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Relationships between system quality, service quality, and customer satisfaction:

M-commerce in the Jordanian context

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Abstract

Purpose – This study aims to explore the impact of system quality dimensions, namely, ease of use, accessibility, interactivity and website innovativeness on service quality (SQ) and customer satisfaction.

Design/methodology/approach – The study used a quantitative approach, by using a survey method. The unit of analysis was the individual. A total of 618 questionnaires were randomly distributed to university students and staff in Jordan. The partial least square path-modeling method was used in the estimation of causal relationships of the constructs examined in the study.

Findings – The outcomes of this study showed that ease of use, interactivity and website innovativeness have significant positive relationships with the SQ. Consequently, SQ significantly influences customer satisfaction.

Research limitations/implications – Limitations of this research were related to the unit of analysis, as it was conducted within the geographical region of Jordan and the university context, where the culture and level of the technological advancement may be different than other countries.

Practical implications – This research can assist mobile commerce (m-commerce) service policymakers to formulate significant policies that could enhance the nature of services being rendered and thus bring greater benefits to the customers.

Originality/value – This research has extended the body of knowledge on emerging trends in m-commerce innovation adoption, more specifically in the university context. Furthermore, it offers insight on the importance of m-commerce in the minds of customers, in such a way that it will bring about the intention to repeat patronage in the future.

Keywords Customer satisfaction, Service quality, University, M-commerce, Systems quality

Paper type Research paper

1. Introduction

Information technology (IT) has brought about many changes in the world today, including in industrial and service sectors. With IT, it has become easier and faster to gain access to



consumers and deliver what consumers have ordered to meet their needs (Ali, 2016; Alfawaer *et al.*, 2011; Ombati *et al.*, 2010). Closely related to IT is the role of the internet that is evolving very rapidly, particularly electronic commerce (e-commerce), as stated in many previous studies such as by Jay and Zhang (2016). Further development of time- and location-bound commerce has resulted in the evolution of one particular type of e-commerce, namely, mobile commerce (m-commerce) that has been categorized under the technology and services sector (Kim *et al.*, 2010; Lu and Su, 2009). M-commerce is becoming the norm and a buzzword, where customers can access products and/or services across locations and in real time, i.e. wherever and whenever (Prabhaker, 2000; Sadi and Noordin, 2011). Because of the mobility of telecommunication devices, existence of m-commerce on devices and improvements in mobile internet services, business transactions become characteristically real-time and seamless (Dholakia and Dholakia, 2004; Olla *et al.*, 2003; Suki, 2011). M-commerce does not necessarily lead to an increase in mobility, but rather it is more cost-effective (Deb and Agrawal, 2017), as it reduces the consumers' need of traveling about in search of a product or service (Mallat *et al.*, 2009). It is expected that customer satisfaction (CS) through m-commerce services can be achieved after experiencing the quality of systems and services rendered to them. As there seems to be lack of studies in the m-commerce area, this article is the result of a study that had been motivated to explore the factors that can enable high-quality m-commerce services within the commercial environment.

In Jordan, mobile phones play a more important role than the internet (Alfawaer *et al.*, 2011), but m-commerce is still in its early stages (Abdelkarim and Nasereddin, 2010; Alfawaer *et al.*, 2011). Even with the increasing mobile subscriptions, the use of m-commerce by mobile phone users is still very low. This is because users may have some doubts when using mobile devices to make purchases, perhaps because of security concerns. Despite its low usage, the popularity of mobile phones has the potential to accelerate m-commerce. Thus, many organizations are now investing enormous amounts of money on these technologies (Kim *et al.*, 2010; Wang and Liao, 2007). In addition, the growing number of mobile device users has resulted in increased usage of m-commerce, which offers portability (Ktoridou *et al.*, 2008; Junglas and Watson, 2003) and ubiquity (Ktoridou *et al.*, 2008; Lyytinen and Yoo, 2002). Another important aspect in m-commerce is service quality (SQ), which should not be neglected by the company to ensure CS (Ali, 2016; Jimenez *et al.*, 2016).

As evidenced in several previous studies, m-commerce is still in its infancy (Lu *et al.*, 2009; Turel and Serenko, 2006). It is a relatively new phenomenon in many markets around the world, such as the USA, Europe, Japan, Africa, the Middle East and Asia-Pacific countries, like Singapore, India, Bangladesh and Malaysia (Johnson and Wannemacher, 2011; Yap, 2011; Islam *et al.*, 2010; Sadi and Noordin, 2011). Hence, it is crucial for service providers to understand or be aware of CS on m-commerce quality and undertake measures to ensure continued provision of these systems. However, there are limited studies on SQ for m-commerce users (Lu *et al.*, 2009; Özer *et al.*, 2013). Therefore, based on the gaps in the literature, this research has investigated the relationship between systems quality, SQ and CS on the use of m-commerce services, specifically in the Jordanian context.

2. Mobile commerce

Mobile communication has also been identified as another form of IT that is playing an increasingly important role in today's business and society. The impact and significant advances in telecommunication and wireless mobile networks in providing facilities and equipment, standards and network implementations are enormous. Also recorded is the user acceptance, which has the potential of creating new business opportunities for firms that provide services to the users (Feng *et al.*, 2006). The assessment reports of popular

companies are always in the media when they make an announcement of their plans to incorporate m-commerce in their business plans (Goodman, 2000; Barnes, 2002).

M-commerce can be essentially defined as an advancement in the wireless connection product that has transcended a level beyond the experiences in television or personal computer, and the hand-held portable device, such as PDA. M-commerce thrives on more interconnected situations enabling the mobile device carriers to get connected all the time and in all the places (O'Dea and Abraham, 2000). Recently, m-commerce has been defined as the transaction executed through the use of mobile phone (Veijalainen *et al.*, 2003).

M-commerce has been highlighted as another phase of business innovation. Therefore, it is opened to aid the extension of the organizational approach to achieve greater heights of business performance, and also affect changes in the inter-relationships among companies, suppliers, customers and partners (Anckar *et al.*, 2003). M-commerce centers on business transactions that are data-driven and value exchanges by mobile device users through wireless telecommunication networks (Cronin, 2003; Feng *et al.*, 2006). According to Paavilainen (2002), m-business is the act of exchanging goods, services and information through the use of mobile technology. It is further said that mobile business on a broader definition includes communicating and transacting a variety of value-added services with the use of different kinds of mobile terminals (Feng *et al.*, 2006).

Many researchers and scholars (Andreou *et al.*, 2002; Chun and Wei, 2004; Wong and Hiew, 2005) defined m-commerce as transactions performed through a wireless device with the aid of a data connection, resulting in transfer of information, services and/or goods. Another definition suggested by Sadi and Noordin (2011), was that m-commerce is the act of using wireless terminals, cellular telephones, smart phones or PDAs, with the aid of the internet to access information needed for conducting business transactions. This can result in a transfer and exchange of information, services and goods. Natural m-commerce serves as an extension for e-commerce. This then allows users to interact with their businesses and communicate with other users in a wireless mode, at any point in time, regardless of location.

Furthermore, some scholars (Turban *et al.*, 2004; Wei and Ozok, 2005) explained that m-commerce is a monetary transaction conducted by a mobile device for the purpose of exchanging goods and services. Notably, there is always a specific operating system associated with the use of a mobile device and a mobile-dedicated network. Based on all these definitions in the m-commerce literature, it can be concluded that any economic-value transaction executed through a mobile device using a wireless telecommunications network as a connection hub to the e-commerce infrastructure is qualified to be called m-commerce.

There are many benefits of wired technology. However, lack of mobility of wired technology offers limited access for users. It infrequently provides flexible functionality as compared to mobile wireless technologies. Mobile technologies can reduce the consumers' need to travel, as the services are readily available through their mobile devices (Mallat *et al.*, 2009).

More importantly, m-commerce strengths lie in core specific features and characteristics, like ubiquitous, flexibility, personalization and localization. These stated features are not present in t- and e-commerce. In this light, there are more advantages, added values and benefits for customers using m-commerce (Boadi *et al.*, 2007).

On this basis, m-commerce can be safely considered as an emerging e-commerce technology that benefits both customers and vendors. Wireless applications used in banking and financial services, ticketing, shopping and traveling are continuously being developed and enhanced to aid easy and effective usage of mobile devices. Therefore, m-commerce has been continuously creating benefit-driven applications and infrastructures that are

improving the companies' and customers' ways of conducting business (Joseph and Mahatanankoon, 2004).

3. The use of mobile commerce in the university context

Hitherto the advent of m-commerce, commercial business transactions were only provided through electronic media. In contrast, today they are being offered on the fast-emerging mobile platform. This development is the result of exponential rise in mobile device usage globally. Reports showed that one-third of the world population has access to mobile phones. Consequently, the development is significantly boosting m-commerce usage (Tiwari and Buse, 2007; Sadi *et al.*, 2010).

