

# Investigating the construct validity of quality measures influencing online shopping in a South African context

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**Abstract.** *Online shopping has become popular over the years and is a widely used way to purchase goods and services. For online retailers to succeed, it is important that they have a quality website to attract and retain customers. The aim of this study was to investigate the construct validity of three respective measurement instruments related to website quality factors, namely; system, information and service quality factors, which may influence consumers within the online shopping environment in a South African context. Primary data was collected through self-administered questionnaires. The demographic and online shopping profile of the sample are presented and followed by confirmatory and exploratory factors analyses on the three instruments. The confirmatory factor analysis found poor fit for the original hypothesised models for each of the scales; further exploratory factor analyses revealed slightly different dimensionalities underlying the scales, yet these were still somewhat aligned with the theoretical framework from which the original scales were derived. Despite this, the study provides a platform for future revision of the scales and future research into website quality factors within the online shopping environment in a South African context.*

**Keywords:** online shopping, website quality, system quality, information quality, service quality, South Africa

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## Introduction

E-commerce has grown significantly over the years and has become an essential part of a consumers' life (Cebi, 2013), as well as an important channel for businesses (Chiu, Wang, et al., 2012). Online shopping, the most popular aspect of e-commerce, has become increasingly common (Sam and Tahir, 2009; Hsieh and Tsao, 2014). Even though the South African online shopping market is still relatively small compared global markets, accounting for 1.2% of South Africa retail sales, it is still rising (Prinsloo, 2016). Due to the fact that consumers have an abundance of shopping websites to shop from, attention is now being focused on the quality of the website (Shin, et al., 2013). A quality website ensures better online experiences, which is important for consumers and is crucial for online retailers as it attracts and retains customers (Hasanov and Khalid, 2012). According to Bilgihan and Bujisic (2014) online shopping is unique in the sense that users base their judgement on what is presented on the website. Therefore, online retailers are becoming increasingly mindful of the quality of their websites (Al-Manasra et al., 2013).

In attempting to determine the quality of websites, a number of authors have adapted and used information system research as a basis (Loiacono et al., 2002; Barnes and Vidgen, 2002; Webb and Webb, 2004). Al-Debei et al. (2014:710) state that a shopping website using web technologies to manage its processes can be referred to as an information system. Xu et al. (2013) state that from consumers' perspectives, it is

common to assess a website on its system, information and service aspects. This research therefore used the system, information and service quality factors identified by DeLone and McLean's information system success model (2003) as the basis for this research to determine the factors that influence online shopping in the South African context. Various authors have highlighted the importance of system, information and service quality factors, which have a direct and indirect impact on users' satisfaction and their intention to use a website within the e-commerce and online shopping context (Brown and Jayakody, 2008; Wang, 2008; Chen and Cheng, 2009; Ziaullah et al., 2015).

## **Literature review**

### ***System quality***

Hsu et al. (2014) simply describe system quality as the desired technical characteristics of a website. System quality, therefore, measures users' perceived user friendliness of a shopping website (Hsu et al., 2012). Even though the information presented on the website is crucial, it is the system that ensures that the information is delivered efficiently and effectively (Hwang et al., 2012). According to DeLone and McLean (2003) system quality factors include usability, reliability, availability, adaptability and response time. Usability refers to the layout and functionality of a website (Kühn et al., 2015). Usability, in essence, is how easy the website is for users to use, understand, operate, find and navigate (Hasan and Abuelrub, 2011). Availability refers to the system being available to perform when needed and to operate correctly. Availability, essentially, refers to users being able to access or make use of a website at any given time. Reliability refers to the system performing how it should for a specified time and the extent to which users can trust the system (Alrawashdeh et al., 2013; Al-Mamary, et al., 2013). Reliability of a shopping website therefore ensures that it performs as intended to allow for easy online shopping, while ensuring the authenticity of products and services (Hanai and Oguchi, 2009). Adaptability refers to a system being able to modify itself efficiently to changes (Andersen and Gronau, 2007; Nechkoska, 2015). Adaptability therefore ensures that a website is able to adapt the users' requirements. Response time refers to the amount of time it takes for a website to perform a function or respond to a request (Gao, 2013). Response time therefore ensures how slow or fast the website takes to perform a function a user has requested.

### ***Information quality***

Information quality refers to the content of an online system which should be personalised, complete, relevant, easy to understand and secure (DeLone and McLean, 2003; Hsu et al., 2014). Content has one of the most significant influences on the users' perceptions of a website (Coker, 2013) as well as their potential buying behaviours (Jeon, 2009). Content on a shopping website includes detailed information on the products and services offered, the order status, corporate policies or public relations, and by providing these, users have a better idea of what to expect, and this decreases uncertainty and risk associated with online shopping (Thongpapanl and Ashraf, 2011). Personalisation refers to a website providing content that is tailored for every user (Jackson, 2007). A shopping website should have recommendation mechanisms in place that provides specific content for a particular user based on their preferences and interests (Liang et al., 2007; Sharma et al., 2013). Completeness can be seen as the extent to which the content is available and sufficient enough to complete a particular task (Kandari, 2010). Relevancy, on the other hand, is the extent in which content is

relevant, appropriate and useful for a particular task (Kandari, 2010; Samsi et al., 2016). The content on a shopping website should therefore be complete and relevant to assist users when shopping online. Ease of understanding refers to the extent which information is clear with ambiguity and easy to understand (Knight and Burn, 2005; Huang and Benyoucef, 2013). Secureness is the security of payments and ensuring the privacy of any information that is shared by the users (Afshardost et al., 2013). An important risk that organisations need to address is the safety and security of transactions (Alharbi et al., 2013). Online shoppers will not make use of a shopping website and provide their personal and financial information if it is not secure (Yu and Zhao, 2013).

