

H_2: System quality is related to antecedents of purchase intention.

   H_{2a}: System quality is positively related to ease of use.

H_{2b}: System quality is positively related to usefulness.

H_{2c}: System quality is positively related to entertainment gratification.

H_{2d}: System quality is negatively related to irritation

H_3: Service quality is related to antecedents of purchase intention.

H_{3a}: Service quality is positively related to ease of use.

H_{3b}: Service quality is positively related to usefulness.

H_{3c}: Service quality is positively related to entertainment gratification.

H_{3d}: Service quality is negatively related to irritation

H_4: Ease of use is positively related to purchase intention.

H_5: Usefulness is positively related to purchase intention.

H_6: Entertainment gratification is positively related to purchase intention.

H_7: Irritation is negatively related to purchase intention.

H_8: Information quality, system quality and service quality are related to purchase intention through the mediation of ease of use.

H_{8a}: Information quality is positively related to purchase intention through the mediation of ease of use.

H_{8b}: System quality is positively related to purchase intention through the mediation of ease of use.

H_{8c}: Service quality is positively related to purchase intention through the mediation of ease of use.

H_9: Information quality, system quality and service quality are related to purchase intention through the mediation of usefulness.

H_{9a}: Information quality is positively related to purchase intention through the mediation of usefulness.

H_{9b}: System quality is positively related to purchase intention through the mediation of usefulness.

H_{9c}: Service quality is positively related to purchase intention through the mediation of usefulness.

H_{10}: Information quality, system quality and service quality are related to purchase intention through the mediation of entertainment gratification.

H_{10a}: Information quality is positively related to purchase intention through the mediation of entertainment gratification.

H_{10b}: System quality is positively related to purchase intention through the mediation of entertainment gratification.

H_{10c}: Service quality is positively related to purchase intention through the mediation of entertainment gratification.

H_{11}: Information quality, system quality and service quality are related to purchase intention through the mediation of irritation.

H_{11a}: Information quality is negatively related to purchase intention through the mediation of irritation.

H_{11b}: System quality is negatively related to purchase intention through the mediation of irritation.

H_{11c}: Service quality is negatively related to purchase intention through the mediation of irritation.

2.7 Summary

Chapter two begins by discussing the current research background. The theoretical frameworks covered consist of TAM, D&M IS Success Model and U&G Theory. Based on the literature review, 11 hypotheses are developed and further discussed in this chapter. Finally, a conceptual framework as shown in Figure 2.4 is proposed. Chapter three will discuss the research methodology to be conducted in the current study, followed by the research paradigm, research approach, sampling design, research instrument, data collection, and data analysis procedure.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Previous chapter explained the theoretical underpinnings that guided the current thesis. Guided by the analysis of the literature, a conceptual framework was created. This framework was supported by a discussion of the rationales behind each proposed hypothesis, which would be tested using the research methodology explained herein. Herein, research paradigm, research approach, sampling design, research instrument and data analysis procedure will be deliberated.

3.2 Research Paradigm

The positivist research paradigm was chosen where it assumed that knowledge is true when it is developed through scientific methods, such as experiments and statistics (Rohmann, Mcgregor & Murnane 2010). The overall scientific approach to research includes the process of proposing and testing hypotheses (Rohmann, Mcgregor & Murnane 2010). Statistical measurement is developed as a method of measuring significance, reliability and validity as criteria of intellectual rigor (logically valid) in the positivistic paradigm (Mcgregor & Murnane 2010). These underpinnings suggest that the positivist paradigm is especially relevant where it seeks to explain and examine the associations between a set of independent and dependent constructs using a series of statistical analyses thereby acknowledging its research questions and attaining the research objectives. Therefore, the positivist research paradigm was used to guide the conduct of the present study, as seen through the flow chart presented in Figure 3.1.

3.3 Research Approach

The present study used a quantitative approach to its research design being guided by a positivist research paradigm (see Figure 3.2). Cavana, Delahaye and Sekaran (2001) propose for a research design to be typically formulated with six elements consisting of purpose of the study, types of investigation, extent of researcher interference, unit of analysis, study setting plus time horizon.

Figure 3.1: Flow Chart

Flow Chart

Literature Search

Questionnaire Design

Sampling Design

Ethics Approval

Pre-test and Pilot Test

Revise Questionnaire

Data Collection

Data Preparation

Data Key In

Data Analysis

Data Interpretation

Data Reporting

Discussion of Findings
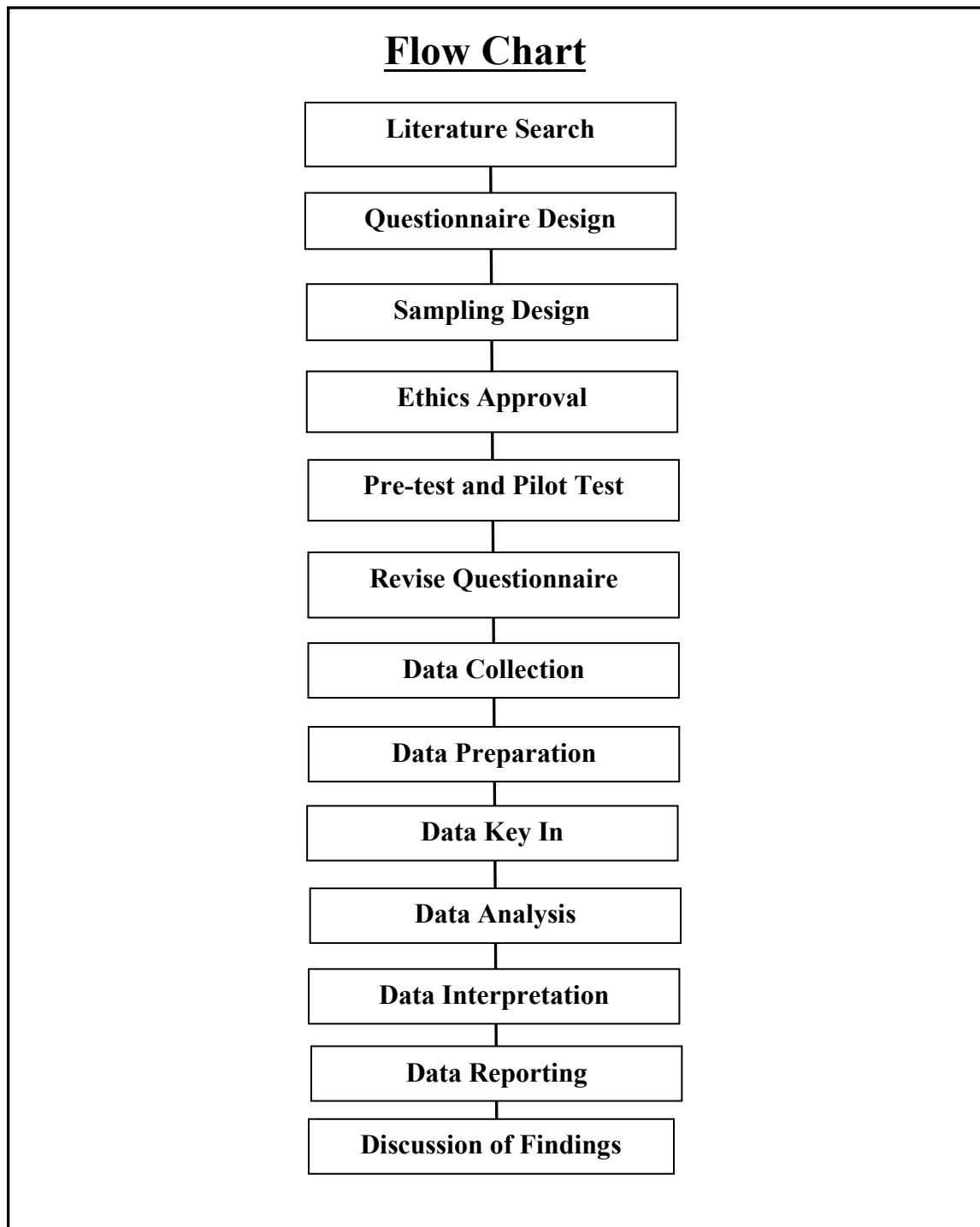
(Mcgregor & Murnane 2010)

Figure 3.2: Research Design

Research Design

Purpose of the Study

- Hypothesis testing

Types of Investigation

- Correlational

Extent of Researcher Interference

- Minimal

Unit of Analysis

- Individuals

Study Setting

- Non-contrived

Time Horizon

- One-shot (cross-sectional)
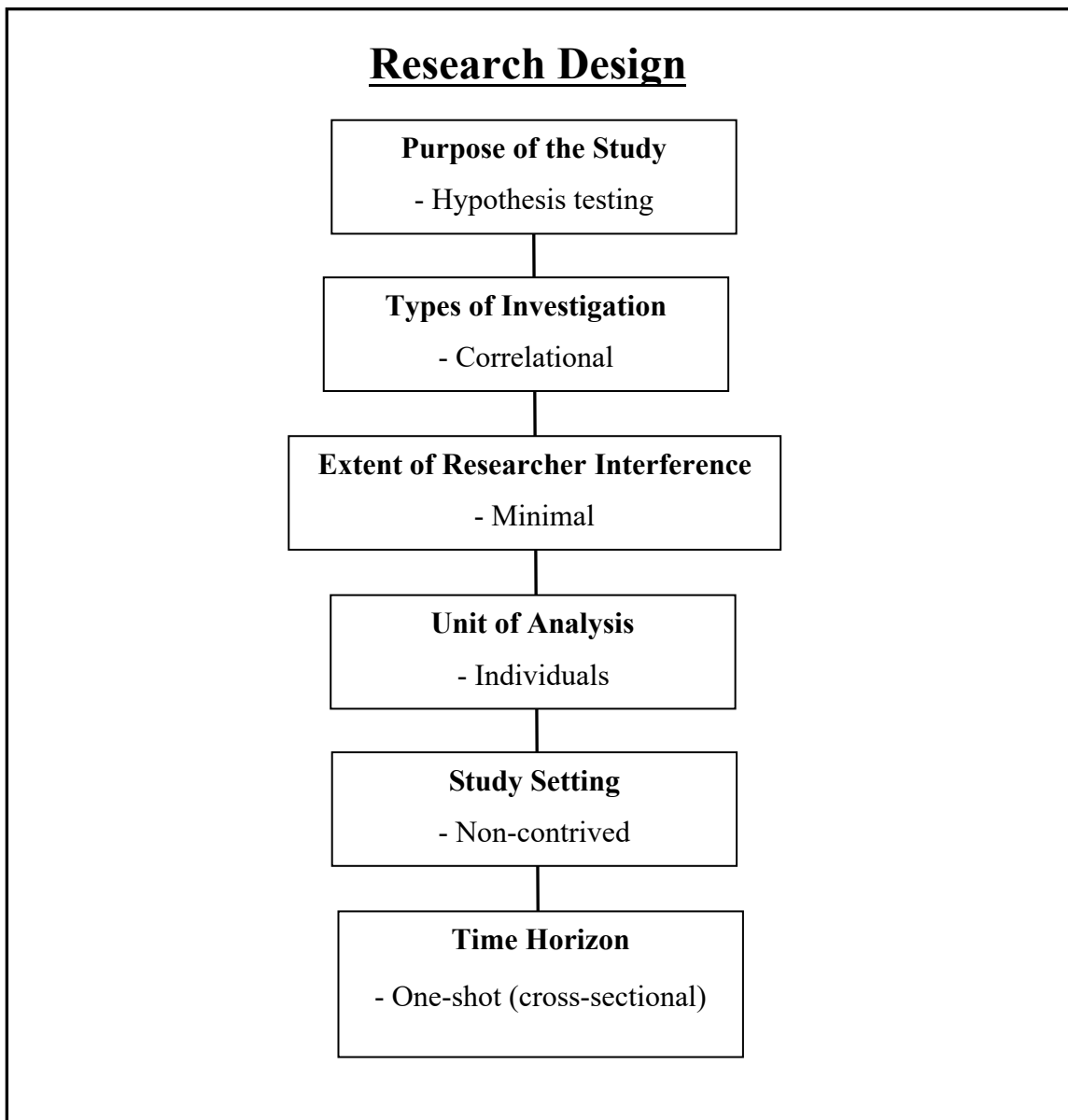
(Cavana, Delahaye &Sekaran 2001)

The current study's purpose is to conduct hypothesis testing as the researcher intends to study the factors affecting purchase intention of mobile application users. It allows the researcher to determine the relationship between two or more factors under a given phenomenon (Cavana, Delahaye & Sekaran 2001; Kenton 2019; Navarro 2019; Privitera 2015).

There are two categories of quantitative investigation: correlational and causal. The present study is interested to examine correlational relationships, a type of relationship where

concurrent shifts between independent and dependent constructs are studied (Cavana, Delahaye & Sekaran 2001). This differs from causal relationships, where changes in the independent constructs could lead to changes in the dependent constructs.

There are three levels of researcher interference: minimal, moderate and excessive. Exploratory and descriptive studies are typically conducted in a low risk, passive environment where the researcher interfere minimally throughout the research process, which differ from the constant changes in controlled interventions in the case of causal relationship studies (Cavana, Delahaye & Sekaran 2001). The researcher exerted minimal level of interference for the current study as per the correlational relationship principle.

The unit of analysis encapsulates the cases that would be used for analysis at an aggregate level (Cavana, Delahaye & Sekaran 2001). Herein, the unit of analysis is at the individual level - that is, consumers who participated in mobile shopping.

There are two types of study setting: contrived and non-contrived. More often, correlational studies are conducted through non-contrived settings, whereas causal studies are conducted through contrived (lab) settings (Cavana, Delahaye & Sekaran 2001). The present study, which was correlational in nature, used a non-contrived setting for study.

Finally, there are two time horizons that typically exist in quantitative studies: cross-sectional and longitudinal. Cross-sectional (or one-shot) studies are carried out over a single period in time that can range from a few days, weeks or months. In contrast, longitudinal studies are carried out over two different points of time in order to study the phenomena over a longer period. For this study, a cross-sectional time horizon was adopted due to its focus to understand mobile application users at this point in time, and due to the resource constraints typically associated with a master-level postgraduate investigation (e.g. funding, manpower, time) (Cavana, Delahaye & Sekaran 2001).

3.4 Sampling Design

3.4.1 Population

Many scholars have suggested the importance of examining media consumption habits of young adults, as information and entertainment mediate through media technologies and form part of their daily lives (Chan-Olmsted, Rim & Zerba 2012). In 2016, according to the Internet Users Survey, the age group of 20-34 represented the user category of the Internet at 53.6%, with an Internet adoption rate of 83.1% (Malaysian Communications and Multimedia Commission 2017). Online users are normally young, college educated, and have median or high income levels (Korgaonkar & Wolin 1999; Luo 2002). Therefore, young adults between the ages of 18 to 35 in Malaysia were targeted as a suitable sample population for this study.

To gather reliable representation of the behaviour of mobile application users, current study selected only mobile shoppers to be participants. The study characterised regular mobile shoppers being participants who have used mobile shopping applications (such as Zalora, Taobao, 11Street, Shopee, Lazada, Carousell, Ezbuy and etc.) in the past six months. The eligibility for participation questions were asked before the participants proceeded to complete the questionnaire. The main aim of having such screening questions in place is to ensure the sample consists of only the right type of participants that is actual mobile shoppers in the age range of 18-35.

3.4.2 Sampling Method

With current advancement in big data technologies and availability of internal fund, the data collection was outsourced to an independent market surveyor that is legally registered and has high profile experience with top companies and multinationals in Malaysia i.e. Vase. More specifically, Vase has a pool of 700,000 people who have voluntarily registered to become survey respondents. The respondents registered on Vase's website and agreed to Vase's terms and conditions, including awareness about Vase's ethical and responsible conduct to ensure the strictest protection of participants' privacy and data storage. Apart from that, the respondents have agreed in writing to have their non-identifiable responses published in return for a small token of appreciation (of about RM6.30 = USD1.58) for their time and effort.

During the survey campaign, Vase only sent out and documented contracted surveys to this pool of voluntarily registered survey respondents, using a computational randomised algorithm. This was carried out by Vase's internal employees, who inserted the researcher's requirements into Vase's internal systems that would use its computational randomised algorithms to randomly select and provide the researcher's project description, participant information statement and consent form (see Appendix 1 and 2) to target participants from Vase's pool of voluntarily registered survey respondents. Also, Vase would disseminate survey and record responses of those respondents who were interested and willing to take the researcher's survey and automatically generated and sent the dataset and report to the researcher once the targeted number of participants had been fulfilled.

Researcher's version of participant information statement, consent form and questionnaire were used in the survey. Vase was required to upload the current study's participant information statement and consent form as requirements into Vase's internal systems. Interested respondents could access participant information statement and consent form through a link created by Vase if they wish to see and read it before consenting to participate in the survey.

Vase would recruit participants who fall under the demographic criteria from their existing database. Therefore, Vase targeted 215 participants aged between 18-35 years old in Malaysia for data collection. Vase would prepare an online survey to collect data from their survey panellist that is available in their database. Vase would send an email to people who were randomly selected from the database as well as fall within the age of 18 to 35. Using the links provided by Vase, the researcher would be able to check the format of the online survey prepared by the external surveyor to ensure that the online questionnaire was identical and reflective of the questionnaire prepared prior to approval for dissemination to randomly selected participants.

The participant information statement and consent form that researcher used was intended to understand the consumption values and behaviours of respondents and they were under no obligation to participate in the study. If participants choose to be involved, they could choose to opt out at any time, and thus none of their responses would be collected. Hence, they would not receive any token of appreciation if they opt out. On the other hand, if they voluntarily

participate, they would be informed that the survey might take up to 30 minutes to complete. Alternatively, there would be an additional option online for the respondents to stop and return to the survey at their convenient time. They were also notified that their responses would not be identifiable in any way (as no personal contact information would be collected or passed onto the researcher) and might be published by the researcher who engaged the services of the independent market surveyor.

Moreover, the survey took a single-blind process where the researcher did not and would not know any personal and private information about any individual survey participant (though survey participants can reach and report to Swinburne Sarawak Ethics Working Committee if they wish to do so for any reason). No foreseeable risks as Vase is a professional and legal service provider that has conducted many surveys over the years for many multinational companies in Malaysia under the same process herein this study. A copy of Vase's proposal on contract terms is attached (see Appendix 8). Once the data collection was completed by Vase, the researcher would then evaluate the data provided by Vase and report the outcomes.

3.4.3 Sample Size

The current study required insights from young adults about their consumption behaviour in m-commerce. Hair, Hult, Ringle, and Sarstedt (2014) suggest the minimum sample size for study is 100 cases when structural models contain few constructs (less than five) with individual construct having more than three items and/or high communalities (0.6 or higher); 150 cases when structural models contain many constructs with each having more than three items and/or modest communalities (about 0.5); 300 cases when structural models contain many constructs with individual construct having fewer than three items and/or low communalities (less than 0.5); and 500 cases when structural models contain a very high number of constructs (10 or more) with each construct having fewer than three items and/or low communalities (less than 0.5). With eight constructs measured with more than three items each under this study, the sample size of 215 participants is deemed to be adequate for the range of statistical analysis that could be carried out for the current investigation.

3.5 Instrumentation

A pilot test with a sample of 20 topic-related experts and academic professionals was conducted by distributing self-administered survey questionnaire. The key purpose of the pilot test was to

obtain feedback on the survey items derived from prior literature search. Averagely, each respondent took approximately 30 minutes to complete the entire survey. Afterwards, based on the feedback from one of the respondents, one of the terms was replaced with the suggested word. Doing this would ensure that potential participants comprehended what the proposed survey questionnaire intended to ask for (Fishbein & Ajzen 2010).

In addition, a pre-test was carried out right after the pilot test to test the design of the improved questionnaire in order to determine that the questionnaire tested was acceptable, with possible biases or discrepancies to be eliminated before using it in the main study stage. Prior studies suggest that a number of 12 to 30 respondents is sufficient for the purpose of pre-test (Hunt, Sparkman Jr, & Wilcox 1982). In an attempt to maximise the validity and reliability of the pre-test result, 50 respondents were targeted right before the actual survey (or main study). Pilot test respondents were excluded from the pre-test data collection to avoid potential response bias effects due to prior exposure to this study via questionnaire distributed during pilot test (De Run 2004).

The respondents targeted for pre-test were acquaintances of the investigator that fell under the age group and used mobile shopping applications in the last six months. Purposive sampling technique was applied in this instance to recruit respondents (Saunders, Saunders, Lewis & Thornhill 2011). The pre-test data collection was conducted over a period of two months. The pre-test data analysis was conducted through Statistical Package for Social Sciences (SPSS) to validate the instrument by measuring its construct reliability and validity (Hair, Hult, Ringle & Sarstedt 2014). The pre-test outcome is shown in Table 3.1. Based on pre-test findings, all the items used in the questionnaire are reliable and valid. Therefore, there was no modification been made on the questionnaire. Further details on the questionnaire design and items are presented in the subsequent sections.

3.5.1 Questionnaire Design

The questionnaire comprised of six sections. Section one determined the eligibility of the respondents through several screening questions. The second section collected data on socio-demographic characteristics of respondents (age, gender, occupation, income etc.). The third and fourth section of the questionnaire determined the qualification of each respondent regarding their purchasing activity through mobile application and also their actual experience

based on their mobile application usage in the last six months. The second last part of the questionnaire consisted of components computing the various antecedents of purchase intention namely information quality, system quality, service quality, ease of use, usefulness, entertainment gratification and irritation. The final section gathered information on purchase intention.

Table 3.1: Summary of Pre-Test Final Measures

Measure	No. of Items	Scale Range	Reliability	Cumulative % of Variance Extracted	Scale Type
Information Quality	17	1-5	0.933	64.98%	Likert 5-Scale
System Quality	7	1-5	0.776	61.05%	Likert 5-Scale
Service Quality	7	1-5	0.792	59.14%	Likert 5-Scale
Entertainment Gratification	14	1-5	0.929	67.86%	Likert 5-Scale
Irritation	8	1-5	0.838	61.85%	Likert 5-Scale
Ease of Use	10	1-5	0.928	71.34%	Likert 5-Scale
Usefulness	15	1-5	0.940	65.60%	Likert 5-Scale
Purchase intention	5	1-5	0.898	83.14%	Likert 5-Scale

3.5.2 Item Source

All chosen measuring items in the current study were revised and adapted from previous studies so as to design the questionnaire. The sources would be further discussed below.

3.5.2.1 Information Quality

Information quality is defined as the characteristics of the output offered by IS, such as accuracy, timeliness and completeness (Peter & McLean 2009). This construct was assessed using the scales as proposed by Hsu, Chang and Chen (2011), Bossena, Jensena and Udsen (2013), Xu (2007), Shin (2007), Lee and Lee (2011), Tsang, Ho and Liang (2004), Seddon and Kiew (1995), Mahatanankoon, Wen and Lim (2006), Sharkey, Scott and Acton (2010) as well as Lim and Ting (2012). Respondents were required to indicate their levels of agreement towards statements that described the degree to which they were confident the data provided

by the mobile application was relevant, understandable, accurate, concise, complete, current, timely and useful. 17 Likert scale statements were employed to measure information quality.

3.5.2.2 System Quality

System quality is termed as the IS's performance through functionality, reliability, ease of use, and convenience (Peter & McLean 2009). System quality is assessed according to statements suggested by Hsu, Chang and Chen (2011), Bossena, Jensena and Udsen (2013), and Sharkey, and Scott and Acton (2010). The statements described the extent to which the respondents believed that the mobile application was easy to use, flexible, reliable, and easy to learn. 7 Likert scale statements were applied in this construct.

3.5.2.3 Service Quality

Service quality is termed as the support rendered by the IS service provider towards its customers and it is usually measured according to the reliability, responsiveness and empathy of the support organisation (Peter & McLean 2009). Questions for service quality have been taken from the studies by Hsu, Chang and Chen (2011) and Bossena, Jensena and Udsen (2013). Through selecting the level of agreement towards the statements, it indicated the respondents believed that the service received from the IT support personnel was responsive, accurate, reliable, technically competent and empathetic. 7 Likert scale statements have been used to measure service quality.

3.5.2.4 Ease of Use

Ease of use is termed as the level to which a person believes that using a particular technology would be free of effort (Davis et al. 1989). Prior studies were served as a reference for the measuring items, such as Hsua, Lub and Hsuc (2006), Bossena, Jensena and Udsen (2013), Cyr, Head and Ivanov (2006), Verkasalo, López-Nicolás, Molina-Castillo and Bouwman (2010), Wanga (2004), Mallat, Rossi, Tuunainen and Oorni (2006), Mahatanankoon, Wen and Lim (2006), Kang (2014), Childersa, Carrb, Peckc and Carson (2001) and Lim (2013). 10 Likert scale statements were adapted to measure ease of use.

3.5.2.5 Usefulness

Usefulness is assessed according to statements recommended by Hsua, Lub and Hsuc (2006), Cyr, Head and Ivanov (2006), Verkasalo, López-Nicolás, Molina-Castillo and Bouwman

(2010), Wua and Wanga (2004), Mahatanankoon, Wen and Lim (2006), Kang (2014), Childersa, Carrb, Peckc and Carson (2001), and Lim (2013). Through selecting the level of agreement towards the statements, it indicated the respondent believed using this mobile application would enhance their performance in shopping. 15 Likert scale statements have been utilised to measure usefulness.

3.5.2.6 Entertainment Gratification

Entertainment gratification is considered to be not only the pleasurable experience but also the positive attitude towards the medium and its contents (Fagerlind & Kihlman 2000; Lim 2015). It is also known as the degree to which Internet media is fun and entertaining to users (Eighmey & McCord 1998; Lim 2015). The measurement items were adapted through prior studies by Xu (2007), Shin (2007), Verkasalo, López-Nicolás, Molina-Castillo and Bouwman (2010), Park, Kee, and Valenzuela (2009), Kang (2014), Lim and Ting (2012) and Luo (2010). The levels indicated by the respondents described the degree to which respondents believed that using the mobile application was perceived to be enjoyable. 14 Likert scales statements have been employed.

3.5.2.7 Irritation

Eighmey and McCord (1998) refer irritation as the degree to which shoppers perceive Internet surfing as irritating and messy. The irritation construct was assessed using prior research done by Xu (2007), Tsang, Liang (2004), Lim (2013) and Lim and Ting (2012). Each measuring item indicated that the respondents believed that using this mobile application would be irritating. 8 Likert scale statements have been employed to measure irritation.