Udo *et al.* (2010) developed the constructs of Web SQ and further analyzed their relationships with behavioral intentions and CS using the e-business environment as a case study. Their study examined the dimensions of the Web SQ based on the e-customer expectations and perceptions. Furthermore, the effect of the risk perception on SQ, CS and the customer intention to continue online shopping had been studied. The survey was conducted using 211 senior students enrolled in the business administration program at a large public university in the southwest of the USA as the respondents. The selected respondents to participate in the study were those who have made at least one online purchase within the past six months. The study revealed that perceived risk does not have an effect on Web SQ. However, the relationship between SQ and other factors was significant. Although this study dealt with just a few factors, the R^2 value (0.619) was higher than in several studies that dealt other similar several factors (Lee and Lin, 2005; Santos, 2003).

Another study by Al-Mushasha and Hassan (2009) proposed an SQ model for m-learning in a university environment. Their model provided a means for measuring overall learner-perceived SQ, the learner satisfaction and behavioral intention to use the service in the future. The findings revealed that interface design, reliability, trust, content of usefulness, content adequacy, ease of use, accessibility and interactivity were factors that lead to m-learning SQ in the university environment. However, two factors (responsiveness and personalization) were found insignificant in relation to the perceived SQ.

4. Implication of mobile commerce services

M-commerce has been newly defined as the transaction executed through the use of mobile phones, and thus senior managers often incorporate m-commerce in their business plans that have the potential of creating new business opportunities for organizations that provide these services (Ali, 2016; Feng *et al.*, 2006; Veijalainen *et al.*, 2006). As stated earlier, previous researchers, such as Sadi and Noordin (2011), defined m-commerce as the transactions done through the wireless device with the aid of data connection resulting in a transfer of information, services and/or goods, including monetary transactions.

M-commerce is also specified to be a subset of e-commerce (Coursaris and Hassanein, 2002; Kwon and Sadeh, 2004). In any m-commerce transaction, like e-banking or e-purchasing of products, a mobile hand-held device such as mobile phones and PDAs can be used for its execution without any need for computers. This development has resulted in the tremendous growth of mobile technologies (Kippenberger, 2000; Kumar and Stokeland, 2003) and creating new phases of opportunities and infrastructure for m-commerce development (Ngai and Gtmsaekaran, 2007). According to Tiwari *et al.* (2008), m-commerce, on the basis of the earlier-discussed features, makes provision for additional value-added utility, including context-specific services and time-critical situations.

There is evidence that m-commerce could benefit users in terms of the ease of accessibility and availability of m-commerce services, from anywhere and at any time (Lu *et al.*, 2009). Therefore, examining the present-day market with respect to the idea of service perspectives, a firm cannot solely rely on its physical product if it aims to achieve optimal effectiveness (Gronroos, 2007). It should have m-commerce in mind to make their services and/or products available to customers across boundaries.

5. Systems quality

Research on information systems (IS) has resulted in various instruments to measure system quality. Among them, ease of use has been regarded as the most frequently used factor in measuring the quality of systems. Other than that, researchers also identified system quality factors, including interactivity, navigation, access, hyperlinks, website innovativeness, enjoyment and entertainment, as being important as well (Deb and Agrawal, 2017; Lin and Hsieh, 2011; O’Cass and Carlson, 2012).

Davis *et al.* (1992), defined ease of use as “the degree to which a person believes that using a particular system would be free of effort”. Teo (2001) defined it as “the degree to which the user expects the use of the system to be user-friendly”. The ISO 20000 defined ease of use as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO, 1998). Meanwhile, Nielsen (1996) pointed out that it can be measured by learnability, efficiency, memorability, low errors and subjective satisfaction. In the m-commerce environment, what can be used to describe adoption and use of system is extended – ease of use is achieved when the system is used to fulfill customer needs and support services are available (Uther, 2002; Costabile *et al.*, 2005). Therefore, ease of use plays a vital role in determining customer-perceived mobile SQ (Abbas, 2016; Bagchi and Kirs, 2010; Lin and Hsieh, 2011).

In a more formal setting, Davis (1989) explained the technology acceptance model (TAM) as the degree of users’ intention to use an IS. It was further detailed through user acceptance of IS. This adoption can be better determined by the degree of user beliefs about the system. In close examination, the theory of reasoned action is consistent with TAM, as it is assumed that attitude toward a system is best operationalized as “perceived ease of use” and “perceived usefulness”. This will further have an impact on the motivation (intention) to use the system and, as a result, into actual usage. Several studies worked on TAM and modified it to suit their respective contexts of study. TAM has proven to be reliable in predicting usage acceptance of IT (Gefen *et al.*, 2003; King and He, 2006; Wang, 2003). Meanwhile on internet usage, Chen *et al.* (2002) established its equal usefulness to consumer perceptions, with the submission that using the internet will ensure there is an improvement in their information seeking and shopping experience. On the other hand, ease of use can be explained by the amount of effort involved in online shopping.

In further development, the unified theory of acceptance and use of technology (UTAUT) (Venkatesh *et al.*, 2003) is consistent with TAM because of the assumption that user intentions in using IS have the potential to result in usage behavior. However, because of the authors’ observation of the model’s weaknesses, TAM was extended through the recommendation of four distinct constructs, namely, performance expectancy, effort expectancy, facilitating conditions and social influence. These provisions made way for facilitation of these primary determinants of usage intention and subsequent behavior. Performance expectancy is the level at which an individual’s belief about system usage helps in maintaining job performance. This is similar to “perceived usefulness” reported in TAM. Effort expectancy is the level of ease experienced during system usage (similar to TAM’s perceived ease of use). Social influence, by its operational definition, is the rate of

individual perception on the importance of how others believe he/she should use the new system. This is essentially similar to subjective norms in theory of planned behavior (TPB). The facilitating condition is the degree to which an individual believes in the existence of organizational and technical infrastructure to support system use. This is also essentially similar to TPB's and TAM's perceived behavioral control.

The dimensions of E-SQ determined by previous researchers, including Gounaris and Dimitriad (2003), Novak *et al.* (2000) and Loiacono *et al.* (2002), have their origins in TAM, as developed by Davis (1989). Davis defined perceived technology ease of use as "the degree to which the prospective user expects the target system to be free of effort". He further perceived technology usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance". These dimensions can help companies to predict consumer behavior when they decide to use a specific technology. It is said that the ease of use and usefulness of using a particular system, affect customer adoption of the system (Davis, 1989; Davis *et al.*, 1989; Legris *et al.*, 2003).

Shneiderman (1998) argued that the subjective satisfaction of a user through the use of IT is influenced by perceived quality characteristics of technology like ease of use and usefulness. According to Spreng and Mackoy (1996), perceived SQ precedes satisfaction with quality and the value of this given quality. It can thus be concluded that perceived SQ is a concept used to understand how service is developed. However, CS is a concept used to evaluate the success of these services in terms of their fulfillment of the customer needs and desires. Gronroos (2001) similarly stated that "quality, as such, should not be measured", but "how well perceived SQ dimensions serve customers, could and should be measured with customers' satisfaction with the service".

SQ of m-commerce can bridge the communication gap between customers and businesses. This is because m-commerce provides customers with "anytime, anywhere" access; thus, it would be possible for them to interact with each other more effectively. In addition, m-commerce allows flexibility in delivering critical services to businesses. Furthermore, it allows the possibility for more flexible fares. For customers who are in a hurry, they do not need to queue at markets and shops or move from one location to another in search of a good bargain. In other words, m-commerce can provide the comfort of handling transactions, such as the purchase of airline tickets and payment of fees for universities from the comfort of the customers' homes or offices. M-commerce has also reduced the need to carry cash or electronic cards around. Based on this preliminary research the following was hypothesized for the study:

H1. There is a significant positive relationship between ease of use and SQ.

Accessibility in the m-commerce environment refers to the availability of the system, where and when customers need to conduct any kind of commercial transactions. The potential benefits of using an m-commerce system cannot be successfully achieved without having reliable speedy online access because customers expect m-commerce services to be available on demand. M-commerce applications and services therefore depend heavily on the underlying network support. Two of the most significant factors that influence the development and quality of m-commerce services are the available bandwidth offered by the wireless networks and network coverage (Papanikolaou and Mavromoustakos, 2006; Siau *et al.*, 2001).

In addition, the growing number of mobile device users is resulting in increased usage of m-commerce. In addition to these features of reachability, identification, accessibility and localization available on e-commerce (Junglas and Watson, 2003), m-commerce also offers portability (Ktoridou *et al.*, 2008; Junglas and Watson, 2003) and ubiquity (Ktoridou *et al.*, 2008;

Lyytinen and Yoo, 2002). The main difference between e-commerce and m-commerce is the interface (small versus large screen) of the mobile device. Tiwari and Buse (2007) emphasized that m-commerce is actually a subset of m-business, as m-businesses include the commercial and the non-commercial areas.