### ***Service quality***

Service quality describes the support a website provides for its users (Hamid, 2008). Service quality measures the users' judgement on the quality of the service provided by an online retailer (Hsu et al., 2012). Service quality factors include responsiveness, assurance, empathy, reliability and follow-up services (Delone and Mclean, 2003; Zeithaml et al., 2002). Responsiveness is thus the user's perception of a website's employees providing helpful and responsive assistance (Qutaishat, 2012). Responsiveness, in essence, is the employees' willingness to provide timely services (Parasuraman et al., 1988 in Ramseook-Munhurrin, 2012). Assurance is the extent in which a website and its employees are able to convey trust and confidence by being knowledgeable and courteous towards users, as well as having a good reputation, establish relationships with well-known businesses and use third party seals for privacy and security (Saha and Grover, 2011; Swaid and Wigand, 2009). Empathy is the amount of attention given to online shoppers, as well as the extent in which employees are caring towards online shoppers (Daniel and Berinyuy, 2010; Yu and Zhao, 2013). Empathy in essence reflect the employees' genuine intention towards the customers' and giving them individualised attention (Ramseook-Munhurrin, 2012). Reliability is the timely, dependable and consistent performance of services (Loke et al., 2011; Parasuraman et al., 1985 in Yarimoglu, 2014). Reliability mainly determines if employees provide accurate services the first time and keep to their promises (Grönroos, 1983 in Kabir and Carlsson, 2010). Follow-up services are crucial as it encourages customers to return to the site and also encourages them to provide reviews, which offers valuable feedback for the online retailer to determine whether they are satisfied with the product and if they have any recommendations for improvement in terms of service delivery (Levin, 2013).

## **Research methodology**

### ***Aim***

The aim of the study was to investigate the construct validity of three respective measurement instruments related to website quality factors, namely; system quality factors, information quality factors and service quality factors, within the online shopping environment which may influence consumers in a South African context.

### ***Procedure and design***

A quantitative approach was adopted for the study with data being collected using an internet-based self-administered questionnaire where a link was posted via social media platforms and online forums which was completed by respondents. The

questionnaire contained the System Quality Factors scale, the Information Quality Factors scale and the Service Quality Factors scale based on the literature review. Non-probability, convenience sampling was used in the collection of the data.

### **Measurement instruments**

For all three scales, respondents were required to indicate their agreement with statements related to the various quality factors on a 5-point Likert scale ranging from 1 – ‘strongly disagree’ to 5 – ‘strongly agree’.

The System Quality Factors scale is a 23-item scale which measures the influence of five system quality factors affecting South African consumers when shopping online. The system quality factors measured include: Usability, Availability, Reliability, Adaptability, and Response Time.

The Information Quality Factors scale is a 23-item scale which measures the influence of five information quality factors influencing South African consumers when shopping online. The information quality factors measured include: Personalisation, Completeness, Relevancy, Ease of Understanding, and Secureness.

The Service Quality Factors scale is a 26-item scale which measures five service quality factors. These factors include Responsiveness, Assurance, Empathy, Reliability, and Follow-up Service, which may influence South African consumers when shopping online.

### **Sample**

Table 1 provides a detailed breakdown of the sample. The overall sample for the study consisted of 123 respondents with 32.5% (n=40) males and 67.5% (n=83) females. In terms of age the majority of the sample were between the ages of 26 -35 (57.7%, n=71) and 18 – 25 (26.8%, n=33). The sample stems predominantly from Gauteng (82.9%, n=102) with marginal representation from other provinces. With regards to the employment status, the majority of respondents indicated that they were permanently employed (70.7%, n=87). Furthermore, the majority of the sample had higher qualifications ranging from a diploma/advanced certificate to a Doctoral degree.

**Table 1. Demographic breakdown of sample**

	Number of respondents (n)	Percentage
<b>Gender</b>		
Male	40	32.5
Female	83	67.5
<b>Age</b>		
18 – 25 years old	33	26.8
26 – 35 year old	71	57.7
36 – 45 years old	9	7.3
46 – 65 years old	10	8.1
<b>Province</b>		
Gauteng	102	82.9
Western Cape	14	11.4
KwaZulu-Natal	3	2.4
Mpumalanga	2	1.6
North West	1	0.8
<b>Employment status</b>		
Permanently employed	87	70.7
Self-employed	19	15.4

Unemployed – looking for work	6	4.9
Part-time employed	4	3.3
Unemployed – not looking for work	1	0.8
Other	6	4.9
<b>Highest qualification</b>		
Matric	12	9.8
Higher Certificate	1	0.8
Diploma or Advanced Certificate	15	12.2
Bachelor's Degree	32	26.0
Post-grad Diploma	2	1.6
Honour's Degree	40	32.5
Master's Degree	19	15.4
Doctoral Degree	1	0.8
Other	1	0.8

Source: Author's own research results.

Table 2 below provides a robust indication of the online shopping profile of respondents. The majority of respondents (85.4%, n=105) access the internet a few times almost every hour with 75.5% (n=93) of respondents shopping online at least once per month.

