



Research article

Customer retention through service quality and satisfaction: using hybrid SEM-neural network analysis approach



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ABSTRACT

Mobile commerce is a developing phenomenon, youth worldwide utilising the platform that provides flexibility, ease, and convenience of online shopping through mobile devices. The study investigates the influence of mobile commerce service quality dimensions on the perception of service quality and customer satisfaction. Satisfaction in Mobile commerce promotes the revisit intention among the customer. The study model was designed on the service quality model SERVQUAL, and the factors were adopted from the information and system quality dimensions. The hypotheses were tested with Jordanian adults, and data was collected through a survey from January 2020 to April 2020. The data was analysed using the variance-based statistical analysis tool with Smart Partial Least Squares 3.2. The non-compensatory analytical technique of artificial neural network analysis was employed to assess the study models. Resultantly, responsiveness and cognitive control factors were significantly related to the Mobile commerce overall service quality. The information quality dimension of content usefulness and adequacy was significantly related to the mobile commerce overall service quality. Mobile commerce system quality dimensions were significantly related to the overall service quality. Furthermore, overall service quality perception significantly influenced customer satisfaction, promoting the revisit intention towards mobile commerce. Multilayer artificial neural network analysis was applied. The result conclusively showed that website innovativeness, content usefulness, and ease of use were the three substantial mobile commerce platforms that impacted overall service quality. The e-business management should use state-of-the-art technology features to enhance the quality perception and develop payment security features to nurture trust among users. Future research opportunities and limitations were reported at the end.

1. Introduction

The initiation of information technology (IT) has facilitated billions of people to connect in real-time using social media worldwide. Moreover, IT has revolutionised individual lifestyles and offered flexibility, effectiveness, and efficiency, an impossible feat in the past (Kaatz, 2020). Rapid technological growth has reached a stage whereby consumers use personal smart devices that offer reasonable processing speed and performance on desktops and laptops (Chi, 2018). The emerging worldwide

web has also significantly transformed human interaction for leisure or commerce purposes (Ali, 2016; Gawron and Strzelecki, 2020). Currently, electronic commerce (E-Comm) is the leading business activity at the firm and personal levels (Rita et al., 2019).

The E-Comm has become widespread as most of the global population utilises the internet for business purposes (GSMA, 2019). Moreover, the advent of E-Comm significantly benefits users from various backgrounds, whereby the Internet connects users globally with time and location advantages (Rita et al., 2019; Heinonen, 2020). Specifically, E-Comm

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helps to manage supply chains and creates efficiency and effectiveness for business operations (Alraja et al., 2020). The manufacturers, suppliers, and customers are interconnected to help people reduce time and cost, leading to heavy reliance on E-Comm for business or personal purposes (Heinonen, 2020).

Satisfying and retaining the customer is always challenging, as customer retention has become more challenging in the E-Comm (Abbasi et al., 2022). Personal mobile devices offer the facility to contact people and use internet services on the go for multiple activities (Jay and Zhang, 2016). The smart mobile capabilities with interactive connectivity initiated mobile commerce (M-Comm), as the next E-Comm phase (Eze et al., 2021). The M-Comm also enriches usability, cost-effectiveness, and efficiency by reducing time to market and searching for products individually (Rita et al., 2019). The M-Comm experiences satisfy the users and direct the user satisfaction towards the M-Comm attributes with expected quality in the time of COVID-19 (Vinerean et al., 2022).

M-Comm platform quality attributes drive customer satisfaction and emerge from the service quality, information quality, and system-level quality attributes offered in the M-Comm platform (Chi, 2018). The service level attributes are necessary features of e-services facilitating the customers and instigating the quality perception towards the e-services (Gbongali et al., 2019). The information quality attributes of the e-portal service are associated with the delivery of right and timely information (Salameh et al., 2018). Nevertheless, system-level features associated with the assessability and innovativeness attributes offer the best e-services to the customers (Japutura et al., 2022; Kaatz, 2020). Retention of M-Comm customers greatly depends on the M-Comm platform quality, promoting customer satisfaction (Wang and Liao, 2007). Incorporating the holistic aspect of the e-service aspect formulate the perception of service quality and nurture customer satisfaction.

The study evaluates and contributes toward the three-tier aspects of M-Comm service quality attributes leading to the perception of overall service quality. The perception of service quality is a multi-facet concept and was estimated with the multiple features of the e-services. The perception of service quality instigates customer satisfaction. However, the firms are interested in engaging and satisfying the firm customers on a long-term basis to revisit the intention for the M-Comm portal.

The following section discusses the relevant literature and hypotheses development. The following section summarises the research methods, the analysis and results, and the discussion and conclusion, respectively.

2. Literature review

Service quality (SQ) is the effectiveness and efficiency perception of an organisation's offered services. Quality perception is a topic of interest for service providers and consumers, whereby quality refers to meeting customer expectations (Parasuraman et al., 2005). The SERVQUAL scale was initially developed to estimate the organisational service quality based on nine aspects. Technological advancement enables users worldwide to use mobile phones for personal and commercial purposes (Kaatz, 2020). Mobile-based services are an extension of electronic services (e-services), whereby M-Comm is the extension of E-Comm, enabling users to conveniently utilise the M-Comm via personal mobile devices (Ghazali et al., 2018).

Meanwhile, the SITEQUAL scale was proposed by Webb and Webb (2004) to measure the website service quality with four dimensions (Sukoco and Wu, 2011). Parasuraman et al. (2005) also proposed the 11-dimensional scale to estimate the E-service quality. There is an ongoing debate on e-services quality as more people engage in M-Comm. Hence, scholars commonly use SERVQUAL and ESQUAL to assess the quality attributes of the websites, e-commerce, or electronic portals (e-portals) (Chi, 2018; Jay and Zhang, 2016). Nonetheless, SERVQUAL and ESQUAL cannot seize the full-service quality attributes of e-portals offering commerce services.

2.1. Customer retention

Delivery of a relevant consumer experience is the hallmark of marketing activities (Zhang and Prybutok, 2005). The positive and engaging customer experience delights the customer and leads to the retention of the customer or rebuying of the product/service by the satisfied customers (Gawron and Strzelecki, 2020). The firms can retain the customer by delivering quality services and enriching the users' experiences with the appropriate SQ attributes that instigate customer satisfaction that promotes customer retention (Chen et al., 2021; Nani and Lina, 2021). For the current study, the revisit intention represents customer retention.

2.2. Overall service quality (OSQ) of M-Comm

The user-level service quality perception is the consumer's judgment towards the M-Comm service, distinct and dominating other services (Liu et al., 2019). The e-services emerge from the service quality perception, conceptualised through information quality and system quality dimensions (Chi, 2018).

2.3. M-Comm service quality dimension

Service quality is an important topic resulting from growing online electronic services, with the measurement scale SERVQUAL by Parasuraman et al. (1988). The traditional model was based on reliability, assurance, tangibility, empathy, and responsiveness with 22 expectancy-based evaluative statements (Parasuraman et al., 2005). Appearances and outlook are the main features that attract users, with the E-Comm website design as the first attribute that captures users' attention (Ghazali et al., 2018). Essentially, users seek features, services, and easy access to web content (Salameh et al., 2018). The website design is a tangible feature of the products that users are attracted to, which builds confidence for M-Comm website usage (Lee et al., 2018). Meanwhile, reliability is the awareness of the product or service's trustworthiness (Udo et al., 2010). Accurately delivering user expectations builds the product's reliability or services (Huang et al., 2018). Generally, website reliability refers to the web contents (Chi, 2018), whereby reliability reduces the risk towards M-Comm sites (Lee et al., 2018).

Responsiveness denotes the readiness to manage customer complaints (Salameh et al., 2018; Hsu et al., 2017). The response time to address the customer-level grievances to provide support, a solution, and an alternative to the information customers requires (Huang et al., 2018; Nguyen et al., 2018). Customer level trust towards the firms' offerings is observable through the users' willingness to accept the firms' service vulnerabilities, whereby the future service quality improves based on customers' expectations (Leong et al., 2020). The personalisation features appear for the customers to have the individual care, attention, and consideration from service providers (Salameh et al., 2018). From the service provider's perspective, service customization refers to understanding customer needs (Liu et al., 2019). Risk perception is the hazard, threat, or perception of danger during service usage (Salameh et al., 2018). The service quality aspect of M-Comm refers to the money dealing in online shopping using M-Comm (Rita et al., 2019). Perceived cognitive control is the control perception of customer decision-making when using M-Comm services (Chi, 2018). Observably, the perception of cognitive control also impacts the service quality perception (Jay and Zhang, 2016).

2.4. M-Comm information quality dimension

Web portals are information systems, and the web portal quality represents the E-Comm platform quality (Chi, 2018). The crucial aspects of information quality include content usefulness and adequacy for web users (Chen et al., 2021). Content usefulness is the information users' information reliability, value, and accuracy (Lin et al., 2018). The

information system was defined as the information value with accuracy, dependence, and consistency (Lee et al., 2018). The content's usefulness is also reflected in the information timeliness and uniformity offered to the customers on E-Comm platforms (Chi, 2018). Content adequacy represents the complete information offered to e-platform users (Eze et al., 2021). The information on E-Comm portals must be complete and comprehensive to provide all relevant information for customers to consider the product or services on the e-portals (Salameh et al., 2018).