From the literature, there is evidence that e-commerce depends heavily on the availability of a wired network connection to the internet and there is still limitation to this service among customers and corporate professionals who are constantly on the move. However, there is also strong evidence that m-commerce can overcome such limitation by offering potential benefits in the field of business. These benefits include the ease of accessibility and availability of m-commerce service from anywhere and at any time. The outcome of the literature review encouraged this research to explore the practical implications of the m-commerce service, as the new millennium has witnessed a remarkable move from wired to wireless services (Lu *et al.*, 2009). Thus, the following was hypothesized for this study:

H2. There is a significant positive relationship between accessibility and SQ.

Interactivity refers to the interactive relationship between the provider, customers and other customers in the m-commerce portal through e-mail communication methods and discussion group activities. According to Ding *et al.* (2011), Kaisara and Pather (2011) and Papadomichelaki and Mentzas (2012), communication methods, like e-mail and discussion groups, are important tools for customers to use in communicating complaints and enquiries to the provider. Thus, interactivity has a significant positive impact on CS (Ding *et al.*, 2011; Kaisara and Pather, 2011; Papadomichelaki and Mentzas, 2012).

Meanwhile, system quality includes three sub-dimensions, namely, ease of use, accessibility and interactivity. Ease of use means the degree of a person's belief that using a particular system would be effort-free or the degree of the users' expectation about the user friendliness of the system. Accessibility refers to the time it takes to actively perform the service. Interactivity is the ability of the website in allowing different flows of communication between the users of the sites, the company's personnel, interactive information search and transactions via the website. It has been recommended that these findings can be used for m-government, m-commerce, m-services and so on. One of the limitations in this study marked the significance of its scope. This is why this study focused on the university environment only. The authors suggested that additional work needs to focus on the government or business enterprises to investigate the influences of factors that result in m-learning in different types of services. There is, therefore, a need to continuously refine the scale into the overall SQ, and incorporate new aspects of overall SQ into the proposed scale. This would verify the measure of overall SQ (Al-Mushasha and Hassan, 2009).

To understand and organize the m-commerce SQ, for theoretical purposes in this study, it was organized by dimensions and sub-dimensions, considering that mobile services can be considered a sub-group of e-services. The sub-dimensions adopted by this study were website design, reliability, responsiveness, trust, personalization, perceived risk, perceived cognitive control, content usefulness, content adequacy, ease of use, accessibility, perceived website innovativeness and interactivity. The adoption of these dimensions was because they seem to have influence on the customer's overall perception about m-commerce SQ and customer's satisfaction, which affect the formation of the user's behavioral intention. Meanwhile, the overall SQ was determined by dimensions SQ, namely, information quality and system quality.

System quality refers to customers' perception of a mobile portal's performance in information retrieval and delivery. Research on IS resulted in various instruments to

measure system quality. Among them, ease of use has been regarded as the most frequently used factor in measuring IS success or user satisfaction. In the context of websites, previous researchers had identified system quality factors, such as interactivity, navigation, access, hyperlinks, perceived website innovativeness, enjoyment and entertainment (La and Kandampully, 2002; Lohse and Spiller, 1998; Loiacono *et al.*, 2002; Madu and Madu, 2002; McKinney *et al.*, 2002; Riel *et al.*, 2001; Zhang and Von Dran 2002; Santos, 2003; Lin and Hsieh, 2011; O’Cass and Carlson, 2012). Thus, the following hypothesis was formulated for the study:

H3. There is a significant positive relationship between interactivity and SQ.

Brand association arising from consumer perception of the consumption experience is observed to influence cognitive evaluation of SQ (Brodie *et al.*, 2009). Understanding system quality as perceived by customers is not only a critical performance outcome of the service experience but also a critical factor in influencing CS and loyalty as determinants of organizational performance (Cronin *et al.*, 2000). In the context of this study, the researcher argued that once a customer makes an assessment that the provider’s website-service experience is perceived to be innovative, the consumer will then be more likely to evaluate the website to have delivered quality e-service, and thus this would increase their satisfaction.

6. Service quality

SQ is a critical factor and noted lately as the measure of effectiveness and efficiency in evaluating m-commerce performance. It has also become an important discourse in the web of academics and practitioners, especially those in service marketing areas (Jimenez *et al.*, 2016), technology (San-Martin *et al.*, 2012) and operations management (Jay and Zhang, 2016). Therefore, an organization providing a higher quality of service would increase the market share and return on investment, thus ensuring the long-term profitability (Jimenez *et al.*, 2016; Ghobadian *et al.*, 1994). Hence, SQ is essential for the organization to achieve greater CS and gain a competitive advantage (Ali, 2016; Jay and Zhang, 2016; Jimenez *et al.*, 2016).

Perceived SQ has been defined as a global judgment or attitude relating to the superiority of service (Parasuraman *et al.*, 1985) and as the consumer’s overall impression of the inferiority/superiority of the organization and its service (Bitner and Hubbert, 1994). Review of the extant literature has shown that only a few studies measured the impact of SQ in m-commerce. Most of these studies only studied m-commerce SQ by examining the behavior of customers (Lu *et al.*, 2009; Ozer *et al.*, 2013), while other studies examined how SQ relates to various m-service applications (Kar *et al.*, 2006; Yun *et al.*, 2005). Al-Mushasha and Hassan (2009) proposed a SQ model for m-learning usage in a university environment. Their model provides a means for measuring the learners’ perceived SQ on its overall learner satisfaction and behavioral intention to use the service in future. The findings revealed interface design, reliability, trust, content usefulness, content adequacy, ease of use, accessibility and interactivity as the factors that lead to m-learning SQ in a university environment. The behavioral intentions in e-learning were also discussed in sufficient detail by Abbas (2016).

Previous studies showed that computer self-efficacy strongly influences the responses of users to IT. Also included are experiences in online shopping (Agarwal and Prasad, 1999; Venkatesh and Davis, 2000). From other related theories of IS perception, UTAUT (Venkatesh, Morris *et al.*, 2003), DeLone and McLean IS Success Model (DeLone and McLean, 1992) and TAM (Davis, 1989) had proven to be reliable in predicting usage acceptance of IT (Gefent *al.*, 2003; King and He, 2006; Wang, 2003). Meanwhile on internet

usage, [Chen *et al.* \(2002\)](#) established its equal usefulness to consumer perception, with the submission that using the internet will ensure that there is an improvement in their information-seeking and shopping experience. [Bhattacharjee \(2001\)](#) developed the IS continuous model based on the consumer's behavior theory of expectation–confirmation and TAM. However, as an extension, it made an attempt to explain user intention to continue the usage of an IS after the initial acceptance. This is also known as the post-adoption model because its extension is more than the acceptance stage on its initial fold. There are five sequential stages in the acceptance and users' continuous usage of an IS.

Additionally, apart from the observed reliance on constructs that were deduced from the theories above, this study's model included constructs from the [DeLone and McLean's \(2003\)](#) IS success model. This IS model was developed to explain the causal interrelationships among six success dimensions. It was suggested that three of these success dimensions have causality with user satisfaction and intention to use. This can result in accumulated benefits. Their model considered the risk on users' behavioral intentions and perceived quality of the website as constructs. The users' fear of identity theft and transaction fraud over the internet have been well documented.

Product innovation within the manufacturing context is often seen within the radical incremental domain, where the process through which new product features or a new combination of existing product features are introduced to provide the basis for articulating innovativeness. According to [Berry *et al.* \(2006, p. 56\)](#), ideas usable in the enhancement of performance improvement can be perceived by customers as an offering of a new benefit of sufficient appeal that influences their behavior, and its strongest term is market-creating service innovation. Broadly, this view encompasses the notion of an innovation that changes consumer or retailer behavior. However, [Kotler \(1983\)](#) argued that innovation emerges strategy as not only emanating from the organization but also stimulated by the organization's customers through advocacy for customers' input into the innovation process. While innovation enables firms to continuously create advances in their offerings ([Kim and Mauborgne, 1997](#)), these offerings must be perceived as innovative by consumers for the firm to gain from the innovation. In this sense, consumers' subjective evaluation of the newness of a product or service is seen to be a crucial aspect of innovation. However, [Anselmsson and Johansson \(2009\)](#) argued that a product or service is an innovation if a consumer considers it to be innovative. [Lee and O'Connor \(2003\)](#) also stressed the importance of evaluating the consumer's perspective, as a new product (or service) is innovative if it is judged by the customer as being so. In this context, innovativeness can be based on elements such as perceived uniqueness with regard to the object's (product, service, etc.) features and functionality, as well as usefulness in comparison to current products or services. More importantly, in-service settings where customers engage with tangible and intangible elements, [Price and Brodie \(2001\)](#) and [Raju and Lonial \(2001\)](#) gave preference to the outside-in customer view over the inside-out firm approach to innovation, when it is needed for the improvement of service delivery and CS. [Garcia and Calantone \(2002\)](#) differentiated product innovation from product innovativeness. They explained that product innovation addresses the process that transforms an invention into a marketable product. On the other hand, product innovativeness is the degree of newness for innovated and marketable products to the firm or market. Based on this, an invention is birthed through an innovation process and then transformed into an innovative market offering. A view that this research adopted here was to characterize innovativeness in the context of website-services, namely, the retailer's website offering (i.e. a retail service interface offering goods and services), which is perceived as being innovative. As the major interest in product innovativeness centers on products' novel changes, the firms' manner of integrating service-

providers because of lack of offering tangibility should explore ways of introducing novel changes in the firm's processes, thus making up the bulk of their intangible offerings (Zolfagharian and Paswan, 2008). Extending this view into the m-commerce environment, perceived website-service innovativeness can be described as the degree to which service processes embedded in the website interface appear (are perceived as) novel to customers when they receive and consume the e-service.