3.5.2.8 Purchase Intention

Purchase intention is termed as desires, wishes or willingness to behave (Limayem, Khalifa & Frini 2000; Zarrad & Debabi 2012). It is also known as a mediating construct between behaviour and attitude (Ajzen & Fishbein 1985; Zarrad & Debabi 2012). This construct was measured following the recommendations of Hsu, Chang and Chen (2011), Xu (2007), Xu, Liao and Li (2007), Shin (2007), Ling, Lau and Tan (2010), Kang (2014) and Lim (2013). The respondents described their degree of purchase intention while using the mobile application. 5 Likert scale statements have been employed to capture various aspects of purchase intention. A summary of the source of items for each construct is presented in Appendix 5.

3.5.3 Response Scale

The first section of the questionnaire included eligibility questions (such as English proficiency, respondents' consent and etc.). The eligibility questions were asked in the form of dichotomous scale (also known as simple category scale). According to Cooper and Schindler (2008), dichotomous scale offers two mutually exclusive response choices such as "yes" and "no" or "agree" and "disagree". This response scale is suitable for demographic questions. As explained earlier, respondents have the right to withdraw from the survey anytime at their own conscious whereas Vase would filter the right respondents by excluding those respondents which indicated "no" in the eligibility questions.

The next section gathered data on socio-demographic characteristics of each respondent (age, gender, occupation, income etc.). Multiple choice and single-response scale were applied as there were two to 10 responses for respondents to choose from for each question. As explained by prior studies, the main alternatives should include ninety percent of the range, with the "others" category concluding the participant's list. The third and fourth sections of the questionnaire determined each respondent's purchasing activity through mobile applications and also their actual experience based on their usage in the last six months.

The fifth and the final sections of the questionnaire examined each respondent's perception through each item of the constructs. The constructs been assessed were information quality, service quality, system quality, ease of use, usefulness, entertainment gratification, irritation and purchase intention. The measurement to be used was through five-point Likert scale where "1" paralleled to "strongly disagree" and "5" corresponded to "strongly agree". Rensis Likert is the creator of the famed Likert scale which is a popular and widely used variation of the summated rating scale. Likert scale presents statement that defines either a favourable or an unfavourable attitude towards the measuring object (Cooper & Schindler 2008). When the items characterise the approach upon which generalisations are contrived, the content validity of the scales is thus ensured (Lim 2015; Ong et al. 2004).

3.6 Data Analysis

Building on the findings from the pilot test and pre-test, the information evaluation for the principal study consisted of several important stages. First stage to be carried out would be the initial data evaluation of the main sample. This included data screening and normality

assessments. Secondly, an evaluation of the response rate was conducted. This included statistics on the usable and unusable responses. Unusable responses included respondents with inconsistent responses or having large number of missing responses. Thirdly, a test to examine common method bias was conducted using Common Method Variance (CMV) via Harman's single factor test.

Fourthly, a descriptive analysis was conducted in elucidating the respondents' socio-demographic background in the main study. Fifthly, an assessment of the measurement model was conducted to determine its convergent and discriminant validity plus its reliability. This included confirmatory factor analysis, correlation analysis, computation and threshold comparisons of Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's alpha. Further threshold comparisons were made against the Heterotrait-Monotrait criterion (HTMT) and the Fornell and Larcker criterion. Finally, an assessment of the structural model was conducted as to examine the support for the proposed hypotheses under study. Detailed descriptions for each stage along with its threshold values for comparison are provided in the presentation of the results in the next chapter (see Figure 3.3).

The preliminary data analysis included the assessment of the normality of data distribution. The data clean-up was conducted in between data collection and the data analysis (Tabachnick & Fidell 2007). The assessment of normality of data distribution was to eliminate the values which fell outside of the range "$\pm$ 3.29 standard deviation" away from the mean, as according to Tabachnick and Fidell (2007). The main purpose of data clean-up was to eliminate all unusual data and ensure the respondents understood and answered all questions in the questionnaire accurately. This review process confirmed the data did not contain any possible errors due to any irrational responses (Alreck & Settle 1995). If several items in different sections of the questionnaire were identified as irrational, current study managed the unreasonable values by excluding questionnaires with irrational data from the data set for analysis.

3.6.1 Harman's Single Factor Test

The CMV using Harman's single factor test was carried out in the thesis to test the common method bias (Podsakoff et al. 1986) as it was unavoidable to foresee any potential common method bias before conducting further analysis of a research study. The main purpose of CMV

test was to use all data to showcase the outcomes of the factor analysis presented in one factor, accounting for both exogenous and endogenous constructs when an extensive amount of CMV existed.

Figure 3.3: Data Analysis

Data Analysis

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┌─────────────────────────────────────────┐
│  Preliminary Data Analysis               │
└─────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────┐
│  Descriptive Data Analysis               │
│  - Response Rate                         │
└─────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────┐
│  Harman's Single Factor test             │
└─────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────┐
│  Descriptive Data Analysis               │
│  - Socio-Demographic Background          │
└─────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────┐
│  Assessment of Measurement Model         │
│  - Confirmatory Factor Analysis          │
│  - Correlation Analysis                  │
│  - Computation & Threshold Comparisons   │
│  - Composite Reliability                 │
│  - Cronbach's Alpha                      │
└─────────────────────────────────────────┘
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┌─────────────────────────────────────────┐
│  Structural Equation Modeling            │
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3.6.2 Descriptive Data Analysis (Socio-Demographics)

Malaysian mobile shoppers aged between 18 to 35 years old were used as a sample for final analysis. Accordingly, the socio-demographic background (age, gender, religion, race, state

and etc.) of the respondents would be obtained through descriptive analysis to have an idea of the sample characteristics.

3.6.3 Assessment of Measurement Model

Reflective measurement model was evaluated to validate the constructs reliability under the present study. The main objective was to ensure the study constructs were suitable in the path model (Chin 1998; Hair et al. 2012b). Several key criteria such as internal consistency reliability, convergent validity and discriminant validity were used in order to assess the reflective measurement model. CR and AVE were known as the key coefficients used to test both convergent validity and internal consistency reliability (Chin 2010; Hair et al. 2011).

Firstly, the construct reliability could be evaluated by using the Cronbach's alpha or Composite Reliability (CR) coefficient. Even though Cronbach's alpha reliability measurement is considered as one of the frequently used reliability measurement (Tenenhaus et al. 2010), various scholars had discussed about the downside of using Cronbach's alpha as a reliability measurement. The main purpose of Cronbach's alpha reliability test was to estimate equally related factor scores of all indicators under the construct (Werts et al. 1974). Somehow, the approach of similar scores from all indicators of the construct is considered as inappropriate in Structural Equation Modeling (SEM). Besides, Hair et al. (2017) indicate that Cronbach's alpha tends to undervalue the internal consistency reliability and it is considered to be a conservative method to assess the internal consistency of the adapted scale in PLS-SEM (Hair et al. 2014a).

Ergo, with the capacity to provide the information of the item loading into the calculation, CR is considered a more appropriate approach to better establish the construct reliability in PLS-SEM analysis (Hair et al. 2011; Kock 2011). Scholars also state that CR is a more creditable approach to assess reliability over Cronbach's alpha (Wong 2013). Hence, the current study applied CR approach to measure the construct reliability as a replacement of the traditionally use of Cronbach's alpha reliability measure. As advised by Hair et al. (2017), acceptable loading values of CR shall be equal to or larger than 0.70.

The convergent validity was carried out through calculating the cross loadings and the AVE value of the constructs. A threshold value of 0.70 was used for the standardised factor loadings

in the measurement model (Hair et al. 2017). This study also used the threshold value greater than 0.5 of the AVE of a latent construct (Bagozzi & Yi 1988; Kock 2011).

The discriminant validity measurement to assess reflective measurement model was tested in the study. It is to ensure the degree to which every reflective construct is distinct from each other under this study through estimating the average communalities and construct correlation (Kock 2011; Chin 2010). Using SmartPLS, the discriminant validity can be obtained through three criteria, which consist of the Heterotrait-Monotrait ratio of correlations (HTMT), Fornell and Larcker's (1981) criterion and cross loading. The discriminant validity of the current study was established using both Fornell and Larcker's (1981) criterion and the Heterotrait-Monotrait's ratio of correlations.

Through the use of Fornell and Larcker's (1981) criterion, it is being suggested that the square root of the AVE shall surpass the correlation values between the constructs of the study (Fornell & Larcker 1981). Meanwhile, HTMT has been recognised as a superior criterion by comparison with the more conservative approach of Fornell and Larcker's criterion in assessing discriminant validity (Henseler, Ringle & Sarstedt 2015). HTMT suggests the ratio of correlations within the study constructs to correlations between the constructs. The threshold values of 0.85 and 0.90 are acceptable (Henseler, Ringle & Sarstedt 2015).

3.6.4 Structural Equation Modeling

The proposed conceptual framework (Figure 2.4) illustrates the correlational relationships between different website attributes with the purchase intention of mobile application users. The aim of this study is to establish an integrated plus coherent model which helps in predicting various factors influencing purchase intention of mobile application users. Specification of the relationships between dependent, independent and mediating constructs is required. To observe the relationships between the latent constructs, two primary approaches are commonly used by prior studies, including path analysis and Structural Equation Models (SEM) (Hair, et. al. 2014). Path analysis is a weaker technique as it assumes that there is no error involved in measuring the constructs involved in a study (Parse 2001) whereas SEM mainly represents a structural model between various latent constructs (Hair, et. al. 2014).

Partial Least Square Path Modelling (PLS-PM) is applied to examine the correlational relationships between different constructs. PLS-PM technique resolves the structural model

blocks algorithm separately. Hence, it estimates the path coefficients in the structural model through the use of coefficient and regression estimation (Hair, et. al. 2014). Application of the PLS-PM is critical because the theoretical knowledge and substantive knowledge pertaining to the factors influencing purchase intention of mobile application users was essential. Therefore, particularly within a Malaysian context, using the PLS-PM technique for such correlational study is suitable where the theoretical and substantive knowledge is relatively uncommon.

Furthermore, SEM is predominantly utilised in measuring the network of casual relationship, liking two or more latent constructs (Hagelin 1999). Each of these latent constructs is measured through a number of observable indicators. It assumes causality among the latent constructs exists and can be examined based on certain observable indicators (known as manifest constructs). SEM represents a joint-point between confirmatory factor analysis and path analysis (Hsieh & Shannon 2005). Nevertheless, this only occurs when the items of a latent construct are reflective in order to produce more realistic and robust outcome (Hair, et. al. 2014). As such, SEM procedure is a more vigorous and stringent method for hypotheses testing and overall model fit (Ting & De Run 2012). In view of that, the SEM software SmartPLS was utilised in testing the relationship between observed constructs to validate a latent construct through the utilisation of convergent validity and discriminant validity in this study.

The SEM software SmartPLS was also used to analyse the direct, extended and mediating relationships between the exogenous constructs and endogenous constructs specified in the research model (Figure 4.1) through the use of Bootstrapping procedure. The bootstrapping procedure is a non-parametric approach to calculate the precision of the PLS estimates conducted (Chin 1998; Fornell & Larcker 1981). Overall, 5,000 cases of sub-samples are extracted in bootstrapping procedures to better estimate the model of each of the sub-samples (Hair et al. 2011).

3.7 Summary

Chapter 3 begins by discussing the research paradigm and research approach. The sampling design is further elaborated. The pilot test is outlined before proceeding to the pre-test, followed by the main study research design for this thesis. This chapter likewise explains the steps involved in designing the research instrument and data analysis procedures. The next chapter would explain further the data analysis findings and results for pilot study (first phase), pre-

test (first phase) together with the key study (second phase) based on the methodologies discussed in the current chapter.

CHAPTER 4: ANALYSES AND FINDINGS

4.1 Introduction

Chapter four covers the data analysis procedures and result interpretations. SmartPLS-3.0 and Statistical Package of Social Sciences (SPSS) were utilised in calculating the structural model using Partial Least Squares-based Structural Equation Modeling (PLS-SEM). This chapter begins by analysing the preliminary data, testing common method biases, thereby presenting the respondents' profile in the study. The measurement model evaluation is also presented right after the structural model evaluation. The constructs validity and reliability were assessed using the evaluation of the reflective measurement model. However, the assessment of the discriminant validity also establishes the distinctness of reflective constructs. Moreover, by addressing the collinearity issues, the formative measurement model was also assessed via the convergent validity, followed by testing the importance and relevance of formative indicators. Finally, the chapter finishes with expanding further the effects of antecedents towards purchase intention of mobile application users and thereafter concluded with the results.

4.2 Preliminary Data Analysis

The current section includes the data screening procedures of the study and the assessment of the normality of data distribution.

4.2.1 Data Clean-Up

The data clean-up procedure of the collected data is necessary to ensure the respondents understood and answered accurately all questions in the questionnaires. It provides a better foundation for subsequent analysis and decision making while employing sophisticated data analytical tools to perform SEM. Out of the 215 completed responses, only six questionnaires were found containing irrational data on several sections of the questionnaire and the six respondents were discarded from the dataset.

4.2.2 Normality Assessment of Data Distribution

The data distribution is considered as normal by eliminating the values which fall outside of the range of "$\pm$ 3.29 standard deviation" away from the mean (Tabachnick & Fidell 2007). Removal of the scores is not advised to exceed more than 0.1% of the entire data distribution.

Following the recommendations mentioned above, the assessment demonstrated sufficient normality of data distribution for all items and no items under the current study require removal.

4.3 Descriptive Data Analysis (Response Rate)

Table 4.1 shows the total number of completed responses is 215 whereas the usable responses are 209. Therefore, the usable rate is 97% and 3% of the completed questionnaires were discarded due to irrational responses and missing values.

Table 4.1: Summary of Responses

	Number	Percentage
Questionnaire Distributed	250	100%
Questionnaire Received	215	86%
Unusable Questionnaires	6	2.4%
Usable Questionnaires	209	83.6%

4.4 Harman's Single Factor Test

The current research undertook the CMV using Harman's single factor test. As recommended by Podsakoff et al. (2012), the current study began data analysis by entering all study constructs into one principal component factor analysis followed by the elimination approach of a principal component of one fixed factor.

The amount of variance to test the common method bias varies based on the field of research such as marketing, management, and psychology (Podsakoff et al. 2006). If there is more than 40.7% of covariance established in an individual factor of a behavioural research, the common method biases do exist. The current study found 14 factors and the most covariance explained by one factor is 32.46% using Harman's single factor test. Therefore, the CMV issue was ruled out as a major concern in the current research (Podsakoff et al. 1986). If the cut-off point is more than 0.90, it shows no correlation between research constructs. The highest correlation between constructs under study is 0.656, that is correlation between system quality and service quality (Bagozzi, Yi & Philips 1991; Jee, Ting & Alim 2019). In view of that, common method bias was ruled out.

4.5 Descriptive Data Analysis (Socio-Demographics)

Table 4.2 indicates that the bulk of the participants' age group falls between 22-25 years old which comprises of over 40%, whereas the age group falls between 18-21 years old is the least with 15.3%. Correspondingly, participants in the age group of 26-29 years old and 30-35 years old have also participated in the survey and the figure is quite substantial with a total of over 19%.

More female respondents participated in the survey that is 120 participants over the total number of 209 respondents. Regarding the marital status, 74.6% are single, 24.9% are married and 0.5% fall under divorced or widowed marital status. Additionally, there are 144 Malays, 45 Chinese, 12 Indians and eight participants that fall under other races. 148 respondents are Muslim, comprising 70.8% of the total respondents, which is the highest percentage among religions, followed by 30 Buddhists, comprising 14%.

The respondents are from the 13 states and the three federal territories in Malaysia. Most of the respondents are from Selangor, comprising 17.2%, followed by Sarawak, comprising 12.9% of the total share. Most of the respondents hold a formal education where 103 respondents are degree holders, which is merely half of the total share. Next are the Diploma holders totalling 61 respondents. There is only one respondent with no formal education among all the respondents.

In explaining the occupation of the respondents, majority who had participated are students at over 34%, while business owners or traders are the least, with only 9 respondents among the total respondents surveyed. However, there is a balance number of self-employed/freelancer and white-collar workers who are also involved in the study.

Over 79% of respondents have a monthly income below RM5,000 or equal, being the highest number of respondents. Surprisingly, nearly 6.7% of participants with earnings of RM10,000 or above had participated. However, only over 13% of participants with monthly income between RM5,000-RM10,000 engaged in this survey.

Table 4.2: Descriptive Statistics for Socio-Demographics of the Sample

Constructs		Frequency	Percentage (%)
Age	18-21 years	32	15.3
	22-25 years	86	41.1
	26-29 years	50	23.8
	30-35 years	41	19.5
Gender	Male	89	42.6
	Female	120	57.4
Marital Status	Single	156	74.6
	Married	52	24.9
	Divorced/Widowed	1	0.5
Race	Malay	144	68.9
	Chinese	45	21.5
	Indian	12	5.7
	Others	8	3.8
Religion	Islam	148	70.8
	Christianity	20	9.6
	Buddhism	30	14.4
	Hinduism	9	4.3
	Others	2	1.0
State	Johor	20	9.6
	Kedah	12	5.7
	Kelantan	5	2.4
	Melaka	4	1.9
	Negeri Sembilan	9	4.3
	Pahang	20	9.6
	Penang	12	5.7
	Perak	19	9.1
	Perlis	2	1.0
	Sabah	19	9.1
	Sarawak	27	12.9
	Selangor	36	17.2
	Terengganu	3	1.4
	W.P - Labuan	2	1.0
	W.P – Putrajaya	1	0.5
	W.P – Kuala Lumpur	18	8.6

Table 4.2: Descriptive Statistics for Socio-Demographics of the Sample (Continued)

Constructs		Frequency	Percentage (%)
Level of Education	No Formal Education	1	0.5
	Primary School	3	1.4
	Secondary School	16	7.7
	Post-Secondary/ Matriculation/ Vocational	13	6.2
	Diploma	61	29.2
	Degree	103	49.3
	Postgraduate	11	5.3
	Others	1	0.5
Occupation	Professional/Executive/Manager	33	15.8
	Business Owner/Traders	9	4.3
	Self-Employed/Freelancer	23	11.0
	White-Collar Worker	24	11.5
	Blue Collar Worker	13	6.2
	Student	73	34.9
	Housewife/Househusband	10	4.8
	Retired/Unemployed	11	5.3
	Others	13	6.2
Income	Below RM1,000	48	23.0
	RM1,000-RM1,999	30	14.4
	RM2,000-RM2,999	38	18.2
	RM3,000-RM3,999	32	15.3
	RM4,000-RM4,999	19	9.1
	RM5,000-RM5,999	16	7.7
	RM6,000-RM6,999	1	0.5
	RM7,000-RM7,999	4	1.9
	RM8,000-RM8,999	5	2.4
	RM9,000-RM9,999	2	1.0
	RM10,000 and above	14	6.7

Table 4.3 depicts the results of respondents' mobile application usage. In terms of respondents' mobile application usage, over 80% of respondents have been using more than one mobile shopping applications whereby 151 respondents use 2 to 3 mobile shopping applications and 25 respondents use 4 to 5 mobile shopping applications. Most of them use Shopee at 64.1% followed by Lazada at 28.2%. The rest of the mobile shopping applications have a moderate share of the total usage. Ezbuy is the least used among other shopping applications at only 0.9% in the survey. Respondents' mobile shopping application usage frequency were also inquired in the survey. 104 respondents use the application a few times a month, 40 use the application a few times a week and 39 respondents seldom use the application. Finally, the last question on mobile shopping application usage is to obtain the respondents most frequently used application, of which Shopee has the largest share, with 134 respondents followed by Lazada with 47 respondents.

The results of the descriptive analysis for study constructs are given in Table 4.4. The mean for ease of use (4.05) is the highest among all constructs while usefulness is shown as the second highest. However, the standard deviation of usefulness (0.80) is slightly higher than the standard deviation of ease of use (0.75). The mobile applications are perceived as easy to use (mean = 4.05; standard deviation = 0.75) and useful (mean = 3.95; standard deviation = 0.80). Having the highest standard deviation (1.11) among the seven constructs, the data of irritation are more widely dispersed than information quality (0.92). The mean of 4.05 for ease of use indicates that most respondents perceive the mobile application is easy to use. Meanwhile, the standard deviation of 0.75 for ease of use is slightly lower in comparison with other research constructs and it shows consistent level of ease of use among mobile application users. Therefore, the results clearly show that most respondents are very close to the means of all constructs. In a nutshell, the mobile applications have been perceived as rather useful and easy to use, fairly entertaining and pleasing (not irritating), and users have strong intention to purchase with the mobile applications.

Table 4.3: Descriptive Statistics for Mobile Application Usage of the Sample

Constructs		Frequency	Percentage (%)
Use More than ONE Mobile Shopping Application	Yes	178	85.2
	No	31	14.8
Number of Mobile Shopping Application Used	1	31	14.8
	2-3	151	72.2
	4-5	25	12.0
	6 and above	2	1.0
Mobile Application Usage	Lazada	154	28.2
	11Street	46	8.4
	Shopee	186	34.1
	Zalora	49	9.0
	Carousell	51	9.3
	TaoBao	31	5.7
	EzBuy	5	0.9
	Others	24	4.4
Mobile Application Usage Frequency	Few times a day	17	8.1
	Once a day	9	4.3
	Few times a week	40	19.1
	Few times a month	104	49.8
	Seldom	39	18.7
Frequently Used Mobile Application	Shopee	134	64.1
	Lazada	47	22.5
	TaoBao	10	4.8
	Zalora	4	1.9
	Carousell	4	1.9
	EzBuy	3	1.4
	11Street	1	0.5
	Others	6	2.9
Mobile Phone Activities	Check e-mails	174	15.5
	Make phone calls	170	15.2
	Use mobile applications (i.e. Grab, Lazada, M2U)	170	15.2
	Take pictures/videos	169	15.1
	Send messages	156	13.9
	Read online news	142	12.7
	Play mobile games	133	11.9
	Others	7	0.6

Table 4.4: Descriptive statistics for Study Constructs of the Sample

Constructs		Mean	Standard Deviation
Information Quality	Information Quality 1	3.89	0.87
	Information Quality 2	3.88	0.94
	Information Quality 3	3.80	0.93
	Information Quality 4	3.82	0.95
	Information Quality 5	3.70	0.89
	Information Quality 6	3.91	0.89
	Information Quality 7	4.00	0.90
	Information Quality 8	3.93	0.91
	Information Quality 9	3.92	0.88
	Information Quality 10	3.97	0.91
	Information Quality 11	3.97	0.97
	Information Quality 12	3.70	0.94
	Information Quality 13	3.74	0.95
	Information Quality 14	3.92	0.94
	Information Quality 15	3.89	0.92
	Information Quality 16	3.78	0.94
	Information Quality 17	3.93	0.90
Average		**3.87**	**0.92**
System Quality	System Quality 1	4.06	0.70
	System Quality 2	3.95	0.69
	System Quality 3	4.04	0.78
	System Quality 4	4.04	0.72
	System Quality 5	3.90	0.69
	System Quality 6	3.83	0.76
	System Quality 7	3.82	0.79
Average		**3.95**	**0.73**
Service Quality	Service Quality 1	3.87	0.75
	Service Quality 2	3.84	0.82
	Service Quality 3	3.79	0.83
	Service Quality 4	3.97	0.68
	Service Quality 5	3.94	0.72
Average		**3.88**	**0.76**

Table 4.4: Descriptive statistics for Study Constructs of the Sample (Continued)

Constructs		Mean	Standard Deviation
Ease of Use	Ease of Use 1	3.93	0.77
	Ease of Use 2	4.12	0.67
	Ease of Use 3	4.02	0.76
	Ease of Use 4	4.11	0.73
	Ease of Use 5	4.08	0.72
	Ease of Use 6	4.02	0.82
	Ease of Use 7	3.99	0.77
	Ease of Use 8	4.14	0.74
Average		**4.05**	**0.75**
Usefulness	Usefulness 1	3.84	0.92
	Usefulness 2	3.90	0.79
	Usefulness 3	4.01	0.81
	Usefulness 4	3.95	0.82
	Usefulness 5	3.90	0.83
	Usefulness 6	3.93	0.81
	Usefulness 7	3.94	0.74
	Usefulness 8	3.89	0.78
	Usefulness 9	3.98	0.77
	Usefulness 10	4.05	0.68
	Usefulness 11	4.03	0.82
Average		**3.95**	**0.80**
Entertainment Gratification	Entertainment Gratification 1	3.81	0.78
	Entertainment Gratification 2	3.85	0.74
	Entertainment Gratification 3	3.89	0.75
	Entertainment Gratification 4	3.90	0.79
	Entertainment Gratification 5	3.97	0.74
	Entertainment Gratification 6	3.97	0.65
	Entertainment Gratification 7	3.74	0.87
	Entertainment Gratification 8	3.84	0.79
	Entertainment Gratification 9	3.86	0.75
Average		**3.87**	**0.76**
Irritation	Irritation 1	3.68	1.16
	Irritation 2	3.50	1.10
	Irritation 3	3.64	1.01
	Irritation 4	3.39	1.18
Average		**3.55**	**1.11**

Table 4.4: Descriptive statistics for Study Constructs of the Sample (Continued)

Constructs		Mean	Standard Deviation
Purchase Intention	Purchase Intention 1	3.83	0.91
	Purchase Intention 2	3.89	0.82
	Purchase Intention 3	3.94	0.80
	Purchase Intention 4	3.94	0.72
	Purchase Intention 5	3.92	0.87
Average		**3.90**	**0.82**

4.6 Research Model

In developing the research model for this thesis, the researcher used SmartPLS 3.0 to carry out the latent construct analysis. All the latent and reflective items were sourced from past studies. All the statements in the questionnaire are referred to as indicators or items in the model. Since all items are reflective, thus any item with a factor loading below 0.40 – 0.70 and commit to the low AVE in the model would be removed from the model (Hair et al. 2014). Consequently, one item which pertains to service quality, two items which pertains to ease of use, four items which pertains to usefulness, five items which pertains to entertainment gratification and four items which pertains to irritation were deleted. The remaining items mean and standard deviation score for the overall model are presented in Figure 4.1. The items for each construct tested are also explained in Figure 4.1.

4.6.1 Measurement Model

Internal consistency reliability, convergent validity and discriminant validity were used to assess the reflective measurement model. CR and AVE were used to test both convergent validity and internal consistency reliability (Chin 2010; Hair et al. 2011). The construct reliability was assessed via CR coefficient.