**Table 2.** *Online shopping profile*

	<b>Number of respondents (n)</b>	<b>Percentage</b>
<b>Online access frequency</b>		
Online a few times per hour every day hour	105	85.4
Online at least once per day	18	14.6
<b>Online shopping frequency</b>		
Shop at least once per day	11	8.9
Shop at least once per week	26	21.1
Shop at least once per month	56	45.5
Shop at least once per year	11	8.9
Missing	19	15.4

Source: Author's own research results.

## Data analysis

The data for the study was analysed using the Statistical Package for the Social Sciences version 20 (SPSS 20) in combination with AMOS 22. The data analyses process consisted of two stages. The first stage focused on examining the construct validity by conducting confirmatory factor analyses on the three instruments. Following this, the second stage of analyses adopted an exploratory approach with exploratory factor analyses also being conducted on the three instruments following the results of the initial confirmatory factor analyses.

### *Confirmatory Factor Analyses*

Confirmatory factor analyses using structural equation modelling (SEM) with maximum likelihood estimation was conducted on all three instruments to examine the underlying factor structure and dimensionality of the instruments. In terms of goodness-of-fit indicators for the models the following measures were used to determine the overall fit of the models (Hair, Black, Babin & Anderson, 2010; Hu & Bentler, 1995, 1998, 1999):

- i) The chi-square test statistic – significant chi-square ( $p < .05$ ) indicates bad fit
- ii) Goodness of Fit Index (GFI) – values  $\geq .95$  indicate good fit
- iii) Comparative Fit Index (CFI) – values  $\geq .95$  indicate good fit
- iv) Root mean square error of approximation (RMSEA) – values  $< .06$  indicate good fit yet values below .08 may also indicate acceptable fit.

Factors within the confirmatory models were allowed to correlate and modification indices (significantly correlated errors) were used to ensure the best fit for the models with significant errors being allowed to correlate based on their theoretical alignment, their content and the judgment of the researcher.

### ***Exploratory Factor Analyses***

In order to further explore the underlying factor structure of the three instruments following the results of the initial confirmatory factor analyses, common factor analyses using the principal axis factoring method (with an oblique (Direct Oblimin) rotation) as well as reliability analyses were conducted on the data. Factors were consequently extracted using a combination of methods including the Kaiser-criterion or latent root criterion (eigenvalues-greater-than-one) and scree-plot test. The number of factors extracted was also considered in light of the *a priori* criterion based on the theoretical framework posited for the factors underlying the instruments. In line with the general rule of thumb and in consideration of the sample size, only items with a factor loading of  $\geq .4$  were considered in the analyses (Field, 2005; Hair *et al.*, 2010). With regard to the reliability analyses, Cronbach's alpha coefficients were calculated for each of the factors/subscales.

### **Findings and results**

In the interest of clarity, the results of both the confirmatory and exploratory factor analyses for each of the instruments will be presented. The results for the System Quality Factors scale will be presented first, followed by the Information Quality Factors scale, and the Service Quality Factors scale will finally be shown.

#### ***System quality factors scale***

##### *Confirmatory factor analysis – System Quality Factors scale*

In line with the underlying theoretical framework, a five-factor model was used in the confirmatory factor analysis of the System Quality Factors scale with all items loading highly on the various factors and all factor loadings being significant ( $p < .001$ ) (see table 3).

**Table 3.** *System Quality Factors scale confirmatory factor analysis standardised item factor loadings (n=123)*

Item	Scale	Usability	Availability	Reliability	Adaptability	Response Time
1	Usability	.801				
2	Usability	.783				
3	Usability	.787				
4	Usability	.811				
5	Usability	.729				
6	Usability	.780				
7	Availability		.629			
8	Availability		.687			

Item	Scale	Usability	Availability	Reliability	Adaptability	Response Time
9	Availability		.728			
10	Reliability			.843		
11	Reliability			.740		
12	Reliability			.619		
13	Reliability			.616		
14	Adaptability				.524	
15	Adaptability				.725	
16	Adaptability				.899	
17	Adaptability				.837	
18	Response Time					.789
19	Response Time					.818
20	Response Time					.860
21	Response Time					.850
22	Response Time					.813
23	Response Time					.744

Source: Author's own research results.

In terms of the model goodness of fit, the overall chi-square test was found to be significant with  $\chi^2(214) = 399.657$ ,  $p < .001$ , suggesting poor fit of the hypothesised model. Furthermore, the GFI = .789 ( $< .95$ ), CFI = .901 ( $< .95$ ) and the RMSEA = .084 ( $> .8$ ) also indicated poor fit for the model (see table 4). Overall, the model thus did not fit the data in spite of the deceptively high factor loadings.

**Table 4.** *System Quality Factors scale goodness-of-fit indices*

Model	$\chi^2$	df	p	GFI	CFI	RMSEA
Original model	399.657	214	<.001	.789	.901	.084

Source: Author's own research results.

Strong relationships were evident among all the factors present in the model with moderate ( $\geq .3$ ) to strong ( $\geq .5$ ) and very strong ( $\geq .7$ ) positive correlations found between all the factors (see table 5).

**Table 5.** *Factor correlation matrix for System Quality Factors scale*

Factor	Usability	Availability	Reliability	Adaptability	Response Time
Usability	1				
Availability	.675	1			
Reliability	.719	.687	1		
Adaptability	.452	.741	.468	1	
Response Time	.557	.691	.697	.698	1

Source: Author's own research results.