Consumer perception of website-service innovativeness is not only relevant to aspects of uniqueness with its features, functionality and usefulness (i.e., service processes) but also reflects on the retailer's brand and its meaning to consumers. The meaning of the brand is the dominant perception held by the customers of the product, which is the customer's brief impression of the brand and its associations (Berry, 2000, p. 129). Keller and Lehmann (2003, p. 28) commented that customers' mindset is all that exists in the customers' mind regarding the brand. These are thoughts, experiences, feelings, perceptions, images, beliefs and attitudes. From this general view, the brand is the meaning attached to any product by consumers (Kapferer, 1992). It is through this that consumers perceive all benefits about the product or service. For instance, consumers may find the product useful or useless, they may like or dislike the product and they may approach or avoid buying the product (Bloch, 1995; Mono, 1997). The meaning of brand from the service's perspective can be derived from the customer's service consumption experience. This is majorly through their experience while interacting with specific attributes of the service, like core service, employees, services capes and websites, as the major determinants of brand attitude (Grace and O'Cass, 2005).

This situation is because service interactions are the brand stimuli given in the service encounter. It is the interaction that makes provision for principal means through which the "service brand image" can be created (Padgett and Allen, 1997). Brand image is important because it influences consumers' subsequent behavior, including intention and actual purchase (Johnson and Puto, 1987; Fishbein, 1967). In the m-commerce context, favorable service brand image creation is an important issue affecting e-retailing because of the absence of tangible products, tangible store and front service personnel (Davis *et al.*, 2000; Pavlou *et al.*, 2007). In this regard, the interface of the website acts as the focal brand stimuli to be delivered to consumers, where the encounter with website-service plays an important role in bringing the service experience online. Thus, communicating the service attributes and symbolic meaning in this "moment of truth" (Cho and Menor, 2010; Davis *et al.*, 2000). As a result of this, the researcher argued that the perception about the delivery of an innovative e-service experience provides the opportunity of distinct positioning to the e-retailer. It allows e-retailers to duly differentiate among competitors, thus positing a viable competitive edge. The researcher conceptualized website-service innovativeness in this study as a holistic perceptual assessment made by consumers. This perceptual assessment is based on their interaction with processes of the website interface (i.e. the e-service). This then focuses on the degree of innovativeness of website as being modern, dynamic and unique, and therefore it is of use to them. Based on this preliminary research, the following was hypothesized:

H4. There is a significant positive relationship between website innovativeness and SQ.

7. Customer satisfaction

Many researchers, including Gronroos (1982), Parasuraman *et al.* (1985) and Udo *et al.* (2010) suggested that SQ, from the customers' perception, is on the basis of the ability of the service to conform to customer expectations. Gronroos (1998) suggested that "quality perception is a function of what the customer expects of the process as well as of what in fact is

experienced". There is a relationship between customer quality perception and the promise given by a firm and the degree to which these promises have been fulfilled.

Parasuraman *et al.* (2005) revealed that word-of-mouth, past experience, personal need and external communication to customer's form customer expectation of SQ. Gronroos (1998) and Gardial *et al.* (1994) stated this in their elaboration of the complex nature of customer expectation and on the ability to change over time. They pointed out that zone of tolerance may vary according to the context and occasion. Therefore, it depends a lot on demographics, background and previous service experience of the customer. The study further illustrated and argued that over-promising services can be impossible because they can be difficult to meet. Thus, the customers' high expectations can contradict the reality of the situation and result in a negative perception of the received service. Having said that, it is evident that customer expectation has not been confirmed, as the expectation of internet users had been identified as the most important factor that will mold the future of the internet and Web-based marketing (Rayman-Bacchus and Molina, 2001). It was shown that the expectation of customers on e-SQ is not well formed, and it is often weak and changeable (Zeithaml *et al.*, 2002; Cronin and Taylor, 1994; Dabholkar *et al.*, 2000).

In comparison with the numerous studies that worked on the quality of face-to-face services, investigations of online SQ remain in their infancy (Akinci *et al.*, 2010; Ding *et al.*, 2011). However, customers' satisfaction is concerned with their perception of the value received in a transaction or relationship in the long run. This definition indicated that CS is a long-term concept (Hallowell, 1996). Bleuel (2004) suggested a realization of CS is when the performance of service is in line with expectation. CS is recognized to be an essential factor that affects long-term relationships between firms and consumers, both within the t- and e-commerce business environments (Storbacka *et al.*, 1994; Shim *et al.*, 2001).

Based on websites, companies can appeal in most cases to pre-adoption CS. This appeal is the first step to being taken before any actual service. The pre-adoption satisfaction relates to customer attraction, but the post-adoption satisfaction aims at customer retention (Khalifa and Liu, 2003; Khalifa and Shen, 2005). Hence, CS is a concept used to evaluate the success of these services in terms of their fulfillment of customers' needs and desires.

This is relevant to m-commerce services if the fact, that customers are always on the move and often in time-critical situations, is considered. IT-based service has emphasized the importance of reliability (Lee and Lin, 2005; Wolfinbarger and Gilly, 2002). Also, Zhu *et al.* (2002) and Lee and Lin (2005) in their argument posited that the dimension of reliability positively influences perceived e-SQ and CS. According to Al-Mushasha and Hassan (2009), Barnes and Vidgen (2001), Lin and Hsieh (2011), Gefen (2002), Lee and Lin (2005), Madu and Madu (2002), Parasuraman (2002), Santos (2003), Wang (2003), Wolfinbarger and Gilly (2002), Yang and Jun (2002), Zeithaml *et al.* (2000) and Zeithaml *et al.* (2002), reliability is the most important determinant of perceived m-commerce SQ.

The era of IT that we are experiencing today has made customers aware and mature about the type of online SQ they want. In line with this theme, therefore, future studies may adopt an expectation-disconfirmation paradigm for the purpose of measuring SQ and CS. Thus, the following was hypothesized:

H5. There is a significantly positive relationship between SQ and CS.

8. Research methodology

8.1 Research approach

In this research, a quantitative approach was adopted throughout the research process. The study was conducted in a university environment studying the identified factors to meet the

research objectives. The data were collected from February 2016 to April 2016. The study's main objective was to find the correlation values of variables under study. While the correlation ranged between -1.0 and $+1.0$, the researcher needed to identify if there is a significant correlation between two variables. This is when the correlation occurs by chance alone or there is a high probability of its actual existence. In social science research, a significance of $p = 0.05$ is accepted generally as the conventional level. The indication is that in 95 times out of 100, the researcher is certain of a true or significant correlation between two variables. When there is only a 5 per cent chance, then the relationship does not truly exist. Correlation is to essentially test for a relationship and not causality.

Thus, when a hypothesis indicates that there is a significant positive relationship between two variables, it can be further tested by examining the correlation between the two variables, using standardized regression weights (r) or coefficients of correlation. This number (r) is between -1.00 and 1.00 , indicating both the direction and the strength of the linear relationship between the two variables. The lower limit of substantive regression coefficient has been proposed to be 0.05 (Compeau and Higgins, 1995), although the researcher's preference for this study was a critical value of 0.10 and higher ($r > 0.10$) for substantive correlations. Also (r) can be generated for variables measured on an interval or ratio scale.

8.2 Unit of analysis

Considering the different data analysis stages of this study, the level of aggregation of data collected was regarded as the unit of analysis. This was determined and guided by the research question, data collection methods, sample size and even the variables included in the framework (Sekaran, 2003). In this study, the problem statement focused on the factors affecting customer perception about m-commerce SQ. This study was interested in individual students and employees in the university. Therefore, the unit of analysis was the individual. This study treated each student's and employee's response as an individual unit and looked at the data gathered once (i.e., cross-sectional), using each individual as a source of data. The data were gathered once, over a period of three weeks, to answer the research questions.

The researcher used a quantitative method and chose the customers of m-commerce in the Arab Open University (AOU) as the population of the study. The researcher used a simple random sampling method to distribute questionnaires to respondents. A total of 870 questionnaires were distributed to four faculties, as described in Table I.