Figure 4.1: Research Model
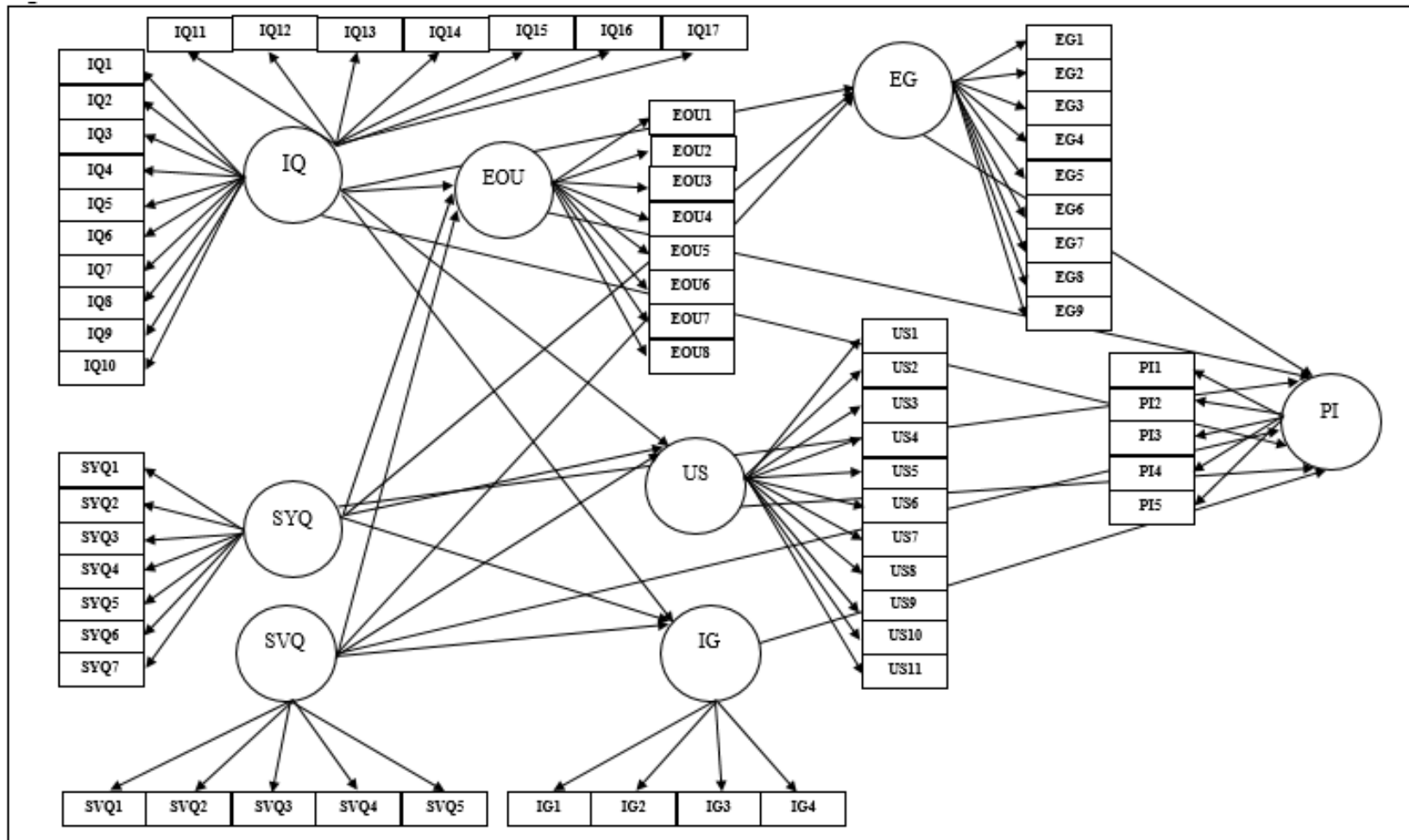
(Davis, Bagozzi & Warshaw 1989; DeLone & McLean 2002)

4.6.2 Convergent Validity

The convergent validity was carried out by calculating the cross loadings and the AVE value of the constructs. Table 4.6 illustrates item loadings of the constructs. The standardised factor loadings in the measurement model are above 0.70, which surpasses the suggested threshold value of 0.70 (Hair et al. 2017). One item in information quality, one item in service quality, two items in ease of use, four items in usefulness, five items in entertainment gratification and four items in irritation were removed from the model as the factor loadings is below the proposed threshold value of 0.70.

The current study also performed the convergent validity using AVE to further validate the reflective measurement model. As recommended by prior research, this study used the threshold value greater than 0.5 of the AVE of a latent construct (Bagozzi & Yi 1988; Kock 2011). Table 4.6 displays that the AVE values of all constructs had exceeded the threshold value of 0.5. Therefore, the results of the convergent validity indicate that the reliability of the reflective measurement model is acceptable.

4.6.3 Discriminant Validity

The discriminant validity measurement used to assess reflective measurement model were Fornell and Larcker's (1981) criterion and the Heterotrait-Monotrait ratio of correlations (HTMT). Under Fornell and Larcker's (1981) criterion, the square root of the AVE is recommended to surpass the correlation values between the constructs of the study (Fornell & Larcker 1981). According to Table 4.7, the square roots of the AVEs exceed the correlation values for each pair of research constructs. Hence, the results of the discriminant validity are satisfactory.

Table 4.5: Cross-Loadings Analysis for Discriminant Validity Checking

Constructs	Information Quality	System Quality	Service Quality	Ease of use	Usefulness	Entertainment gratification	Irritation	Purchase Intention
IQ1	**0.850**	0.428	0.362	0.384	0.358	0.313	0.016	0.310
IQ2	**0.840**	0.478	0.436	0.424	0.429	0.328	0.067	0.378
IQ3	**0.827**	0.367	0.308	0.294	0.352	0.332	0.040	0.280
IQ4	**0.817**	0.403	0.408	0.322	0.403	0.390	0.016	0.340
IQ5	**0.820**	0.425	0.400	0.339	0.320	0.407	0.088	0.283
IQ6	**0.871**	0.445	0.353	0.377	0.387	0.324	0.122	0.326
IQ7	**0.802**	0.421	0.303	0.405	0.366	0.237	0.086	0.346
IQ8	**0.836**	0.456	0.345	0.319	0.371	0.303	0.042	0.244
IQ9	**0.871**	0.414	0.361	0.400	0.403	0.389	0.082	0.346
IQ10	**0.828**	0.380	0.304	0.358	0.346	0.259	0.067	0.269
IQ11	**0.792**	0.448	0.330	0.412	0.371	0.345	0.157	0.332
IQ12	**0.825**	0.391	0.389	0.338	0.338	0.351	0.024	0.317
IQ13	**0.849**	0.460	0.413	0.368	0.398	0.355	0.069	0.331
IQ14	**0.852**	0.464	0.371	0.377	0.375	0.323	0.061	0.336
IQ15	**0.838**	0.457	0.362	0.288	0.322	0.317	0.043	0.225
IQ16	**0.799**	0.381	0.412	0.252	0.294	0.354	-0.039	0.266
IQ17	**0.858**	0.409	0.385	0.345	0.346	0.322	0.020	0.314
SYQ1	0.367	**0.769**	0.592	0.489	0.441	0.457	0.123	0.450
SYQ2	0.404	**0.759**	0.536	0.453	0.428	0.420	0.135	0.389
SYQ3	0.393	**0.737**	0.613	0.554	0.520	0.484	0.189	0.520
SYQ4	0.399	**0.791**	0.547	0.533	0.417	0.490	0.246	0.497
SYQ5	0.364	**0.748**	0.584	0.451	0.356	0.472	0.078	0.378
SYQ6	0.358	**0.751**	0.569	0.478	0.468	0.416	0.122	0.422
SYQ7	0.402	**0.703**	0.450	0.463	0.402	0.367	0.174	0.391
SVQ1	0.283	0.506	**0.722**	0.496	0.378	0.483	0.060	0.432
SVQ2	0.335	0.598	**0.790**	0.522	0.499	0.516	0.064	0.525
SVQ3	0.357	0.517	**0.725**	0.462	0.439	0.432	0.036	0.395
SVQ4	0.333	0.575	**0.732**	0.437	0.448	0.528	0.141	0.404
SVQ5	0.332	0.556	**0.744**	0.443	0.412	0.449	0.035	0.428
EOU1	0.359	0.571	0.562	**0.769**	0.614	0.610	0.175	0.612
EOU2	0.344	0.466	0.495	**0.793**	0.542	0.530	0.158	0.569
EOU3	0.341	0.470	0.544	**0.746**	0.567	0.458	0.129	0.527
EOU4	0.348	0.596	0.528	**0.817**	0.580	0.512	0.267	0.606
EOU5	0.318	0.464	0.454	**0.800**	0.551	0.478	0.214	0.553
EOU6	0.248	0.457	0.462	**0.746**	0.507	0.506	0.178	0.541

EOU7	0.399	0.571	0.539	**0.833**	0.668	0.572	0.199	0.630
EOU8	0.318	0.505	0.409	**0.801**	0.478	0.376	0.217	0.546
US1	0.287	0.466	0.477	0.534	**0.764**	0.505	0.174	0.542
US2	0.341	0.450	0.458	0.533	**0.720**	0.501	0.103	0.485
US3	0.372	0.511	0.517	0.619	**0.783**	0.442	0.125	0.585
US4	0.312	0.431	0.446	0.493	**0.775**	0.447	0.083	0.506
US5	0.332	0.420	0.429	0.507	**0.765**	0.429	0.128	0.505
US6	0.354	0.494	0.478	0.608	**0.806**	0.465	0.118	0.566
US7	0.317	0.441	0.416	0.515	**0.706**	0.407	0.120	0.499
US8	0.308	0.359	0.422	0.551	**0.783**	0.456	0.117	0.500
US9	0.325	0.396	0.405	0.521	**0.768**	0.445	0.137	0.544
US10	0.343	0.394	0.399	0.509	**0.774**	0.391	0.178	0.557
US11	0.360	0.459	0.445	0.589	**0.703**	0.476	0.165	0.574
EG1	0.294	0.351	0.477	0.475	0.453	**0.719**	0.060	0.457
EG2	0.258	0.465	0.471	0.427	0.372	**0.750**	0.157	0.440
EG3	0.310	0.497	0.466	0.562	0.488	**0.751**	0.193	0.503
EG4	0.272	0.352	0.447	0.418	0.401	**0.763**	0.189	0.439
EG5	0.370	0.599	0.524	0.548	0.463	**0.745**	0.255	0.506
EG6	0.295	0.392	0.532	0.441	0.418	**0.743**	0.136	0.482
EG7	0.275	0.464	0.462	0.475	0.483	**0.806**	0.235	0.496
EG8	0.269	0.394	0.499	0.501	0.477	**0.766**	0.195	0.460
EG9	0.369	0.501	0.550	0.539	0.495	**0.788**	0.201	0.507
IG1	0.071	0.188	0.092	0.264	0.196	0.244	**0.875**	0.184
IG2	0.088	0.161	0.072	0.169	0.133	0.188	**0.788**	0.119
IG3	0.066	0.207	0.131	0.225	0.159	0.229	**0.838**	0.187
IG4	-0.051	0.054	-0.096	0.055	-0.004	0.027	**0.760**	-0.003
PI1	0.320	0.457	0.478	0.556	0.595	0.484	0.114	**0.813**
PI2	0.321	0.460	0.516	0.627	0.638	0.563	0.212	**0.829**
PI3	0.304	0.505	0.509	0.613	0.574	0.470	0.124	**0.777**
PI4	0.287	0.506	0.481	0.617	0.496	0.526	0.134	**0.825**
PI5	0.301	0.479	0.443	0.587	0.589	0.544	0.135	**0.870**

Table 4.6: Convergent Validity and Reliability

Construct	Items	Loadings	AVE	Composite Reliability	Cronbach's Alpha
Information Quality	IQ1	0.850	0.696	0.975	0.973
	IQ2	0.840			
	IQ3	0.827			
	IQ4	0.817			
	IQ5	0.820			
	IQ6	0.871			
	IQ7	0.802			
	IQ8	0.836			
	IQ9	0.871			
	IQ10	0.828			
	IQ11	0.792			
	IQ12	0.825			
	IQ13	0.849			
	IQ14	0.852			
	IQ15	0.838			
	IQ16	0.799			
	IQ17	0.858			
System Quality	SYQ1	0.769	0.565	0.901	0.871
	SYQ2	0.759			
	SYQ3	0.737			
	SYQ4	0.791			
	SYQ5	0.748			
	SYQ6	0.751			
	SYQ7	0.703			
Service Quality	SVQ1	0.722	0.552	0.860	0.797
	SVQ2	0.790			
	SVQ3	0.725			
	SVQ4	0.732			
	SVQ5	0.744			

Table 4.6: Convergent Validity and Reliability (Continued)

Construct	Items	Loadings	AVE	Composite Reliability	Cronbach's Alpha
Ease of Use	EOU1	0.769	0.622	0.929	0.913
	EOU2	0.793			
	EOU3	0.746			
	EOU4	0.817			
	EOU5	0.800			
	EOU6	0.746			
	EOU7	0.833			
	EOU8	0.801			
Usefulness	US1	0.764	0.577	0.937	0.926
	US2	0.720			
	US3	0.783			
	US4	0.775			
	US5	0.765			
	US6	0.806			
	US7	0.706			
	US8	0.783			
	US9	0.768			
	US10	0.774			
	US11	0.702			
Entertainment Gratification	EG1	0.719	0.577	0.925	0.908
	EG2	0.750			
	EG3	0.751			
	EG4	0.763			
	EG5	0.745			
	EG6	0.743			
	EG7	0.806			
	EG8	0.766			
	EG9	0.788			
Irritation	I1	0.875	0.666	0.888	0.881
	I2	0.788			
	I3	0.838			
	I4	0.760			
Purchase Intention	PI1	0.813	0.678	0.913	0.881
	PI2	0.829			
	PI3	0.777			
	PI4	0.825			
	PI5	0.870			

Table 4.7: Results of Fornell and Larcker's Criterion

	IQ	SVQ	SYQ	EOU	US	EG	I	PI
IQ	**0.834**							
SVQ	0.415	**0.733**						
SYQ	0.511	0.650	**0.751**					
EOU	0.427	0.611	0.654	**0.788**				
US	0.438	0.548	0.580	0.718	**0.760**			
EG	0.400	0.652	0.594	0.645	0.594	**0.759**		
I	0.073	0.108	0.210	0.250	0.179	0.246	**0.814**	
PI	0.373	0.561	0.584	0.730	0.704	0.730	0.181	**0.823**

Note: Bold diagonal values represent the square root of the AVE, and the off-diagonal value represent the correlation coefficient.

The existing study also used HTMT.$_{90}$ to evaluate discriminant validity by examining the ratio of correlations within the study constructs to correlations between the constructs. The threshold values of 0.85 and 0.90 are acceptable (Henseler, Ringle & Sarstedt 2015). Table 4.8 illustrates that all the results of the HTMT.$_{90}$ criterion are lower than the critical value of 0.90 for each group-specific model estimation. The results of the discriminant validity are satisfactory. Apart from that, cross loadings analysis was employed to check the discriminant validity of measurement model.

Table 4.8: Results of Heterotrait-Monotrait (HTMT.90) Criterion

	IQ	SVQ	SYQ	EOU	US	EG	I	PI
IQ								
SVQ	0.457							
SYQ	0.554	0.879						
EOU	0.447	0.692	0.725					
US	0.458	0.615	0.639	0.775				
EG	0.421	0.744	0.658	0.701	0.646			
I	0.100	0.150	0.223	0.258	0.458	0.258		
PI	0.400	0.647	0.662	0.811	0.776	0.811	0.182	

4.7 Structural Equation Model

The SEM software SmartPLS was utilised to test the relationship between observed constructs and to analyse the direct, extended and mediating relationships between the exogenous constructs and endogenous constructs specified in the research model (Figure 4.1). Overall, 5,000 cases of sub-samples were extracted in bootstrapping procedures. The T-statistics for

significance testing was produced during the procedure (Hair et al. 2014; Hair, Ringle & Sarstedt 2011). The use of Variance Inflated Factor (VIF) followed by the assessment of t-values and coefficient of determination score (R^2) help assessing the collinearity among latent constructs. The structural model analysis plus the empirical outcomes of the proposed hypotheses under the existing study will be expounded some more in the next few sections.

4.7.1 Bootstrapping Direct Effect

Bootstrapping technique was performed to measure the path coefficient for the direct effect relationships among latent constructs. Through replacing the original sample, this study used a sub-sample of 5,000 to determine the bootstrap standard errors that establish the appropriate t-values for significance testing of structural path (Hair et al. 2011). The tabulated results indicate that the critical value of significance level for one-tailed test is different from the two-tailed test. Somehow, as suggested by Hair et al. (2017), the level of significance of the path coefficient should be at least at the 0.05 level of significance. Hence, the current study adopted the one-tailed test where the critical values for significance level at 0.01, 0.05, and 0.10 are 2.33, 1.645, and 1.28, respectively (Hair et al. 2017). Each path relationship with its corresponding beta, standard error, and t-value are presented in Table 4.9. Table 4.9 illustrates the significance of each estimated path relationship at confidence levels of 99% (significance level at 0.01) and 95% (significance level at 0.05).

4.7.2 Bootstrapping Mediation Effect

Bootstrapping technique was performed to measure the path coefficients for the mediation effect relationships among latent constructs. Mediation is a crucial approach which indicates various constructs of a research study where the causes and effects of the constructs explains the ultimate systematically. In the mediation procedure, a mediating construct is applied to explain the indirect relationships and its effect between both independent and dependent constructs in the study. Baron (1986)'s explanation is that mediation is the generative mechanism whereby the centre independent construct is capable of influencing the other dependent construct of interest. Besides, mediation is the best tool to use for evaluating cases where there is a strong association between the predictor and criterion construct.

Table 4.9: Estimation of Overall Path Coefficient for Direct Effect Relationships (Bootstrapping)

Path Relationship	Beta	Standard Error	t-value	p-value
Information Quality -> Ease of Use	0.098	0.050	1.950	0.051
Information Quality -> Usefulness	0.165	0.063	2.618 **	0.009
Information Quality -> Entertainment Gratification	0.093	0.057	1.628	0.104
Information Quality -> Irritation	-0.037	0.074	0.499	0.618
System Quality -> Ease of Use	0.365	0.098	3.740 **	0.000
System Quality -> Usefulness	0.252	0.096	2.636 **	0.008
System Quality -> Entertainment Gratification	0.209	0.101	2.064 *	0.039
System Quality -> Irritation	0.323	0.123	2.621 **	0.009
Service Quality -> Ease of Use	0.322	0.093	3.463 **	0.001
Service Quality -> Usefulness	0.328	0.096	3.402 **	0.001
Service Quality -> Entertainment Gratification	0.454	0.098	4.655 **	0.000
Service Quality -> Irritation	-0.131	0.143	0.917	0.359
Ease of Use -> Purchase Intention	0.375	0.066	5.678 **	0.000
Usefulness -> Purchase Intention	0.317	0.072	4.422 **	0.000
Entertainment Gratification -> Purchase Intention	0.204	0.065	3.131 **	0.002
Irritation -> Purchase Intention	-0.020	0.046	0.426	0.670

** p ≤ 0.01, * p ≤ 0.05

Table 4.10 shows the beta, standard error, and t-value for each path relationship within the overall model. Beta value of -0.006 indicates that irritation negatively mediates system quality and purchase intention. Additionally, each t-value is designated with a confidence interval of either 90% (significance level at 0.10), 95% (significance level at 0.05) or 99% (significance level at 0.01) to show the significance of each estimated path relationship.

4.7.3 Blindfolding

The study also measured the effect size (f^2) between two constructs in the research model. As stated by Chin (2010), it determines to the extent of effect a particular independent construct has on a dependent construct. Particularly, the f^2 values help define the relative effect of a predictor construct towards an endogenous construct and justify the strength of their relationships. The suggested threshold values of f^2 of 0.02, 0.15 and 0.35 are the effect size of low, moderate, and high respectively (Cohen 1988). Table 4.11 shows that service quality of mobile applications has the strongest effect on ease of use to support the purchase intention of mobile application users ($f^2 = 0.168$). However, irritation has no effect towards purchase intention ($f^2 = 0.001$). Information quality also has no effect towards irritation ($f^2 = 0.001$). Both relationships' f^2 values are less than the suggested threshold value of 0.02.

In order to get the model's level of predictive accuracy, coefficient of determination score (R^2) was measured. The r square helps with evaluating the predictive accuracy of the model and the value ranges from 0 to 1. It is also considered as the combined effects of both exogenous and endogenous constructs of the study. Cohen (1988) indicates that the level of predictive accuracy which comes with the R^2 values of 0.26, 0.13, and 0.02 denotes strong, moderate, and weak. As shown in Table 4.11, R^2 values of ease of use, usefulness, gratification and irritation is 0.482, 0.411, 0.456, and 0.052 respectively. Hence, information quality, service quality and system quality have a substantial impact on ease of use, usefulness and gratification but moderate impact on irritation.

Table 4.10: Estimation of Overall Path Coefficient for Mediation Effect Relationships (Bootstrapping)

Path Relationship	Beta	Standard Error	t-value	*p*-value
Information Quality -> Ease of Use -> Purchase Intention	0.037	0.038	1.851	0.020
Service Quality -> Ease of Use -> Purchase Intention	0.121	0.124	2.716 **	0.044
System Quality -> Ease of Use -> Purchase Intention	0.137	0.134	3.296 **	0.042
Information Quality -> Usefulness -> Purchase Intention	0.052	0.054	2.217 **	0.024
Service Quality -> Usefulness -> Purchase Intention	0.104	0.105	2.522 **	0.041
System Quality -> Usefulness -> Purchase Intention	0.080	0.078	2.343 **	0.034
Information Quality -> Entertainment Gratification -> Purchase Intention	0.019	0.020	1.255	0.015
Service Quality -> Entertainment Gratification -> Purchase Intention	0.093	0.093	2.597 **	0.036
System Quality -> Entertainment Gratification -> Purchase Intention	0.043	0.041	1.710	0.025
Information Quality -> Irritation-> Purchase Intention	0.001	0.002	0.171	0.004
Service Quality -> Irritation -> Purchase Intention	0.003	0.003	0.258	0.010
System Quality -> Irritation-> Purchase Intention	-0.006	-0.006	0.375	0.017

** p ≤ 0.01, * p ≤ 0.05

This study also assesses the collinearity among the latent constructs using Variance Inflated Factor (VIF) in the structural model (Kock & Lynn 2012). Based on prior studies, the suggested threshold value of VIF greater or equal to 3.3 shows a potential collinearity problem (Diamantopoulos & Siguaw 2006). Table 4.11 indicates that VIF values for all constructs are lower than the suggested threshold value of collinearity problem. Therefore, the results reveal that each construct of the model is appropriate to be tested on the structural model.

The predictive relevance (Q^2) was another path coefficient measure used to assess a structural model. According to Stone and Geisser, Q^2 is commonly applied to evaluate the predictive relevance through blindfolding procedure. The main purpose of the process is to further determine whether the study model is sufficient to predict all indicators of an endogenous latent construct under the study (Geisser 1974; Stone 1974). Q^2 value which is larger than 0 (zero) indicates the predictive relevance of the exogenous constructs on specific endogenous construct under the study (Hair et al. 2017). Table 4.11 also demonstrates that the Q^2 values of information quality, service quality and system quality on ease of use, usefulness, gratification and irritation are above the threshold value of 0. Thereby, the predictive relevance of this study's path model is confirmed since the Q^2 values have satisfactorily met the suggested threshold value.

In order to get the model's level of predictive accuracy, coefficient of determination score (R^2) was measured. The r square helps with evaluating the predictive accuracy of the model and the value ranges from 0 to 1. It is also considered as the combined effects of both exogenous and endogenous constructs of the study. Cohen (1988) indicates that the level of predictive accuracy which comes with the R^2 values of 0.26, 0.13, and 0.02 denotes strong, moderate, and weak. As shown in Table 4.11, R^2 values of ease of use, usefulness, gratification and irritation is 0.482, 0.411, 0.456, and 0.052 respectively. Hence, information quality, service quality and system quality have a substantial impact on ease of use, usefulness and gratification but moderate impact on irritation.

This study also assesses the collinearity among the latent constructs using Variance Inflated Factor (VIF) in the structural model (Kock & Lynn 2012). Based on prior studies, the suggested threshold value of VIF greater or equal to 3.3 shows a potential collinearity problem (Diamantopoulos & Siguaw 2006). Table 4.11 indicates that VIF values for all constructs are

lower than the suggested threshold value of collinearity problem. Therefore, the results reveal that each construct of the model is appropriate to be tested on the structural model.

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Table 4.11: Estimation of Overall Path Predictive Accuracy (Blindfolding)

Constructs		F^2	R^2	VIF	Q^2
Purchase Intention	Ease of use -> Purchase Intention	0.151		2.472	
	Usefulness -> Purchase Intention	0.120	0.622	2.204	0.390
	Entertainment Gratification -> Purchase Intention	0.059		1.848	
	Irritation -> Purchase Intention	0.001		1.078	
Ease of Use	Information Quality -> Ease of Use	0.014		1.369	
	System Quality -> Ease of Use	0.105	0.482	2.457	0.279
	Service Quality -> Ease of Use	0.168		2.254	
Usefulness	Information Quality -> Usefulness	0.034		1.369	
	System Quality -> Usefulness	0.044	0.411	2.457	0.217
	Service Quality -> Usefulness	0.081		2.254	
Entertainment Gratification	Information Quality -> Entertainment Gratification	0.012		1.369	
	System Quality -> Entertainment Gratification	0.033	0.456	2.457	0.239
	Service Quality -> Entertainment Gratification	0.089		2.254	
Irritation	Information Quality -> Irritation	0.001		1.369	
	System Quality -> Irritation	0.045	0.052	2.457	0.026
	Service Quality -> Irritation	0.008		2.254	

4.8 Hypothesis Testing

A total of 11 hypothesised relationships were tested in the model of current study. Table 4.12 showcase the decisions of the findings. The results found that the direct effect of factors (information quality, system quality, service quality) influencing the antecedents (ease of use, usefulness, entertainment gratification, irritation) of purchase intention of mobile application users are partially positive and significant. Firstly, because the threshold values between information quality and the antecedents of purchase intention are 1.950, 2.618, 1.628 and 0.499 respectively of which only usefulness meets the threshold value. Secondly, the t-values between system quality and the antecedents of purchase intention are 3.740, 2.636, 2.064 and 2.621 respectively and they meet the threshold values as a whole. Service quality also exerts significant positive influence on three of the antecedents (ease of use, usefulness and entertainment gratification) of purchase intention through strong threshold values of 3.463, 3.402, and 4.655 respectively. On the other hand, service quality and irritation have a weaker relationship through lower threshold value of 0.917. Concurrently, the direct effect of factors (ease of use, usefulness, entertainment gratification) influencing the purchase intention of mobile application users are positive and significant as the threshold values are 5.678, 4.422 and 3.131 respectively and they meet the threshold values. Therefore, H_{1b}, H_{2a}, H_{2b}, H_{2c}, H_{2d}, H_{3a}, H_{3b}, H_{3c}, H_4, H_5 and H_6 are supported.