2.5. M-Comm system quality dimension

Websites are systems based on multiple attributes with system-level features promoting the quality perception for the users (Udo et al., 2010). Ease of use in technology is the minimal effort required to use technology (Venkatesh et al., 2003). The user perception is that technology can be easily used and perform the required tasks to support technology usage (Chen et al., 2021). The fewer efforts required in using M-Comm websites is one of the most desired features for users (Salameh et al., 2018). Accessibility describes the service delivery speed or timeliness rendered by the service providers (Eze et al., 2021). The third system-level quality dimension is interactivity offered on the M-Comm site (Udo et al., 2010). Website interactivity enriches the users' level of experience to instantly contact the supplier, customer, and M-Comm service provider (Ghazali et al., 2018). The fourth dimension of M-Comm system quality was the perceived website innovativeness (Salameh et al., 2018). The website innovativeness is the users' perception that the website has unique and UpToDate features that add user privacy and security or offer state-of-the-art service quality experiences (Udo et al., 2010).

2.6. Service quality dimensions related to OSQ

The website design (WBD) discloses the e-portal's physical appearance and resembles the product's physical aspects, as Parasuraman et al. (2005) described. Furthermore, the M-Comm portal layout and design are the M-Comm portal quality aspect, whereby the website design promotes the overall customer-perceived service quality (O'Cass and Carlson, 2012). Salameh et al. (2018) postulated that the WBDs of the e-commerce platform significantly influence the SQ of the e-commerce platform. Reliability (REL) is another SERVQUAL dimension representing trustworthiness, uniformity, and precision in providing service (Parasuraman et al., 1988). The REL of the e-service delivery system promotes the delivery perception of the service providers' promises (Chi, 2018). Responsiveness (RSP) is an aspect of the SERVQUAL involving prompt responses to customer-driven grievances or other allied responses to customer demands or requests (Parasuraman et al., 2005). Ghazali et al. (2018) documented that the e-commerce platform responsiveness significantly aspect of quality perception among the e-commerce users. Trust (TRT) was discussed in the SERVQUAL framework (Parasuraman et al., 2005), representing the users' willingness to expect minimum vulnerability and expect service providers' promises fulfilment (Salameh et al., 2018). Leong et al. (2020) established that the e-commerce aspect of trust instigates the perception of quality for the e-commerce platform. Personalisation (PER) is the perception of delivering customers with individualised and discrete services (Alraja et al., 2020) and providing customised services to fulfil the needs of the e-portal (Ghazali et al., 2018). The customer perceives PER as an added value of e-portals that form the perception of higher quality services (Nguyen et al., 2018). Alraja et al. (2020) documented a significant and positive effect of the SQ of the social media-based commerce Omni consumers. Meanwhile, the risk (PRK) is the personal judgment of hazard and threat on the relevant issues (Shrawan and Mohit, 2018). Recently, Abbasi et al. (2022) claimed that the PRK insignificantly instigated the adoption of e-commerce. Finally, the perception of cognitive control (PCC) means judging the individual's perception of the environment based on the previous experience, which emerges as the belief about an event, object, or happening

(Salameh et al., 2018). PCC depicts the probable consequences of using the information system (Parasuraman et al., 2005) and reduces uncertainty, improving customers' perceived service value (Chi, 2018). The customers' judgment encourages understanding the environment, leading to emotions related to the provided services (Shrawan and Mohit, 2018). Huang et al. (2018) identify that the PCC reduces the positive judgment toward the electronic retailing services. Thus, the following hypotheses are proposed:

- H1a. WBD positively affects the OSQ of M-Comm.
- H1b. REL positively affects the OSQ of M-Comm.
- H1c. RSP positively affects the OSQ of M-Comm.
- H1d. TRT positively affects the OSQ of M-Comm.
- H1e. PER positively affects the OSQ of M-Comm.
- H1f. PRK has a negative effect on the OSQ of M-Comm.
- H1g. PCC has a negative effect on the OSQ of M-Comm.

2.7. Information quality dimensions related to OSQ

Information quality is a crucial part of the overall internet service quality (Salameh et al., 2018), with dimensions based on content usefulness (CUF) and content adequacy (CAD) (Ali, 2016), whereby the former involves providing correct information on the website (Udo et al., 2010). The CUF is an information quality aspect of OSQ depicted through the information accuracy, dependence, and consistency of the e-portal (Salameh et al., 2018). The information offered on the e-portal must be errorless and helpful for customers to execute necessary transactions. Rita et al. (2019) postulated that the CUF is essential for nurturing the perception of SQ for the e-Comm platform.

CAD is the completeness of the information provided on the e-portal (Ali, 2016). The extensive and comprehensive information on the e-portal helps users understand and execute the necessary transaction over the e-platform (Chi, 2018). Notably, the information completeness on M-Comm platforms promoted satisfaction and was vital to the M-Comm quality aspects (Jay and Zhang, 2016). Alsondos and Salameh (2020) documented a significant impact of CAD on the perception of M-commerce platforms. Therefore, the following hypotheses are proposed:

- H2a. CUF positively affects the OSQ of M-Comm.
- H2b. CAD positively affects the OSQ of M-Comm.

2.8. System quality dimensions related to OSQ

SQ dimensions refer to the e-portal features offered by systematic web portals (Kaatz, 2020). The perceived website innovativeness (PWI), interactivity (INT), ease of use (EOU), and accessibility (ACC) are systematic aspects of the M-Comm platform that enhance user experiences (Eze et al., 201; Gawron and Strzelecki, 2020). PWI is an integral aspect of website quality, depicting the website's uniqueness, functionality, and associated features (O'Cass and Carlson, 2012). The web portal's uniqueness and higher user-driven features help form the perception of e-portal quality (Jay and Zhang, 2016). Alsondos et al. (2020) narrated that the PWI for e-commerce influences the perception of SQ. INT refers to the option to contact the service provider and other M-Comm users to instantly engage, discuss or negotiate the product or services over the M-Comm platform (Hossain et al., 2020). Nguyen et al. (2018) informed that the INT harnesses social media shopping behavior. EOU is the perception of easiness and effortlessness using M-Comm websites (Chi, 2018). EOU also reduces the users' effort and encourages the M-Comm users to perform online purchases on the go (Jay and Zhang, 2016). Salameh et al. (2018) found that the EOU of M-Comm platforms significantly promoted the perception of M-portal SQ. ACC denotes the

M-Comm platform availability and necessary attributes that demonstrate the M-Comm platform quality (Hsu et al., 2017). The bandwidth and reliable speed of processing the transaction over the M-Comm platform harness the quality perception (Rita et al., 2019). Ghazali et al. (2018) suggested that ACC instigates SQ's perception of the e-shopping portals. Thus, the following hypotheses are postulated:

- H3a.** PWI positively affects the OSQ of M-Comm.
- H3b.** INT positively affects the OSQ of M-Comm.
- H3c.** EOU positively affects the OSQ of M-Comm.
- H3d.** ACC positively affects the OSQ of M-Comm.

2.9. OSQ influences customer satisfaction (CSN)

CSN describes the value perception acquired from a system or technology (Shrawan and Mohit, 2018). Meeting customer expectations enhances and instigates customer satisfaction (Ghazali et al., 2018). Essentially, the OSQ aspect of the M-Comm platform stimulates customer satisfaction (Udo et al., 2010). Ghazali et al. (2018) postulated that the perception of quality instigates customer satisfaction in using the e-portal. Thus, the following hypothesis is proposed:

- H4.** OSQ positively affects the CSN.

2.10. Customer satisfaction (CSN) influences the revisit intention (RIT) to use M-Comm

CSN forms a positive perception towards the web portal (Sheu and Chang, 2022), fulfilling customer expectations to build a positive perception to engage in the prospective behaviour of E-Comm service usage (Alraja et al., 2020). Chi (2018) postulated that customer satisfaction with the M-Comm portal significantly influences the revisit intention among American apparel consumers. Therefore, the following hypothesis is presented:

- H5.** CSN positively affects the RIT towards M-Comm

2.11. Mediation effect of OSQ

The service quality attributes form OSQ, developing customer satisfaction (Rita et al., 2019). Meanwhile, the e-portal content usefulness and content adequacy develop OSQ (Udo et al., 2010). OSQ also initiated the customer level satisfaction towards using e-service platforms. System quality factors instigate OSQ towards using e-services (Salameh et al., 2018). Moreover, the e-services perceived service quality instigates customer satisfaction (Huang et al., 2013). Hence, the following hypotheses are forwarded:

HM1 a-g: OSQ mediates the relationship between the service quality dimensions (WDB, REL, TRT, RSP, PER, PRK & PCC) and customer satisfaction towards M-Comm.

HM2 a-b: OSQ mediates the relationship between the information quality dimensions (CUF & CAD) and customer satisfaction towards M-Comm.

HM3 a-d: OSQ mediates the relationship between the system quality dimensions (PWI, INT, EOU & ACC) and customer satisfaction towards M-Comm.

2.12. Mediation effect of the customer satisfaction

Customer satisfaction is built based on the overall e-services quality perception (Shrawan and Mohit, 2018). The continuous intention to use E-Comm relies on customer satisfaction with the e-services (Chi et al., 2018; Nani and Lina, 2021). Customer satisfaction may lead to reuse, offering positive feedback, and delivering positive comments on social media (Chen et al., 2021). Therefore, the following hypothesis is proposed:

HM4: Customer satisfaction mediates the relationship between OSQ and the revisits intention for M-Comm.