8.3 Partial least square structural equation modeling approach

The partial least squares (PLS) modeling was proposed by Wold (1982, 1985), as cited by Lohmöller (1987, 1989), in the computational aspect of the LVPLS software. It has also been attributed to Wold through theoretical development by Chin (1998, 2001) and Chin and Newsted (1999) for the new graphical interface (PLS-Graph) and for enhanced validation

Table I.
Number of
questionnaires
distributed to each
faculty in AOU

Name of faculty	No. of students and employee in each faculty	% of sample size	No. of respondents
Faculty of business	1,619	29	245
Faculty of education	1,226	21	186
Faculty of computer	1,503	26	228
Faculty of language	1,388	24	211
Total	5,736	100	870

methods. The Lohmöller's program PLSX for unit's x variables data is the basis of the PLS-Graph software and eventually enabled similar options.

8.3.1 The partial least square path model. The PLS path-modeling method is a commonly used method for the estimation of causal relationships in the field of path models involving latent constructs that are measured indirectly by many indicators. Previous studies by Wold (1982), Lohmöller (1989), Chin (1998) and Tenenhaus *et al.* (2005) explained the methodological basis and methods for outcome evaluation and provided some instances of this methodology.

A PLS path model's description is provided by two models; a measurement model linking the manifest variables (MVs) to their latent variables (LVs); and a structural model relating endogenous LVs to other LVs. The measurement model is referred to as the outer model, whereas the structural model is referred to as the inner one.

The inner model describes the relation between unobserved or LVs, while the outer describes the relationship between a LV and its MV. An example of PLS path model is shown in Figure 3.1. The general design of a PLS model presents a recursive inner model that is exposed to predictor specifications. Therefore, the inner model comprises a casual chain system and includes two varying types of outer models; the reflective and formative measurement models, which are represented by Modes A and B, respectively. The choice of a particular outer mode can be explained by theoretical rationales (Diamantopoulos and Winklhofer, 2001).

8.3.2 The partial least squares path-modeling algorithm. The PLS algorithm is primarily a regression sequence based on weight vectors. The weight vectors achieved at convergence achieve a fixed-point equation. Lohmöller (1989) suggested that the basic PLS algorithm includes the following three stages.

- (1) *Stage 1:* an iterative estimate of LV scores, comprising a four-phase iterative process that is repetitive until the achievement of convergence. The steps are:
 - external approximation of the LV score;
 - inner weight estimation;
 - LV scores internal approximation; and
 - outer weights estimation.
- (2) *Stage 2:* the outer weight/loading and path coefficient estimation.
- (3) *Stage 3:* location parameter estimation.

8.3.3 Methodological characteristics. The literature concerning PLS path modeling and other publications regarding causal modeling applications using the PLS path-modeling method often highlighted the method's beneficial feature (Falk and Miller, 1992; Fornell and Bookstein, 1982; Jöreskog and Wold, 1982; Lohmöller, 1989).

The widespread use of PLS path modeling in the circles of scientists and practitioners stemmed from four basic features:

- (1) as opposed to singularly stressing on the common reflective mode, the PLS path-modeling algorithm enables the unconfined calculation of cause-and-effect relationship models using both reflective and formative measurement models (Diamantopoulos and Winklhofer, 2001);
- (2) PLS can be used in the estimation of path models in smaller sample sizes (Chin and Newsted, 1999); and
- (3) PLS path models can turn very complex as they comprise varying latent and MVs, but they never lead to issues of estimation (Wold, 1985).

Moreover, PLS path modeling is considered as methodologically beneficial, compared to covariance based structural equation modeling (CBSEM) in cases when improper or non-convergent outcomes are possible, e.g. Heywood cases (Krijnen *et al.*, 1998).

Furthermore, with increasingly complex models, the amount of LVs and MVs may be great in relation to the observation numbers. Finally, PLS path modeling can be used in highly skewed distributions (Bagozzi, 1994) or when the observation independence is not guaranteed because according to Fornell (1982, P.443), “there is no distributional requirements”.

In this study, SmartPLS path modeling was used to establish measurement and structural models. The measurement model was used to explain or assess construct reliability and validity of the current study. Second, the structural model was used to conduct bivariate correlation analysis and simultaneous regressions analyses to establish correlations and relationship effects among the constructs under investigation. Additionally, using the PLS mechanisms of algorithm and bootstrapping, the mediating effects of a mediator on the relationship between variables were made possible for analysis. The researcher used bootstrapping to obtain standard errors for hypothesis testing. Furthermore, bootstrapping was used to draw conclusions about characteristics of the population of the current study, which represented the intended population distribution (Hair *et al.*, 2011). Hence, the use of bootstrapping enabled the estimation of empirical sampling distribution of a parameter by resampling from a sample with replacement.

Hair *et al.* (2010) stated that PLS is now well known as an alternative to SEM method, which includes LISREL and AMOS, among other programs. The PLS path modeling is more suited to complex models, such as those with hierarchical constructs (with a complete disaggregation method), mediating and moderating impacts (Chin *et al.*, 2003). PLS modeling has to be used at the initial stage of theoretical development to assess and validate exploratory models. In addition, one of its powerful features is its suitability for prediction-oriented research where the methodology helps researchers to concentrate on the explanation of endogenous constructs. In addition, PLS determines the measurement and structural models through multiple regressions, whose estimates can be vulnerable to issues of multi-collinearity. Finally, PLS path modeling can be used in reflective and formative measurement models (Chin, 1998b; Chin and Newsted, 1999).

8.3.3.1 Reflective and formative measurement models. Structural equation models often include LVs having multiple indicators. The measurement model or the outer model provides specifications of the relationship between indicators and LVs. The direction of the path association per measurement model and, hence, the causality existing between the indicators and the LVs, are defined either through a reflective or a formative method (Henseler *et al.*, 2009).

The reflective measurement model originates from the classical test theory along with psychometrics (Nunnally and Bernatein, 1994). Every indicator reflects an erroneous measurement of LV. The causality direction is from the constructs to the indicators, and thus, observed measure constructs are reflected in the indicators’ changes (Henseler *et al.*, 2009).

In certain circumstances, like the onset of the model development, it is suitable to determine causality from the measures of the construct, as opposed to the other way around (Blalock, 1985). This type of circumstance reflects a formative measurement model, which is sufficient when a construct is defined as a combination of indicators. A good example is the marketing mix elements determined through the combination of variables (Fornel, 1982); and therefore, it has to be modeled as a typically linear combination of indicators along with a disturbance term (Diamantopoulos, 2006).

As a result, construct modification is often revealed in the changes in indicators. LV is consequently described as a weighted score across the representative indicator variable, considered as one dimension. When the value of one indicator increases, a higher score is established for the composite variable, no matter what the values of the other indicators are (Henseler *et al.*, 2009).

On the other hand, the formative measurement model uses the overall index domain where the indicators represent the overall important dimension or independent source of LVs. This implies that the omission of a single indicator could lead to the omission of a specific part of the formative measurement model and modify the variable's meaning (Diamantopoulos and Winklhofer, 2001).

8.3.3.2 Sample size. The debate surrounding sample size stems from the considerable challenges faced when carrying out CBSEM with smaller samples. A significant number of simulation studies dedicated to CBSEM made comparisons to alternative discrepancy functions and their estimation bias, robustness and accuracy, in terms of sample size. For instance, Boomsma and Hoogland (2001) claimed that in small samples of 200 or less, there are issues of non-convergence and improper CBSEM solution. The author concluded that CBSEM, based on the selected discrepancy function and model complexity, called for several hundred or sometimes thousands of samples.

In PLS path modeling, the size of the sample can be significantly smaller. This aspect of the sample was illustrated by Wold (1989) through the analysis of a path model on the basis of a data set comprising 10 observations and 27 MVs. Based on a rule of thumb, for a robust estimation of PLS path modeling, the sample size should be equal to the larger of the following sizes (Barclay *et al.*, 1995):

- ten times the scale's number of indicators with the highest number of formative indicators; and
- ten times the highest number of structural paths concentrated on a specific construct located in the inner model.

Similarly, Chin and Newsted (1999) illustrated a Mount Carlo sample study concerning PLS with small samples. The selection of a suitable sample size hinges on the relationship magnitude or the required degree of power. Clearly, it is important for the researcher to keep in consideration the distributional characteristics of the data, potential missing data, the psychometric properties of the variables examined and the relationship magnitude prior to deciding on a suitable sample size, to use or guarantee that an appropriate sample size concerning the phenomenon of interest is available (Marcoulides and Saunders, 2006).

Similarly, Goodhu *et al.* (2006) emphasized that although PLS path modeling appears to lack specialty in a small sample size, its performance in light of its statistical power is at par with other methods for normally distributed data. According to them, PLS path modeling is still a method that is convenient and robust, which is suitable for several research situations like complex research model with too small sample sizes rather than CBSEM methods. Consistent with their conclusion, Marcoulides and Saunders (2006) revealed that "PLS rule of thumb may be effective in some circumstances, it may fail in others".