The indirect effects of IS qualities (information quality, system quality, service quality) influencing purchase intention through the mediation of utilitarian (ease of use, usefulness) and hedonic (entertainment gratification, irritation) values are also presented in Table 4.13. First of all, the threshold values between information quality, system quality, service quality and purchase intention with the mediation of ease of use are 1.851, 3.296 and 2.716 respectively. Ease of use has a weaker mediation impact on the relationship between information quality and purchase intention of mobile application users. Next, the threshold values between information quality, system quality, service quality and purchase intention with the mediation of usefulness are 2.217, 2.343 and 2.522 respectively. It shows that usefulness is a strong and important mediator on the relationships between information quality, system quality, service quality and purchase intention of mobile application users. Then, the threshold values between information quality, system quality, service quality and purchase intention through the mediation of entertainment gratification are 1.255, 1.710 and 2.597 respectively. Entertainment gratification has a weaker mediation impact on the relationships between information quality, system quality

and purchase intention of mobile application users. Lastly, the mediating effect of irritation on information quality, system quality and service quality towards the purchase intention of mobile application users are negative and insignificant as the t-values are 0.171, 0.375 and 0.258 respectively and do not meet the threshold values. Consequently, H_{8b}, $H_{8c,}$ H_{9a}, H_{9b}, H_{9c} and H_{10c} are supported.

4.9 Summary

This chapter presents the findings for direct and mediating effects. Both effects were tested with PLS-SEM. The decisions pertaining to the hypotheses developed in earlier chapter are also provided herein. Further discussion of this chapter will be explained in chapter five.

Table 4.12: Results of the Direct Effect Hypotheses

	Path Relationship	Beta	Standard Error	t-value	*p*-value	Decision#
H_{1a}	Information Quality -> Ease of Use	0.098	0.050	1.950	0.051	NS
H_{1b}	Information Quality -> Usefulness	0.165	0.063	2.618**	0.009	S
H_{1c}	Information Quality -> Entertainment Gratification	0.093	0.057	1.628	0.104	NS
H_{1d}	Information Quality -> Irritation	-0.037	0.074	0.499	0.618	NS
H_{2a}	System Quality -> Ease of Use	0.365	0.098	3.740**	0.000	S
H_{2b}	System Quality -> Usefulness	0.252	0.096	2.636**	0.008	S
H_{2c}	System Quality -> Entertainment Gratification	0.209	0.101	2.064*	0.039	S
H_{2d}	System Quality -> Irritation	0.323	0.123	2.621**	0.009	S
H_{3a}	Service Quality -> Ease of Use	0.322	0.093	3.463**	0.001	S
H_{3b}	Service Quality -> Usefulness	0.328	0.096	3.402**	0.001	S
H_{3c}	Service Quality -> Entertainment Gratification	0.454	0.098	4.655**	0.000	S
H_{3d}	Service Quality -> Irritation	-0.131	0.143	0.917	0.359	NS
H_4	Ease of Use -> Purchase Intention	0.375	0.066	5.678**	0.000	S
H_5	Usefulness -> Purchase Intention	0.317	0.072	4.422**	0.000	S
H_6	Entertainment Gratification -> Purchase Intention	0.204	0.065	3.131**	0.002	S
H_7	Irritation -> Purchase Intention	-0.020	0.046	0.426	0.670	NS

Decision#: S = Supported; NS = Not Supported

Table 4.13: Results of the Mediation Effect Hypotheses

	Path Relationship	Beta	Standard Error	t-value	p-value	Decision#
H_{8a}	Information Quality -> Ease of Use -> Purchase Intention	0.037	0.038	1.851	0.064	NS
H_{8b}	System Quality -> Ease of Use -> Purchase Intention	0.137	0.134	3.296**	0.001	S
H_{8c}	Service Quality -> Ease of Use -> Purchase Intention	0.121	0.124	2.716**	0.007	S
H_{9a}	Information Quality -> Usefulness -> Purchase Intention	0.052	0.054	2.217**	0.027	S
H_{9b}	System Quality -> Usefulness -> Purchase Intention	0.08	0.078	2.343**	0.019	S
H_{9c}	Service Quality -> Usefulness -> Purchase Intention	0.104	0.105	2.522**	0.012	S
H_{10a}	Information Quality -> Entertainment Gratification -> Purchase Intention	0.019	0.02	1.255	0.210	NS
H_{10b}	System Quality -> Entertainment Gratification -> Purchase Intention	0.043	0.041	1.710	0.087	NS
H_{10c}	Service Quality -> Entertainment Gratification -> Purchase Intention	0.093	0.093	2.597**	0.009	S
H_{11a}	Information Quality -> Irritation -> Purchase Intention	0.001	0.002	0.171	0.864	NS
H_{11b}	System Quality -> Irritation -> Purchase Intention	-0.006	-0.006	0.375	0.707	NS
H_{11c}	Service Quality -> Irritation -> Purchase Intention	0.003	0.003	0.258	0.797	NS

Decision#: S = Supported; NS = Not Supported

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

5.1 Introduction

This chapter will provide a detailed insight of the overall findings based on the contextual influence. The theoretical and managerial implications will be highlighted and discussed. Chapter five will conclude by outlining the research limitation encountered plus proposing directions for future research.

5.2 Contextual Influences

Current thesis studies TAM, D&M IS Success Model and U&G Theory in a Malaysian context. Different utilitarian and hedonic values that influence purchase intention will result in various outcomes. Moreover, the testing of different perceptions of mobile application users towards purchase intention can better explain the various theories adapted and tested in the thesis. The discussions are drawn from the context of the Malaysian m-commerce industry.

The current study investigates the possible utilitarian and hedonic factors influencing purchase intention of mobile application users. The utilitarian factors include ease of use and usefulness whereas the hedonic factors include entertainment gratification and irritation. These factors, also known as the mediating constructs, are used in the research model to examine the indirect effects between three independent constructs (information quality, system quality and service quality) and one dependent construct (purchase intention). These factors may or may not accelerate the purchase intention (Davis, Bagozzi & Warshaw 1989; DeLone & McLean 2002). The findings from chapter four will further elaborate the direct and indirect relationships between different factors influencing purchase intention of mobile application users.

5.3 Research Model Discussion

SEM was employed to study the concurrent modelling of relationships among multiple constructs and to further discover the strength of the relationships tested simultaneously in a structural model (Hair et al. 2014). H_1 until H_{11} were created to observe the path relationships among information system qualities, utilitarian and hedonic factors, and purchase intention. The next section will examine the findings of each hypothesis originated from chapter four.

5.3.1 Information Quality is Positively Related to Ease of Use and Usefulness

Table 5.1: Summarised H_{1a} and H_{1b} Results

Hypothesis		Result
H_{1a}:	Information quality is positively related to ease of use.	Not Supported
H_{1b}:	Information quality is positively related to usefulness.	Supported

The findings in chapter four (see Table 4.12) show that mobile application users perceive information quality is positively associated with the usefulness of mobile application. The findings are consistent with the studies conducted earlier on. The finding highlights that information quality provided through mobile application is a critical reason guiding users to believe in the usefulness of that mobile application (Lin & Lu 2000). The characteristics of information quality such as easy and quick access to large volume of information, produces the most current information, and high quality information are all strong indicators of great information quality. However, there is no positive relationship between information quality and ease of use.

This result portrays consistency with former studies which highlight that information quality and usefulness of a system are greatly related with each other (DeLone & McLean 1992; Seddon 1997). The mobile application produces better quality of information would result in greater perceived usefulness but it does not essentially contribute to ease of use. By comparing the data in Table 4.12, these findings thus confirm that the information quality has a positive association with usefulness over ease of use. This indicates that Malaysian mobile application users perceive that better information quality leads to more usefulness of mobile applications.

As mentioned in the preceding paragraph, mobile application with better information quality does not necessarily contribute to ease of use even though ease of use is being considered as one of the attributes for data quality (Richard & Diane 1996). However, a study on public transport in Ireland shows that newcomers to the transport system would commonly obtain public transport information before and during their journeys. This result indicates that a lack of information requires additional effort to use public transport in Ireland and this may deter newcomers from using it (James & Brian 2011). The insignificant relationship between information quality and ease of use in the current study suggests that information quality of mobile shopping applications does not interfere with users' perceived ease of use. A viable

explanation could be the public transportation is a necessity good whereby public transport information quality would not act as a barrier to stop ne=comers from using public transport. In comparison, items sold on mobile applications are a mixture of essential and non-essential goods, hence with or without high product information quality, shoppers will still be able to shop with mobile devices effortlessly.

5.3.2 Information Quality is Positively Related to Entertainment Gratification

Table 5.2: Summarised H$_{1c}$ Result

Hypothesis	Result
H$_{1c}$: Information quality is positively related to entertainment gratification.	Not Supported

Drawing on the finding in chapter four, it shows that information quality generates a weak impact on entertainment gratification. The information quality has a weak association with entertainment gratification derived from using the mobile application. Entertainment gratification consists of perceptions such as relieve boredom, enjoyable, and high interactivity. The finding suggests that the enhancement of information quality on mobile application does not make the mobile users feel entertained, excited, and pleasant when using it.

The finding is inconsistent with past research which argues that information made available through mobile application could influence mobile users' emotions and hence attitude (Chen & Wells 1999; Chen et al. 2002; Kim & Stoel 2004). For example, up-to-date and comprehensive content (Luo 2002) can be manipulated by mobile retailers in order to enhance online users' web browsing experience, which then creates positive attitudes that increases user satisfaction (Chen & Wells 1999; Chen et al. 2002; Kim & Stoel 2004). As such, the finding indicates that mobile users may not necessarily have to rely on information quality to obtain entertainment gratification when using mobile application.

The insignificant relationship between information quality and entertainment gratification in this study could be attributed to the categories of mobile applications. An investigation on the mobile travel applications in Korea has emphasised the significant correlation between information quality and entertainment gratification (Kim, Ahn & Chung 2013). Since the travel industry is one of the biggest service industries (Revfine 2019), the travel mobile application

which is one of the most widely-used mobile applications are created to provide concise and clear information so as to make travelling informative and fun-filled to the users (Chawla 2018). In view of that, the tour information on the mobile applications is generally more interactive and entertaining by using tools like 360-degree virtual tour and tourism promotional video. In particular, tourism promotional videos are used by holidaymakers to choose their holiday destinations because those videos let them fantasise and visualise their dream holiday destinations (Fong, Firoz & Sulaiman 2017). Young tourists tend to travel to destinations with diverse cultures and majority of them prefer to select holiday destinations based on audio-visual media such as videos, films, and television (Fong, Firoz & Sulaiman 2017).

On the other hand, products have limited ways of information presentation and therefore mobile shoppers do not derive much entertainment value from the product information provided in mobile shopping applications (Kim, Ahn & Chung 2013). As 41.1% of respondents fall under the age of 22-25 years old with approximately one third of them are students (see Table 4.2), these young adults may have strong tendency to seek for more entertainment value over information quality when they shop via mobile shopping applications.

5.3.3 System Quality is Positively Related to Ease of Use and Usefulness

Table 5.3: Summarised H_{2a} and H_{2b} Results

Hypothesis	Result
H_{2a}: System quality is positively related to ease of use.	Supported
H_{2b}: System quality is positively related to usefulness.	Supported

System quality exerts positive impact on ease of use and usefulness of mobile applications. Mobile application users perceive the mobile applications they are using is having satisfactory login response time, performing reliably, seldom crashes, and easy to be accessed anytime and anywhere. Even though there are several mixed results towards the relationships between ease of use and usefulness as a measure of system quality, somehow the current investigation managed to get positive results. Numerous studies have also revealed strong influence that system quality has towards usefulness and ease of use (Hong et al. 2001/2002; Hsieh & Wang 2007; Peter, DeLone & McLean 2008). The current findings indicate that Malaysian mobile application users strongly believe that system quality makes them feel content with the mobile

application, hence a preferable perception on the ease of use and usefulness of mobile application.

5.3.4 System Quality is Positively Related to Entertainment Gratification

Table 5.4: Summarised H$_{2c}$ Result

Hypothesis	Result
H$_{2c}$: System quality is positively related to entertainment gratification.	Supported

The analysis conducted confirms that system quality is positively related to entertainment gratification. According to the U&G Theory, media entertainment as being able to fulfil mobile application users' needs through creating escapism, hedonistic pleasure, emotional release and aesthetic enjoyment (Lim 2015; McQuail 1983). Mobile applications with modern interface and friendly screens are insufficient to maintain users' continued usage (Bing & Xiaohui 2016; Guo, Xiao, Van Toorn, Lai & Seo 2016; Wu & Chen 2016). Past studies have demonstrated that producing high entertainment value leads to a higher tendency for media users to frequently use the media (Lim 2015; Stafford & Stafford 2001). Social networking sites with exciting contents that fulfil users' need for relaxation will increase users' intention to continue using the site (Mikyeung 2018).

Likewise, mobile application users tend to expect such entertainment pleasure while shopping online (Hooff et al. 2010; Kim & Forsythe 2007; Lim 2015). The result confirms that the mobile applications have successfully accomplished such expectations (Huang & Wu 2008; Lim 2015). This finding also indicates that Malaysian mobile application users perceive the enhanced mobile application system as entertaining, enjoyable, and cool. Users of Shopee, the most frequently used mobile shopping application, are captivated when watching the live stream promotional video and participating in entertainment activities such as in-app games and daily lucky draw. This phenomenon exhibits that system quality plays a significant role in providing an enjoyable shopping experience to mobile shoppers.

5.3.5 Service Quality is Positively Related to Ease of use and Usefulness

Table 5.5: Summarised H$_{3a}$ and H$_{3b}$ Result

Hypothesis	Result
H$_{3a}$: Service quality is positively related to ease of use.	Supported
H$_{3b}$: Service quality is positively related to usefulness.	Supported

As indicated in Table 4.12, service quality has generated positive impacts on ease of use and usefulness. The service quality has a strong association with mobile applications which are user-friendly with available user guides and help functions to enhance the mobile user's task performance. As highlighted in past studies, user training provided by internal IT department, responsiveness and cooperativeness of external IT developer are strongly associated with the usefulness of IT system (Agarwal & Prasad 1999; Gefen 2000; Igbaria et al. 1997). Such outcomes also indicate that Malaysian mobile application users perceive the service support they receive as one essential indicator to influence their perceptions of ease of use and usefulness of mobile applications.

5.3.6 Service Quality is Positively Related to Entertainment Gratification

Table 5.6: Summarised H$_{3c}$ Result

Hypothesis	Result
H$_{3c}$: Service quality is positively related to entertainment gratification.	Supported

The findings elucidate that there is a positive relationship between service quality and entertainment gratification. U&G Theory discovers that values and needs can be fulfilled using mediums such as radio, internet, and television (Pihlström 2008; Stafford & Schkade 2004). Research indicates that mobile application users find online interactive features such as product design or customisation tools (Dixon 2005; Lim 2015), comment, instant live customer consultants, and chat box (Lim 2015; Wolfinbarger & Gilly 2001) are fun to use. These interactive features are one of the major indicators of service quality (Lim 2015; Machlis 1998; Westhorpe 2008). Moreover, mobile application users perceive the system support they receive as an essential positive indicator to create a strong impact towards their entertainment gratification (Kim, Ahn & Chung 2013). Hence, as suggested by previous studies, service quality is confirmed having positive relationship with entertainment gratification of mobile application users.

5.3.7 Information Quality, System Quality and Service Quality are Negatively Related to Irritation

Table 5.7: Summarised H$_{1d}$, H$_{2d}$ and H$_{3d}$ Results

Hypothesis	Result
H$_{1d}$: Information quality is negatively related to irritation	Not Supported
H$_{2d}$: System quality is negatively related to irritation	Supported
H$_{3d}$: Service quality is negatively related to irritation	Not Supported

The findings depict mixed results for the relationships among information quality, system quality, service quality and irritation. The outcomes highlight that information quality and service quality do not have any impacts towards irritation. In particular, advertisements that are messy, confusing, frustrating, and annoying are found not to be the significant predictors for the irritated feelings of mobile application users. The results also indicate Malaysian mobile application users do not perceive annoying mobile application content and poor service provided by mobile application providers will negatively affect information quality and service quality of mobile applications. In other words, Malaysian mobile application users are not necessarily irritated by poor information quality and unsatisfactory service quality.

The finding of the relationship between information quality and irritation contradicts with past studies. For instance, Luo (2002) claims that mobile application providers tend to use attractive fonts, graphics, and images to track mobile application users' behaviour and information. Unfortunately, mobile application users perceive these strategies as offending and unwanted. Furthermore, it is being highlighted by Ducoffe (1996) and Lim (2015) that these irritating features of mobile application cause users' anxiety, ruin shopping experiences, and distract mobile shoppers' attention. Subsequently, mobile shoppers who experience irritation like unwanted pop-up banners while doing mobile shopping are often distracted and have difficulty in using the mobile application (Huang 2008; Konrad 2002; Lim 2015).

Notwithstanding that, the inconsistent finding on the relationship between information quality and irritation can be supported by Chowdhury et al.'s (2006) case study which presents the insignificant influence of mobile advertisement toward irritation. A plausible explanation would be the mobile application users have not been exposed to many mobile advertisements

while using the shopping applications (Chowdhury et al. 2006). Apart from that, other factors like low price, heavy promotion and product variety may cause the mobile users care less about the presence of mobile advertisements (Chowdhury et al. 2006). From the observations, Shopee and Lazada are widely known for offering a wide range of affordable products coupled with attractive sales promotion. The aforementioned factors may have outweighed the irritation caused by mobile advertisements.

Besides that, the result of the relationship between service quality and irritation also inconsistent with prior research which may be due to the industries of mobile applications. A study on the banking industry in United Kingdom has highlighted that low quality of Internet banking service will cause feelings of irritation for the Internet user (Broderick & Vachirapornpuk 2002). In view of that, mobile shoppers may perceive that poor retail service quality is not a significant factor that contributes to irritating shopping experience. As opposed to retail industry, mobile banking users tend to prioritise banking service quality offered through mobile banking application due to high perceived risk and market competitiveness of banking industry (Lin & Shih 2013). The success of mobile banking applications is mainly based on security and personalised top-notch user experience (Redka 2018).

In comparison, the finding in Table 4.12 confirms that system quality is negatively related with irritation. This is supported by one of the case studies in video streaming mobile application whereby interruptions in a video clip leads to irritation (Tan, Gustafsson & Heikkila 2006). If the system is unstable, there will be increased rebuffering frequency and length that require longer waiting time and cause irritation (Tan, Gustafsson & Heikkila 2006). As indicated by previous study, mobile application users do not like to wait (Weinberg 2000) because the longer the users have to wait, the more negative reaction will occur (Davis & Heineke 1998; Durrande-Moreau 1999; Tom & Lucey 1995). Hence, the system quality of the mobile applications is confirmed to be negatively associated with irritation.

5.3.8 Ease of Use is Positively Related to Purchase Intention

Table 5.8: Summarised H$_4$ Result

Hypothesis	Result
H$_4$: Ease of use is positively related to purchase intention.	Supported

The data analysis conducted earlier on demonstrates that ease of use is positively related to purchase intention of mobile application users in Malaysia. Particularly, using the application without the help of others, easy to use, easy to learn and easy to operate are noteworthy indicators of ease of use that are used to predict the purchase intention of mobile application users. The results show that Malaysian mobile application users have positive attitude and hold high beliefs about ease of use. They strongly believe that a mobile application that is easy to use will elevate their intention to purchase on the go. Users' ease of use perception of mobile applications also imply that they probably would step up on their purchase intention as mobile applications that are easy to learn, use and operate without the help from others will allow them to shop in the way they wish to.

Such finding is consistent with prior research (Conner et al. 2003; Qiu & Li 2008). Qiu and Li (2008) highlight that positive ease of use perception could let mobile application users have favourable impression towards mobile retailers at the initial usage and further extend their willingness to continue future buyer-seller relationship. Therefore, a greater level of ease of use may generate positive attitudes (Teo, Luan & Sing 2008) and thus influence purchase intention of mobile application users.

5.3.9 Usefulness is Positively Related to Purchase Intention

Table 5.9: Summarised H$_5$ Result

Hypothesis	Result
H$_5$: Usefulness is positively related to purchase intention.	Supported

The analysis run suggests that usefulness does have a positive impact on users' purchase intention. As mentioned by Phillips, Calantone and Lee (1994), usefulness reflects users' feeling that applying the new technology will be beneficial to the users' personal organisation's well-being. Time saving, useful to engage online transaction, accomplish task quickly, and useful to buy what I want are discovered as compelling indicators of mobile users' perceived usefulness. In general, Malaysians users believe that a useful mobile application enables them to acquire a product or services that will enhance their performance while saving their time. As a result, Malaysian mobile application users who consider that the mobile applications are usefulness may make their purchases via mobile devices. The finding thus verifies the past

studies that usefulness creates a positive impact towards purchase intention of mobile application users.

5.3.10 Entertainment Gratification is Positively Related to Purchase Intention

Table 5.10: Summarised H$_6$ Result

Hypothesis	Result
H$_6$: Entertainment gratification is positively related to purchase intention.	Supported

The finding from Table 4.12 displays that entertainment gratification is positively linked with the purchase intention of mobile application users. The value of shopping is not primarily driven by the objective to purchase but rather through consumer's personal motivation to visit a website for emotional and entertainment release, for example, killing time, participating in online promotional activities and evaluating websites (Kim, Lee & Kim 2004; Yoo & Chung 2002). Specifically, excited, fun to use, entertaining and pleasant are found to be significant indicators of mobile application users' entertainment gratification when predicting their purchase intention. The result indicates that Malaysian consumers are entertained as well as feel fun and pleasant while using the mobile shopping applications. They strongly believe that using the mobile application equates to enjoyable feeling. These delightful feelings will make them feel good and attain a real sense of joy whenever they do mobile shopping and ultimately lead to favourable purchase intention. Hence, the finding corroborates the positive relationship between entertainment gratification and purchase intention of mobile application users.

5.3.11 Irritation is Negatively Related to Purchase Intention

Table 5.11: Summarised H$_7$ Result

Hypothesis	Result
H$_7$: Irritation is negatively related to purchase intention.	Not Supported

The result of this study puts forward that irritation has a negative relationship with purchase intention. Irritation is known as feelings of confusion, distraction and messiness while surfing the website (Chen & Wells 1999; Hausman & Siekpe 2009). It follows that unsystematic websites are ineffective and lead to negative perception of the advertising value (Forrester Research, Inc. 2001; Hausman & Siekpe 2009). Precisely, confusing, messy, and frustrated

with unwanted pop-up ads are found to be significant indicators that will negatively influence the purchase intention level of mobile application users. Malaysian mobile consumers do become aware that unwanted pop-up advertisements in the mobile applications are frustrating and irritating. For instance, James and Kover (1992) highlight that inappropriate use of colour on the mobile application's interface, disorganised contents containing features like broken links, lower quality graphics or flashy animation are mobile application designs that may irritate the users. Hence, the result from current investigation validates that irritation asserts negative influence on purchase intention.

5.3.12 The Mediating Effects of Hedonic and Utilitarian Factors towards IS Qualities and Purchase Intention of Mobile Application Users

Table 5.12: Summarised H_{8a}, H_{8b}, H_{8c}, H_{9a}, H_{9b}, H_{9c}, H_{10a}, H_{10b}, H_{10c}, H_{11a}, H_{11b}, and H_{11c} Results

Hypothesis	Result
H_{8a}: Information quality is positively related to purchase intention through the mediation of ease of use.	Not Supported
H_{8b}: System quality is positively related to purchase intention through the mediation of ease of use.	Supported
H_{8c}: Service quality is positively related to purchase intention through the mediation of ease of use.	Supported
H_{9a}: Information quality is positively related to purchase intention through the mediation of usefulness.	Supported
H_{9b}: System quality is positively related to purchase intention through the mediation of usefulness.	Supported
H_{9c}: Service quality is positively related to purchase intention through the mediation of usefulness.	Supported
H_{10a}: Information quality is positively related to purchase intention through the mediation of entertainment gratification.	Not Supported
H_{10b}: System quality is positively related to purchase intention through the mediation of entertainment gratification.	Not Supported
H_{10c}: Service quality is positively related to purchase intention through the mediation of entertainment gratification.	Supported
H_{11a}: Information quality is negatively related to purchase intention through the mediation of irritation.	Not Supported
H_{11b}: System quality is negatively related to purchase intention through the mediation of irritation.	Not Supported
H_{11c}: Service quality is negatively related to purchase intention through the mediation of irritation.	Not Supported

The mediation findings from preceding chapter (see Table 4.13) emphasise that the relationships between information quality, system quality, and service quality with purchase intention of mobile application users have mixed results when mediated by utilitarian (ease of use and usefulness) and hedonic (entertainment gratification and irritation) factors.

5.3.12.1 Ease of Use as Mediator

The threshold values for the relationships between information quality, system quality, service quality with purchase intention under mediation of ease of use are 1.851, 3.296 and 2.716 respectively. It shows ease of use has a stronger mediating impact on the relationships between system quality and service quality towards purchase intention of mobile application users. Mobile application users perceive the mobile application has satisfying support, available user guides and help functions, satisfactory response time and reliable performance through the intervention of ease of use. On the other hand, ease of use generates the least mediating effect on the relationship between information quality and purchase intention. As the current study is focusing on mobile shopping applications, ease of use does not contribute much to the relationship between information quality and purchase intention. This could be due to the limitation of mobile application system in promoting ease of use through the enhancement of information quality. In order to provide high information quality so as to increase ease of use on mobile application, excessive system capability is required and it may compromise system quality.

Moreover, as one of the most frequently used mobile shopping applications in Malaysia, Shopee runs mixed business models, namely business-to-business (B2B), business-to-consumer (B2C), and consumer-to-consumer (C2C). Therefore, it is challenging for Shopee to maintain ease of use of its website through information quality control over the merchandise information uploaded by external merchants and consumers. Because of that, Shopee tends to increase cosumer's purchase intention via low price strategy and product variety strategy. In contrast, Zalora imposes higher requirements towards the merchandise information made available on the company website by its external merchants. For that reason, it is easier to surf Zalora website which has high information quality with well-presented and comprehensive product information.