3. Materials and methods

3.1. Study research design and sample size

The research design is based on the quantitative method to explore the factors impacting Jordan adults' satisfaction and revisit intention for m-commerce. The target population of the current study was Jordanian adults, and the sample size calculation was performed with G-Power 3.1 with the power of 0.95 and the effect size of 0.15 with 15 predictors, and the required sample size was 199 (Faul et al., 2007). Nevertheless, the minimum threshold of 200 samples was suggested for PLS-SEM (Hair et al., 2019). The convenience sampling technique was utilised with a few added qualifying questions and took the respondents' consent to participate in the study. Furthermore, the data collection was performed by placing the survey online on social media like www.facebook.com and WhatsApp, whereby the respondents were encouraged to share the link with their fellows. The final analysis was performed with 618 valid responses. The data collection was performed from January 2020 to April 2020.

3.2. Research instrument

The questionnaire was designed in English, with the question items for website design adapted from Parasuraman et al. (1988), and Salameh et al. (2018). Additionally, reliability items were adapted from Parasuraman et al. (1988) and Salameh et al. (2018), and responsiveness was based on Parasuraman et al. (2005) and Salameh et al. (2018). Trust items were borrowed from Parasuraman et al. (2005) and Salameh et al. (2018), whereas personalisation question items were taken from Parasuraman et al. (1988) and Yang et al. (2005). Perceived risk items were taken from Udo et al. (2010) and Zhang and Prybutok (2005), while perceived cognitive control items were adapted from Ding et al. (2011). Content usefulness and content adequacy question items were adopted from Salameh et al. (2018) and Yang et al. (2005), and ease of use items was based on Yang et al. (2005).

Furthermore, accessibility question items followed Parasuraman et al. (1988) and Yang et al. (2005), and interactivity items were adapted from Salameh et al. (2018). Perceived website innovativeness items referred to O'Cass and Carlson (2012), and OSQ was assessed based on Parasuraman et al. (2005) and Yang et al. (2005). Meanwhile, the satisfaction items were based on Udo et al. (2010) and Yang et al. (2005), while the revisit intention was estimated according to Udo et al. (2010) and Salameh et al. (2018). The scale items are provided in Annexure 1. Finally, a five-point Likert scale (1–5, from "strongly disagree" to "strongly agree") was used for the dependent variable and all other variables. The study was reviewed and approved by the institutional review board of the University Utara Malaysia (UUM). Figure 1, present the study model.

3.3. Assessment of common method variance (CMV)

Harman's (1976) one-factor test was recommended to evaluate the CMV issues of the study constructs (Podsakoff et al., 2003), which confirms that CMV is not a critical issue as the highest factor account for 36.71% variance and less than the suggested limit of 50% (Podsakoff et al., 2003). Furthermore, the Latent constructs correlation matrix revealed no issue of CMV, as all the correlations were well under the 0.900 threshold (Podsakoff et al., 2013). Results are provided in Table 1.

3.4. Multivariate normality

An online web power tool (<https://webpower.psychstat.org/wiki/tutorials/index>) was employed to assess the data normality based on the multivariate data normality proposed by Peng and Lai (2012). The data

set was not normal, as Mardia’s multivariate coefficient p-values were less than 0.05 (Cain et al., 2017).

3.5. Data analysis method

The PLS-SEM with the Smart-PLS software 3.2 was used to evaluate the data, whereby PLS-SEM is a multivariate investigation tool that evaluates path models with latent constructs (Hair et al., 2019). PLS-SEM empowers the researcher to work with non-normal and small data sets. Correspondingly, PLS-SEM is naturally casual-predictive, providing the advantage of dealing with complex models (Chin, 2010). Two-step procedures suggested examining data with PLS-SEM, the first measurement performed to appraise every study construct (Hair et al., 2019). The second stage was completed to estimate the structural model relations and examine study hypotheses with significance levels (Chin, 2010). Model assessment performed with r^2 , Q^2 , and the effect size f^2 describes the exogenous construct’s path effect for the endogenous construct (Hair et al., 2019). The mediational analysis is the backbone of social science, and for the current work, the transmittal approach is adopted to hypothesize the mediational relationships (Memon et al., 2018). Taking the guidelines from Hair et al. (2019), we follow the preacher and Hayes approach, where the indirect relationship between the impendent and outcome variables exits through the mediator evaluated with the bootstrapping and sampling distribution helps detect the mediational effect. The bootstrapping results offer detailed evaluations of the mediation effect; the researcher must look for the confidence interval (CI) lower and higher value, and if the zero did not exist between the CI low and CI high (Hair et al., 2019). It establishes the existence of meditation between the input and outcome variables (Memon et al., 2018).

Artificial neural network (ANN) analysis is a non-compensatory analytical technique with deep learning algorithms based on input, output, and hidden layers. The hidden layer connects the input and output neurons (Leong et al., 2020), acting as the block-box similar to the human brain (Hayat et al., 2021). The study utilised the Root Mean Square Errors (RMSE) value of trained and tested data to identify the predictive accuracy (Leong et al., 2020). ANN analysis offers the benefits

of understanding the factors that influence the outcome more importantly.

4. Results

4.1. Demographic profile

The study respondents comprised 36.2% men and 63.8% women, with 33.7% students, 11.3% employees, and 50% working and enrolled. The respondents were divided into six age groups: below 20 years (10.4%), 21–25 (38.5%), 26–30 (22.7%), 31–35 (14.6%), 36–39 (7.8%), and above 40 years old (6.1%). Furthermore, 10.8% of the 618 respondents had secondary school level education, 77.9% had bachelor’s level education, 6.1% had higher diploma level education, and 5.2% had masters. The demographic details of the respondents are presented in Table 2.

4.2. Reliabilities and validities

The Cronbach’s Alpha (CA) values for each construct were above the threshold of 0.70, and the minimum score of CA values was 0.768 (Chin, 2010). The results are provided in Table 3. Furthermore, all the Dillion-Goldstein’s (DG) rho values were also above the threshold of 0.70, whereby the minimum score of DG rho was 0.779 (Hair et al., 2019). The composite reliability (CR) values exceeded the threshold of 0.70, and the minimum CR value was 0.844 (Chin, 2010). The average variance extracted (AVE) for all construct items must be above the 0.50 score to support each construct uni-dimensionality (Hair et al., 2019). Additionally, each construct’s variance inflation factor (VIF) values were below the threshold of 3.3, suggesting no multicollinearity issue (Chin, 2010). All the study constructs showed appropriate discriminant validities (See Annexure 1). Furthermore, the Fornell-Larcker criterion (1981) was utilised for the discriminant validity of the study constructs. The criterion was estimated using the square root of the respective construct AVE, which must be higher than the correlation of the other constructs (Hair et al., 2019). The discriminant validity was also evaluated with the hetro-trait-mono-trait (HTMT) ratio proposed by Henseler et al. (2015).

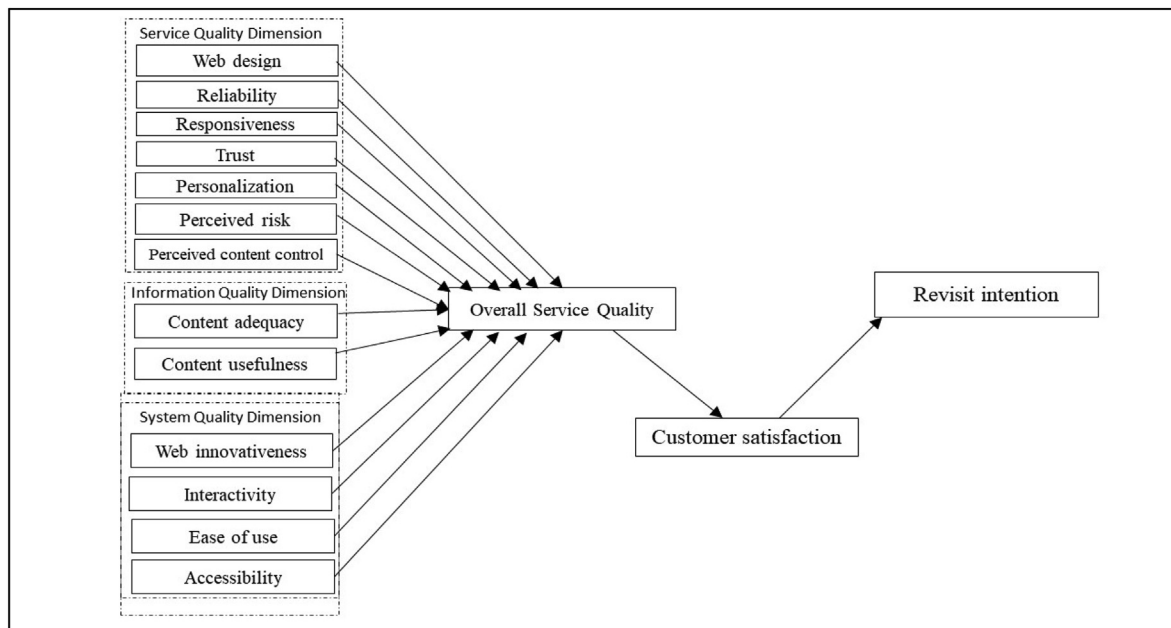


Figure 1. Proposed m-commerce customer retention model.