### *Exploratory factor analysis – System Quality Factors scale*

Following the results of the confirmatory factor analysis, further exploratory factor analysis was conducted on the System Quality Factors scale to examine the underlying dimensionality.

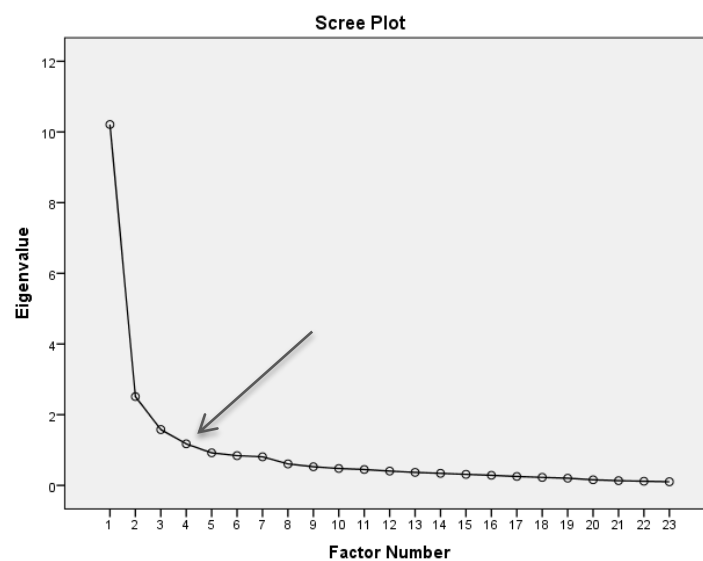
**Table 6.** *KMO and Bartlett's test of sphericity statistics for System Quality Factors scale*

<b>Kaiser-Meyer-Olkin measure of Sampling Adequacy</b>		.892
<b>Bartlett's Test of Sphericity</b>	Apprx. Chi-Square	1981.646
	df	253
	Sig.	.000

Source: Author's own research results.

The KMO measure (.892) and the Bartlett's test of sphericity  $\chi^2(253) = 1981.646$ ,  $p < .01$ , suggested sufficient inter-correlation and common variance within the data to conduct an exploratory factor analysis (see table 6).

Examination of the Kaiser-criterion (eigenvalues-greater-than 1) as well as the scree-plot suggested that four factors be extracted (see figure 1). The *a priori* criterion, stipulating the extraction of five factors model based on the theoretical framework, produced unstable factors, items that cross-loaded onto more than one factor as well as factors which were difficult to interpret. Four factors were consequently extracted.



**Figure 1.** *Scree-plot System Quality Factors scale*

Source: Author's own research results.

The pattern matrix for the final factor solution after rotation is provided in table 7 below. Items 14, 11 and 5 did not load significantly ( $< .4$ ) on any of the factors (see table 7).

**Table 7.** *Pattern matrix (rotated factor matrix) System Quality Factors scale*

Items	Factor			
	1	2	3	4
22	.874			
23	.761			
19	.732			
21	.687			



Items	Factor			
	1	2	3	4
20	.627			
18	.551			
14				
11				
3		.886		
1		.884		
2		.850		
4		.628		
6		.507		
5				
13			.744	
12			.714	
10			.429	
16				.818
17				.690
15				.616
8				.564
7				.549
9				.509

Source: Author's own research results.

Table 8 provides a summary of the items which loaded significantly on the various factors.

**Table 8.** *Significant items per factors extracted System Quality Factors scale*

Factor 1		
Item	Content	Loading
18	A shopping site that has a fast response time influences me to shop online.	.551
19	A shopping site that operates at good constant speeds influences me to shop online.	.732
20	A shopping site that has pages that load quickly influences me to shop online.	.627
21	A shopping site that has images that load quickly influences me to shop online.	.687
22	A shopping site that has links that open quickly influences me to shop online.	.874
23	A shopping site that allows quick access to its services influences me to shop online.	.761
Factor 2		
Item	Content	Loading
1	A shopping site that is easy to use influences me to shop online.	.884
2	A shopping site that is easy to navigate influences me to shop online.	.850
3	A shopping site that provides trouble-free shopping influences me to shop online.	.886
4	A shopping site that has a simple layout influences me to shop online.	.628
6	A shopping site that is well organised influences me to shop online.	.507
Factor 3		
Item	Content	Loading
10	A shopping site that performs reliably influences me to shop online.	.429
12	A shopping site that provides a safe shopping environment influences me to shop online.	.714
13	A shopping site that ensures the authenticity of the products/services influences me to shop online	.744
Factor 4		
	Content	Loading
15	A shopping site that adapts to different screen device sizes influences me to shop online.	.616
16	A shopping site that adapts to different operating systems influences me to shop online.	.818
17	A shopping site that adapts to different user system specifications influences me to shop online (e.g. portrait or landscape view).	.690

7	A shopping site that is available 24/7 influences me to shop online.	.549
8	A shopping site that avoids downtime due to maintenance influences me to shop online.	.564
9	A shopping site that helps with error recovery influences me to shop online (e.g. when you need to refresh a page and your details are saved)	.509

Source: Author's own research results.

Factor 1 was constituted mainly from items relating to the speed of online shopping sites with the item with the highest factor loading being 'A shopping site that has links that open quickly influences me to shop online'. The factor was thus labelled 'Response Time' (see table 8).