5.3.12.2 Usefulness as Mediator

The threshold values for the relationships between information quality, system quality and service quality with purchase intention under the mediation of usefulness are 2.217, 2.343 and 2.522 respectively. The findings affirmed that usefulness is a strong mediating construct for the three IS quality constructs and purchase intention construct. The results are supported by a study in Massive Open Online Courses (Wu & Chen 2016). The course providers are suggested to prioritise useful function over ease of use as an important mediator and to improve users' belief in the effectiveness of Massive Open Online Courses so as to generate continuance intention. In view of that, mobile application users perceive that a useful mobile application, coupled with good information, impeccable system and excellent services, will enhance their purchase intention.

5.3.12.3 Entertainment Gratification as Mediator

The threshold values between information quality, system quality, and service quality with purchase intention through the intervention of entertainment gratification are 1.255, 1.710 and 2.597 respectively. Entertainment gratification is found to have a rather weak mediating impact on the relationships between information quality and system quality with the purchase intention. One of the possible reasons that the purchase intention of mobile shoppers are directly affected by the information quality and system quality rather than through the mediation of entertainment gratification is most of the mobile shopping applications do not focus on providing entertainment gratification to the mobile users. Majority of the mobile retailers attempt to increase their customers' desire to purchase merely via the provision of useful content and reliable mobile application system. Only a few of the mobile shopping applications such as Shopee (i.e. the most frequently used mobile application by respondents of this study) offer entertaining mobile purchase experience. For example, the live stream feature available on Shopee's mobile application enables Shopee sellers to perform live product demonstration and review while the consumers may ask questions using chat function and obtain their answers immediately during the live stream (Tay 2019).

In contrast to information quality and system quality, Table 4.13 illustrates that the relationship between service quality and purchase intention is strongly mediated by entertainment gratification. Statements like satisfying support, being able to talk to representative, and customised services are found to be important indicators for the aforesaid mediating

relationship. These findings confirm that entertainment gratification is a significant mediator for the relationship between service quality and purchase intention of mobile application users.

5.3.12.4 Irritation as Mediator

The mediating relationships between information quality, system quality and service quality with the purchase intention through the intervention of irritation are all insignificant as the threshold values of these relationships are 0.171, 0.375 and 0.258 respectively. These results pinpoint that Malaysian mobile application users' perception of IS qualities and their corresponding purchase intention are not negatively mediated by irritation. As such, Malaysian mobile users do not really bothered by the irritation encountered when using the mobile applications since their purchase intention are purely influenced by the information quality, system quality and service quality of mobile applications. Based on Table 4.3, a possible explanation for the unsupported results could be because Shopee mobile shopping application, which is being used by more than half of the respondents of this study, may contain little irritating features like unwanted advertisements, flashy animation and annoying messages. Having almost half of the respondents fall in the age group of 22-25, it is also quite likely that these young adults may emphasise more on IS qualities of mobile applications and tend to overlook any irritation encountered when they shop via mobile devices. As a result, irritation is not a mediator for the relationships between IS qualities and purchase intention of mobile application users.

Overall, H_{8a}, H_{10a}, H_{10b}, H_{11a}, H_{11b} and H_{11c} are not supported. By comparing the utilitarian factors (ease of use and usefulness) with the hedonic factors (entertainment gratification and irritation), utilitarian factors serve as stronger mediators in intervening the relationships between information quality, system quality and service quality with the purchase intention of mobile application users.

5.4 Implications

The current section will elaborate the theoretical and managerial implications based on the outcomes and earlier deliberations. Ultimately, the contributions of the current study will also be discussed.

5.4.1 Theoretical Implications

First and foremost, current study integrates TAM, D&M IS Success Model and U&G Theory within the domain of m-commerce. The results in chapter four show that through integrating existing theories and incorporating additional constructs (i.e. information quality, system quality, service quality, entertainment gratification and irritation) within TAM, new insights which are diverse from the earlier findings are discovered. The proposed conceptual framework is examined closely to have a comprehensive understanding of mobile application users' purchase intention. The relationships between different independent constructs (information quality, system quality, service quality, ease of use, usefulness, entertainment gratification, and irritation) with dependent construct (purchase intention) are explored to confirm the factors influencing purchase intention of mobile application users in Malaysia.

The second theoretical implication is contributed by the research findings of H_{8b}, H_{8c}, H_{9a}, H_{9b}, H_{9c} and H_{10c}. The mediating role of hedonic and utilitarian factors towards purchase intention of mobile application users is assessed in current study to validate the indirect relationships among latent constructs through the mediation of utilitarian and hedonic factors. The finding confirms that usefulness is a strong mediator for the three IS quality constructs and purchase intention construct (see section 5.3.12) and will provide a new way of thinking for the future research.

Another theoretical implication is based on the study context. There are eight constructs (information quality, system quality, service quality, ease of use, usefulness, entertainment gratification, irritation, and purchase intention) that have been rigorously tested in Western context. By comparing the cultural differences between Western and Eastern countries, some of the constructs might not be applicable in Asian context. Findings from the current study could promote a good understanding towards the factors influencing purchase intention of mobile application users from Malaysian perspective. Hence, through empirical testing, the researcher would be able to suggest constructs that are appropriate for Malaysia which is a multi-cultural, multi-racial, multilingual, and multi-religious country. Furthermore, past studies rarely use a holistic approach to study the purchase intention of mobile application users in a specific country from both utilitarian and hedonic point of views (Ndubisi & Chiew 2005 2006; Shimp & Kavas 1984). Hence, the current thesis attempts to articulate the direct and indirect relationships among constructs from different models in the realm of m-commerce to

better explain the mobile application users' purchase intention in a racially diverse country, Malaysia.

The last theoretical implication is contributed by the research findings of H_6. The research has exemplified the significance of entertainment gratification in explaining the factors influencing purchase intention of mobile application users (see section 5.3.10). Past literature has focused on ease of use and usefulness as the utilitarian factors in relation to mobile application users' purchase intention (Amin, Rezaei & Abolghasemi 2014; Gu, Lee & Suh 2009). Nonetheless, the role of entertainment gratification as the hedonic factor determining the purchase intention has rarely been investigated. This study theoretically contributes by examining the impacts of entertainment gratification in association with the purchase intention of online shoppers in the m-commerce context.

5.4.2 Managerial Implications

There are several practical implications stemming from this study.

The first practical implication is contributed by the research findings of H_{2a}, H_{2b}, H_{2c}, H_{2d}, H_{3a}, H_{3b}, and H_{3c}. The findings indicate that system quality and service quality are significant predictors of utilitarian (ease of use and usefulness) and hedonic (entertainment gratification and irritation) factors (see sections 5.3.3 to 5.3.7). Based on the demographic profile of the current research, Shopee is the most frequently used mobile shopping application for more than 60% of the respondents. A possible explanation will be the excellent system quality and service quality experienced by the users of Shopee have given them the impression that this mobile shopping application is user-friendly, effective and captivating.

Mobile retailers could enhance the system quality and service quality of the mobile applications in order to let the mobile users feel that the mobile applications are easy to use, useful plus entertaining. Thereby to increase the system quality, the overall mobile application design shall promote smoother usage through reliable performance, reduced login time and satisfactory response time. In addition, the mobile retailers may consider increasing the service quality through providing excellent customer support. If the mobile application users are not able to receive customer support in time when encountering problems with the mobile applications, negative impression maybe created towards the ease of use and usefulness of the mobile applications. Moreover, user guides and help functions are features of mobile applications that

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can be built in so as to create positive perception of ease of use and usefulness of the mobile applications. Among the strategies that are available to possibly decrease the negative effects of service delays are informing consumers of the expected duration of the delay (Hui & Tse 1996) and apologising to consumers (Sarel & Marmorstein 1998).

The second practical implication is related to the research finding of H_{1b}. The result shows that information quality is a significant predictor of usefulness (see section 5.3.1). Mobile retailers could enhance the information quality of the mobile applications in order to let the mobile users feel that the mobile applications are useful. The mobile retailers may reconsider the value proposition in the mobile application context. Mobile devices are a frequently used, location-sensitive device with limited visual space, hence, it is important to effectively design the information on mobile application based on several guidelines such as memorable, brief and well-coordinated with time and user's location. For instance, if the mobile application system captures that the mobile application user is surfing a backpack, it is appropriate to suggest similar products that come with impressive and brief marketing promotion. It is often misleading to simply reuse a company's Internet marketing strategy to mobile marketing strategy in order to avoid mobile marketing failure (Shankar & Balasubramanian 2009).

Thirdly, the significant role played by both utilitarian and hedonic values should be taken into account when designing the mobile applications. These values could help the mobile retailers to create positive impact on purchase intention and thus stay competitive in the market. For example, the utilitarian factors (ease of use and usefulness) have a strong direct effect on purchase intention of mobile application users. Mobile retailers may design interactive mobile applications by taking into consideration the important indicators of ease of use and usefulness such as easy to learn, learn without the help of others, provide customised user guide information (Chen, Chang & Chen 2017), accomplish goals quickly, and time saving.

Besides, mobile retailers may create interesting mobile applications by looking into the feature of entertainment gratification. If mobile application users have negative perception towards the overall experience due to not less entertaining experience and unable to relieve boredom, these uninteresting encounters may reduce the desire of mobile users to purchase via the mobile applications. Therefore, there is a need for mobile retailers to address entertainment gratification issue in order to provide users entertaining mobile shopping experience. Smartphone manufacturers may consider to expand their phone capacity in order to promote

better user experience and enjoyment in playing games, watching videos, online shopping and so forth. Also, mobile retailers may create an interactive platform which allows mobile application users to engage with each other and share their own post-purchase experience.

5.5 Limitations of the Research

The current research addresses several study limitations to be further dealt with in future research. The following limitations will provide the basis for future studies to continuously improve the proposed conceptual framework so as to have a better comprehension of the purchase intention of mobile application users.

First of all, even though the researcher had taken the precautionary steps to collect representative samples from different states in Malaysia, the unequal development between urban and rural areas in each state are not being addressed in the thesis and thus may lead to random errors. Respondents from the cities may have a higher probability to access information on various products and services made available on the mobile application. In contrast, respondents from rural areas most probably have limited usage of mobile applications due to poor network coverage and connection.

Next, even though random and systematic sampling techniques are generally known as being superior in addressing generalisability of findings, they are still not considered as the perfect approaches for a study when the entire population is large and difficult to access. This issue may jeopardise the findings. Moreover, employing non-probability sampling technique in data collection may also run the risk of compromising the validity of the findings.

The last limitation of current study is the external validity of this study. It may be inappropriate to generalise the study findings with reference to just a few major types of mobile application as they operate based on different business models. For instance, Zalora uses business-to-consumer (B2C) business model whereas Shopee generates revenue by integrating different business models, thus, it is difficult to generalise the study results across diverse mobile applications. In view of that, future research on one specific type of mobile application that offers similar business model may offer additional validation of the proposed conceptual framework.

5.6 Future Research Directions

The current study will recommend four future research directions. First of all, there is still a need to conduct a nationwide study on the various antecedents-to-consequences relationships towards purchase intention of mobile application users. This nationwide study may consider to compare and contrast the data obtained across all states in Malaysia.

Moreover, other than the current constructs proposed in this thesis, future research can also ponder incorporating additional constructs like values (including life style value, cultural value, personal value, and national value), trust, word-of-mouth, consumer willingness to pay, and mobile loyalty so as to further refine the proposed conceptual framework in a more holistic approach. In particular, it is important to compare and contrast the impact of national value versus personal value within a plural society such as Malaysia (Schwartz 1999), thus requiring further exploration in such neighbourhood. Future studies can also improve the conceptual framework by adding new mediating constructs such as satisfaction, habit (Hsiao, Chang & Tang 2016), social value and emotional value (Wang, Liao & Yang 2013). Moderating constructs such as gender (Hew et al. 2015) and online review (Huang & Korfiatis 2015) are also encouraged to be included in future studies. Inclusion of potential antecedents, mediators and moderators may provide an impactful contribution to the purchase intention study in m-commerce research rather than purely relying on the IS qualities and interface design of mobile applications.

The third recommendation for future research direction is replicating the current mobile application research in other countries which share similar or different cultural value and personal value orientation for cross-cultural comparison of results. Replication of study would enable researchers to compare and contrast the effectiveness and practicability of the proposed conceptual framework across borders.

Lastly, further research is necessary to explore and examine additional boundary conditions for the conceptual framework under this study to obtain an in-depth understanding of purchase intention of mobile application users. Replication of current study may take the form of similar business model operating in the same industry sector. Results from such studies may enhance the generalisability of the proposed conceptual framework.

5.7 Summary

This chapter has discussed the results of hypotheses, focusing on the relationships between antecedents as well as the direct and indirect influences exerted by antecedents on the purchase intention of Malaysian mobile application users. Additionally, this chapter articulates the possible impact due to the adoption of current research method and study context in order to frame the findings from a proper perspective. In-depth theoretical implications are discussed, followed by the managerial implications for marketers and mobile retailers. The research limitations in terms of methodology are also highlighted. Finally, recommendations for future research which are related to the use of other potential theories and antecedents plus the replication of the current study are suggested.

REFERENCES

Adak, M & Yumusak, N 2014, 'Studies on usability of mobile applications: review', *Global Journal of Technology*, vol. 6, pp. 37-43.

Adetunji, R & Yazam, S 2012, 'Assessing audiences' satisfaction of advertising digital-billboard: A U&G theoretical perspective', *2nd International Conference on arts, social sciences & technology,* Penang, pp. 1-17.

Agarwal, R & Prasad, J 1999, 'Are individual differences germane to the acceptance of new information technologies?', *Decision Sciences*, vol. 30, no. 2. pp. 361-391.

Ajzen, I & Madden, T 1986, 'Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control', *Journal of Experimental Social Phycology*, vol. 22, no. 5, pp. 453-474.

Ajzen, I & Sheikh, S 2013, 'Action versus inaction: anticipated affect in the Theory of Planned Behavior', *Journal of Applied Social Psychology*, vol. 43, no. 1, pp. 155-162.

Akter, S, D'Ambra, J & Ray, P 2011, 'An evaluation of PLS based complex models: the roles of power analysis, predictive relevance and GoF index', *A renaissance of information technology for sustainability and global competitiveness,* 17th Americas Conference on Information SystemsAMCIS 2011, Detroit, pp. 1-7.

Alam, M, Faiz, M & Aftab, M 2015, 'Mobile marketing: A study of purchasing intention', *British Journal of Economics, Management & Trade*, vol. 7, no. 3, pp. 218-226.

Alberto, U, Vilma, C 2011, 'Technology Acceptance Model for the use of information technology in Universities', *Computers in Human Behavior*, vol. 27, no.2, pp. 845-851.

Ali, A, Ouda, A & Capretz, L 2014, 'A study of the interface usability issues of mobile learning applications for smart phones from the user's perspective', *International Journal on Integrating Technology in Education*, vol. 3, no. 4.

Almutairi, H & Subramanian, G 2005, 'An empirical application of the Delone and Mclean model in the Kuwaiti private sector', *Journal of Computer Information Systems*, vol. 45, no. 3, pp. 113-122.

Alshurideh, M 2014, 'The influence of mobile application quality and attributes on the continuance intention of mobile shopping', *Life Science Journal*, vol. 11, no. 10.

Aluri, A, Slevitch, L & Larzelere, R 2016, 'The influence of embedded social media channels on travellers, gratifications, satisfaction, and purchase intentions', *Cornell Hospitality Quarterly*, vol. 57, no. 3, pp. 250-267.

Ambition 2016, *Market trends salary report 2016 Malaysia*, Ambition Group, viewed 22 April 2016,
<http://ambitionau.sites.4matnetworks.com/File.ashx?path=Root/Documents/Market-Trends/MY-Market-Trends-Report-2016.pdf>.

Amin, M, Rezaei, S & Abolghasemi, M 2014, 'User satisfaction with mobile websites: the impact of perceived usefulness (PU), perceived ease of use (PEOU) and trust', *Nankai Business Review International*, vol. 5, no. 3, pp. 258-274.

Bagozzi, R, Baumgartner, H & Yi, Y 1992, 'State versus action orientation and the Theory of Reasoned Action: An application to coupon usage', *Journal of Consumer Research*, vol. 18, pp. 505-518.

Bagozzi, R, Yi, Y & Phillips, L 1991, 'Assessing construct validity in organizational research', *Administrative Science Quarterly*, vol. 36, no. 3, pp. 421-458.

Baron, R & Kenny, D 1986, 'The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology*, vol. 51, no. 6, pp. 1173-1182.

Basheer, AMA, Ibrahim, AMA, 2010, 'Mobile marketing: Examining the impact of trust, privacy concern and consumers' attitudes on intention to purchase', *International Journal of Business and Management*, vol. 5, no. 3, pp. 32-33.

Bloemer, J & Ruyter, K 1998, 'On the relationship between store image, store satisfaction and store loyalty', *European Journal of Marketing*, vol. 32, no. 5-6, pp. 499-513.

Bossen, C, Jensen, L & Udsen, F 2013, 'Evaluation of a comprehensive EHR based on the DeLone and McLean model for IS success: Approach, results, and success factors', *International Journal of Medical Informatics*, vol. 82, no.10, pp. 940-953.

Bradley, J 2012, 'If we build it, they will come? The Technology Acceptance Model', *Information Systems Theory: Explaining and Predicting our Digital Society*, vol. 1, no. 28, pp. 20.

Broderick, A & Vachirapornpuk, S 2002, 'Service quality in Internet banking: The importance of customer role', *Marketing Intelligence & Planning*, vol. 20, no.6, pp. 327-335.

Byrne, B 2010, *Structural Equation Modelling with AMOS: Basic concepts, applications, and programming*, Routledge, New York.

Cavana, R, Delahaye, B & Sekaran, U 2000, *Applied business research: qualitative and quantitative methods*, National Library of Australia, Sydney.

Cha, J 2011, 'Exploring the Internet as a unique shopping channel to sell both real and virtual items: A comparison of factors affecting purchasing intention and consumer characteristics', *Journal of Electronic Commerce Research*, vol. 12, no. 2, pp. 115-132.

Chan-Olmsted, S, Rim, H & Zerba, A 2012, 'Mobile news adoption among young adults: Examining the roles of perception, news consumption, and media usage', *Journalism & Mass Communication Quarterly*, vol. 90, no. 1, pp. 126-147.

Chawla, S 2018, *Various categories and types of mobile applications*, E-commerce Nation, viewed 10 December 2019, <https://www.ecommerce-nation.com/various-categories-types-of-mobile-applications>.

Chen, Q & Wells, W 1999, 'Attitude toward the site', *Journal of Advertising Research*, vol. 39, no. 5, pp. 27-37.

Chen, W, Chang, D & Chen, C 2017, 'The role of Utilitarian and Hedonic values on users' continued usage and purchase intention in a social commerce environment', *Journal of Economics and Management*, vol. 13, no. 2, pp. 193-220.

Childers, T & Carr, C, Peck, J & Carson, S 2001, 'Hedonic and Utilitarian motivations for online retail shopping behavior', *Journal of Retailing*, vol. 77, no.4, pp. 511-535.

Chin, W & Todd, P 1995, 'On the use, usefulness, and ease of use of Structural Equation Modelling in MIS research: A note of caution', *MIS Quarterly*, vol. 19, no. 2, pp. 237-246.

Chin, W 1996, *The Partial Least Squares approach for Structural Equation Modelling*, Lawrence Erlbaum Associates, Houston.

Chin, W 1998, 'The Partial Least Squares approach to Structural Equation Modelling', *Modern Methods for Business Research*, vol. 295, no. 2, pp. 295-336.

Chiu, Y, Lin, C & Tang, L 2005, 'Gender differs: Assessing a model of online purchase intentions in E-tail service', *International Journal of Service Industry Management*, vol. 16, no. 5, pp. 420.

Cho, Y 2015, 'Exploring factors that affect usefulness, ease of use, trust, and purchase intention in the online environment', *International Journal of Management & Information Systems*, vol. 19, no. 1, pp. 1-16.

Chowdhury, H, Parvin, N, Weitenberner, C, & Becker, M 2006, 'Consumer attitude toward mobile advertising in an emerging market: An empirical study', *International Journal of Mobile Marketing*, vol. 1, no. 2, pp. 33-41.

Churchill J 1979, 'A Paradigm for developing better measures of marketing constructs', *Journal of Marketing Research*, vol. 16, no. 1, pp. 64.

Churchill J 1983, *Marketing Research: Methodological Foundations*, Holt Saunders International Editions, Japan.

Cohen, J 1988, *Statistical power analysis for the behavioral sciences*, N.J.: L. Erlbaum Associates, Hillsdale.

Cohen, J 1992, 'Statistical power analysis', *SAGE Journals*, vol. 1, no. 3, pp. 98-101.

Consumer Barometer 2015, *The online & multiscreen world (MY)*, Consumer Barometer, viewed 20 April 2016,
<https://www.consumerbarometer.com/en/insights/?countryCode=MY>.

Creswell, J 2013, *Research design: Qualitative, quantitative, and mixed methods approaches*, Sage Publications, Thousand Oaks.

Crook, C & Booth, R 1997, 'Building rapport in electronic mail using Accommodation Theory', *SAM Advanced Management Journal*, vol. 62, no. 1, pp. 4-17.

Cyr, D, Head, M & Ivanov, A 2006, 'Design aesthetics leading to m-loyalty in mobile commerce', *Information & Management*, vol. 43, no.8, pp. 950-963.

Dagger, T, Sweeney, J & Johnson, L 2007, 'A hierarchical model of health service quality scale development and investigation of an integrated model', *Journal of Service Research*, vol. 10, no.2, pp. 123-142.

Davis, F 1989, 'Perceived usefulness, perceived ease of use, and user acceptance of Information Technology', *MIS Quarterly*, vol. 13, no. 3, pp. 320-321.

Davis, F, Bagozzi, R & Warshaw, P 1989, 'User acceptance of computer technology: A comparison of two theoretical models', *Management Science*, vol. 35, no. 8, pp. 982-1003.

Day, G & Montgomery, D 1999, 'Charting new directions for marketing', *The Journal of Marketing*, vol. 63, pp. 3-13.

DeLone, W & McLean, E 2014, 'The DeLone and McLean Model of Information Systems Success: A ten-year update', *Journal of Management Information Systems*, vol. 19, no. 4, pp. 1-30.

Demangeot, C & Broderick, A 2013, 'Consumer multiculturation: Consequences of multi-cultural identification for brand knowledge', *Consumption Markets & Culture*, vol. 17, no. 3, pp. 231-253.

Diamantopoulos, A & Siguaw, J 2006, 'Formative versus reflective indicators in organizational measure development: A comparison and empirical illustration', *British Journal of Management*, vol. 17, no. 4, pp. 263-282.

Dianne, C, Milena, H, Alex, I 2006, 'Design aesthetics leading to m-loyalty in mobile commerce', *Information & Management*, vol. 43, no. 8, pp. 950-963.

Dong, H 2007, 'User acceptance of mobile Internet: Implication for convergence technologies', *Interacting with Computers*, vol. 19, no. 4, pp. 472-483.

Ducoffe, R 1996, 'Advertising value and advertising on the Web', *Journal of Advertising Research*, vol.6, no.4, pp. 21-35.

Edirisingha, P 2012, *Interpretivism and Positivism (ontological and epistemological perspectives)*, Wordpress.com, 14 March, viewed 24 April 2016, <https://prabash78.wordpress.com/category/research-paradigms-and-approaches/>.

Eignor & Daniel, R 2001, *Standards for educational and psychological testing*, American Psychological Association, Washington.

Falk, R & Miller, N 1992, *A primer for soft modelling*, University of Akron Press, Ohio.

Fishbein, M & Ajzen, I 2010, *Predicting and changing behaviour: The reasoned action approach*, Taylor & Francis, New York.

Floh, A, Koller M and Zauner, A 2013, 'Taking a deeper look at online reviews: The asymmetric effect of valence intensity on shopping behaviour', *Journal of marketing management*, vol. 29, no. 5-6, pp. 646-670.

Fong, Y, Firoz, D & Sulaiman, W 2017, 'The impact of tourism advertisement promotional videos on young adults', *The National University of Malaysia*, viewed 10 December 2019, vol. 12, no. 3, <http://ejournal.ukm.my/ebangi/article/view/22424/7052>.

Fornel, C & Larcker, D 1981, 'Evaluating Structural Equation Models with unobservable variables and measurement error', *Journal of Marketing Research*, vol. 18, no. 1, pp. 39-50.

Fornell, C & Cha, J 1994, 'Partial Least Squares', *Advanced Methods of Marketing Research*, vol. 407, pp. 52-78.

Gardner, M 1985, 'Mood states and consumer behavior: A critical review', *Journal of Consumer Research*, vol. 12, no.3, pp. 281-300.

Gefen, D 2000, 'E-commerce: The role of familiarity and trust', *Omega*, vol. 28, no.6, pp. 725-737.

Gefen, D & Keil, M 1998, 'The impact of developer responsiveness on perceptions of usefulness and ease of use: An extension of the Technology Acceptance Model', *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, vol. 29, no. 2, pp. 35-49.

Geisser, S 1974, 'A predictive approach to the random effect model', *Biometrika*, vol. 61, no.1, pp. 101-107.

Goodhue, D 1995, 'Understanding user evaluations of information systems', *Management Science*, vol. 41, no. 12.

Gordon, C, Bruner, II, Kumar, A 2005, 'Explaining consumer acceptance of handheld Internet devices', *Journal of Business Research*, vol. 58, no.5, pp. 553-558.

Groupe Spéciale Mobile Association 2012, *Definitive data and analysis for the mobile industry*, GSMA Intelligence, viewed 10 November 2018, <https://data.gsmaintelligence.com/>.

Gu, J, Lee, S, Suh, Y 2009, 'Determinants of behavioural intention to mobile banking', *Expert Systems with Applications*, vol. 36, no. 9, pp. 11605-11616.

Hagelin, E 1999, 'Coding data from child health records: The relationship between interrater agreement and interpretive burden', *Journal of Pediatric Nursing*, vol. 14, no. 5, pp. 313-321.

Hair, J, Hult, G, Ringle, C & Sarstedt, M 2014*, A primer on partial least squares Structural Equation Modeling (PLS-SEM),* Sage Publications, Thousand Oaks.

Hasan, B 2016, 'Perceived irritation in online shopping: The impact of website design characteristics', *Computers in Human Behavior*, vol. 54, pp. 224-230.