Table 1. Latent construct correlation matrix.

	WBD	REL	RSP	TRT	PER	PCC	PRK	CUF	CAD	PWI	ACC	EOU	INT	OSQ	CSN	BIT
WBD	1.000	0.240	0.398	0.335	0.330	0.291	0.099	0.516	0.437	0.543	0.449	0.494	0.412	0.458	0.407	0.415
REL	0.240	1.000	0.564	0.505	0.422	0.451	0.120	0.412	0.496	0.316	0.393	0.443	0.389	0.409	0.429	0.351
PRP	0.398	0.564	1.000	0.390	0.495	0.442	0.157	0.517	0.548	0.467	0.507	0.483	0.437	0.521	0.457	0.521
TRT	0.335	0.505	0.390	1.000	0.507	0.492	0.031	0.442	0.487	0.469	0.561	0.553	0.415	0.447	0.531	0.477
PER	0.330	0.422	0.495	0.507	1.000	0.509	0.227	0.543	0.508	0.451	0.515	0.644	0.477	0.473	0.582	0.492
PCC	0.291	0.451	0.442	0.492	0.509	1.000	0.116	0.571	0.599	0.473	0.493	0.548	0.518	0.452	0.483	0.497
PRK	0.099	0.120	0.157	0.031	0.227	0.116	1.000	0.203	0.147	0.165	0.168	0.235	0.140	0.118	0.138	0.192
CUF	0.516	0.412	0.517	0.442	0.543	0.571	0.203	1.000	0.644	0.616	0.558	0.601	0.537	0.618	0.614	0.579
CAD	0.437	0.496	0.548	0.487	0.508	0.599	0.147	0.644	1.000	0.528	0.627	0.631	0.528	0.609	0.559	0.538
PWI	0.543	0.316	0.467	0.469	0.451	0.473	0.165	0.616	0.528	1.000	0.600	0.658	0.510	0.601	0.561	0.633
ACC	0.449	0.393	0.507	0.561	0.515	0.493	0.168	0.558	0.627	0.600	1.000	0.683	0.602	0.617	0.603	0.608
EOU	0.494	0.443	0.483	0.553	0.644	0.548	0.235	0.601	0.631	0.658	0.683	1.000	0.619	0.617	0.655	0.631
INT	0.412	0.389	0.437	0.415	0.477	0.518	0.140	0.537	0.528	0.510	0.602	0.619	1.000	0.599	0.528	0.595
OSQ	0.458	0.409	0.521	0.447	0.473	0.452	0.118	0.618	0.609	0.601	0.617	0.617	0.599	1.000	0.684	0.696
CSN	0.407	0.429	0.457	0.531	0.582	0.483	0.138	0.614	0.559	0.561	0.603	0.655	0.528	0.684	1.000	0.747
BIT	0.415	0.351	0.521	0.477	0.492	0.497	0.192	0.579	0.538	0.633	0.608	0.631	0.595	0.696	0.747	1.000

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit intention.

The results confirm the discriminant validity of the study constructs. The results are offered in annexure 1.

4.3. Path analysis

The next step involved the measurement calculation in investigating the study hypothesis. The adjusted r^2 value for the 13 exogenous constructs on OSQ explained the 56.8 percent change. The model’s predictive relevance (Q^2) value is 0.320, indicating a medium predictive relevance (Chin, 2010), and the adjusted r^2 value for the exogenous construct of OSQ of the customer satisfaction for the M-Comm showed a 46.7% change in the customer satisfaction towards M-Comm. Besides, the predictive relevance (Q^2) value for part of the model was 0.348, suggesting a medium predictive relevance (Chin, 2010). The adjusted r^2 value for the customer satisfaction as an exogenous construct on the revisit intention to use M-Comm indicated a 55.8% change in the revisit intention of using the M-Comm. The predictive relevance (Q^2) value for part of the model was 0.431, indicating a high predictive relevance (Chin, 2010).

The model standardised path values, t-values, and significance level are illustrated in Table 4. The path analysis for the service quality dimensions impacting the OSQ shows that the WBD, REL, TRT, PER and

PKR insignificantly influence the OSQ. The current analysis suggests not to accept H1a, H1b, H1d, H1e, and H1f. Conversely, the path between RSP and OSQ ($\beta = 0.101$, $t = 2.555$, $p = 0.005$) demonstrated the influence of the responsiveness on OSQ as positive and significant. The result suggests admitting the H1c. Moreover, the path value for the PCC and OSQ ($\beta = -0.088$, $t = 2.348$, $p = 0.010$) indicated a negative but significant effect of the perceived cognitive control on OSQ. It offers support to accept the H1g.

The evaluation of the information quality dimension represents that the path coefficient between CUN and OSQ ($\beta = 0.181$, $t = 4.903$, $p = 0.000$) demonstrated a significant positive effect of the content usefulness on OSQ. The finding offers statistical sustenance to accept the H2a. The path value for the CAD and OSQ ($\beta = 0.152$, $t = 3.581$, $p = 0.000$) indicated the effect of the content adequacy on OSQ as positive and significant. The result advocates admitting the H2b. The system quality dimension assessment revealed that the path between PWI, INT, EOU and ACC on OSQ is positive and statistically significant. The statistical analysis offers sufficient support to accept the H3a, H3b, H3c, and H3d. Meanwhile, the path coefficient between OSQ and CSN ($\beta = 0.684$, $t = 28.848$, $p = 0.000$) signified a significant and positive effect on customer satisfaction; therefore, it offers valuable provision to admit the H4. The path value for the CSN and RIT ($\beta = 0.747$, $t = 2.807$, $p = 0.003$) exhibited that customer satisfaction positively and significantly impacted the revisit intention to use M-Comm among the sample; thus, H5 was accepted.

4.4. Mediation analysis

The mediation effect of RSP and CSN (HM1c) was mediated by OSQ, which showed that OSQ mediated the relationship between RSP and CSN (see Table 5); hence, HM1c is accepted. The relationship between the PCC and CSN was mediated by OSQ, which offered support to accept the HM1g. The other results represent that the OSQ doesn’t significantly mediate the relationship between the service quality dimension (WBD, REL, TRT, RER, and PRK) and the CSN. It offers statistical evidence not to accept the HM1a, HM1b, HM1d, HM1e, and HM1f. The result revealed that OSQ significantly mediated the relationship between CUF and CSN. It suggests accepting the HM2a. The outcome exposed that OSQ significantly mediates the relationship between CAD and CSN. It recommends admitting the HM2b. Next, the relationship between EOU, ACC, INT, and PWI on CSN was significantly mediated by OSQ, supporting to accept the

Table 2. Demographic profile.

	N	%		N	%
Gender			Status		
Male	224	36.2	Students only	208	33.7
Female	394	63.8	Employees only	70	11.3
Total	618	100.0	Both	340	50
			Total	618	100.0
Age Group			Education		
Below 20 years	64	10.3	Diploma/technical school certificate	68	10.8
21–25 years	238	38.5	Bachelor’s degree or equivalent	477	77.9
26–30 years	140	22.7	Higher Diploma	39	6.1
31–35 years	90	14.6	Master’s	34	5.2
36–39 years	48	7.8	Total	618	100.0
More than 40 years	38	6.1			
Total	618	100.0			

Table 3. Reliability and validity.

Variables	No. Items	Mean	SD	CA	DG rho	CR	AVE	VIF
WBD	5	3.99	0.715	0.758	0.784	0.832	0.501	1.638
REL	5	3.11	0.736	0.739	0.762	0.835	0.560	2.316
RSP	4	3.64	0.786	0.760	0.784	0.848	0.583	2.060
TRT	6	3.23	0.885	0.844	0.854	0.885	0.563	1.948
PER	5	3.42	0.758	0.760	0.768	0.848	0.583	1.110
PRK	4	3.82	0.998	0.860	0.880	0.902	0.697	1.110
PCC	3	3.49	0.719	0.822	0.824	0.894	0.738	1.991
CUF	5	3.54	0.825	0.820	0.822	0.874	0.582	2.468
CAD	5	3.38	0.794	0.848	0.854	0.892	0.623	2.499
EOU	5	3.70	0.778	0.848	0.849	0.891	0.622	3.196
ACC	4	3.75	0.836	0.755	0.761	0.845	0.577	2.561
INT	4	3.47	0.864	0.874	0.878	0.914	0.726	1.961
PWI	3	3.77	0.821	0.813	0.815	0.889	0.727	2.316
OSQ	4	3.55	0.747	0.737	0.751	0.837	0.566	-
CSN	4	3.45	0.891	0.891	0.893	0.924	0.753	-
RIT	4	3.71	0.889	0.905	0.907	0.934	0.577	-

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit intention. SD: Standard Deviation; CA: Cronbach's Alpha; DG rho - Dillon-Goldstein's rho; CR - Composite Reliability; AVE - Average Variance Extracted; VIF - Variance Inflation Factors.

Source: Author's data analysis

Table 4. Path coefficients.