Items which loaded significantly onto factor 2 primarily focus on ease of use, simplicity and organisation. The highest loading items on the factor were 'A shopping site that provides trouble-free shopping influences me to shop online' and 'A shopping site that is easy to use influences me to shop online'. The factor was consequently labelled 'Usability' (see table 8).

Factor three contained items which focus on reliability, authenticity and the provision of a safe shopping environment. The item content thus seems to relate to the reliability and trustworthiness of the shopping site with the highest loading item being 'A shopping site that ensures the authenticity of the products/services influences me to shop online'. The factor was thus labelled 'Reliability' (see table 8).

The final factor, Factor 4, consisted of items which relate predominantly to the availability and adaptability of the shopping site. The highest loading item on the factor was 'A shopping site that adapts to different operating systems influences me to shop online'. The factor was thus labelled as 'Adaptability and Availability' (see table 8).

Similar to the findings from the confirmatory factor analysis, moderate positive correlations ( $\geq .3$ ) to strong positive correlations ( $\geq .5$ ) were found between all the extracted factors (see table 9).

**Table 9.** *Factor correlation matrix for System Quality Factors scale (exploratory)*

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1			
Factor 2	.360	1		
Factor 3	.336	.460	1	
Factor 4	.584	.426	.314	1

Source: Author's own research results.

Table 10 below provides the Cronbach's Alpha reliability coefficients for each of the factors identified. All the factors/subscales showed good internal consistency and reliability with all the Cronbach's Alpha coefficients  $> 0.6$  (Field, 2005; Hair, Black, Babin & Anderson, 2010).

**Table 10.** *Cronbach's alpha coefficients per factor System Quality Factors scale*

	Label	Cronbach's Alpha
Factor 1	Response Time	.922
Factor 2	Usability	.902
Factor 3	Reliability	.788
Factor 4	Adaptability & Availability	.845

Source: Author's own research results.

### Information Quality Factors scale

#### Confirmatory factor analysis – Information Quality Factors scale

Confirmatory factor analysis of the Information Quality Factors scale was based on a five-factor model in line with the underlying theoretical framework. The analysis yielded high factor loadings for all the items on the various factors underlying the scale (see table 11). All factor loadings were found to be statistically significant ( $p < .001$ ).

**Table 11.** Information Quality Factors scale confirmatory factor analysis standardised item factor loadings ( $n = 128$ )

Item	Scale	Personalisation	Completeness	Relevancy	Ease of Understanding	Secureness
1	Personalisation	.888				
2	Personalisation	.933				
3	Personalisation	.791				
4	Personalisation	.619				
5	Completeness		.704			
6	Completeness		.890			
7	Completeness		.523			
8	Relevancy			.703		
9	Relevancy			.702		
10	Relevancy			.817		
11	Relevancy			.727		
12	Relevancy			.762		
13	Ease of Understanding				.801	
14	Ease of Understanding				.801	
15	Ease of Understanding				.917	
16	Ease of Understanding				.932	
17	Ease of Understanding				.820	
18	Ease of Understanding				.736	
19	Secureness					.846
20	Secureness					.789
21	Secureness					.932
22	Secureness					.777
23	Secureness					.503

Note: All factor loadings were found to be statistically significant ( $p < .05$ ).

Source: Author's own research results.

Despite the high factor loadings, the overall fit of the hypothesised model was found to be problematic. Overall the chi-square test was found to be significant with  $\chi^2(215) = 388.555$ ,  $p < .001$ , indicating poor fit. Further fit indices also indicated poor fit of the model with the GFI = .795 ( $< .95$ ), CFI = .914 ( $< .95$ ) and the RMSEA = .081 ( $> .8$ ) (see table 4). Overall the model thus did not fit the data.

**Table 12.** Information Quality Factors scale goodness-of-fit indices

Model	$\chi^2$	df	p	GFI	CFI	RMSEA
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Original model	388.555	215	<.001	.795	.914	.081
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Source: Author's own research results.

In examining the correlations between the various factors in the model, strong relationships between the different factors within the model was found with only 'Personalisation' and 'Secureness' not correlating highly within the posited model. All other correlations ranged from moderate positive ( $\geq .3$ ) to strong ( $\geq .5$ ) and very strong ( $\geq .7$ ) positive correlations. Strong relationships thus exist between the various dimensions underlying the model. Table 13 below provides a breakdown of the correlations between the factors.

**Table 13.** *Factor correlation matrix for Information Quality Factors scale*

Factor	Personalisation	Completeness	Relevancy	Ease of Understanding	Secureness
Personalisation	1				
Completeness	.402	1			
Relevancy	.400	.750	1		
Ease of Understanding	.327	.586	.807	1	
Secureness	.154	.456	.543	.491	1

Source: Author's own research results.

#### *Exploratory factor analysis – Information Quality Factors scale*

In order to further explore the underlying dimensionality of the Information Quality Factors scale in light of the findings of the confirmatory factor analysis; alternative exploratory factor analysis was conducted on the data.