Hausman, A & Siekpe, J 2009, 'The effect of Web interface features on consumer online purchase intentions', *Journal of Business Research,* vol. 62, no. 1, pp. 5-13.

Henseler, J, Ringle, C & Sarstedt, M 2015, 'A new criterion for assessing discriminant validity in variance-based Structural Equation Modelling', *Journal of the Academy of Marketing Science*, vol. 43, no. 1, pp. 115-135.

Henthorne, T, LaTour, M & Nataraajan, R 1993, 'Fear appeals in print advertising: An analysis of arousal and ad response', *Journal of Advertising*, vol. 22, no. 2, pp. 59-69.

Hew, J, Lee, V, Ooi, K, & Wei, J 2015, 'What catalyses mobile apps usage intention: An empirical analysis', *Industrial Management & Data Systems*, vol. 115, no. 7, pp. 1269-1291.

Hill, R 1998, 'What sample size is "enough" in internet survey research', *Interpersonal Computing and Technology: An Electronic Journal for the 21st Century*, vol. 6, no.3-4, pp. 1-10.

Holzwarth, M, Janiszewski, C & Neumann, M 2006, 'The influence of avatars on online consumer shopping behavior', *Journal of Marketing*, vol. 70, no.4, pp. 19-36.

Hoyle, R 1995, *Structural Equation Modelling: Concepts, issues, and applications*, Sage Publications, Thousand Oaks.

Hsiao, C, Chang, J, & Tang, K 2016, 'Exploring the influential factors in continuance usage of mobile social Apps: Satisfaction, habit, and customer value perspectives', *Telematics and Informatics*, vol. 33, no. 2, pp. 342-355.

Hsieh, H & Shannon, S 2005, 'Three approaches to qualitative content analysis', *Qualitative Health Research*, vol. 15, no. 9, pp. 1277-1288.

Hsieh, J & Wang W 2007, 'Explaining employee' Extended use of complex information systems', *European Journal of Information Systems*, vol. 16, no. 3, pp. 216-227.

Hsiao, W, Wu, S, Wu, I & Chia-Yi 2015, 'Analyzing consumer loyalty of mobile advertising: A view of involvement, content, and interactivity and the mediator of advertising value', *The Ninth International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies*, UBICOMM 2015, Chicago, pp. 44-49.

Hsu, C, Chang, K & Chen, M 2011, 'The impact of Website quality on customer satisfaction and purchase intention: Perceived playfulness and perceived flow as mediators', *Information Systems and e-Business Management*, vol. 10, no.4, pp. 549-570.

Hsu, C, Lu, H, Hsu, H 2007, 'Adoption of the mobile Internet: An empirical study of multimedia message service (MMS)', *Omega*, vol. 35, no. 6, pp. 715-726.

Huang, E 2008, 'Use and Gratification in e-consumers', *Internet Research*, vol. 18, no. 4, pp. 405-426.

Huang, G & Korfiatis, N 2015, 'Trying before buying: The moderating role of online reviews in trial attitude formation toward mobile applications', *International Journal of Electronic Commerce*, vol. 19, no. 4, pp. 77-111.

Huang, N & Wu, Z 2008, 'A review on Hilbert-Huang transform: Method and its applications to geophysical studies', *Reviews of Geophysics*, vol. 46, no. 2, pp.1-23.

Hunt, S, Sparkman, R & Wilcox, J 1982, 'The pretest in survey research: Issues and preliminary findings', *Journal of Marketing Research*, vol. 19, no. 2, pp. 269-273.

Hwang, Y 2005, 'Investigating the effects of perceived Web quality on eTrust, mediated by hedonic needs and anxiety', *A conference on a human scale,* 11th Americas Conference on Information Systems AMCIS 2005, Omaha, pp. 34.

Ibrahim, K 2009, 'Analyzing the use of UTAUT model in explaining an online behaviour: Internet banking adoption', PhD thesis, Brunel University Brunel Business School, Brunei.

James, K & Brian, C 2011, 'An examination of the quality and ease of use of public transport in Dublin from a newcomer's perspective', *Journal of Public Transportation*, vol. 14, no. 1.

James, W & Kover, A 1992, 'Do overall attitudes toward advertising affect involvement with specific advertisements?', *Journal of Advertising Research*, vol. 32, no. 5, pp. 78-83.

Jee, T 2016, 'Attitudinal ambivalence towards sales promotion technique', PhD thesis, University Malaysia Sarawak, Sarawak.

Jee, T, Ting, H & Alim, M 2019, 'Community based tourism re-visit intention: Tourists' perspective', *International Journal of Business and Society*, vol 20, no. 2, pp. 585-604.

Jennex, M & Olfman, L 2003, 'A knowledge management success model: An extension of DeLone and McLean's IS SuccessModel', *Ninth Americas conference on information systems,* AMCIS 2003, Tampa, Paper 330

Jialal, I & Devaraj, S 2002, 'Remnant lipoproteins: Measurement and clinical significance', *Clinical Chemistry*, vol. 48, no. 2, pp. 217-219.

Jick, T 1979, 'Mixing qualitative and quantitative methods: Triangulation in action', *Administrative science quarterly*, vol. 24, no. 4, pp. 602-611.

Joseph, F, Jeffrey, J & Christian, M 2019, 'When to use and how to report the results PLS-SEM', *European Business Review*, vol. 31, no. 1.

Kang, S 2014, 'Factors influencing intention of mobile application use', *International Journal of Mobile Communications*, vol. 12, no. 4, pp. 360-377.

Kassarjian, H 1977, 'Content analysis in consumer research', *Journal of Consumer Research*, vol. 4, no. 1, pp. 8-18.

Keillor, B, Lewison, D, Hult, G & Hauser, W 2007, 'The service encounter in a multi-national context', *Journal of Services Marketing*, vol. 21, no.6, pp. 451-461.

Kenton, W 2019, *Statistical Significance*, Investopedia, viewed 22 October 2019, <https://www.investopedia.com/terms/s/statistically_significant.asp >.

Kerlinger, F & Lee, H 2000, *Foundations of Behavioral Research*, Harcourt College Publishers, Fort Worth.

Kim, C, Kim, S & Kang, H 2016, 'Driving sustainable competitive advantage in the mobile industry: Evidence from U.S. wireless carriers', *Sustainability*, vol. 8, no. 659, pp. 1-13.

Kim, J, Ahn, K & Chung, N 2013, 'Examining the factors affecting perceived enjoyment and usage intention of ubiquitous tour information services: A service quality perspective', *Asia Pacific Journal of Tourism Research*, vol. 18, no. 6, pp. 598-617.

Kim, J & Forsythe, S 2007, 'Hedonic usage of product virtualization technologies in online apparel shopping', *International Journal of Retail & Distribution Management*, vol. 35, no. 6, pp. 502-514.

Kim, J, Lee, H, Kim, H, 2004, 'Factors affecting online search intention and online purchase intention', *Seoul Journal of Business*, vol. 10, no.2, pp. 31.

Kim, S & Stoel, L 2004, 'Apparel retailers: Website quality dimensions and satisfaction', *Journal of Retailing and Consumer Services*, vol. 11, no.2, pp. 111.

Kim, S, Williams, R & Lee, Y 2002, 'Attitude toward online shopping and retail website quality: A comparison of US and Korean consumers', *Journal of International Consumer Marketing*, vol. 16, no. 1, pp. 89-111.

Kock, N & Lynn, G 2012, 'Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations', *Journal of the Association for Information Systems*, vol. 13, no. 7, pp. 546-580.

Kock, N 2011, 'Using WarpPLS in e-collaboration studies: Descriptive statistics, settings and key analysis results', *International Journal of e-Collaboration*, vol. 7, no. 2, pp. 1-18.

Lee, J & Lee, M 2011, 'Factors influencing the intention to watch online video advertising', *Cyberpsychology, Behavior, and Social Networking*, vol. 14, no. 10, pp. 619-624.

Lerner, J & Keltner, D 2001, 'Fear, anger, and risk', *Journal of Personality and Social Psychology*, vol. 81, no. 1, pp. 146-159.

Lim, W 2015, 'Antecedents and consequences of e-shopping: An integrated model', *Internet Research*, vol. 25, no. 2, pp. 184-217.

Lim, W & Ting, D 2012, 'E-shopping: An analysis of the Uses and Gratifications Theory', *Modern Applied Science Communications*, vol. 6, no. 6, pp. 48-63.

Lin, C, Lee, S & Horng D 2011, 'The effects of online reviews on purchasing intention: The moderating role of need for cognition', *Social Behaviour and Personality*, vol. 39, no. 1, pp. 71-82.

Lin, C & Shih, K 2013, 'Service quality of mobile banking systems', *Management, Knowledge and Learning International Conference 2013*, Active citizenship by knowledge management & innovation, Croatia, pp. 515-521.

Ling, K, Lau, T & Tan, H 2010, 'The effects of shopping orientations, online trust and prior online purchase experience toward customers', *International Business Research*, vol. 3, no. 3, pp. 63-76.

Ling, K, Daud, D, Piew, T, Keoy, K & Hassan, P 2010, 'Perceived risk, perceived technology, online trust for the online purchase intention in Malaysia', *International Journal of Business and Management*, vol. 6, no. 6, pp. 170.

Linus, K, Wilson, K & Stanley, K 2019, 'Perceived usefulness and ease of use as mediators of the effect of health information systems on user performance', *European Journal of Computer Science and Information Technology*, vol. 7, no. 1.

Lowry, P & Gaskin, J 2014, 'Partial least squares (PLS) Structural Equation Modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it', *IEEE Transactions on Professional Communication*, vol. 57, no. 2, pp. 123-146.

Lucas, H & Spitler, V 1999, 'Technology use and performance: A field study of broker workstations*', *Decision Sciences*, vol. 30, no. 2, pp. 291-311.

Luo, X 2013, 'Uses and Gratifications Theory and e-consumer behaviors', *Journal of Interactive Advertising*, vol. 2, no. 2, pp. 34-41.

Mahatanankoon, P & Wen, J 2006, 'Evaluating the technological characteristics and trust affecting mobile device usage', *International Journal of Mobile Communications*, vol. 4, no. 6, pp. 662-681.

Mahatoo, W 1989, 'Motives must be differentiated from needs, drives, wants: Strategy implications', *European Journal of Marketing*, vol. 23, no. 3, pp. 29-35.

Malaysian Communications and Multimedia Commission 2017, *Internet Users Survey 2017*, Malaysian Communications and Multimedia Commission, viewed 25 October 2018, <https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/MCMC-Internet-Users-Survey-2017.pdf>.

Malhotra, N & Birks, D 2006, *Marketing research: An applied approach*, Pearson Education Limited, Harlow.

Markun, H, Kenny, S & Freddy, G 2019, 'Understanding factors influencing consumers online purchase intention via mobile app: Perceived ease of use, perceived usefulness, system quality, information quality and service quality', *Marketing of Scientific and Research Organizations*, vol. 32, no. 2.

Massoud, M, Van, K, Wing-Keung, W & Ismail, B 2018, 'E-purchase intention of Taiwanese consumers: Sustainable mediation of perceived usefulness and perceived ease of use', *Sustainability*, vol. 10, no. 1.

Maxwell, J 2013, *Qualitative research design: An interactive approach*, SAGE Publications, Thousand Oaks.

McGregor, S & Murnane, J 2010, 'Paradigm, methodology and method: Intellectual integrity in consumer scholarship', *International Journal of Consumer Studies*, vol. 34, no. 4, pp. 419-427.

McQuail, D & Cuilenburg, J 1983, *Diversity as A media policy goal: A strategy for evaluative research and a Netherlands case study*, Sage Publications, Leiden.

Mehrabian, A & Russell, J 1974, *An approach to environmental psychology*, The MIT Press, Cambridge.

Meola, A 2016, *The rise of m-commerce: mobile shopping stats & trends*, Business Insider, viewed 9 April 2018, <www.businessinsider.com/mobile-commerce-shopping-trends-stats-2016-10/?IR=T>.

Meskaran, F, Ismail, Z & Shanmugam, B 2013, 'Online purchase intention: Effects of trust and security perception', *Australian Journal of Basic and Applied Sciences*, vol. 7, no. 6, pp. 307-308.

Mikyeung, B 2018, 'Understanding the effect of the discrepancy between sought and obtained gratification on social networking site users' satisfaction and continuance intention', *Computers in Human Behavior*, vol. 79.

Gentle, J 2009, *Computational statistics*, Springer Science & Business Media, Fairfax.

Mondi, M, Woods, P & Rafi, A 2008, 'A 'Uses and Gratification Expectancy Model' to predict students' perceived e-Learning experience', *Educational Technology & Society*, vol. 11, no. 2, pp. 241-261.

Moon, J, Kim, Y 2001, 'Extending the TAM for a World-Wide-Web context', *Information & Management*, vol. 38, no.4, pp. 217-230.

Morgan, D 2007, 'Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods', *Journal of Mixed Method Research*, vol. 1, no.48, pp. 48-76.

Nasri, W, Charfeddine, L, 2012, 'An exploration of facebook.com adoption in tunisia using Technology Acceptance Model (TAM) and Theory of Reasoned Action (TRA)', *Interdisciplinary Journal of Contemporary Research in Business*, vol. 4, no. 5.

Navarro, D 2019, *Learning statistics with R: A tutorial for psychology students and other beginners*, Creative Commons, Adelaide.

Ndubisi, N 2004, 'Understanding the salience of cultural dimensions on relationship marketing, it's underpinnings and aftermaths', *Cross Cultural Management: An International Journal*, vol. 11, no. 3, pp. 70-89.

Newby-Clark, I, McGregor, I & Zanna, M 2002, 'Thinking and caring about cognitive inconsistency: When and for whom does attitudinal ambivalence feel uncomfortable?', *Journal of Personality and Social Psychology*, vol. 8, no. 2, pp. 157-166.

Nielsen, *E-commerce: Evolution or revolution in the fast-moving consumer goods world,* The Nielsen Company (US), viewed 22 April 2016, <http://www.nielsen.com/content/dam/nielsenglobal/apac/docs/reports/2014/Nielsen-Global-E-commerce-Report-August-2014.pdf>.

Ninna, M, Matti, R, Virpi, K, Anssi, Ö 2006, 'An empirical investigation of mobile ticketing service adoption in public transportation', *Personal and Ubiquitous Computing*, vol. 12, no. 1, pp. 57-65.

Nunnally, J & Bernstein, I 1994, *Psychometric Theory*, McGraw-Hill, New York.

Obiedat, R 2013, 'Impact of online consumer reviews on buying intention of consumers in UK: Need for cognition as mediating role', *iJAC*, vol. 6, no. 2, pp. 16-21.

Olorunniwo, F, Hsu, M & Udo, G 2006, 'Service quality, customer satisfaction, and behavioural intentions in the service factory', *Journal of Services Marketing*, vol. 20, no. 1, pp. 59 - 72.

Park, N, Kee, K & Valenzuela, S 2009, 'Being immersed in social networking environment: Facebook groups, Uses and Gratifications, and social outcomes', *Cyberpsychology & Behavior*, vol. 12, no. 6, pp. 729-733.

Parse, R 2001, 'Contributions to the discipline', *Nursing Science Quarterly*, vol. 14, no. 1, pp. 5.

Parse, R 2001, *Qualitative inquiry: The path of sciencing*, Jones and Bartlett Publishers, Massachusetts.

Patton, M 2005, *Qualitative research*, SAGE Publications Inc, Thousand Oaks.

Petter, S, Delone, W & Mclean, E 2008, 'Measuring Information Systems Success: Models, dimensions, measures, and interrelationships', *European Journal of Information Systems*, vol. 17, no.3, pp. 236-263.

Phillips, L, Calantone, R & Lee, M 1994, 'International technology adoption: Behavior structure, demand certainty and culture', *Journal of Business & Industrial Marketing*, vol. 9, no. 2, pp. 16-28.

Pihlstrom, M 2008, *Perceived value of mobile service use and its consequences*, Swedish School of Economics and Business Administration, Helsinki.

Podsakoff, P & Organ, D 1986, 'Self-reports in organizational research: Problems and prospects', *Journal of Management*, vol. 12, no. 4.

Podsakoff, P, Bommer, W, Podsakoff, N & Mackenzie, S 2006, 'Relationships between leader reward and punishment behaviour and subordinate attitudes, perceptions, and behaviors: A meta-analytic review of existing and new research', *Organizational Behavior and Human Decision process*, vol. 99, no.2, pp. 113-142.

Podsakoff, P, MacKenzie, S & Podsakoff, N 2012, 'Sources of method bias in social science research and recommendations on how to control it', *Annual Review of Psychology*, vol. 63, no.1, pp. 539-569.

Podsakoff, P, MacKenzie, S, Lee, J & Podsakoff, N 2003, 'Common method biases in behavioral research: A critical review of the literature and recommended remedies', *Journal of Applied Psychology*, vol. 88, no. 5, pp. 879-903.

Priester, J, Petty, R & Park, K 2007, 'Whence univalent ambivalence? From the anticipation of conflicting reactions', *Journal of Consumer Research*, vol. 34, no. 1, pp. 11-21.

Privitera, G 2015, *Statistics for the behavioral sciences*, Sage Publications, Thousand Oaks.

Qiu, L & Dong, L 2008, 'Applying TAM in B2C e-commerce research: An extended model', *Tsinghua Science and Technology*, vol. 13, no. 3, pp. 265-272.

Radkevitch, U, Heck, E & Koppius, O 2006, 'Leveraging offshore IT outsourcing by SMEs through online marketplaces', *Journal of Information Technology Case and Application Research,* vol. 8, no. 3, pp. 40 - 57.

Ramayah, T, Ignatius, J 2005, 'Impact of perceived usefulness, perceived ease of use and perceived enjoyment on intention to shop online', *ICFAI Journal of Systems Management*, vol. 3, pp. 36-51.

Redka, M 2018, *Top industries that can benefit from Mobile Apps*, MLSDev, viewed 12 December 2019, < https://mlsdev.com/blog/top-industries-that-can-benefit-from-mobile-apps>.

Revfine 2019, *Travel industry; An overview of one of the largest service industries*, Revfine, viewed 10 December 2019, < https://www.revfine.com/travel-industry/ >.

Richard, Y & Diane, M 1996, 'Beyond Accuracy: What data quality means to data consumers', *Journal of Management Information Systems*, vol. 12, no. 4.

Ringle, C, Sarstedt, M & Straub, D 2012, 'A critical look at the use of PLS-SEM in MIS Quarterly', *MIS Quarterly*, vol. 36, no. 1, pp. 3-14.

Rosalie, J, Andrea, F & Michelle, S 1999, 'Item parceling strategies in SEM: Investigating the subtle effects of unmodeled secondary constructs', *Organizational Research Methods*, vol. 2, no. 3.

Rosenthal, R & Rosnow, R 1991, E*ssentials of behavioral research. Methods and data analysis*, McGraw Hill Inc, Boston:

Rossi, M & Tuunainen, V 2018, 'An empirical investigation of mobile ticketing service adoption in public transportation', *Personal and Ubiquitous Computing*, vol. 12, no.1, pp. 57-65.

Run, D & Cyril, E 2004, *Unintended effects of ethnically target advertising*, University of Otago, Dunedin.

Ryan, G & Valverde, M 2006, 'Waiting in line for online services: a qualitative study of the user's perspective', *Info Systems Journal*, vol. 16, no.2, pp. 181-211.

Saadeghvaziri, F, Dehdashti, Z, Askarabad, M 2013, 'Assessing beliefs, attitudes, purchase intention and behavioral responses', *Journal of Economic and Administrative Sciences*, vol. 29, no.2, pp. 102-103.

Santos, J 1999, 'Cronbach's alpha: A tool for assessing the reliability of scales', *Journal of extension*, vol. 37, no. 2, pp. 1-5.

Saunders, M, Lewis, P & Thornhill, A 2011, *Research methods for business students*, Pearson Education, India:

Schwartz, S 1999, 'A theory of cultural values and some implications for work', *Applied Psychology: An International Review,* vol. 48, no. 1, pp. 23-47.

Seddon, P & Kiew, M 1994, 'A partial test and development of Delone and Mclean's model of IS success', *International Conference on Information Systems*, vol. 4, no. 1, pp. 90-109.

Sekaran, U & Bougie, R 2016, *Research methods for business: a skill building approach*, John Wiley & Sons, Chichester.

Shankar, V & Balasubramanian, S 2009, 'Mobile marketing: A synthesis and prognosis', *Journal of Interactive Marketing*, vol. 23, no. 2, pp. 118-129.

Sharkey, U, Scott, M & Acton, T 2010, 'The influence of quality on e-commerce success: An empirical application of the Delone and Mclean IS success model', *International Journal of e-Business Research*, vol. 6, no. 1, pp. 68-84.

Shimp, T & Kavas, A 1984, 'The Theory of Reasoned Action applied to coupon usage', *Journal of Consumer Research*, vol. 11, no.3, pp. 795-809.

Shin, D 2007, 'User acceptance of mobile Internet: Implication for convergence technologies', *Interacting with Computers*, vol. 19, no. 4, pp. 472-483.

Shmueli, G, Ray, S, Velasquez E, & Shatla, S 2016, 'The elephant in the room: Evaluating the predictive performance of PLS models', *Journal of Business Research*, vol. 69, no.10.

Shmueli, G, Sarstedt, M, Hair, J, Cheah, J, Ting, H, Vaithilingam, S & Ringle, C 2019, 'Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict', *European Journal of Marketing*, vol. 53, no. 11.

Shukla, A, Sharma, N & Swami, S 2010, 'Website characteristics, user characteristics and purchase intention: Mediating role of website satisfaction', *International Journal of Internet Marketing and Advertising*, vol. 6, no. 2, pp. 142-167.

Siau, K, Lim, E, Shen, Z 2001, 'Mobile commerce: Promises, challenges, and research agenda', *Journal of Database Management*, vol. 12, no. 3, pp. 4-13.

Sitegiant 2019, *Malaysia Marketplace Comparison*, Sitegiant, viewed 28 October 2019, <https://www.sitegiant.my/malaysia-marketplace-comparison/ >.

Spreng, R & Chiou, J 2002, 'A cross-cultural assessment of the satisfaction formation process', *European Journal of Marketing*, vol. 36, no. 7/8, pp. 829-839.

Stafford, T, Stafford, M & Schkade, L 2004, 'Determining Uses and Gratifications for the Internet', *Decision Sciences*, vo. 35, no. 2, pp. 259-288.

Steele, T, Schwendig, W & Kilpatrick, J 1992, 'Duplicate responses to multiple survey mailings: A problem?', *Journal of Advertising Research*, vol. 32, no. 2, pp. 26-33.

Stone, M 1974, 'Cross-validatory choice and assessment of statistical predictions', *Journal of the Royal Statistical Society. Series B (Methodological),* vol. 36, no. 2, pp. 185-203.

Streiner, D 1994, 'Figuring out factors: The use and misuse of factor analysis', *Canadian Journal of Psychiatry*, vol. 39, no. 3, pp. 135-140.

Tabachnick, B & Fidell, L 2007, *Using multivariate statistics*, Pearson Education, Inc, California.

Tan, X, Gustafsson, J, Ericsson, G & Gustafsson, J 2006, 'Perceived video streaming quality under initial buffering and rebuffering degradations', *Conference Proceedings*.

Tay, R 2019, *Shopee now has a live streaming feature for sellers who want to entertain*, Business Insider Singapore, viewed 5 December 2019, <https://www.businessinsider.sg/shopee-now-has-a-live-streaming-feature-for-sellers-who-want-to-entertain/>.

Tenenhaus, M & Hanafi 2010, *A bridge between PLS path modelling and multi-block data analysis*, Springer, Routledge.

Tenenhaus, M, Mauger, E & Guinot, C 2010, *Use of ULS-SEM and PLS-SEM to measure a group effect in a regression model relating two blocks of binary variables*, Springer, Berlin.

Teo, T, Wong, S & Chai C 2008, 'A cross-cultural examination of the intention to use technology between Singaporean and Malaysian pre-service teachers: An application of the Technology Acceptance Model (TAM)', *Journal of Educational Technology & Society*, vol. 11, no. 4, pp. 265-280.

Thanaporn, P & Rapeepat, T 2015, 'Factors influencing official mobile application purchasing intention in Bangkok', *International Journal of Management and Applied Science (IJMAS)* , vol. 1, no. 9.

Theodorakis, N & Alexandris, K 2008, 'Can service quality predict spectators' behavioral intentions in professional soccer?', *Managing Leisure*, vol. 13, no. 3/4, pp. 162-178.

Thompson, M, Zanna, M & Griffin, D 1995, 'Let's not be indifferent about (attitudinal) ambivalence', *Attitude strength: Antecedents and consequences*, vol. 4, pp. 361-386.

Thibaud 2016, *Taobao Global: A new strategy to keep one step ahead of the game targeting Millennials*, daxueconsulting, viewed 10 November 2018, <https://daxueconsulting.com/taobao-global/>.

Ting, H & Run, E 2015, 'A qualitative inquiry into the formation of generational cohorts: A case of an emerging market', *Journal of Economics and Business Research*, vol. 21, no. 1, pp. 126-143.

Ting, H, Run, E 2012, 'Generation X and Y attitude towards controversial advertising', *Asian Journal of Business Research,* vol. 2, no. 2, pp. 18-32.

Tsang, M, Ho, S & Liang, T 2004, 'Consumer attitudes toward mobile advertising: An empirical study', *International Journal of Electronic Commerce*, vol. 8, no. 3, pp. 67-78.

Urbach, N & Müller, B 2012, 'The updated DeLone and McLean Model of Information Systems Success', *Information Systems Theory: Explaining and Predicting Our Digital Society*, vol. 1, pp. 1-18.

Venkatesh, V & Davis, F 2000, 'A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies', *Management Science*, vol. 46, no.2, pp. 186-204.

Venkatesh, V & Morris, M 2000, 'Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior', *MIS Quarterly*, vol. 24, no.1, pp. 115-139.

Verkasalo, H, López-Nicolás, C, Molina-Castillo, F & Bouwman, H 2010, 'Analysis of users and non-users of smartphone applications', *Telematics and Informatics*, vol. 27, no.3, pp. 242-255.

Walker, D & Dubitsky, T 1994, 'Why liking matters', *Journal of Advertising Research*, vol. 34, no. 3, pp. 9.

Wang, H, Liao, C, & Yang, L 2013, 'What affects mobile application use? The roles of consumption value', *International Journal of Marketing Studies*, vol. 5, no. 6, pp. 11-22.