Hypo		Beta	CI - Min	CI - Max	T	p	r ²	f ²	Q ²	Decision
<i>Service quality dimensions affecting OSQ</i>										
H1a	WBD → OSQ	0.011	-0.043	0.068	0.315	0.376		0.000		Reject
H1b	REL → OSQ	0.027	-0.028	0.083	0.791	0.215		0.001		Reject
H1c	RSP → OSQ	0.101	0.035	0.165	2.555	0.005		0.012		Accept
H1d	TRT → OSQ	0.003	-0.054	0.058	0.104	0.459		0.000		Reject
H1e	PER → OSQ	-0.005	-0.062	0.053	0.135	0.446		0.000		Reject
H1f	PRK → OSQ	-0.047	-0.088	0.013	1.205	0.114		0.005		Reject
H1g	PCC → OSQ	-0.088	-0.149	-0.026	2.348	0.010		0.009		Accept
<i>Information quality dimensions affecting OSQ</i>										
H2a	CUF → OSQ	0.181	0.124	0.243	4.903	0.000		0.032		Accept
H2b	CAD → OSQ	0.152	0.077	0.221	3.581	0.000		0.022		Accept
<i>System quality dimensions affecting OSQ</i>										
H3a	PWI → OSQ	0.159	0.079	0.234	3.439	0.000		0.026		Accept
H3b	INT → OSQ	0.201	0.139	0.266	5.238	0.000		0.049		Accept
H3c	EOU → OSQ	0.090	0.012	0.163	1.878	0.030		0.006		Accept
H3d	ACC → OSQ	0.128	0.054	0.203	2.807	0.003	0.577	0.015	0.320	Accept
<i>OSQ influencing customer satisfaction</i>										
H4	OSQ → CSN	0.684	0.644	0.722	28.848	0.000	0.468	0.366	0.348	Accept
H5	CSN → RIT	0.747	0.711	0.780	2.807	0.003	0.559	0.878	0.431	Accept

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit intention.

Source: Author's data analysis

HM3a, HM3b, HM3c, and HM3d. Finally, the CSN mediation effect between OSQ and RIT for M-Comm was evaluated in HM4, revealing that customer satisfaction significantly mediated the relationship between OSQ and RIT, hence evidence to accept the HM4.

4.5. Artificial neural network (ANN) analysis

4.5.1. Model 1

We utilized the multi-layer perception (MLP) ANN, consisting of the three layers, i.e., input, hidden and output. The study utilised the feed-

forward-back propagation (FFBP) with MLP ANN (Leong et al., 2020). To address over-fitting, we utilized the ten-fold ANN model in the SPSS neural network algorithm. 70% of the data was utilized for training, 20% for testing and the remaining put on hold (Hayat et al., 2021). The results in Table 6 show the high predictive accuracy as the RMSE's values of training (RMSE = 0.284) and testing (RMSE = 0.312) were close (Gbongali et al., 2019), indicating that the data fitting and higher predictive accuracy were achieved by the ANN model 1.

Next, a sensitivity analysis was employed to evaluate each exogenous construct contribution in the model for OSQ (Hayat et al., 2020). Table 7

shows that the five most significant contributory factors were content usefulness, followed by ease of use, perceived web innovativeness, reliability, and personalisation, respectively. The ANN model can predict the overall perceived service quality by 47.8% by the goodness of fit (Hayat et al., 2021).

4.5.2. Model 2

The ANN Model 2 assessed customer satisfaction. The results for Model 2 are portrayed in Table 8, showing a high predictive accuracy as the RMSE's values of training (RMSE = 0.180) and testing (RMSE = 0.194) were close, suggesting that the ANN Model 2 achieved the data fitting and higher predictive accuracy. The ANN model 2 can predict the overall perceived service quality by 61.7% by the goodness of fit (Hayat et al., 2021). As there was only one input, the sensitivity analysis was impossible.

4.5.3. Model 3

The results for Model 3 are shown in Table 9, whereby the high predictive accuracy as the RMSE's values of training (RMSE = 0.462) and testing (RMSE = 0.451) was close, signifying that the data fitting and higher predictive accuracy were achieved by the ANN Model 3. The ANN model 2 can predict the overall perceived service quality by 61.7% by the goodness of fit (Hayat et al., 2021). As there was only one input, the sensitivity analysis was impossible.

5. Discussion

5.1. Service quality dimensions affecting the overall service quality

The study findings confirmed that the responsiveness ($f^2 = 0.012$) and perceived cognitive control ($f^2 = 0.009$) significantly and positively affected OSQ. The results coincided with Wang and Liao (2007), whereby the responsiveness of the electronic platform influenced the quality perception of the online learning system. Responsiveness was reflected as offering prompt responses to the customers' requests and queries to build quality services (Parasuraman et al., 2005). Perceived cognitive control was also significantly related to the customer OSQ. The results confirmed Ding et al. (2011), whereby the perceived cognitive control promoted the positive evaluation of using e-services. The analysis showed that the M-Comm platform web design, reliability, trust, personalisation, and perception risk requires enhancement to promote the platform's OSQ among Jordanian adults. However, the e-service level attributes of

Table 6. The RMSE for training and testing processes in the ten-fold ANN Model 1.

	Training			Testing			Hold out	Total
	N	SSE	RMSE	N	SSE	RMSE		
1.	418	0.744	0.177	133	0.464	0.199	67	618
2.	441	3.189	0.463	113	0.625	0.330	64	618
3.	419	1.926	0.299	130	0.658	0.307	69	618
4.	427	3.803	0.506	120	0.782	0.526	71	618
5.	425	0.933	0.139	124	0.378	0.165	69	618
6.	445	1.003	0.150	110	0.497	0.254	63	618
7.	432	1.488	0.224	126	0.606	0.285	60	618
8.	431	2.765	0.381	125	0.863	0.491	62	618
9.	444	0.725	0.108	109	0.206	0.105	65	618
10.	436	2.476	0.393	114	0.903	0.459	68	618
Mean		1.905	0.284		0.598	0.312		
SD			0.144			0.141		

website design, reliability, trust, personalisation, and risk need attention. The current e-platforms are not good enough to build the perception of the quality of M-Comm portals.

5.2. Information quality dimension affecting the overall service quality

Additionally, the content provided on the e-portal requires relevancy and correctness in all forms, which the e-portal administration should offer. Our study findings maintained the argument that content usefulness and adequacy had a significant and small positive effect on OSQ perception of M-Comm among the respondents (Chin, 2010). The findings confirmed that the information quality attributes significantly instigate the quality perception; our finding coincides with results postulated by Ali et al. (2016). The content availability and completeness enriched the user experience and offered a higher information level to engage with the e-portal (Lin et al., 2018).

5.3. System quality dimension affecting the overall service quality

Furthermore, the system quality attributes of the M-Comm portal are necessary to deliver the e-services to the customers. The ease of use of the M-Comm attaches the perception of service quality for the M-Comm portal. The current study result connects with the finding that Gawron

Table 5. Mediating effects.

Hypo	Associations	Beta	CI - Min	CI - Max	T	P	Decision
HM1a	WBD → OSQ → CSN	0.007	-0.027	0.059	0.316	0.376	No Mediation
HM1b	REL → OSQ → CSN	0.018	-0.019	0.057	0.788	0.215	No Mediation
HM1c	RSP → OSQ → CSN	0.069	0.025	0.113	2.590	0.005	Mediation
HM1d	TRT → OSQ → CSN	0.002	-0.037	0.039	0.104	0.459	No Mediation
HM1e	PER → OSQ → CSN	-0.003	-0.042	0.037	0.135	0.446	No Mediation
HM1f	PRK → OSQ → CSN	-0.032	-0.061	0.009	1.218	0.112	No Mediation
HM1g	PCC → OSQ → CSN	-0.060	-0.102	-0.018	2.373	0.009	Mediation
HM2a	CAF → OSQ → CSN	0.104	0.053	0.148	3.642	0.000	Mediation
HM2b	CAD → OSQ → CSN	0.124	0.083	0.169	4.733	0.000	Mediation
HM3a	EOU → OSQ → CSN	0.061	0.008	0.114	1.862	0.031	Mediation
HM3b	ACC → OSQ → CSN	0.088	0.038	0.139	2.763	0.003	Mediation
HM3c	INT → OSQ → CSN	0.138	0.093	0.181	5.133	0.000	Mediation
HM3d	PWI → OSQ → CSN	0.109	0.052	0.162	3.397	0.000	Mediation
HM4	OSQ → CSN → RIT	0.511	0.466	0.555	18.933	0.000	Mediation

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit intention.

Source: Author's data analysis.

Table 7. Sensitivity analysis.

	WBD	REL	RSP	TRT	PER	PRK	PCC	CUF	CAD	EOU	ACC	INT	PWI
1	0.078	0.081	0.079	0.057	0.074	0.070	0.080	0.075	0.079	0.076	0.092	0.071	0.089
2	0.057	0.078	0.077	0.076	0.077	0.064	0.076	0.076	0.074	0.111	0.083	0.066	0.086
3	0.044	0.072	0.068	0.060	0.106	0.060	0.089	0.094	0.064	0.119	0.065	0.063	0.095
4	0.064	0.109	0.068	0.078	0.084	0.054	0.067	0.102	0.084	0.089	0.058	0.064	0.078
5	0.081	0.078	0.056	0.069	0.078	0.069	0.070	0.111	0.075	0.073	0.076	0.092	0.073
6	0.072	0.095	0.067	0.059	0.077	0.064	0.092	0.076	0.104	0.063	0.082	0.067	0.081
7	0.067	0.077	0.071	0.072	0.079	0.047	0.080	0.078	0.069	0.091	0.097	0.073	0.099
8	0.069	0.073	0.097	0.063	0.059	0.062	0.079	0.108	0.069	0.073	0.098	0.066	0.085
9	0.079	0.084	0.077	0.065	0.069	0.076	0.054	0.098	0.091	0.102	0.076	0.055	0.075
10	0.067	0.085	0.068	0.079	0.096	0.062	0.084	0.086	0.066	0.073	0.062	0.085	0.087
Mean importance	0.068	0.083	0.072	0.067	0.079	0.062	0.077	0.090	0.077	0.087	0.078	0.070	0.084
Normalized Importance	67%	92%	80%	75%	88%	69%	85%	100%	85%	96%	87%	78%	94%

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit Intention.