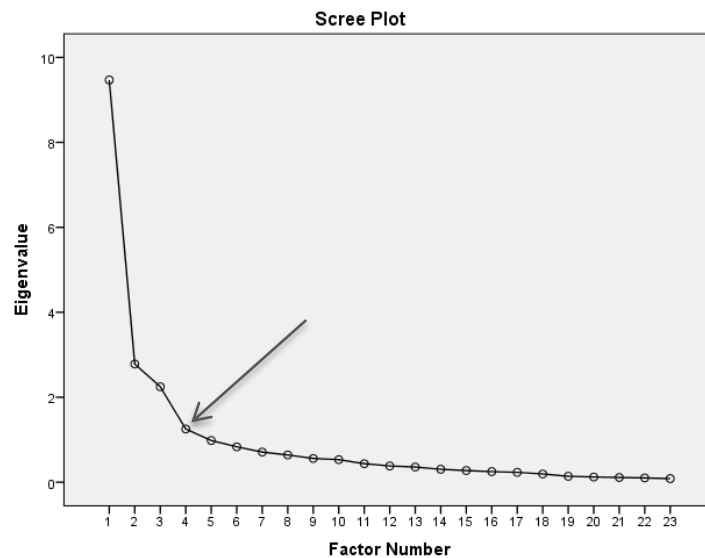
**Table 14.** *KMO and Bartlett's test of sphericity statistics for Information Quality Factors scale*

Kaiser-Meyer-Olkin measure of Sampling Adequacy		.870
Bartlett's Test of Sphericity	Apprx. Chi-Square	2121.276
	df	253
	Sig.	.000

Source: Author's own research results.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy as well as the Bartlett's test of sphericity was utilised to determine the factorability of the data. Both the KMO measure (.870) and the Bartlett's test of sphericity  $\chi^2$  (253) = 2121.276,  $p < .01$ , suggested sufficient inter-correlation and common variance within the data to conduct a factor analysis (see table 14).

The Kaiser-criterion (eigenvalues-greater-than 1) as well as the scree-plot suggested the extraction of four factors (see figure 2). Although the *a priori* criterion, in line with the posited theoretical framework underlying the scale, stipulates five factors, the lack of stable factors, cross-loading of items in the five factor model and difficulty in interpreting factors, further supported the decision to extract four factors.



**Figure 2. Scree-plot Information Quality Factors scale**

Source: Author's own research results.

Table 15 provides the pattern matrix for the final factor solution after rotation. Only item 12 and item 9 did not load significantly ( $< .4$ ) onto any of the factors (see table 15).

**Table 15. Pattern matrix (rotated factor matrix) Information Quality Factors scale**

Items	Factor			
	1	2	3	4
15	.917			
16	.882			
18	.801			
17	.786			
14	.686			
13	.621			
2		.972		
1		.848		
3		.798		
4		.552		
19			.854	
21			.833	
20			.808	
22			.798	
23			.566	
6				.709
5				.652
11				.612
10				.473
8				.438
7				.425
12				
9				

Source: Author's own research results.

From the pattern matrix the following table (table 16) provides a summarised version of the various items which loaded onto the different factors.

**Table 16.** *Significant items per factors extracted Information Quality Factors scale*

<b>Factor 1</b>		
<b>Item</b>	<b>Content</b>	<b>Loading</b>
13	A shopping site that provides information that is easy to understand influences me to shop online.	.621
14	A shopping site that provides clear instructions influences me to shop online.	.686
15	A shopping site that provides information that is simple influences me to shop online.	.917
16	A shopping site that provides information that is easy to read influences me to shop online.	.882
17	A shopping site that provides information that is straight to the point influences me to shop online.	.786
18	A shopping site that provides information that is clear in meaning influences me to shop online.	.801
<b>Factor 2</b>		
<b>Item</b>	<b>Content</b>	<b>Loading</b>
1	A shopping site that suggests products/services based on my interests influences me to shop online.	.848
2	A shopping site that suggests products/services I am likely to buy influences me to shop online.	.972
3	A shopping site that suggests products/services based on my purchasing history influences me to shop online.	.798
4	A shopping site that provides accurate recommendations as to what I am looking for influences me to shop online.	.552
<b>Factor 3</b>		
<b>Item</b>	<b>Content</b>	<b>Loading</b>
19	A shopping site that has secure methods of payment influences me to shop online.	.854
20	A shopping site that protects my credit/debit card details influences me to shop online.	.808
21	A shopping site that has privacy policies in place influences me to shop online.	.833
22	A shopping site that protects my personal information influences me to shop online.	.798
23	A shopping site that prevents unlawful use of my information influences me to shop online.	.566
<b>Factor 4</b>		
<b>Item</b>	<b>Content</b>	<b>Loading</b>
5	A shopping site that provides comprehensive information on their products/services influences me to shop online.	.652
6	A shopping site that provides comprehensive information on their shopping process influences me to shop online.	.709
7	A shopping site that provides comprehensive information about the company influences me to shop online.	.425
8	A shopping site that provides all the relevant information I need influences me to shop online.	.438
10	A shopping site that provides relevant information on their products/services influences me to shop online.	.473
11	A shopping site that provides up-to-date information on their products/services influences me to shop online.	.612

Source: Author's own research results.

Factor 1 was constituted predominantly from items related to clear, simple and easy to read information with regard to online shopping. The highest loading item on the factor was 'A shopping site that provides information that is simple influences me to shop online', and thus the factor was labelled 'Ease of Understanding' (see table 16).

Items which loaded significantly onto Factor 2 were related to interests and preferences of the individual when shopping online with the highest loading item being 'A shopping site that suggests products/services I am likely to buy influences me to shop online'. The factor was subsequently labelled 'Personalisation' (see table 16).