8.3.3.3 Model complexity. With the increased model complexity, certain CBSEM discrepancy functions, such as GFI and AGFI, decline, and they may become unsuitable for more complex models (Anderson and Gerbing, 1984) For instance, authors Boomsma and Hoogland (2001) conducted an experimental variation of model complexity by modifying the estimated parameters and the number of freedom levels, and they revealed that the more parameters to be estimated, the more will be the occurrence of non-convergence and

ineffective solution. In other words, the larger the number of estimation requirements, the more information will be required.

Hence, PLS is widely used for its suitability in explaining complex relationships (Fornell, 1982; Fornell *et al.*, 1990). Similarly, according to Wold (1985), PLS is prominent among larger models when the importance moves from individual variables and parameters to a group of variables and total parameters. Hence, in complex models having LVs, PLS is the most common choice. In addition, PLS algorithm enables a significant increase in model complexity and significant reduction between the distance of subject matter analysis and statistical methods within domains that are characterized by continuous reliable data access.

8.3.4 Evaluation of the partial least square path model. The PLS path modeling does not use the condition of global goodness of fit (GoF). As such, Chin (1998) proposed a catalog of criteria for the assessment of partial model structures. The criteria comprise a two-phase process that covers the outer model assessment.

At the onset of the two-level process, model assessment concentrates on the measurement models. The measurement reliability and validity are revealed by a systematic evaluation of PLS, based on specific criteria linked with formative and reflective outer models. It is only reasonable to assess the inner path model estimates when the calculated LV scores reveal appropriate validity and reliability.

8.4 Covariance-based structural equation modeling and variance-based structural equation modeling approaches

- CBSEM was proposed as a confirmatory model, and it is distinct from the PLS path modeling as the latter is prediction-oriented.
- CBSEM has always been the common approach for the estimation of SEMs. The popularity of PLS path modeling is recent, particularly in the consumer and service research field.
- The PLS path modeling should be considered as more than a less strict replacement of CBSEM rather as an approach that complements CBSEM (Lohmöller, 1989).
- CBSEM, components-based SEM along with PLS path modeling should be considered as methods that complement each other. The aim of CBSEM is to decrease the fit-function between the sample covariance matrix and the implied covariance one. As for the PLS path modeling, the estimates of parameters are acquired to decrease the residual variance of dependent variables, both manifest and latent. Nevertheless, conditions may exist when PLS path modeling may outperform the CBSEM in its assessment of hierarchical construct models (Mathwick *et al.*, 2001).
- Using CBSEM for the identification of reflective hierarchical models is a challenging task. Even in cases when the model is identified theoretically, it may take backlash from empirical under-identification, which could lead to non-convergence and/or unsuitable solutions. As for formative hierarchical construct models or such models with a combination of formative and reflective constructs, the challenges are multiplied. The PLS path modeling is not as vulnerable to identification issues and unsuitable solutions as compared to CBSEM (Mathwick *et al.*, 2001).
- Cassel, Hackl and Westlund (1999) managed to present the robust deviation from normality of PLS path modeling with expectation of highly skewed distributions with the help of a Monte Carlo simulation.

- The PLS path modeling is more suited to complex models such as those with hierarchical constructs (with a complete disaggregation method), mediating and moderating impacts (Chin *et al.*, 2003).
- The formative construct analysis in CBSEM is challenging and requires the identification of rules making its application challenging, particularly in multidimensional or hierarchical models. The PLS path modeling is primarily enabled for the convenient handling of formative constructs, despite the well documented biasing impact of incorrectly specifying formative constructs. In a Jarvis, MacKenzie and Podsakoff (2003) literature review, Petter *et al.* (2007) stated that 30 per cent of the constructs are specified in an incorrect manner.
- The primary benefit of CBSEM that is superior to PLS path modeling is its use of formal testing procedures enabling for the assessment of the global model fit's validity (Bollen and Bollen, 1989; Chin, 1998a; Tenenhaus *et al.*, 2005). As for hierarchical construct models, not only the model fit but also different alternative nested models are assessed through formal testing procedures, (Edwards, 2001; Marsh and Hocevar, 1985; Rindskopf and Rose, 1988). This is impossible in the PLS path modeling, and as a result, the model validity cannot be assessed globally.
- In social sciences, unobserved heterogeneity and measurement errors are prominent. PLS path modeling applications are often based on the rationale that the data analyzed stemmed from one population. This rationale of homogeneity is always unrealistic as individual's perceptions and evaluations of latent constructs are mostly heterogeneous that can impact both the measurement part (varying LVs means in a single segment) and the structural part (varying relations between the LVs in a single segment) of a causal model (Williams *et al.*, 2003).
- There is a lack of a well-developed statistical instrument to extend and reinforce the PLS path-modeling method.
- Monte Carlo simulations should complement the use of actual data sets. The Monte Carlo simulations may function as an effective tool in exploring the effect of improper solutions in CBSEM for hierarchical models and the possibility for the PLS path modeling to solve the problem.
- The PLS modeling has to be used in the initial stage of theoretical development to assess and validate exploratory models. In addition, one of its powerful features is its suitability for prediction-oriented research where the methodology helps researchers to concentrate on the explanation of endogenous constructs.
- Another feature of PLS is its vulnerability to multi-collinearity. PLS determines measurement and structural models through multiple regressions, and hence, its estimates can be vulnerable to issues of multi-collinearity.
- PLS produces LV scores which are construct proxies measured by one or more than one indicator (MVs).
- PLS path modeling bypasses issues of small sample size; hence, it can be used in certain situations where other methods are ineffective.
- PLS path modeling is able to estimate highly complex models having numerous latent and MVs.
- The PLS path modeling has looser assumptions regarding variable distribution and erroneous terms.

- The PLS path modeling can be used in reflective and formative measurement models.

9. Analysis and findings

A total of 642 questionnaires were returned and this implied a response rate of 73.79 per cent, thus 228 questionnaires representing 26.20 per cent were not returned. Out of these returned 642 questionnaires, the researcher observed that 24 were not completed and were discarded accordingly. This, therefore, implied that only 618 (71.03 per cent) of the questionnaires were used for further analysis.

9.1 Respondents’ demographic profile

The demographic variables of the respondents were gathered with the intention of collecting information about the respondents that participated in the survey. In this respect, the respondents were asked certain questions concerning the time they have been using m-commerce, their age, gender, the highest level of education, marital status and URL list of m-commerce websites that they had visited or patronized for purchasing products/services (Table II).

As shown in Table II, the 63.8 per cent female respondents participated in the survey against 36.2 per cent male respondents. Meanwhile, the table reveals that those respondents that have less than one-year m-commerce experience constituted 48.2 per cent against 7.6 per cent respondents that have between three and five years’ experience. It can, therefore, be said that the respondents are well familiar with m-commerce usage and have carried out

Profile	Description	Figure	(%)
How long using m-commerce	Less than 1 year	298	48.2
	Between 1 and 3 years	125	20.2
	Between 3 and 5 years	47	7.6
	More than 5 years	148	23.9
List of URL of m-commerce	http://jo.opensooq.com (opensooq)	272	44.0
	www.exxab.com/jo (Exxab)	27	4.4
	http://sallaty.jo (sallaty)	49	7.9
	www.jordan-travel.jo (Jordan-travel)	116	18.8
	http://markavip.com/jo (markavip)	228	36.9
	Others	70	11.3
Gender	Male	224	36.2
	Female	394	63.8
Age	Less than 20 years	64	10.4
	Between 21 and 25 years	238	38.5
	Between 26 and 30 years	140	22.7
	Between 31 and 35 years	90	14.6
	Between 36 and 39 years	48	7.8
Highest level of education	More than 40 years	38	6.1
	Diploma	68	10.8
	Bachelor’s degree	477	77.9
	High diploma	39	6.1
	Masters or higher	34	5.2
Status	Student only	208	33.7
	Employee only	70	11.3
	Both	340	55.0

Table II.
Respondents’
demographic profile

several transactions through a mobile platform. For instance, the respondents who visit <http://jo.opensooq.com> (opensooq) to execute their transactions had the highest percentage of participants (44.0 per cent) in the survey, whereas the respondents who purchase items through www.exxab.com/jo (Exxab) had the lowest percentage (4.4 per cent) in the survey. The participants who were between 21 and 25 years of age had the highest participation of 38.5 per cent, whereas the respondents who were between 36 and 40 years of age had the lowest percentage of participation (7.8 per cent) in the survey. This is an indication that most of the respondents are considerably young and they are used to m-commerce. In addition, the highest level of education among the participants was 77.9 per cent bachelor's degree, against 5.2 per cent who held a master's degree or higher certificate. In the final analysis, the category of adult workers constituted a maximum of 55.0 per cent participation, while full-time employees only had the minimum percentage of participation (11.3 per cent) in the survey. As a result, the respondents have some characteristics that may help to achieve the overall objectives of the present study.