Table 8. The RMSE for training and testing processes in the ten-fold ANN Model 2.

	Training			Testing			Hold out	Total
	N	SSE	RMSE	N	SSE	RMSE		
1.	444	5.369	0.558	110	1.421	0.646	64	618
2.	422	5.428	0.574	125	1.364	0.486	71	618
3.	440	5.418	0.559	127	1.639	0.597	51	618
4.	443	5.562	0.584	116	1.336	0.538	69	618
5.	440	5.724	0.566	121	1.287	0.562	57	618
6.	456	5.875	0.559	111	1.068	0.602	51	618
7.	440	5.143	0.531	110	2.054	0.714	68	618
8.	436	4.783	0.593	122	2.072	0.553	60	618
9.	439	5.785	0.585	106	1.313	0.545	73	618
10.	432	5.612	0.597	124	1.444	0.493	62	618
Mean		5.469	0.180		1.499	0.194		
SD			0.020			0.069		

Table 9. The RMSE for training and testing processes in the ten-fold ANN Model 3.

	Training			Testing			Hold out	Total
	N	SSE	RMSE	N	SSE	RMSE		
1.	436	4.662	0.492	121	1.399	0.440	61	618
2.	447	4.645	0.468	116	1.082	0.468	55	618
3.	426	4.481	0.467	122	0.981	0.402	70	618
4.	440	4.727	0.484	122	0.992	0.339	56	618
5.	428	4.553	0.473	137	1.377	0.414	53	618
6.	426	4.197	0.450	131	1.487	0.498	61	618
7.	425	3.862	0.458	133	1.644	0.462	60	618
8.	431	4.526	0.466	122	1.060	0.432	65	618
9.	426	4.226	0.430	126	1.345	0.558	66	618
10.	433	4.320	0.438	123	1.286	0.497	62	618
Mean		4.419	0.462		1.265	0.451		
SD		0.267	0.019		0.226	0.060		

and Strzelecki (2020) promulgated that e-services' ease of use is necessary for the perception of quality and acceptance of e-services. Our finding advocates that the assessability promoted OSQ, enabling users to instantly gather and acquire necessary product-level information for prospective users to choose quickly. Our study finding agrees with the

outcome that Salameh et al. (2018) predicted. The accessibility empowers the users to engage with the firms' representatives through voice or instant messaging services that satisfy the customers, perceived as having service quality. Besides, the results suggested a positive relationship between interactivity and OSQ. The results are paralleled with Huang et al. (2018), whereby the service level interactivity facilitated the users to acquire all prevalent services. Next, the finding proposed that the website innovativeness instigates the perception of service quality. Our finding collaborated with Salameh et al. (2018), whereby the website innovativeness features helped the firms engage and satisfy the customer with innovative services and website features as consistent features that generated the quality perception among online users.

5.4. Overall service quality impact on customer satisfaction

The following hypothesis evaluated the effect of OSQ on customer satisfaction. The result confirmed that the OSQ harnessed a positive understanding of the e-services, nurturing customer satisfaction. Our study confirms the consequence established by Ghazali et al. (2018) that perception of quality nurtures customer satisfaction.

5.5. Customer satisfaction impact on revisit intention to use M-Comm

Finally, the last hypothesis assessed the effect of customer satisfaction on the revisit intention. The findings verified the argument that customer satisfaction had a significant and sizeable positive effect on the revisit intention among Jordanian adults. The study result corroborated with Chi (2018), whereby customer satisfaction with websites depicted the willingness to utilise web portals for commerce purposes in the future.

5.6. Mediating effects of overall service quality

The mediation analysis results revealed that the OSQ insignificantly mediated the relationship between the service quality dimension of WBD, REL, TRT, PER, and PER and the CSN. The finding proposes improving the M-Comm platform web design, reliability, trust, personalisation, and risk aspect. The users recognized that the commerce websites lack in web design, reliability, risk, personalization, and trust. Information and system quality aspects of M-Comm harness customer satisfaction through the OSQ. It shows that e-commerce portals are more concentrating on the technical aspect of e-commerce platforms and need to build the service level features of the e-commerce platform (Heinonen, 2020; Vinerean et al., 2022). Lastly, the perceived customer satisfaction significantly mediates the relationship between the overall service quality and revisit intention. The result recommends promoting the

e-portal features that build customer satisfaction as it harnesses the revisit intention.

5.7. Theoretical implications

The current work makes the theoretical contribution by combing the three-tier characteristics of M-Comm services nurturing the perception of overall service quality, and the overall service quality perception promotes customer satisfaction. The customer perception of overall service quality is necessary for customer satisfaction and harnessing the intention to revisit the M-Comm portal. Secondly, the current work identifies the M-Comm services' overall service quality with the ANN. The ANN, as a non-compensatory analysis, offers better insight than the ordinary regression analysis and offers a more realistic outlook of the factors contributing to the outcome. The overall service quality perception largely depends on the M-Comm platform's content usefulness, ease of use and reliability.

5.8. Managerial implications

The study presented several practical contributions, suggesting that business firms improve the service quality dimensions to harness customer satisfaction in using M-Comm sites (Lee et al., 2018). The M-Comm service quality requires thorough investigation and development to attract customers to utilise M-Comm. The e-portal service level dimensions of web design, reliability, trust, personalisation, and risk perception require enhancement (Jay and Zhang, 2016). Besides, the development of OSQ nurtures the intention to use M-Comm platforms (Salameh et al., 2018). The firms should interact more with their respective customers to acquire better-perceived equities (Kaatz, 2020).

Additionally, the customer's comments on online services for M-Comm could highlight the issues that drive the customer perception of equities, resulting in an enhanced purchase intention level (Jay and Zhang, 2016). Lastly, M-Comm platforms should revamp the online stores and utilise state-of-the-art technologies to facilitate users to reduce the efforts to perform search, purchase, and post-purchase activities efficiently (Kaatz, 2020). It also offers more individualized support and personalisation of the web services that may instigate the value proposition and maximize utility.

6. Conclusion

The study analysed the effects of overall service quality for M-Comm sites linked with customer satisfaction that form the revisit intention to use M-Comm sites among the Jordanian samples. The study extended the SERVQUAL scale to estimate the overall service quality of the M-Comm websites perceived by the Jordanian M-Comm consumers. Overall service quality was divided into dimensions of service quality, information quality, and system quality. The service quality dimensions (responsiveness and perceived cognitive control) for M-Comm sites significantly influenced overall service quality. Meanwhile, the content usefulness and adequacy significantly promoted the perception of M-Comm service quality for the information quality dimensions. Furthermore, the system quality dimensions are essential components of overall service quality.

The website's overall service quality generates significant customer satisfaction, forming the revisit intention to use the M-Comm.

6.1. Study limitations

Having the current work's strengths, the current study is associated with the three prevalent limitations. Firstly, the current study adopted a cross-sectional research design to assess the consumer-level service quality perception and the intention to reuse M-Comm. Hence, future research should adopt the longitudinal research design to understand the associated perception of M-Comm service quality based on different attributes of M-Comm. Secondly, instead of using the behaviour proxy (intention to revisit the M-Comm), the actual usage behaviour should be employed to explore the influence of M-Comm attributes on the usage behaviour. Finally, the previous role of the M-Comm experience should be utilised to explore overall service quality perception in utilising the platforms, forming the attitude, satisfaction and intention, and future use behaviours of M-Comm.

Declarations

Author contribution statement

Anas A Salamah, Ph D: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data.

Shahizan Hassan, Ph D: Conceived and designed the experiments; Performed the experiments.

Ali Aljaafreh: Performed the experiments; Analyzed and interpreted the data.

Walaa A Zabadi: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Mohammad Ali AlQudah: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Abdullah Al Mamun, Ph D; Naeem Hayat, PhD: Analyzed and interpreted the data; Wrote the paper.

Thavamaran Kanesan, Ph D: Contributed reagents, materials, analysis tools or data.

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Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Annexure 1.*Questionnaire*

Website design

M-commerce provides visually appealing features.
M-commerce provides attractive site colors, graphics, and fonts.
M-commerce provides a good page layout.
M-commerce provides well-designed site menus.
M-commerce has innovative features.

Reliability

When m-commerce promises to do something, it does so.
When I have problems, m-commerce is the best service in solving them.
M-commerce is dependable.
M-commerce always performs the service right the first time.
M-commerce insists on error-free records.

Responsiveness

I believe m-commerce gives me prompt service.
I believe the m-commerce service can always help me.
I believe m-commerce enables at any time to respond to my requests.
M-commerce tells me exactly when services will be performed.