Werthner, H and Ricci, F 2004, 'E-commerce and tourism', *Communications of the ACM*, vol. 47, no. 12, pp. 101-105.

Werts, C, Linn, R & Joreskog, K 1974, 'Intraclass reliability estimates: Testing structural assumptions', *Educational and Psychological Measurement*, vol. 34, no.1, pp. 25-33.

Wu, B & Chen, X 2016, 'Continuance intention to use MOOCs: Integrating the technology acceptance model (TAM) and task technology fit (TTF) model', *Computers in Human Behavior*, vol. 67.

Groupe Speciale Mobile Association 2012, *What is the impact of mobile telephony on economic growth*, Groupe Speciale Mobile Association, viewed 25 March 2018, <file:///C:/Users/IDTang/Documents/SWINBURNE/gsma-deloitte-impact-mobile-telephony-economic-growth.pdf>.

Wixom, B & Todd, P 2005, 'A theoretical integration of user satisfaction and technology acceptance', *Information Systems Research*, vol. 16, no. 1, pp. 85-102.

Wolfinbarger, M & Gilly, M 2001, 'Shopping online for freedom, control, and fun', *California Management Review Reprint Series*, vol. 43, no. 2, pp. 34-55.

Wong, C 2015, *Top 10 online shopping sites in Malaysia*, ec Insider, viewed 20 April 2016, <http://www.ecommercemilo.com/2015/11/top-10-online-shopping-sites-malaysia>.

Wong, K 2013, 'Partial Least Squares Structural Equation Modelling (PLS-SEM) techniques using SmartPLS', *Marketing Bulletin*, vol. 24, no. 1, pp. 1-32.

Wu, J & Wang, S 2005, 'What drives mobile commerce? An empirical evaluation of the revised technology acceptance model', *Information & Management*, vol. 42, no.5, pp. 719-729.

Xu, D 2006, 'The Influence of personalization in affecting consumer attitude toward mobile advertising in China', *Journal of Computer Information Systems*, vol. 47, no. 2, pp. 9-19.

Xu, D, Liaw, S & Li, Q 2008, 'Combining empirical experimentation and modeling techniques: A design research approach for personalized mobile advertising applications', *Decision Support Systems*, vol. 44, no.3, pp. 710-724.

Xu, J, Benbasat, I, & Cenfetelli, R 2013, 'Integrating service quality with system and information quality: An empirical test in the e-service context', *MIS Quarterly*, vol. 37, no.3, pp. 337-352.

Yang 2018, 'Influence of informational factors on purchase intention in social recommender systems', *Online Information Review*.

Yang, W, Diane, M, Beverly, K & Richard, Y 2002, 'AIMQ: A methodology for information quality assessment', *Information & Management*, vol. 40, no. 2.

Yoo 2004, 'Perceived social support and morale of the elderly staying at home', *Journal of Korean Academy of Nursing*, vol. 34, no. 2, pp. 297-306.

Yoon, C, Sagynov, E 2015, 'Exploring factors that affect usefulness, ease of use, trust, and purchase intention in the online environment', *International Journal of Management & Information Systems – First Quarter 2015*, vol. 19, no. 1, pp. 24-27.

Zheng, Y, Zhao, K, Antonis, S 2013, 'The impacts of information quality and system quality on users' continuance intention in information-exchange virtual communities: An empirical investigation', *Decision Support Systems*, vol. 56, pp. 513-524.

APPENDICES

Appendix 1 Consent Form

Swinburne University of Technology Sarawak Campus

Project Title: Assessing Factors Affecting Purchase Intention Of Mobile Application Users

Principal Investigator(s): Dr Ling Chui Ching, Dr Jee Teck Weng, Dr Lim Weng Marc

1. I consent to participate in the project named above. I have been provided a copy of the participant information statement to which this consent form relates and any questions I have asked have been answered to my satisfaction.
2. I agree to complete questionnaires asking me about "Assessing Factors Affecting Purchase Intention Of Mobile Application Users"
3. I acknowledge that:
   (a) my participation is voluntary and that I am free to withdraw from the project at any time without explanation;
   (b) the Swinburne project is for the purpose of research and not for profit;
   (c) my anonymity is preserved and I will not be identified in publications or otherwise without my express written consent.

Agree and proceed to survey	Disagree and do not proceed to survey

(By clicking the button above you are agreeing to our terms and conditions and privacy policy in attachment 2)

Appendix 2 Participant Information Statement

Participant Information Statement

Project Title
Assessing Factors Affecting Purchase Intention Of Mobile Application Users

Investigators
Chief Investigator: Dr Ling Chui Ching

(Lecturer, Swinburne University of Technology Sarawak Campus)

Co-Investigator: Dr Jee Teck Weng

(Lecturer, Swinburne University of Technology Sarawak Campus)

Co-Investigator: Associate Professor Dr Lim Weng Marc

(Associate Dean, Swinburne University of Technology Sarawak Campus)

Student Investigator: Ida Tang Xin En

(Higher Degree Researcher, Swinburne University of Technology Sarawak Campus)

Dear Sir/Ms,

You are invited to participate in a research project entitled "Assessing Factors Affecting Purchase Intention Of Mobile Application Users" conducted by Dr Ling Chui Ching, Dr Jeffrey Jee Teck Weng, Dr Lim Weng Marc and Ida Tang Xin En of Swinburne University of Technology Sarawak Campus in their effort to understand the purchasing behaviour of young adults in Malaysia. The survey is part of an academic research project and its outcome will provide the foundation to prepare a thesis for the degree of Master of Business (Research) under the Faculty of Business, Design and Arts at Swinburne University of Technology Sarawak Campus, Malaysia.

What This Project Is About and Why Is It Being Undertaken?

This study will investigate the factors influencing mobile application users' purchase intention by exploring different factors such as information quality, system quality, service quality, ease of use, usefulness, entertainment gratification, irritation, values, and purchase intention. In addition, demographic profile of participants such as gender, age, educational attainment and so on will also be measured. We believe that this research project will produce new knowledge on the issues that affect Malaysians' support for mobile commerce development in Malaysia. These findings will help to inform policy-makers and researchers on effective strategies for managing mobile commerce initiatives.

What Is Involved In Participation?

By taking part in this study, you will be required to complete an online survey conducted by Vase Technologies to the best of your knowledge. Completing the questionnaire constitutes your consent to participate in this project and voluntary consent to your time, effort and supply of information. Completing the questionnaire also indicates that you are in between 18 to 35 years. The questionnaire will take approximately 20 to 30 minutes to complete and you are encouraged to complete the questionnaire in your own time independently. There is no wrong or right answer as we are only interested in your opinions on the statements.

Consent to Participate and Right to Withdraw

Please be aware that participation is strictly voluntary and you may refuse to participate at any time without any disadvantage to yourself of any kind. You may contact the researchers to find out more about this project without any obligation to participate. You also have the right to ask any questions about the study at any time during your participation.

Participant Anonymity

This survey questionnaire was developed without pursuing any identifiable information of participants. Please take note that apart from the information which you will be providing in the survey, you will remain anonymous to the researchers throughout the study.

Privacy and Confidentiality

Privacy and confidentiality of your responses will be strictly maintained and in no cases will your personal identity/information be disclosed. The followings are the key measures to maintain privacy:

- The outcome of the study will be used solely for academic purposes. In any future publications, research findings will be presented as an accumulated outcome in order to protect participants' identity.

- The non-identifiable data collected from this survey will be transformed into electronic form which will be retained on a password protected computer and in a secure filing drawer/cabinet. Only those involved in the project will be able to gain access to it.

- Data will be preserved securely at least for 5 years and 7 years for maximum. Following this timeline, data will be destroyed. You can see also Swinburne's Privacy Policy on Conduct of Research at http://www.swinburne.edu.au/privacy/.

Research Output

This research project is being commenced by Ms Ida Tang Xin En to meet the requirements for the degree of Master of Business (Research) at Swinburne University of Technology Sarawak Campus, Malaysia. It is expected that scholarly publications will arise from this project which may be in the form of journal articles, book chapters and/or conference papers. Given that no identifying information will be collected when you answer the questionnaire, your anonymity will be preserved in any such publications. All responses will be treated in the strictest confidence and only aggregated data will be reported.

Further Information About The Project

If you require any further information about the project, please do not hesitate to contact Ms Ida Tang Xin En, candidate, Master of Research (Business) under the Faculty of Business, Design and Arts, Swinburne University of Technology Sarawak Campus at +60 16-576 2108 or via email at idatangxinen@gmail.com.

Alternatively, you can contact the principal coordinating supervisor of this project, Dr Ling Chui Ching, Faculty of Business, Design and Arts, Swinburne University of Technology Sarawak Campus at +60 19-278 0516 or via email at ccling@swinburne.edu.my.

Concerns/complaints about the project - who to contact:

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the *National Statement on Ethical Conduct in Human Research*. If you have any concerns or complaints about the conduct of this project, you can contact:

Ethics & Integrity Officer, Swinburne University of Technology Sarawak Campus, Jalan Simpang Tiga, 93350 Kuching, Sarawak, Malaysia

Tel :+60 82 260 923 or +60 82 260 923 or ethics@swinburne.edu.my

Thank you very much for your cooperation and we greatly appreciate your participation in this research project.

Appendix 3 Questionnaire

Section 1: Eligibility for Participation in the Study

Please tick the box that represents the most appropriate response for the following questions:

A1: Are you currently aged in between 18 to 35 years?

○ Yes

○ No

A2: Are you proficient in the English Language?

○ Yes

○ No

A3: Have you used any of the mobile shopping application (such as Zalora, Taobao, 11Street, Shopee, Lazada, Carousell, ezbuy and etc.) during the last SIX months?

○ Yes

○ No

You have answered YES to all of A1-A3, please proceed to Section 2.

You are NOT eligible to participate in this study.

Thank you for taking time to complete this questionnaire. Have a nice day.

Section 2: Demographic factors

Please tick the appropriate answer and write in the relevant space provided, if any.

B1: Age

◯ 18-21

◯ 22-25

◯ 26-29

◯ 30-35

B2: Gender

◯ Male

◯ Female

B3: Marital status

◯ Single

◯ Married

◯ Divorced/Widowed

B4: Race

◯ Malay

◯ Chinese

◯ Indian

◯ Others: _____

B5: Religion

- ○ Islam

- ○ Christianity

- ○ Buddhism

- ○ Hinduism

- ○ Others

B6: State

- ○ Johor

- ○ Kedah

- ○ Kelantan

- ○ Melaka

- ○ Negeri Sembilan

- ○ Pahang

- ○ Penang

- ○ Perak

- ○ Perlis

- ○ Sabah

- ○ Sarawak

- ○ Selangor

- ○ Terengganu

- ○ W.P - Labuan

- ○ W.P – Putrajaya

- ○ W.P – Kuala Lumpur

B7: Level of Education

- ○ No formal education

- ○ Primary school

- ○ Secondary school

- ○ Post-secondary/ Matriculation/ Vocational

- ○ Diploma

- ○ Degree

- ○ Postgraduate

- ○ Others

B8: Occupation

- ○ Professional/Executive/Manager

- ○ Business owner/traders

- ○ Self-employed/freelancer

- ○ White-collar worker

- ○ Blue collar worker

- ○ Student

- ○ Housewife/Househusband

- ○ Retired/Unemployed

- ○ Others

B9: Income

○ Below RM1000

○ RM1000-RM1999

○ RM2000-RM2999

○ RM3000-RM3999

○ RM4000-RM4999

○ RM5000-RM5999

○ RM6000-RM6999

○ RM7000-RM7999

○ RM8000-RM8999

○ RM9000-RM9999

○ RM10000 and above

Section 3: Mobile Shopping Application Usage

Please tick the box that best matches your mobile shopping application usage during the last SIX months.

C1: Are you currently using more than ONE mobile shopping application?

○ YES, go to C2

○ NO, go to C3

C2: How many mobile shopping applications are you using currently?

○ 2-3

○ 4-5

○ 6 and above

C3: Which of the following mobile shopping application are you using currently? (Tick all that applies)

○ Lazada

○ 11Street

○ Shopee

○ Zalora

○ Carousell

○ Taobao

○ Ezbuy

○ Others: _____

C4: How often do you shop using the mobile shopping application?

○ Few times a day

○ Once a day

○ Few times a week

○ Few times a month

○ Seldom

Section 4: Actual Experience

D1: Which of the following mobile shopping application have you most frequently used during the last SIX months?
(Note: You can only choose one option)

- ○ Lazada
- ○ 11Street
- ○ Shopee
- ○ Zalora
- ○ Carousell
- ○ Taobao
- ○ Ezbuy
- ○ Others: _____

Section 5: Consumers' Perceptions

Please answer the questions under section 5 based on your actual experience with the mobile shopping application that you most frequently used during the last SIX months, as indicated by your answer above.

Please circle the number that best describes how strongly you agree or disagree with each of the following statements, using a 1-5 rating scale given below:

1 = Strongly disagree

2 = Disagree

3 = Neither agree nor disagree

4 = Agree

5 = Strongly Agree

Section 5(a): Information Quality

Listed below are statements that describe the degree to which you believe that the information provided by the mobile shopping application is relevant, understandable, accurate, concise, complete, current, timely, and useful. Please circle the number which best describes your perceived information quality of this mobile shopping application.

IQ1   Information obtained from the mobile shopping application is useful.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ2   The mobile shopping application gives me quick and easy access to large volume of information.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ3   The mobile shopping application produces the most current information.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ4   The mobile shopping application provides me with all the information I need.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ5   The information provided by the mobile shopping application is accurate.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ6   I feel that the mobile shopping application is a good source for timely information.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ7   It is important that the mobile shopping application is able to give me information that is of interest to me.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ8   Accurate information in the mobile shopping application improves my shopping effectiveness.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ9   Timely information in the mobile shopping application improves my shopping performance.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ10 Information in mobile shopping application that is useful in aiding my shopping decisions is appreciated.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ11 Information in mobile shopping application that makes it easier for me to compare product choices when shopping at mobile application is desirable.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ12 The mobile shopping application provides me with high-quality information.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ13 The mobile shopping application provides consistent and dependable information.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ14 It is easy to find information in the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ15 Information in the mobile shopping application appears orderly and easy to read.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

IQ16   Information in the mobile shopping application is always updated.

        1   2   3   4   5
Strongly ○   ○   ○   ○   ○   Strongly
Disagree   Agree

IQ17   The mobile shopping application provides me with the information I need for my shopping.

        1   2   3   4   5
Strongly ○   ○   ○   ○   ○   Strongly
Disagree   Agree

Section 5(b): System Quality

Listed below are statements that describe the degree to which you believe that the system of the mobile shopping application is easy to use, flexible, reliable, and easy to learn. Please circle the number which best describes your perceived system quality of this mobile shopping application.

SQ1   The mobile shopping application enables me to get on to it quickly.

        1   2   3   4   5
Strongly ○   ○   ○   ○   ○   Strongly
Disagree   Agree

SQ2   The mobile shopping application performs reliably.

        1   2   3   4   5
Strongly ○   ○   ○   ○   ○   Strongly
Disagree   Agree

SQ3   The mobile shopping application can be adapted to meet a variety of needs.

        1   2   3   4   5
Strongly ○   ○   ○   ○   ○   Strongly
Disagree   Agree

SQ4   The mobile shopping application makes it easy to get anywhere on the site.

       1   2   3   4   5

Strongly   ◯   ◯   ◯   ◯   ◯   Strongly
Disagree   Agree

SQ5   Response time for login is satisfactory.

       1   2   3   4   5

Strongly   ◯   ◯   ◯   ◯   ◯   Strongly
Disagree   Agree

SQ6   The mobile shopping application responds rapidly and satisfactorily when shifting
       between screens.

       1   2   3   4   5

Strongly   ◯   ◯   ◯   ◯   ◯   Strongly
Disagree   Agree

SQ7   The mobile shopping application is stable to a satisfactory degree (seldom crashes).

       1   2   3   4   5

Strongly   ◯   ◯   ◯   ◯   ◯   Strongly
Disagree   Agree

Section 5(c): Service Quality

Listed below are statements that describe the degree to which you believe that the service received from the IT support personnel is responsive, accurate, reliable, technically competent, and empathy. Please circle the number which best describes your perceived service quality of this mobile shopping application.

SVQ1 I can speak with a representative at the mobile shopping application in case I have
       problems with my account.

       1   2   3   4   5

Strongly   ◯   ◯   ◯   ◯   ◯   Strongly
Disagree   Agree

SVQ2 When I access my account I feel secure as the mobile shopping application instils confidence.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

SVQ3 The mobile shopping application understands the needs of their customers.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

SVQ4 The mobile shopping application delivers the service exactly as promised.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

SVQ5 The mobile shopping application provides various services.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

SVQ6 I am satisfied with the support I received.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

SVQ7 I am satisfied with the available user guides and help functions.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Section 5(d): Entertainment Gratification

Listed below are statements that describe the degree to which you believe that using the mobile shopping application is perceived to be enjoyable. Please circle the number which best describes your perceived entertainment gratification of this mobile shopping application.

EG1   Using the mobile shopping application to purchase products provides me with lots of enjoyment.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

EG2   I find it boring using the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

EG3   I find it pleasant using the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

EG4   I find it entertaining to use the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

EG5   I think the mobile shopping application is fun to use.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

EG6   I feel excited when surfing on the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

EG7   I enjoy surfing the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

EG8   I think the mobile shopping application is cool.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

EG9   I use the mobile shopping application because it is entertaining.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

EG10   I use the mobile shopping application to relieve boredom.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

EG11   I use the mobile shopping application in order to kill time.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

EG12   I use the mobile shopping application because it is exciting.

1   2   3   4   5

Strongly
Disagree

Strongly
Agree

EG13 I have fun when interacting with the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

EG14 Using the mobile shopping application allows me to relax.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Section 5(e): Irritation

Listed below are statements that describe the degree to which you believe that using this mobile shopping application would be irritating. Please circle the number which best describes your perceived irritation of this mobile shopping application.

I1   I often feel irritated when using the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

I2   I feel that the mobile shopping application is messy.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

I3   I feel that the mobile shopping application is confusing.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

I4   I am often irritated by unwanted pop-ups in the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

I5   I often feel frustrated when using the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

I6   I feel that advertisement from the mobile shopping application is irritating.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

I7   I feel that advertisements from the mobile shopping application are almost everywhere.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

I8   I feel that the contents in advertisements from the mobile shopping application are often annoying.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Section 5(f): Perceived Ease of Use

Listed below are statements that describe the degree to which you believe engaging in this mobile shopping application would be free of effort. Please circle the number which best describes your perceived ease of using this mobile shopping application.

PEOU1   Using the mobile shopping application would be clear and understandable.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PEOU2   Using the mobile shopping application would not require a lot of mental effort.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PEOU3   The mobile shopping application would be easy to use.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PEOU4   Using the mobile shopping application would allow me to shop the way I want to shop.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PEOU5   I find it easy to use the mobile shopping application to find what I want.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PEOU6   I learn how to use the mobile shopping application very quickly.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PEOU7   I find it easy learning to use the mobile shopping application.

         1   2   3   4   5

| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

PEOU8   I think learning to operate the mobile shopping application is easy.

| | 1 | 2 | 3 | 4 | 5 | |
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

PEOU9   I think becoming skillful at using the mobile shopping application is easy.

| | 1 | 2 | 3 | 4 | 5 | |
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

PEOU10   I can use the mobile shopping application without help from others.

| | 1 | 2 | 3 | 4 | 5 | |
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

Section 5(g): Perceived Usefulness

Listed below are statements that describe the degree to which you believe using this mobile shopping application would enhance your performance in shopping. Please circle the number which best describes your perceived usefulness of this mobile shopping application.

PU1   Using the mobile shopping application would improve my shopping productivity.

| | 1 | 2 | 3 | 4 | 5 | |
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

PU2   Using the mobile shopping application would enhance my effectiveness in shopping.

| | 1 | 2 | 3 | 4 | 5 | |
| Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

PU3   Using the mobile shopping application would be useful in buying what I want.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PU4   Using the mobile shopping application would improve my shopping ability.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PU5   I am able to accomplish my shopping goals more quickly when I am using the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PU6   Using the mobile shopping application improves my shopping decisions.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PU7   Using the mobile shopping application makes it easier for me to satisfy my needs.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PU8   Using the mobile shopping application enables me to accomplish tasks more quickly.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PU9   Using the mobile shopping application increases my chances of getting a reward.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

PU10   Using the mobile shopping application would increase my productivity in online transactions.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

PU11   Using the mobile shopping application would improve my performance in online transactions.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

PU12   Using the mobile shopping application would make it easier for me to engage in online transactions.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

PU13   I think using the mobile shopping application is very useful for me to engage in online transactions.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

PU14   Using the mobile shopping application would enhance my effectiveness in online transactions.

	1	2	3	4	5

| | Strongly Disagree | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly Agree |

PU15 I think using the mobile shopping application saves time.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Section 6: Purchase Intention

Listed below are statements that describe your degree of purchase intention while using this mobile shopping application. Please circle the number which best describes your purchase intention while using this mobile shopping application.

PI1 I prefer to shop using the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PI2 I plan to do more of my shopping via the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PI3 When I need to buy a particular product, I search for a mobile shopping application that has the product.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PI4 It is likely that I will transact with the mobile shopping application in the near future.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

PI5   Given the chance, I intend to use the mobile shopping application.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Appendix 4 Comments of Pilot Study Participants

Respondent	Comment	Modification
1	"After going through the questionnaires, I think they are really well written and I personally couldn't have wrote it better."	Not applicable
2	IQ17 Replace "work" with "shopping"	Term replaced
3	No comment	Not applicable
4	No comment	Not applicable
5	No comment	Not applicable
6	No comment	Not applicable
7	No comment	Not applicable
8	No comment	Not applicable
9	No comment	Not applicable
10	No comment	Not applicable
11	No comment	Not applicable
12	No comment	Not applicable
13	No comment	Not applicable
14	No comment	Not applicable
15	No comment	Not applicable

Appendix 5 Summary of Sources of Key Measurement Scales

Measure	Author	No. of Items	No. of Variables	Scale Range	Scale Type
Information Quality	Chia-Lin Hsu, Kuo-Chien Chang and Mu-Chen Chen (2011) Claus Bossena, Lotte Groth Jensena and Flemming Witt Udsen (2013) David Jingjun Xu (2007) Dong-Hee Shin (2007) Joonghwa Lee and Mira Lee (2011) Melody M. Tsang, Shu-Chun Ho, and Ting-Peng Liang (2004) Peter B. Seddon and Min-Yen Kiew (1995) Pruthikrai Mahatanankoon, H. Joseph Wen and Billy B.L. Lim (2006) Ultan Sharkey, Murray Scott and Dr. Tom Acton (2010) Weng Marc Lim and Ding Hooi Ting (2012)	17	1	5	Likert
System Quality	Chia-Lin Hsu, Kuo-Chien Chang and Mu-Chen Chen (2011) Claus Bossena, Lotte Groth Jensena and Flemming Witt Udsen (2013) Ultan Sharkey, Murray Scott and Dr. Tom Acton (2010)	7	1	5	Likert
Service Quality	Chia-Lin Hsu, Kuo-Chien Chang and Mu-Chen Chen (2011) Claus Bossena, Lotte Groth Jensena and Flemming Witt Udsen (2013)	7	1	5	Likert

Appendix 5 Summary of Sources of Key Measurement Scales (Continued)

Measure	Author	No. of Items	No. of Variables	Scale Range	Scale Type
Ease of Use	Chin-Lung Hsua, Hsi-Peng Lub and Huei-Hsia Hsuc (2006) Claus Bossena, Lotte Groth Jensena and Flemming Witt Udsen (2013) Dianne Cyr, Milena Head and Alex Ivanov (2006) Hannu Verkasalo, Carolina López-Nicolás, Francisco J. Molina-Castillo and Harry Bouwman (2010) Jen-Her Wua and Shu-Ching Wanga (2004) Niina Mallat, Matti Rossi, Virpi Kristiina Tuunainen and Anssi Oorni (2006) Pruthikrai Mahatanankoon, H. Joseph Wen and Billy B.L. Lim (2006) Seok Kang (2014) Terry L. Childersa, Christopher L. Carrb, Joann Peckc and Stephen Carson (2001) Weng Marc Lim (2013)	10	1	5	Likert

Appendix 5 Summary of Sources of Key Measurement Scales (Continued)

Measure	Author	No. of Items	No. of Variables	Scale Range	Scale Type
Usefulness	Chin-Lung Hsua, Hsi-Peng Lub and Huei-Hsia Hsuc (2006) Dianne Cyr, Milena Head and Alex Ivanov (2006) Hannu Verkasalo, Carolina López-Nicolás, Francisco J. Molina-Castillo and Harry Bouwman (2010) Jen-Her Wua and Shu-Ching Wanga (2004) Pruthikrai Mahatanankoon, H. Joseph Wen and Billy B.L. Lim (2006) Seok Kang (2014) Terry L. Childersa, Christopher L. Carrb, Joann Peckc and Stephen Carson (2001) Weng Marc Lim (2013)	15	1	5	Likert
Entertainment Gratification	David Jingjun Xu (2007) Dong-Hee Shin (2007) Hannu Verkasalo, Carolina López-Nicolás, Francisco J. Molina-Castillo and Harry Bouwman (2010) Namsu Park, Kerk F. Kee, and Sebastia´n Valenzuela (2009) Seok Kang (2014) Weng Marc Lim and Ding Hooi Ting (2012) Xueming Luo (2010)	14	1	5	Likert

Appendix 5 Summary of Sources of Key Measurement Scales (Continued)

Measure	Author	No. of Items	No. of Variables	Scale Range	Scale Type
Irritation	David Jingjun Xu (2007) Melody M. Tsang, Shu-Chun Ho, and Ting-Peng Liang (2004) Weng Marc Lim (2013) Weng Marc Lim and Ding Hooi Ting (2012)	8	1	5	Likert
Purchase Intention	Chia-Lin Hsu, Kuo-Chien Chang and Mu-Chen Chen (2011) David Jingjun Xu (2007) David Jingjun Xu, Stephen Shaoyi Liao and Qiudan Li (2007) Dong-Hee Shin (2007) Kwek Choon Ling, Lau Teck Chai and Tan Hoi Piew (2010) Seok Kang (2014) Weng Marc Lim (2013)	5	1	5	Likert

Appendix 6 Summary of Items

| Measure	Label	Items
Information Quality	IQ1	Information obtained from the mobile shopping application is useful.
	IQ2	The mobile shopping application gives me quick and easy access to large volume of information.
	IQ3	The mobile shopping application produces the most current information.
	IQ4	The mobile shopping application provides me with all the information I need.
	IQ5	The information provided by the mobile shopping application is accurate.
	IQ6	I feel that the mobile shopping application is a good source of timely information.
	IQ7	It is important that the mobile shopping application is able to give me information that is of interest to me.
	IQ8	Accurate information in the mobile shopping application improves my shopping effectiveness.
	IQ9	Timely information in the mobile shopping application improves my shopping performance.
	IQ10	Information in the mobile shopping application that is useful in aiding my shopping decisions is appreciated.
	IQ11	Information in mobile shopping application that makes it easier for me to compare product choices when shopping in mobile application is desirable.
	IQ12	The mobile shopping application provides me with high-quality information.
	IQ13	The mobile shopping application provides consistent and dependable information.
	IQ14	It is easy to find information in the mobile shopping application.
	IQ15	Information in the mobile shopping application appears orderly and easy to read.
	IQ16	Information in the mobile shopping application is always updated.
	IQ17	The mobile shopping application provides me with the information I need for my shopping.
System Quality	SYQ1	The mobile shopping application enables me to get on to it quickly.
	SYQ2	The mobile shopping application performs reliably.
	SYQ3	The mobile shopping application can be adapted to meet a variety of needs.
	SYQ4	The mobile shopping application makes it easy to get anywhere on the site.
	SYQ5	Response time for login is satisfactory.
	SYQ6	The mobile shopping application responds rapidly and satisfactorily when shifting between screens.
	SYQ7	The mobile shopping application is stable to a satisfactory degree (seldom crashes).
Service Quality	SQ1	I can speak with a representative at the mobile shopping application in case I have problems with my account.
	SQ2	When I access my account I feel secure as the mobile shopping application instils confidence.
	SQ3	The mobile shopping application understands the needs of their customers.
	SQ4	The mobile shopping application delivers the service exactly as promised.
	SQ5	The mobile shopping application provides various services.
	SQ6	I am satisfied with the support I received.
	SQ7	I am satisfied with the available user guides and help functions.