The items which loaded significantly onto Factor 3 relate primarily to elements regarding security in relation to online shopping. 'A shopping site that has secure methods of payment influences me to shop online', was the highest loading item and thus the factor was labelled as 'Secureness' (see table 16).

The final factor contained items which relate to both comprehensive information as well as relevant and up-to-date information. The highest loading item was 'A shopping site that provides comprehensive information on their shopping process influences me to shop online'. Considering the importance of both the element of comprehensiveness or completeness of information as well as the relevancy of information, the factor was labelled 'Completeness and Relevancy' (see table 16).

In line with the findings from the confirmatory factor analysis, moderate positive correlations ( $\geq .3$ ) to strong positive correlations ( $\geq .5$ ) were found between the extracted factors, except for the factors 'Personalisation' and 'Secureness' (see table 17).

**Table 17.** *Factor correlation matrix for Information Quality Factors scale (exploratory)*

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1			
Factor 2	.250	1		
Factor 3	.372	.123	1	
Factor 4	.551	.408	.384	1

Source: Author's own research results.

In line with the factor analyses, Cronbach's Alpha reliability coefficients were calculated for each of the factors identified. Table 18 below shows that all the factors/subscales showed good internal consistency and reliability with all the Cronbach's Alpha coefficients  $> 0.6$  (Field, 2005; Hair, Black, Babin & Anderson, 2010).

**Table 18.** *Cronbach's alpha coefficients per factor Information Quality Factors scale*

	Label	Cronbach's Alpha
Factor 1	Ease of Understanding	.935
Factor 2	Personalisation	.888
Factor 3	Secureness	.877
Factor 4	Completeness & Relevancy	.819

Source: Author's own research results.

### **Service Quality Factors scale**

#### *Confirmatory factor analysis – Service Quality Factors scale*

Based on the underlying theoretical framework, a five-factor model was utilised in the confirmatory factor analysis of the Service Quality Factors scale. All the items in the analysis loaded highly on the various factors with all factor loadings being significant ( $p < .001$ ). Item 26 was the only exception with a small factor loading of .266, yet this was still found to be significant ( $p < .01$ ) (see table 19).

**Table 19.** *Service Quality Factors scale confirmatory factor analysis standardised item factor loadings (n = 128)*

Item	Scale	Responsiveness	Assurance	Empathy	Reliability	Follow-up Service
1	Responsiveness	.656				
2	Responsiveness	.864				

Item	Scale	Responsiveness	Assurance	Empathy	Reliability	Follow-up Service
3	Responsiveness	.895				
4	Responsiveness	.879				
5	Responsiveness	.882				
6	Assurance		.768			
7	Assurance		.695			
8	Assurance		.747			
9	Assurance		.385			
10	Assurance		.794			
11	Assurance		.719			
12	Empathy			.709		
13	Empathy			.794		
14	Empathy			.891		
15	Empathy			.627		
16	Reliability				.812	
17	Reliability				.741	
18	Reliability				.895	
19	Reliability				.855	
20	Reliability				.861	
21	Reliability				.889	
22	Follow-up Service					.415
23	Follow-up Service					.496
24	Follow-up Service					.951
25	Follow-up Service					.942
26	Follow-up Service					.266

Source: Author's own research results.

Overall the hypothesised model did not fit the data well. The chi-square test was significant,  $\chi^2(282) = 648.454$ ,  $p < .001$ , indicating poor fit. The additional goodness-of-fit indices also suggested poor fit for the model with the GFI = .739 ( $< .95$ ), CFI = .854 ( $< .95$ ) and the RMSEA = .103 ( $> .8$ ) (see table 20).

**Table 20.** *Service Quality Factors scale goodness-of-fit indices*

Model	$\chi^2$	df	p	GFI	CFI	RMSEA
Original model	648.454	282	<.001	.739	.854	.103

Source: Author's own research results.

Strong relationships were found between the factors present in the model with moderate ( $\geq .3$ ) to strong ( $\geq .5$ ) and very strong ( $\geq .7$ ) positive correlations found between the majority of the factors (see table 13). Weak positive correlations ( $< .3$ ) however were found between 'Follow-up Service' and the other factors in the model, with almost no correlation between 'Follow-up Service' and 'Reliability' (see table 21).

**Table 21.** *Factor correlation matrix for Service Quality Factors scale*

	Responsiveness	Assurance	Empathy	Reliability	Follow-up
--	----------------	-----------	---------	-------------	-----------



					Service
Responsiveness	1				
Assurance	.822	1			
Empathy	.821	.754	1		
Reliability	.785	.874	.735	1	
Follow-up Service	.263	.247	.205	.095	1

Source: Author's own research results.

#### *Exploratory factor analysis – Service Quality Factors scale*

The dimensionality of the Service Quality Factors scale following the results of the confirmatory factor analysis was further investigated by conducting an exploratory factor analysis.

**Table 22.** *KMO and Bartlett's test of sphericity statistics for Service Quality Factors scale*

<b>Kaiser-Meyer-Olkin measure of Sampling Adequacy</b>		.888
<b>Bartlett's Test of Sphericity</b>	Apprx. Chi-Square	2621.553
	df	325
	Sig.	.000

Source: Author's own research results.

The KMO measure (.888) and the Bartlett's test of sphericity  $\chi^2$  (325) = 2621.553,  $p < .01$ , suggested sufficient inter-correlation and common variance within the data to conduct an exploratory factor analysis (see table 22).