Trust

M-commerce provides safe transactions.
M-commerce provides trustworthy services.
M-commerce provides adequate security features.
M-commerce will not misuse my personal information.
I believe m-commerce has a good reputation.
I believe my privacy is protected at this m-commerce.

Personalization

M-commerce enables me to control my commercial transaction progress.
M-commerce enables me to buy the product I need.
M-commerce enables me to choose what I want to buy.
The m-commerce records my commercial transaction progress and performance.
M-commerce provides personalized commercial transaction support.

Perceived risk

I worry about credit card information being stolen.
I worry about the product quality on the Internet.
I worry about safe transactions online.
I worry about how my personal information might be used when I buy online.

Perceived cognitive control

I know what to expect in the following steps.
I know how long it takes to complete the transaction.
I know what information will be provided on each page.

Content usefulness

M-commerce provides content that exactly fits my needs.
M-commerce provides useful content.
M-commerce provides accurate content.
M-commerce provides up-to-date content.
M-commerce provides unique content.

Content adequacy

M-commerce provides complete content.
M-commerce provides sufficient content.
M-commerce provides comprehensive content compared to other systems.
M-commerce provides a complete service description.
The m-commerce provides detailed contact information.

Ease of use

M-commerce is easy to use.
M-commerce makes it easy for me to find the content I need.
The content provided by m-commerce is easy to understand.
M-commerce is user-friendly.
The operation of m-commerce is stable.

Accessibility

M-commerce enables me to get on to it quickly.
M-commerce has a high speed of page loading.
M-commerce does not crash.
I can access m-commerce whenever I need it.

Perceived website interactivity

M-commerce makes it easy for me to ask questions to service providers.
M-commerce makes it easy for me to discuss questions with other beneficiaries from the service.
M-commerce makes it easy to share what I buy with the commercial community.
M-commerce makes it easy for me to access the shared content from the commercial community.

Perceived website innovativeness

M-commerce offers unique features for customers that are different from existing m-commerce.
M-commerce is highly innovative.
M-commerce has innovative features.

Overall perceived service quality

M-commerce offers a very competitive service.
The service quality provided by m-commerce matches my expectations.
M-commerce delivers superior service in every way.
Overall, the services provided by m-commerce have excellent quality.

Customer satisfaction

I am completely satisfied with the performance of the m-commerce service.
I am pleased with the experience of using the m-commerce service.
My decision to use the m-commerce service was a wise one.
I think I did the right thing by using the m-commerce services.

Revisit intention

I intend to continue using the m-commerce service in the future.
I will continue using the m-commerce service in the future.
I will regularly use the m-commerce service in the future.
I would like to recommend the m-commerce service to others.

Annexure 2

Table: Fornell-Larcker Criterion.

	WBD	REL	RSP	TRT	PER	PCC	PRK	CUF	CAD	PWI	ACC	EOU	INT	OSQ	CSN	RIT
WBD	0.708															
REL	0.240	0.748														
PRP	0.398	0.564	0.764													
TRT	0.335	0.505	0.390	0.751												
PER	0.330	0.422	0.495	0.507	0.723											
PCC	0.291	0.451	0.442	0.492	0.509	0.859										
PRK	0.099	0.120	0.157	0.031	0.227	0.116	0.835									
CUF	0.516	0.412	0.517	0.442	0.543	0.571	0.203	0.763								
CAD	0.437	0.496	0.548	0.487	0.508	0.599	0.147	0.644	0.789							
PWI	0.543	0.316	0.467	0.469	0.451	0.473	0.165	0.616	0.528	0.853						
ACC	0.449	0.393	0.507	0.561	0.515	0.493	0.168	0.558	0.627	0.600	0.760					
EOU	0.494	0.443	0.483	0.553	0.644	0.548	0.235	0.601	0.631	0.658	0.683	0.789				
INT	0.412	0.389	0.437	0.415	0.477	0.518	0.140	0.537	0.631	0.510	0.602	0.599	0.852			
OSQ	0.458	0.409	0.521	0.447	0.473	0.452	0.118	0.618	0.609	0.601	0.617	0.617	0.599	0.752		
CSN	0.407	0.429	0.429	0.457	0.531	0.582	0.483	0.138	0.614	0.808	0.561	0.655	0.528	0.684	0.868	
RIT	0.415	0.351	0.521	0.477	0.492	0.497	0.192	0.579	0.538	0.633	0.608	0.631	0.595	0.696	0.747	0.883

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit Intention.

Table: HTMT Ratio.

	WBD	REL	RSP	TRT	PER	PCC	PRK	CUF	CAD	PWI	ACC	EOU	INT	OSQ	CSN	RIT
WBD	–															
REL	0.380	–														
PRP	0.510	0.739	–													
TRT	0.414	0.667	0.667	–												
PER	0.440	0.580	0.640	0.635	–											
PCC	0.357	0.586	0.558	0.596	0.640	–										
PRK	0.165	0.145	0.204	0.114	0.227	0.150	–									
CUF	0.646	0.527	0.664	0.534	0.684	0.695	0.267	–								
CAD	0.502	0.641	0.678	0.557	0.626	0.716	0.185	0.770	–							
PWI	0.667	0.403	0.599	0.567	0.756	0.792	0.606	0.778	0.657	–						
ACC	0.568	0.556	0.668	0.703	0.653	0.624	0.229	0.699	0.779	0.756	–					
EOU	0.601	0.579	0.596	0.651	0.790	0.656	0.282	0.613	0.631	0.792	0.840	–				
INT	0.462	0.481	0.527	0.483	0.572	0.608	0.157	0.633	0.606	0.606	0.736	0.713	–			
OSQ	0.583	0.542	0.690	0.567	0.618	0.575	0.149	0.791	0.765	0.778	0.825	0.775	0.741	–		
CSN	0.468	0.531	0.553	0.612	0.700	0.564	0.155	0.712	0.791	0.657	0.657	0.752	0.596	0.841	–	
RIT	0.464	0.442	0.626	0.546	0.580	0.576	0.214	0.674	0.611	0.738	0.738	0.722	0.667	0.858	0.829	–

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit Intention.

Table. Loadings and Cross-Loading.

Item Code	WBD	REL	RSP	TRT	PER	PCC	PRK	CUF	CAD	PWI	ACC	EOU	INT	OSQ	CS	RIT
WBD1	0.576	0.158	0.253	0.218	0.260	0.228	0.211	0.361	0.228	0.381	0.302	0.361	0.206	0.212	0.218	0.189
WBD2	0.633	0.083	0.232	0.095	0.245	0.079	0.121	0.327	0.137	0.261	0.211	0.232	0.120	0.197	0.223	0.155
WBD3	0.804	0.188	0.277	0.276	0.276	0.267	0.038	0.371	0.348	0.386	0.334	0.395	0.369	0.346	0.275	0.313
WBD4	0.787	0.113	0.263	0.215	0.196	0.190	0.046	0.342	0.346	0.352	0.337	0.326	0.262	0.349	0.244	0.303
WBD5	0.713	0.260	0.359	0.316	0.227	0.233	0.025	0.425	0.389	0.494	0.368	0.404	0.396	0.423	0.419	0.407
REL1	0.186	0.634	0.372	0.490	0.422	0.350	0.123	0.228	0.400	0.217	0.363	0.382	0.182	0.216	0.304	0.217
REL2	0.182	0.817	0.499	0.324	0.390	0.359	0.065	0.364	0.359	0.253	0.289	0.378	0.338	0.314	0.366	0.313
REL3	0.154	0.790	0.431	0.324	0.275	0.327	0.127	0.306	0.354	0.264	0.215	0.247	0.283	0.371	0.299	0.295
REL4	0.213	0.740	0.385	0.437	0.226	0.333	0.050	0.325	0.398	0.207	0.361	0.366	0.344	0.296	0.326	0.214