9.2 Descriptive statistics of the variables

To summarize the data of the study, a descriptive analysis was carried out so as to describe the general situation of the variables. As can be seen in Table III, the mean, standard deviation, minimum and maximum of the constructs have been reported. Importantly, the average mean of all the variables was between 3.452 and 3.779, while the standard deviation ranged between 0.747 and 0.891. The maximum and minimum responses of the variables are equally reported in Table III.

9.3 The prediction quality of the model

It is widely known in multivariate data analysis literature that R^2 of the endogenous variables is responsible or is the cause of the variance of a particular variable, as explained by the predictor variables. Therefore, the degree of the R^2 for the endogenous variables was considered as an indicator of predictive power of the mode. Additionally, to ascertain this further, the technique of sample reuse as developed by Stone (1975) and Geisser (1975) was applied for the purpose of predicting model validity. Wold (1982) in this perspective argued that for this technique to perfectly fit, the PLS modeling approach must be adopted (Göts *et al.*, 2011).

Specifically, the Stone-Geisser non-parametric test can be used to ascertain the predictive relevance of the model (Chin, 1998b; Fornell and Cha, 1994; Geisser, 1975; Stone, 1975). This can be achieved through the employment of the blindfolding procedure as contained in Smart-PLS 2.0 package. The procedure of blindfolding is scheduled for the purpose of removing some of the data and handling it as missing values to estimate the parameters. After this, the estimated parameters are then used to restructure the raw data which were

Dimensions	N	Minimum	Maximum	Mean	SD
Ease of use	618	1	5	3.700	0.778
Accessibility	618	1	5	3.752	0.836
Interactivity	618	1	5	3.473	0.864
Website innovativeness	618	1	5	3.779	0.821
SQ	618	1	5	3.557	0.747
CS	618	1	5	3.452	0.891

Table III.
Descriptive statistics
of the variables

previously assumed to be missing. As a result, the blindfolding process produces general cross-validating metric of Q^2 .

Generally, Q^2 has different forms which the researcher can obtain, depending on the form of prediction that is desired. For instance, when using underlying LVs for the prediction of data points, a cross-validated communality Q^2 can be obtained. On the other hand, if LVs that are used to predict the block in question and the data points are obtained, then a cross-validated redundancy Q^2 is the output.

Fornell and Cha (1994) asserted that the cross-validated redundancy measure can be a reliable indicator of the predictive relevance of the examined model. Fornell and Cha maintained that as a criterion test, if the value of redundant communality is found to be greater than 0 for all endogenous variables, the assumption is that the model has predictive validity power; otherwise, the predictive relevance of the model cannot be concluded. The results of the study related to the prediction quality of the model, as illustrated in [Table IV](#), were the cross-validated redundancy for the CS and SQ (OVSQ) having values of 0.345 and 0.321, respectively. These values are more than zero indicating an adequate predictive validity of the model based on the criteria suggested by Fornell and Cha (1994).

9.4 The goodness of fit of the whole model

Unlike the CBSEM approach, PLS SEM has only one measure of GoF. As defined by Tenenhaus *et al.* (2005), a global fit measure for PLS path modeling is the geometric mean of the average communality and average of R^2 for the endogenous constructs. Therefore, the GoF measure accounts for the variance extracted by both outer and inner models. In this view, the GoF values can be estimated based on the procedures laid down by Wetzels *et al.* (2009) to support the validity of the PLS model, as given in the following formula:

$$GoF = \sqrt{(R^2 * AVE)} \tag{1}$$

For the purpose of this study, the obtained GoF value was 0.580 as calculated by the formula:

$$GoF = \sqrt{(0.532 * 0.632)} = 0.580 \tag{2}$$

Importantly, baseline values of GoF (small = 0.1, medium = 0.25 and large = 0.36), as suggested by Wetzels *et al.* (2009), formed the standard for comparison. The outcomes revealed that the GoF model tends toward large, and this indicates adequate global PLS model validity.

9.5 Hypotheses testing procedures

After completing the necessary procedures, the hypothesized relationships of the model were tested by performing the PLS algorithm, after which the coefficient paths were generated, as depicted in [Figures 2](#) and [3](#).

Table IV.
Predictive quality of
the model

Constructs	Variable type	R^2	Cross-validated redundancy	Cross-validated communality
CS	Endogenous	0.464	0.345	0.753
SQ	Endogenous	0.575	0.321	0.566

To reach a conclusion whether the path coefficients are statistically significant or otherwise, bootstrapping techniques as contained in the SmartPLS 2.0 were used. Specifically, the *t*-values that follow each path coefficient were generated with the aid of the bootstrapping technique, and eventually, the *p*-values were generated as shown in Table IV. The influence of system quality dimensions on the SQ revealed a significant relationship. In specific terms,

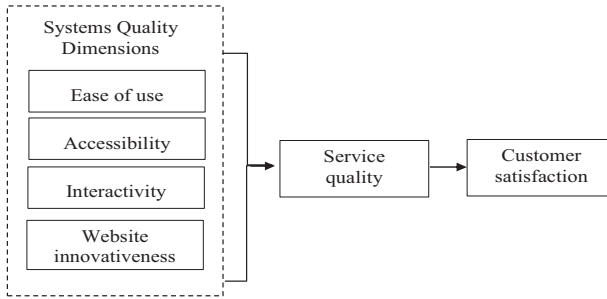


Figure 1.
Research framework

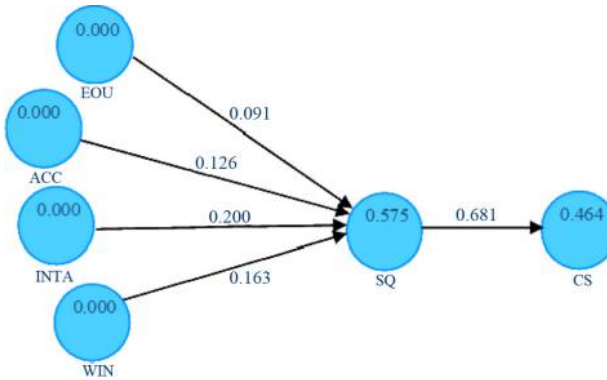


Figure 2.
Path model results

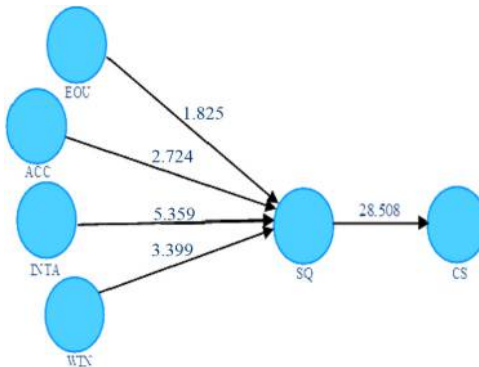


Figure 3.
Path model
significance results

ease of use (EOU), accessibility (ACC), interactivity (INTA) and website innovativeness (WIN) have positive influence with parameters ($\beta = 0.091, t = 1.825, \text{ and } p < 0.05$), ($\beta = 0.126, t = 2.724, \text{ and } p < 0.01$), ($\beta = 0.200, t = 5.359, \text{ and } p < 0.01$) and ($\beta = 0.163, t = 3.399, \text{ and } p < 0.01$), respectively. Finally, having examined the impact of SQ on CS, the result revealed a significant positive relationship ($\beta = 0.681, t = 28.508, \text{ and } p < 0.01$).

As shown in **Table V**, the impact of exogenous variables on the endogenous variables were obtained using the following formula:

$$Effect\ size(f) = \frac{R_{incl}^2 - R_{excl}^2}{1 - R_{incl}^2}$$

The effect size of all exogenous variables as depicted in **Table V** was between 0.007 and 0.047 for all variables; thus, this range described, according to **Cohen's (1992)** criterion, that all values were less than 0.1 and therefore can be described as small.

PLS-SEM was used by this research as the major analysis technique because the assumption of multivariate normality of the data was not fulfilled. Having established the validity and reliability of the measurement model, the hypothesized relationships were tested. The structural model was examined and the results were reported in detail, as shown in **Tables VI and VII**.