Appendix 6 Summary of Items (Continued)

Measure	Label	Items
Ease of Use	EOU1	Using the mobile shopping application would be clear and understandable.
	EOU2	Using the mobile shopping application would not require a lot of mental effort.
	EOU3	The mobile shopping application would be easy to use.
	EOU4	Using the mobile shopping application would allow me to shop the way I want to shop.
	EOU5	I find it easy to use the mobile shopping application to find what I want.
	EOU6	I learn how to use the mobile shopping application very quickly.
	EOU7	I find it easy learning to use the mobile shopping application.
	EOU8	I think learning to operate the mobile shopping application is easy.
	EOU9	I think becoming skillful at using the mobile shopping application is easy.
	EOU10	I can use the mobile shopping application without help from others.
Usefulness	US1	Using the mobile shopping application would improve my shopping productivity.
	US2	Using the mobile shopping application would enhance my effectiveness in shopping.
	US3	Using the mobile shopping application would be useful in buying what I want.
	US4	Using the mobile shopping application would improve my shopping ability.
	US5	I am able to accomplish my shopping goals more quickly when I am using the mobile shopping application.
	US6	Using the mobile shopping application improves my shopping decisions.
	US7	Using the mobile shopping application makes it easier for me to satisfy my needs.
	US8	Using the mobile shopping application enables me to accomplish tasks more quickly.
	US9	Using the mobile shopping application increases my chances of earning a reward.
	US10	Using the mobile shopping application would increase my productivity in online transactions.
	US11	Using the mobile shopping application would improve my performance in online transactions.
	US12	Using the mobile shopping application would make it easier for me to engage in online transactions.
	US13	I think using the mobile shopping application is very useful for me to engage in online transactions.
	US14	Using the mobile shopping application would enhance my effectiveness in online transactions.
	US15	I think using the mobile shopping application saves time.

Appendix 6 Summary of Items (Continued)

Measure	Label	Items
Entertainment Gratification	EG1	Using the mobile shopping application to purchase products provides me with lots of enjoyment.
	EG2	I find it boring using the mobile shopping application.
	EG3	I find it pleasant using the mobile shopping application.
	EG4	I find it entertaining to use the mobile shopping application.
	EG5	I think the mobile shopping application is fun to use.
	EG6	I feel excited when surfing on the mobile shopping application.
	EG7	I enjoy surfing the mobile shopping application.
	EG8	I think the mobile shopping application is cool.
	EG9	I use the mobile shopping application because it is entertaining.
	EG10	I use the mobile shopping application to relieve boredom.
	EG11	I use the mobile shopping application in order to kill time.
	EG12	I use the mobile shopping application because it is exciting.
	EG13	I have fun when interacting with the mobile shopping application.
	EG14	Using the mobile shopping application allows me to relax.
Irritation	IG1	I often feel irritated when using the mobile shopping application.
	IG2	I feel that the mobile shopping application is messy.
	IG3	I feel that the mobile shopping application is confusing.
	IG4	I am often irritated by unwanted pop-ups in the mobile shopping application.
	IG5	I often feel frustrated when using the mobile shopping application.
	IG6	I feel that advertisement from the mobile shopping application is irritating.
	IG7	I feel that advertisements from the mobile shopping application are almost everywhere.
	IG8	I feel that the contents in advertisements from the mobile shopping application are often annoying.
Purchase Intention	PI1	I prefer to shop using the mobile shopping application.
	PI2	I plan to do more of my shopping via the mobile shopping application.
	PI3	When I need to buy a particular product, I search for a mobile shopping application that has the product.
	PI4	It is likely that I will transact with the mobile shopping application in the near future.
	PI5	Given the chance, I intend to use the mobile shopping application.

Appendix 7 Vase's Proposal on Contract Terms

VASE.AI
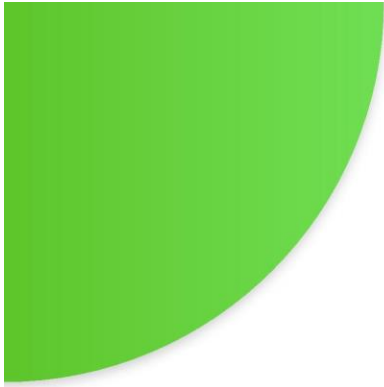
Esomar 28

Vase's answers to
ESOMAR 28 questions.

Table of Content

Introduction to Esomar28

The primary aim of these 28 Questions is to increase transparency and raise awareness of the key issues for researchers to consider when deciding whether an online sampling approach is fit for their purpose. Put another way, the aim is to help researchers to ensure that what they receive meets their expectations. The questions are also designed to introduce consistent terminology for providers to state how they maintain quality, to enable buyers to compare the services of different sample suppliers. Notes on the context of the questions explain why the questions should be asked and which issues researchers should expect to be covered in the answer.

These new questions replace ESOMAR's "26 Questions to help Research Buyers of Online Samples". ESOMAR has updated the text to recognize the ongoing development of techniques. While some of the questions remain constant, new questions have been added to incorporate new techniques and new technology in this area. In particular, this revision recognises the broad trend within the industry to build online samples from multiple sources rather than relying on a single panel.

It should be noted that these 28 Questions focus on the questions that need to be asked by those buying online samples. If the sample provider is also hosting the data collection you will need to ask additional questions to ensure that your project is carried out in a way that satisfies your quality requirements.

The 28 Questions complement ESOMAR's Guideline to Online Research which was revised in 2011 to add updated legal and ethical guidance and new sections on privacy notices, cookies, downloadable technology and interactive mobile.

Company Profile

1. What experience does your company have in providing online samples for market research?

Context: *This answer might help you to form an opinion about the relevant experience of the sample provider. How long has the sample provider been providing this service and do they have for example a market research, direct marketing or more technological background? Are the samples solely provided for third party research, or does the company also conduct proprietary work using their panels?*

Vase Technologies Sdn Bhd has been providing an exclusively-online research panel in Malaysia since 2015. Vase was founded by 3 individuals with a background in computer science, artificial intelligence & machine learning, which naturally makes us very technologically focused. Over the years since our beginning, we have acquired extensive knowledge & learned best practices in panel recruitment, panel management, panel validation, fraud control, as well as created algorithms that increase efficiency & accuracy in the way we do things.

Vase has quickly garnered the attention of researchers and worked with more than 200 companies & PhDs in our short 2 year in operations. We have since expanded our panel coverage to Singapore in 2016, and are looking to enter multiple Southeast Asian markets in the coming years.

Sample Sources and Recruitment

2. Please describe and explain the type(s) of online sample sources from which you get respondents. Are these databases? Actively managed research panels? Direct marketing lists? Social networks? Web intercept (also known as river) samples?

Context: *The description of the types of sources a provider uses for delivering an online sample will provide insight into the quality of the sample.*

Our online panel comes from our exclusive database, which we recruit using online marketing methods from various sources (SEO, Social Media, Referrals, Affiliates). Eager respondents signup at *https://getvase.com* and go through a rigorous validity checking process, including phone, bank account & NRIC validation, to ensure creating duplicate accounts are close to impossible.

With the help of artificial intelligence, our panel managers screen through new respondents weekly & remove fraudulent respondents.

3. If you provide samples from more than one source: How are the different sample sources blended together to ensure validity? How can this be replicated over time to provide reliability? How do you deal with the possibility of duplication of respondents across sources?

Context: *The description of the types of sources a provider uses for delivering an online sample will provide insight into the quality of the sample.*

Vase's panel only come from our exclusive database.

4. Are your sample source(s) used solely for market research? If not, what other purposes are they used for?

Context: *Combining respondents from sources set up primarily for different purposes (like direct marketing for example) may cause undesirable survey effects.*

Vase's panel are solely used for market research purposes. Under special circumstances, clients may request to collect contact details of respondents with consent (double opt-in) for marketing purposes.

5. How do you source groups that may be hard to reach on the internet?

Context: *Ensuring the inclusion of hard-to-reach groups on the internet (like ethnic minority groups, young people, seniors etc.) may increase population coverage and improve the quality of the sample provided.*

Vase employ digital marketing practises which allows us to precisely target groups that are hard to reach. These campaigns also include customised incentives to entice such groups to join our panel.

We are also consistently testing out new recruitment methods, including but not limited to display ads on targeted websites, referrals & social networks.

6. If, on a particular project, you need to supplement your sample(s) with sample(s) from other providers, how do you select those partners? Is it your policy to notify a client in advance when using a third party provider?

Context: *Many providers work with third parties. This means that the quality of the sample is also dependent on the quality of sample providers that the buyer did not select. Transparency is essential in this situation. Overlap between different providers can be significant in some cases and de-duplication removes this source of error, and frustration for respondents. Providers who observe process standards like the ISO standards are required to give you this information.*

Such instances rarely happen due to the size and capability of our own panel. However, when we are in need of employing third party providers, clients are fully involved in the process of selecting the third party provider that we work with.

Sampling and Project Management

7. What steps do you take to achieve a representative sample of the target population?

Context: *The sampling processes (i.e. how individuals are selected or allocated from the sample sources) used are the main factor in sample provision. A systematic approach based on market research fundamentals may increase sample quality.*

Vase built a proprietary internal tool to pick out representative sample (based on official census statistics) from our database. A generic sampling will create up to 200 permutations based on the number of criteria. Our internal tool's algorithm follows through the following steps to pick out samples:

1. Aggregate respondents that matches the screening criteria (demographics & other factors).
2. Randomly sample the required amount based on predictive analysis from the aggregated samples.

During deployment, samples are consistently monitored to make sure quotas are fulfilled accordingly. We allow or disallow respondents of particular demographics from answering the survey based on quotas achieved.

8. Do you employ a survey router?

Context: *A survey router is a software system that allocates willing respondents to surveys for which they are likely to qualify. Respondents will have been directed to the router for different reasons, perhaps after not qualifying for another survey in which they had been directly invited to participate, or maybe as a result of a general invitation from the router itself. There is no consensus at present about whether and how the use of a router affects the responses that individuals give to survey questions.*

No.

9. If you use a router: Please describe the allocation process within your router. How do you decide which surveys might be considered for a respondent? On what priority basis are respondents allocated to surveys?

Context: *Biases of varying severity may arise from the prioritisation in choices of surveys to present to respondents and the method of allocation.*

-

10. If you use a router: What measures do you take to guard against, or mitigate, any bias arising from employing a router? How do you measure and report any bias?

Context: *If Person A is allocated to Survey X on the basis of some characteristic then they may not be allowed to also do Survey Y. The sample for Survey Y is potentially biased by the absence of people like Person A.*

-

11. If you use a router: Who in your company sets the parameters of the router? Is it a dedicated team or individual project managers?

Context: *It may be necessary to try to replicate your project in the future with as many of the parameters as possible set to the same values. How difficult or easy will this be?*

-

12. What profiling data is held on respondents? How is it done? How does this differ across sample sources? How is it kept up-to-date? If no relevant profiling data is held, how are low incidence projects dealt with?

Context: *The usefulness to your project of pre-profiled information will depend on the precise question asked and may also depend on when it was asked. If real time profiling is used, what control do you have over what question is actually asked?*

Vase collects the following information from our respondents upon registration:

- Name
- Email
- Gender
- Birthdate
- Address
- Marital Status
- Race
- Religion
- Education Level
- Primary Transportation Mode
- Employment Status
- Occupation
- Industry
- Personal Income Range
- Household Income Range
- Phone Number - Verified
- Bank Account Number
- Multiple other behavioural data

NRIC details are requested upon respondent's first payout and used to validate their identity & bank account information.

Other than data points from initial profiling survey that we conduct, we collect data in regards to other topics (media, shopper behaviour, internet usage etc) from surveys that we deploy after registration. We continuously update our respondent's demographic information through surveys that we send.

All data transmitted on our platform are encrypted by SSL, which prevents man-in-the-middle (MiTM) attacks from modifying data between client and server.

13. Please describe your survey invitation process. What is the proposition that people are offered to take part in individual surveys? What information about the project itself is given in the process? Apart from direct invitations to specific surveys (or to a router), what other means of invitation to surveys are respondents exposed to? You should note that not all invitations to participate take the form of emails.

Context: *The type of proposition (and associated rewards) could influence the type of people who agree to take part in specific projects and can therefore influence sample quality. The level of detail given about the project may also influence response.*

Respondents receive an email / sms to inform them regarding available surveys. Invitation email contains the following information:

- Reward for answering the survey
- Expected time taken to answer
- Unique link to access survey
- Opt-out link

Survey content differs between respondents as per their answers. Unlike other methodologies, display logic & termination logics are used to ensure respondents only see questions that are relevant to their profile.

14. Please describe the incentives that respondents are offered for taking part in your surveys. How does this differ by sample source, by interview length, by respondent characteristics?

Context: *The reward or incentive system may impact on the reasons why people participate in a specific project and these effects can cause bias to the sample.*

Vase incentivises respondents with cash or product rewards. Cash rewards are similar to the point systems other market research companies use, but with better clarity for respondents. Rewards differ by factors such as interview length & project type (online survey vs online focus groups.)

Depending on respondents' demographics, Vase may employ product rewards as an incentive to entice respondents to answer. Product rewards may range from physical rewards (hamper, etc), to electronic vouchers.

15. What information about a project do you need in order to give an accurate estimate of feasibility using your own resources?

Context: *The "size" of any panel or source may not necessarily be an accurate indicator that your specific project can be completed or completed within your desired time frame.*

Vase will be able to provide clients with an accurate estimate based on:

- Overall sample definition
- Demographics – specific quotas for variables, if any
- Other behavioural screening criteria (e.g. online shoppers only, cosmetics user only etc.)
- Number of responses needed
- Length of interview (including stimulus)
- Project timeline

With these data points, we will be able to come up with whether a particular project is feasible for us to undertake. If a feasibility issue exists, we will work with clients to come up with compromise in terms of extending project timeline, shortening length of interview (reducing/splitting stimulus across different surveys), reducing number of responses etc.

16. Do you measure respondent satisfaction? Is this information made available to clients?

Context: *Respondent satisfaction may be an indicator of willingness to take future surveys. Respondent reactions to your survey from self-reported feedback or from an analysis of suspend points might be very valuable to help understand survey results.*

Vase measures respondents' satisfaction indirectly using internal metrics. A non-exhaustive list of the metrics we measure includes: unsubscribe rate, survey abandon rate, question abandon rate, customer support tickets to users ratio, customer support satisfaction, etc.

Certain information will be available to clients upon request.

17. What information do you provide to debrief your client after the project has finished?

Context: *One should expect a full sample provider debrief report, including gross sample, start rate, participation rate, drop-out rate, the invitation/contact text, a description of the field work process, and so on. Sample providers should be able to list the standard reports and metrics that they make available.*

Clients are updated during 4 phases:

1. Completion of survey scripting, prompted to check survey and confirm deployment.
2. Upon fieldwork deployment.
3. Real time update on fieldwork progress depending on projects.
4. Upon fieldwork completion.

Upon request, clients will be able to obtain any relevant metadata such as email open rates, email click rates, survey abandon rates, average survey time, incidence rate and any other related information in regards to the fieldwork.

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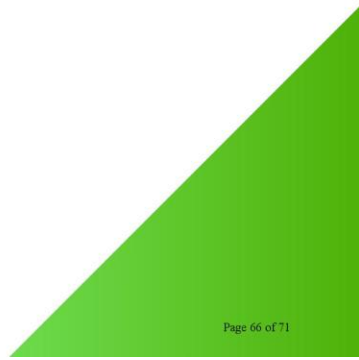
Data Quality and Validation

18. Who is responsible for data quality checks? If it is you, do you have in place procedures to reduce or eliminate undesired within survey behaviours, such as (a) random responding, (b) Illogical or inconsistent responding, (c) overuse of item non-response (e.g. "Don't Know") or (d) speeding (too rapid survey completion)? Please describe these procedures.

Context: *The use of such procedures may increase the reliability and validity of the survey data.*

Vase applies multiple techniques to ensure the quality of the data that we provide to clients for analysis, specifically:

- Speeder check
- Straightliners check
- Logic check
- Habitual non-response to open ended questions
- Demographics check

Respondents who consistently fail our quality checks will be removed from our database entirely. Instances where clients request for full raw data without additional processing can be fulfilled as well.

19. How often can the same individual be contacted to take part in a survey within a specified period whether they respond to the contact or not? How does this vary across your sample sources?

Context: *Over solicitation may have an impact on respondent engagement or on self-selection and non-response bias.*

Respondents on average receive a survey bi-weekly, this allow us to not overburden respondents, while keeping them engaged in answering surveys.

20. How often can the same individual take part in a survey within a specified period? How does this vary across your sample sources? How do you manage this within categories and/or time periods?

Context: *Frequency of survey participation may increase the risk of undesirable conditioning effects or other potential biases.*

Restrictions are set from study-to-study. We can control invitations based on previous studies a particular respondent has completed, and within a desired time frame (generally 3 to 6 months between similar studies) specified. Needless to say, no one respondent can respond to the same study twice.

21. Do you maintain individual level data such as recent participation history, date of entry, source, etc., on your survey respondents? Are you able to supply your client with a project analysis of such individual level data?

Context: *This type of data per respondent including how the total population is defined and how the sample was selected and drawn, may increase the possibilities for analysis of data quality.*

All metadata of a survey response such as email open, email clicks, survey start date, survey submission date, user agent, source IP are recorded and stored in our database. Under normal circumstances, clients do not get access to such data, it is for internal usage & analysis only.

22. Do you have a confirmation of respondent identity procedure? Do you have procedures to detect fraudulent respondents? Please describe these procedures as they are implemented at sample source registration and/or at the point of entry to a survey or router. If you offer B2B samples what are the procedures there, if any?

Context: *Confirmation of identity can increase quality by decreasing multiple entries, fraudulent panellists etc.*

All respondents provide name, email, phone number, bank account number & NRIC for validation. We verify email through unique links, and phone number through SMS. Bank accounts are validated with logic rules & upon first respondent reward payout. For certain countries, NRIC validity is obtained through the existing banking infrastructure, and we also access publicly available resources (differs by country) to validate NRIC. This ensures there will be no duplication of people in our database.

Also, as mentioned earlier, our panel managers screen through new respondents once a week using our proprietary AI-based respondent screener.

Policies and Compliances

23. Please describe the 'opt-in for market research' processes for all your online sample sources.

Context: *The opt-in process indicates the respondents' relationship with the sample source provider. The market generally makes a distinction between single and double opt-in. Double opt-in refers to the process by which a check is made to confirm that the person joining a panel or database wishes to be a member and understands what to expect (in advance of participating in an actual survey for a paying client).*

Vase communicates with our potential respondents clearly through our website that they will be participating in market research surveys before they sign up. At signup, respondents are shown a message in regards to accepting our terms of use & privacy policy.

We also make sure it is easy to opt-out from our panel any time a respondent wish by providing them unsubscribe links in most email we send out. Respondents are encouraged to reply to our email if they have any enquiries, without having to email to a specialised support email.

24. Please provide a link to your Privacy Policy. How is your Privacy Policy provided to your respondents?

Context: *Not complying with local and international privacy laws might mean the sample provider is operating illegally. An example privacy policy is given in the ESOMAR Guideline for Online Research.*

Latest privacy policy can be found at *https://getvase.com/privacy.html* (subject to change for different countries). Link to privacy policies are showed during the signup process.

25. Please describe the measures you take to ensure data protection and data security.

Context: *The sample provider usually stores sensitive and confidential information on panellists and clients in databases. These data need to be properly secured and backed-up, as does any confidential information provided by the client. The sample provider should be able to provide you with the latest date at which their security has been evaluated by a credible third-party*

Vase hosts all our respondents related data on Microsoft Azure, an ISO 27001:2013 security standard certified public cloud provider. Furthermore, all data is encrypted-at-rest and in transit with industry standard protocols (TLS 1.2 and AES-256-CBC). Internally, only personnel directly in charge of panel management have access to respondent's personal identifiable information. In addition, all employees are required to abide to our NDAs and are subject to disciplinary action if violated.

26. What practices do you follow to decide whether online research should be used to present commercially sensitive client data or materials to survey respondents?

Context: *There are no foolproof methods for protecting audio, video, still images or concept descriptions in online surveys. In today's social media world, clients should be aware that the combination of technology solutions and respondent confidentiality agreements are "speed bumps" that mitigate but cannot guarantee that a client's stimuli will not be shared or described in social media.*

Vase communicates clearly with clients that there is no foolproof way to protect commercially sensitive data or materials that we are presenting to survey respondents, but we adhere to multiple best practices to minimise the chance of data falling into the wrong hands.

Firstly, respondents are subjected to restrictions on sharing/re-use of any material on our website by virtue of their agreement to our Terms and Conditions. Secondly, general protection such as limitation to content after participation is applied. Thirdly, screening questions are added when sensitive materials are being displayed, screening out relevant industry competitors.

27. Are you certified to any specific quality system? If so, which one(s)?

Context: *Being certified may require the supplier to perform tasks in a pre-determined manner and document procedures that should be followed.*

Vase host all our respondents related data on Microsoft Azure, among their certifications are:

- ISO/IEC 27018
- CSA/CSM
- ITAR
- CJIS
- HIPAA
- IRS 1075
- More here: https://azure.microsoft.com/en-us/support/trust-center/

28. Do you conduct online surveys with children and young people? If so, do you adhere to the standards that ESOMAR provides? What other rules or standards, for example COPPA in the United States, do you comply with?

Context: *The ICC/ESOMAR International Code requires special permissions for interviewing children. These are described in the ESOMAR Online Research Guideline. In the USA researchers must adhere to the requirements of the Children's Online Privacy Act (COPPA). Further information on legislation and codes of practice can be found in Section 6 of ESOMAR's Guideline for Online Research.*

Vase rarely undertake projects that require us to survey children / young people. Young people (13 y/o and above) are permitted to have an account on our platform.

When required to conduct research on children, they are accessed through permission from parent / guardian from our own respondents base. All contact is done through parent / guardian with supervision.
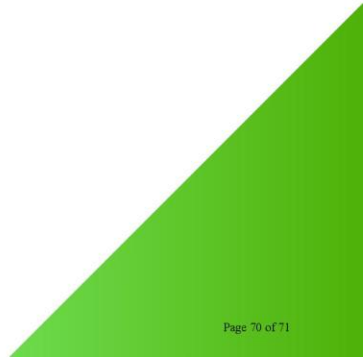
Contact

Website

HTTPS://VASE.AI

Email

EXPERT@VASE.AI

Address

Vase Technologies Sdn Bhd (1152290-M)
B-15-07
No. 6, Pesiaran Multimedia, Seksyen 7
40000, Shah Alam
Selangor, Malaysia

Appendix 8 Ethics Clearance Approval

To: Dr Ling Chui Ching, Sarawak

SHR Project 2018/224 - Assessing Factors Affecting Purchase Intention Of Mobile Application Users
Dr Ling Chui Ching, A/Prof Weng Marc Lim, Dr Jee Teck Weng, Ida Tang Xin En (Student) —
Sarawak
Approved duration: 16-07-2018 to 28-03-2019 [Adjusted]

I refer to the ethical review of the above project by a Subcommittee (SHESC1) of Swinburne's Human Research Ethics Committee (SUHREC). Your response to the review as e-mailed on 11 July 2018 was put to the Subcommittee delegate for consideration.

I am pleased to advise that, as submitted to date, ethics clearance has been given for the above project to proceed in line with standard on-going ethics clearance conditions outlined below.

- The approved duration is **16 July 2018** to **28 March 2019** unless an extension is subsequently approved.

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the *National Statement on Ethical Conduct in Human Research (2018)* and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor, and addition or removal of other personnel/students from the project, requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical   review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project. Information on project monitoring and variations/additions, self-audits and progress reports can be found on the Research Intranet pages.

- A duly authorised external or internal audit of the project may be undertaken at any

  time.

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance, citing the Swinburne project number. A copy of this e-mail should be retained as part of project record-keeping.

Best wishes for the project.

Yours sincerely,

Sally Fried

Secretary, SHESC1

Appendix 9 Acknowledgement of the Ethics Final Report

From: donotreply@infonetica.net <donotreply@infonetica.net>

Sent: Friday, 8 November, 2019 5:20 AM

To: ChuiChing Ling <ccling@swinburne.edu.my>

Cc: resethics@swin.edu.au

Subject: Acknowledgement of Report for 20190853-1921

Dear Ling ,

The Annual or Final Report for project 20190853-1921   Assessing Factors Affecting Purchase Intention Of Mobile Application Users has been processed and satisfies the reporting requirements set under the terms of ethics clearance.

Regards,

Ms Sally Fried

Research Ethics Office

Swinburne University of Technology

P: 9214 8145 | E: resethics@swin.edu.au