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Item Code	WBD	REL	RSP	TRT	PER	PCC	PRK	CUF	CAD	PWI	ACC	EOU	INT	OSQ	CS	RIT
RSP1	0.336	0.478	0.774	0.280	0.395	0.394	0.166	0.396	0.417	0.414	0.349	0.389	0.353	0.407	0.426	0.457
RSP2	0.317	0.511	0.781	0.342	0.413	0.310	0.088	0.322	0.453	0.289	0.446	0.420	0.403	0.424	0.312	0.389
RSP3	0.300	0.450	0.817	0.318	0.394	0.351	0.145	0.385	0.450	0.364	0.446	0.380	0.367	0.415	0.378	0.423
RSP4	0.260	0.255	0.675	0.242	0.298	0.290	0.076	0.500	0.346	0.371	0.293	0.270	0.187	0.337	0.273	0.312
TRT1	0.167	0.352	0.253	0.782	0.323	0.325	0.101	0.318	0.364	0.336	0.433	0.381	0.277	0.359	0.375	0.323
TRT2	0.158	0.460	0.316	0.802	0.351	0.379	0.036	0.297	0.379	0.289	0.387	0.400	0.304	0.374	0.408	0.349
TRT3	0.271	0.388	0.333	0.832	0.331	0.373	0.054	0.317	0.384	0.355	0.486	0.377	0.333	0.350	0.380	0.361
TRT4	0.359	0.321	0.324	0.629	0.464	0.399	-0.030	0.406	0.335	0.351	0.436	0.400	0.306	0.286	0.363	0.330
TRT5	0.338	0.366	0.314	0.750	0.440	0.368	-0.010	0.364	0.358	0.463	0.418	0.527	0.379	0.366	0.480	0.456
TRT6	0.250	0.388	0.203	0.688	0.410	0.398	-0.042	0.311	0.384	0.323	0.373	0.415	0.266	0.249	0.385	0.325
PER1	0.138	0.449	0.289	0.372	0.624	0.367	0.090	0.343	0.349	0.221	0.335	0.416	0.403	0.291	0.373	0.300
PER2	0.281	0.229	0.362	0.325	0.773	0.313	0.175	0.359	0.336	0.311	0.297	0.470	0.292	0.340	0.441	0.318
PER3	0.291	0.174	0.388	0.311	0.733	0.380	0.180	0.446	0.359	0.364	0.323	0.438	0.226	0.274	0.407	0.338
PER4	0.333	0.266	0.414	0.374	0.736	0.350	0.219	0.444	0.375	0.425	0.431	0.503	0.372	0.403	0.417	0.410
PER5	0.140	0.404	0.327	0.435	0.739	0.432	0.144	0.369	0.412	0.288	0.446	0.483	0.407	0.371	0.457	0.390
PCC1	0.252	0.383	0.364	0.358	0.420	0.825	0.120	0.399	0.493	0.395	0.422	0.446	0.418	0.383	0.384	0.436
PCC2	0.257	0.375	0.387	0.397	0.436	0.874	0.044	0.491	0.475	0.398	0.394	0.449	0.402	0.368	0.452	0.411
PCC3	0.242	0.402	0.387	0.505	0.454	0.876	0.132	0.576	0.570	0.424	0.451	0.513	0.509	0.411	0.410	0.432
PRK1	0.104	0.112	0.166	0.043	0.186	0.035	0.831	0.152	0.175	0.115	0.203	0.192	0.129	0.097	0.130	0.171
PRK2	0.056	0.063	0.078	-0.059	0.129	0.126	0.819	0.175	0.040	0.156	0.115	0.146	0.116	0.104	0.069	0.138
PRK3	0.029	0.050	0.177	0.018	0.214	0.116	0.828	0.224	0.116	0.113	0.134	0.212	0.103	0.040	0.090	0.144
PRK4	0.107	0.142	0.135	0.090	0.240	0.117	0.859	0.162	0.155	0.151	0.114	0.242	0.113	0.117	0.154	0.178
CUF1	0.289	0.388	0.404	0.317	0.452	0.553	0.273	0.759	0.539	0.447	0.462	0.511	0.461	0.426	0.447	0.499
CUF2	0.381	0.277	0.336	0.269	0.396	0.359	0.167	0.753	0.422	0.376	0.336	0.461	0.378	0.439	0.384	0.397
CUF3	0.464	0.346	0.433	0.427	0.383	0.464	0.011	0.753	0.588	0.495	0.513	0.494	0.442	0.509	0.491	0.433
CUF4	0.482	0.334	0.406	0.360	0.423	0.406	0.207	0.798	0.463	0.572	0.402	0.469	0.414	0.466	0.451	0.416
CUF5	0.340	0.234	0.385	0.301	0.420	0.402	0.141	0.750	0.438	0.448	0.405	0.365	0.357	0.506	0.552	0.465
CAD1	0.281	0.482	0.409	0.331	0.379	0.466	0.150	0.507	0.782	0.381	0.446	0.498	0.383	0.425	0.388	0.388
CAD2	0.337	0.521	0.439	0.415	0.394	0.518	0.112	0.520	0.818	0.403	0.496	0.548	0.411	0.490	0.452	0.444
CAD3	0.375	0.284	0.454	0.332	0.439	0.453	0.250	0.496	0.784	0.400	0.481	0.481	0.385	0.449	0.475	0.435
CAD4	0.411	0.338	0.470	0.401	0.430	0.456	0.060	0.529	0.825	0.495	0.533	0.500	0.446	0.556	0.493	0.481
CAD5	0.305	0.342	0.388	0.434	0.362	0.476	0.025	0.488	0.734	0.389	0.511	0.463	0.452	0.464	0.386	0.364
PWI1	0.427	0.299	0.449	0.394	0.365	0.448	0.142	0.501	0.470	0.833	0.499	0.534	0.459	0.497	0.458	0.528
PWI2	0.498	0.300	0.387	0.416	0.357	0.422	0.108	0.534	0.440	0.851	0.535	0.580	0.410	0.551	0.502	0.556
PWI3	0.459	0.202	0.360	0.388	0.434	0.337	0.178	0.539	0.441	0.875	0.497	0.568	0.437	0.484	0.471	0.533
ACT1	0.349	0.268	0.359	0.371	0.480	0.401	0.220	0.452	0.443	0.557	0.765	0.618	0.492	0.495	0.538	0.518
ACT2	0.426	0.351	0.452	0.459	0.388	0.359	0.128	0.428	0.534	0.474	0.814	0.521	0.523	0.470	0.446	0.478
ACT3	0.228	0.353	0.400	0.369	0.225	0.349	-0.012	0.325	0.418	0.337	0.692	0.353	0.356	0.397	0.309	0.305
ACT4	0.346	0.238	0.339	0.499	0.441	0.385	0.146	0.474	0.505	0.435	0.762	0.555	0.446	0.502	0.510	0.518
EOU1	0.436	0.339	0.394	0.452	0.520	0.487	0.163	0.443	0.482	0.639	0.617	0.797	0.495	0.493	0.531	0.571
EOU2	0.281	0.364	0.387	0.342	0.553	0.421	0.286	0.470	0.472	0.489	0.518	0.792	0.411	0.453	0.507	0.486
EOU3	0.350	0.394	0.402	0.434	0.524	0.453	0.180	0.506	0.507	0.488	0.514	0.818	0.514	0.495	0.517	0.474
EOU4	0.480	0.336	0.386	0.412	0.449	0.454	0.219	0.459	0.473	0.531	0.510	0.793	0.474	0.442	0.523	0.537
EOU5	0.396	0.314	0.335	0.520	0.488	0.350	0.098	0.483	0.541	0.449	0.527	0.741	0.530	0.533	0.503	0.425
INT1	0.255	0.356	0.349	0.352	0.381	0.411	0.073	0.371	0.438	0.406	0.463	0.507	0.815	0.474	0.464	0.545
INT2	0.386	0.369	0.330	0.361	0.406	0.428	0.124	0.444	0.483	0.430	0.527	0.512	0.875	0.511	0.459	0.487
INT3	0.353	0.370	0.433	0.335	0.407	0.451	0.133	0.495	0.462	0.460	0.533	0.525	0.854	0.483	0.410	0.472
INT4	0.399	0.245	0.379	0.366	0.428	0.472	0.143	0.513	0.421	0.441	0.527	0.561	0.862	0.564	0.467	0.524
OSQ1	0.381	0.258	0.363	0.237	0.297	0.281	0.185	0.412	0.467	0.445	0.467	0.407	0.403	0.760	0.518	0.520
OSQ2	0.322	0.327	0.512	0.324	0.321	0.389	0.038	0.499	0.507	0.510	0.489	0.466	0.436	0.793	0.511	0.556
OSQ3	0.306	0.343	0.401	0.371	0.444	0.411	0.035	0.523	0.473	0.433	0.481	0.548	0.556	0.831	0.584	0.543
OSQ4	0.385	0.300	0.271	0.422	0.356	0.260	0.114	0.417	0.375	0.422	0.417	0.424	0.391	0.604	0.432	0.472
CST1	0.390	0.434	0.387	0.479	0.489	0.429	0.048	0.547	0.486	0.495	0.513	0.590	0.498	0.649	0.869	0.673
CST2	0.329	0.302	0.421	0.423	0.485	0.391	0.212	0.484	0.436	0.473	0.458	0.531	0.369	0.535	0.862	0.656
CST3	0.317	0.375	0.376	0.428	0.522	0.390	0.114	0.531	0.501	0.476	0.533	0.581	0.477	0.577	0.875	0.590
CST4	0.370	0.370	0.403	0.508	0.525	0.462	0.114	0.567	0.515	0.501	0.586	0.571	0.485	0.606	0.866	0.670

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Item Code	WBD	REL	RSP	TRT	PER	PCC	PRK	CUF	CAD	PWI	ACC	EOU	INT	OSQ	CS	RIT
RIT1	0.333	0.359	0.468	0.413	0.440	0.451	0.146	0.504	0.486	0.533	0.555	0.550	0.585	0.628	0.698	0.911
RIT2	0.341	0.311	0.460	0.406	0.437	0.477	0.224	0.524	0.502	0.590	0.571	0.593	0.569	0.634	0.655	0.915
RIT3	0.422	0.314	0.435	0.453	0.507	0.401	0.149	0.476	0.440	0.519	0.476	0.564	0.464	0.527	0.665	0.847
RIT4	0.371	0.250	0.478	0.413	0.347	0.426	0.162	0.546	0.474	0.598	0.546	0.520	0.479	0.675	0.618	0.857

Note: WBD: Web design; REL: Reliability, RSP: Responsiveness; TRT: Trust; PER: Personalisation; PCC: Perceived cognitive control; PRK: Perceived risk, CUF: Content usefulness, CAD: Content adequacy, PWI: Perceived web innovativeness, ACC: Accessibility, EOU: Ease of use, INT: Interactivity, OSQ: Overall perceived service quality, CSN: Customer satisfaction, RIT: Revisit Intention.

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