Table V.
The results of inner structural model

No	Hypotheses	Path coefficient	Standard error (STERR)	t-value	p-value	Decision
1	EOU → SQ	0.091**	0.050	1.825	0.034	Supported
2	ACC → SQ	0.126***	0.046	2.724	0.003	Supported
3	INTA → SQ	0.200***	0.037	5.359	0.000	Supported
4	WIN → SQ	0.163***	0.048	3.399	0.000	Supported
5	SQ → CS	0.681***	0.024	28.508	0.000	Supported

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table VI.
The effect size of exogenous constructs

Endogenous construct	Exogenous constructs	Effect size
SQ	ACC	0.014
	EOU	0.007
	INTA	0.047
	WIN	0.028

Table VII.
Summary of the findings

Hypothesis	Hypothesized path	Decision
<i>H1</i>	There will be a significant positive relationship between ease of use and SQ	Supported
<i>H2</i>	There will be a significant positive relationship between accessibility and SQ	Supported
<i>H3</i>	There will be a significant positive relationship between interactivity and SQ	Supported
<i>H4</i>	There will be a significant positive relationship between website innovativeness and SQ	Supported
<i>H5</i>	There will be a significantly positive relationship between SQ and CS	Supported

10. Discussions

The findings of this study revealed that ease of use has a significant and positive relationship with SQ. Previous studies had equally found similar results (Abbas, 2016; Costabile *et al.*, 2005; Papanikolaou and Mavromoustakos, 2006). For instance, Papanikolaou and Mavromoustakos (2006) asserted that ease of use plays a pivotal function in determining perceived mobile SQ and satisfaction of a website. It, therefore, implied that customers of m-commerce do not face any form of difficulty or exert extra mental and physical efforts while using or navigating through the m-commerce site. Additionally, customers may be willing to overlook some minor challenges that may be inherent in the usage of m-commerce website, preferably if the site can fulfill some critical functions, as well as their expectations, as no amount of ease of use can compensate for maximum system functionality (Davis, 1989). In fact, the result obtained may be because of the fact that service providers have paid the required and more attention to educate customers about the easiness that is associated with purchasing of services and products on their sites. Consequently, the providers need to make m-commerce more easy to use by educating customers in simple ways to help them go through m-commerce activities.

Another finding is that the relationship between accessibility and SQ was found to be positive. This outcome is in line with Jun, Yang and Kim (2004), who indicated that accessibility of a m-commerce website helps customers to easily gather necessary information they require in making their decision quickly. As customers prefer to have more than one way of contacting their m-commerce service provider, the quality of service needs to be enhanced further. The service provider could provide various alternatives for customers to keep in touch with the latest offers. Even though transactions are being carried out online, alternatives such as e-mail addresses, telephone and fax numbers should be made available through which customers can reach the service provider either to lodge a complaint or make orders or inquiries about the availability of service. For instance, Burke (2002) and Cox and Dale (2001) discovered that online consumers regularly prefer to talk to company representatives through telephone or through other normal means of communication. It is therefore important that m-commerce service providers need to be proactive through provision and adoption of electronic CRM, like call centers which can handle complaints and queries from various channels, as this will improve the perception of overall SQ of the m-commerce (Kim and Ong, 2005). In addition, informative sources such as online bulletin boards and chat rooms through which online customers can obtain and update their information can be made available, as this will allow customers to make better informed decisions.

Furthermore, the relationship between interactivity and SQ was found to be positive, which was in line with the outcomes of other studies (Huang *et al.*, 2013; Sukoco and Wu, 2011). Sukoco and Wu (2011) stated that interactivity is one of the significant factors that determines or describes information quality of the website with respect to product and price that is being offered. Interactivity importantly helps to give a possibility of participation to m-commerce users in modifying the form and content of a mediated environment in real time. Therefore, for customer perception of the quality of m-commerce website and users' virtual experience to be improved, greater attention must be paid to interactivity (Li *et al.*, 2002). For customers, interactivity represents a greater investment on the part of the service provider, and it has a greater implication in generating better brand and product attitude (Schlosser *et al.*, 2006). Furthermore, when a website is highly interactive, communication can be easily facilitated, information can be customized and images on the site can be manipulated to stimulate interest and entertain customers (Fiore *et al.*, 2005). In addition, Sicilia, Ruiz and Munuera (2005) found that websites with higher interactivity help to

stimulate smooth information processing and automatically lead to a flow of state, and of course it can be equated to a high level of SQ.

The findings also showed a positive relationship between website innovativeness and SQ, which is in line with O’Cass and Carlson (2012). The implications of this finding highlighted the importance of ensuring that m-commerce service providers design and deliver a dynamic and unique website consumption experience to consumers, as this will go a long way to influence the way consumers evaluate SQ of the site. Importantly, when customer perception of site innovativeness is enhanced, other positive factors that will bring about repeated online purchases shall be guaranteed (Deb and Agrawal, 2017). In addition, this result further indicated that m-commerce companies can take advantage of innovativeness for quickly responding to events and changes that are unpredictable in the online service environment. This goes beyond their normal or conventional approach to customer service issues, as it requires the organization to be proactive. This further implied that an m-commerce organization needs to invest heavily in their “innovativeness” capabilities, with the aim of thriving in the contemporary highly competitive market so as to increase their share of the market and financial performance while responding to uncertainty in the ever-turbulent business environment.

Finally, there is a direct influence of SQ on CS, which previous studies had corroborated the outcome of this study (Anderson *et al.*, 1994; Cronin and Taylor, 1992; Lee and Lin, 2005; Udo *et al.*, 2010). Consequently, the outcomes indicated that the rate of CS will increase when the SQ increases.

11. Conclusion, limitations and future research

This research had several contributions regarding the empirical analysis and subsequent implementation of its findings. Some research implications were derived from this study.

It is important to emphasize that theories originate from practice and they also form a foundation for the development of new practices. The result of this study showed that the target customers who have general knowledge and adaptive attitudes in the domain of IT would greatly benefit the m-commerce service implementation process within the organization. This research contributed toward the body of knowledge on emerging trends in m-commerce innovation adoption in universities.

The result of this study indicated that SERVQUAL model can be applied to developing countries like Jordan and others, subject to giving due consideration to the limitation in the study findings. For instance, the inculcation of perceived risk, perceived cognitive control and perceived website innovativeness structure in the SERVQUAL model was very apparent from the outcomes of the study which therefore suggested the necessity to examine other possible constructs that can provide more power in explicating online behavior in developing countries. Second, the extended SERVQUAL model used in this study can be used in other online behavior studies, such as m-payment or m-government. As this study examined information quality dimension that has two variables, system quality dimension with two variables and SQ dimension with seven variables toward measuring overall SQ, future scholars might consider other contexts and pay attention to more controlled subsets of users with the purpose of identifying exceptions and other constraints on how the customer can perceive overall SQ in m-commerce. Additionally, it would also be of great benefit and significance, if longitudinal studies can be performed for the purpose of testing other proposed studies that may come up over time. It would be advantageous to include other sets of antecedents or mediating variables such as subjective norm and attitude. This study, therefore, presented many findings that are related to significant factors that have impacted on overall SQ. Therefore, the outcomes have several implications for service

providers and other establishments that are venturing into e-purchasing in developing countries.

Furthermore, this study offered insight on the importance of m-commerce in the minds of customers, in such a way that it will bring about the intention to repeat patronage in the future. Apart from the theoretical contributions of this study, some insights can also be derived by m-commerce practitioners and policymakers. This study contributed to the m-commerce service implementation practice. The outcome of this study recommended that the key dimension of how customers perceive SQ in m-commerce is the SQ itself. Although the technical usability and reliability of service are considered as important aspects of m-commerce SQ, the primary concern in a commercial environment should be on how m-commerce services enhance performance and effectiveness. As a result of this, customers will embrace the technology much more easily if that technology can enhance their purchasing life and make it easier and within reach. This is an important issue given the fact that many customers hold performance-oriented goals, which in turn can motivate their attitude toward new services and technologies. Furthermore, based on the outcomes of this study, the trend of usage of m-commerce among AOU students and employees will continue to increase, as m-commerce users believe that their service providers are committing enough resources to maintain the overall perceived quality of the m-commerce. For this to continue, m-commerce service providers in Jordan must not relent in their efforts to continue to sensitize users by creating awareness of latest updates and how customers can benefit. This is important, as such steps will enable the industry to meet its vision of becoming the global hub of m-commerce in the Middle East.

Additionally, organizational decision makers can use the result of this study to forecast the role of m-commerce customer attitude toward overall SQ by simply formulating better policies to win more customers. The outcome can also be used to develop strategies through which more customers can be attracted by showing them the benefits and usefulness they can derive from services being offered that give added-value through reduction of cost and time. In addition, by using the findings of this study, service providers can allow customers to have trials of their services. Through this, the customers can develop some sort of comfort or confidence toward using the service. Importantly, the chance given to customers to try m-commerce services will reduce the level of fear and uncertainty that customers may have. Hence, customers' trust will enhance and eventually have an important influence on the customers' attitude toward overall SQ.

Although the findings of this study have contributed greatly, it has some limitations that need to be considered, such as the unit of analysis. While the notion of m-commerce services appeared to be a universal concept regardless of industry or size, this study limited itself to the study of m-commerce SQ variables from the customers' perception and not including the views of the m-commerce providers. In addition, the generalization of this study may be limited because of the fact that the study was conducted within the geographical region within Jordan, with its own unique culture and limited population.

Given the limitations of this study, opportunities for future research abound. A comparative study could be done in this area, for example, the m-commerce system quality in other developing and developed countries. Furthermore, future researchers can consider other variables in the framework such as behavioral intention, customer loyalty and value of m-commerce services. Furthermore, more diverse populations and samples can be used by future researchers to verify the dimensions this study has developed.

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