In terms of the number of factors to extract, the Kaiser-criterion (eigenvalues-greater-than 1) suggested the extraction of five factors, in line with the *a priori* criterion. This however resulted in two unstable factors (less than 3 significant loadings per factor) as well as cross-loadings of items on more than one factor (see table 23). Consequently the extraction of four factors was also investigated, again yielding unstable factors (see table 24). Finally, in examining the scree-plot (see figure 3), the decision was made to extract three factors in order to ensure the interpretability and stability of the resulting factors.

**Table 23.** *Pattern matrix (rotated factor matrix) Service Quality Factors scale – 5 factors*

Items	Factor				
	1	2	3	4	5
19	.814				
21	.791				
18	.789				
20	.782				
10	.744				
26	.737				
1	.632				
17	.564				
11	.505				
8	.495				
16	.471		.432		
7	.403				
24		.992			
25		.895			
13			.740		
14			.723		

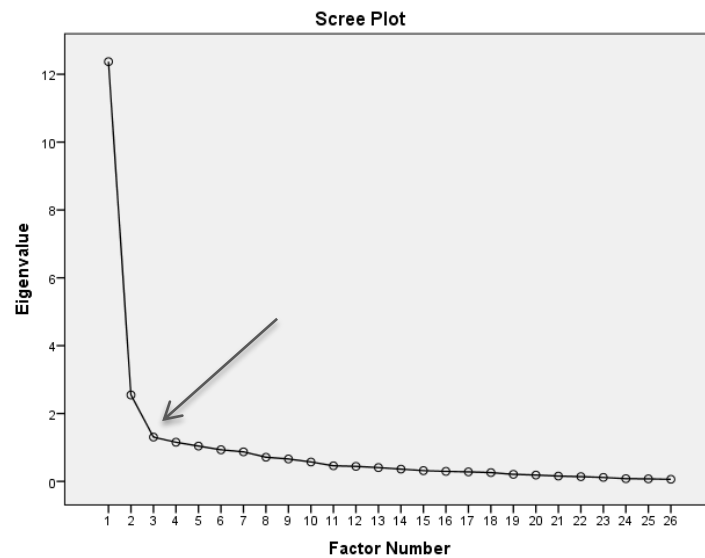
Items	Factor				5
	1	2	3	4	
12			.651		
3			.458		.438
15					
9					
23				.556	
22				.420	
2					.653
5					.615
6					.574
4					.567

Source: Author's own research results.

**Table 24.** *Pattern matrix (rotated factor matrix) Service Quality Factors scale – 4 factors*

Items	Factor			
	1	2	3	4
21	.882			
19	.867			
18	.847			
20	.841			
10	.775			
26	.720			
1	.689			
17	.607			
8	.580			
11	.556			
7	.509			
16	.499			
6	.407			
24		.980		
25		.932		
9				
3			.855	
14			.794	
13			.780	
4			.768	
2			.669	
12			.635	
15			.461	
5	.427		.445	
23				.464
22				

Source: Author's own research results.



**Figure 3. Scree-plot Service Quality Factors scale**

Source: Author's own research results.

Table 25 below provides the pattern matrix for the final factor solution with three factors extracted. Items 9 and 22 did not load significantly ( $< .4$ ) on any of the factors with item 5 cross-loading on both Factor 1 and Factor 3 (see table 25).

**Table 25. Pattern matrix (rotated factor matrix) Service Quality Factors scale – 3 factors**

Items	Factor		
	1	2	3
21	.923		
19	.877		
18	.845		
20	.825		
10	.807		
17	.678		
8	.653		
16	.610		
26	.603		
1	.603		
11	.600		
7	.558		
6	.485		
9			
24		.962	
25		.919	
23		.488	
3			.887
4			.771
13			.757
2			.705
14			.701
15			.455
12			.451
5	.432*		.446*
22			

Source: Author's own research results.

Table 26 provides a summary of the items which loaded significantly on the various factors.

**Table 26. Significant items per factors extracted Service Quality Factors scale**

<b>Factor 1</b>		
<b>Item</b>	<b>Content</b>	<b>Loading</b>
1	An online retailer that provides prompt services influences me to shop online.	.603
6	An online retailer that is trustworthy influences me to shop online.	.485
7	An online retailer that goes out of their way to help me influences me to shop online.	.558
8	An online retailer that has a good reputation influences me to shop online.	.653
10	An online retailer that I am confident in influences me to shop online.	.807
11	An online retailer that is transparent (open and candid) influences me to shop online.	.600
16	An online retailer that ensures accurate transactions influences me to shop online.	.610
17	An online retailer that keeps accurate records of purchases influences me to shop online.	.678
18	An online retailer that keeps to their fulfilment promises influences me to shop online.	.845
19	An online retailer that performs their services right the first time influences me to shop online.	.877
20	An online retailer that is effective in providing services influences me to shop online.	.825
21	An online retailer that is efficient in providing services influences me to shop online.	.923
26	An online retailer that addresses issues if I am dissatisfied with the product/service, influences me to shop online.	.603
<b>Factor 2</b>		
<b>Item</b>	<b>Content</b>	<b>Loading</b>
23	An online retailer that follows up on abandoned purchases influences me to shop online.	.488
24	An online retailer that encourages customer reviews influences me to shop online.	.962
25	An online retailer that encourages product/service ratings influences me to shop online.	.919
<b>Factor 3</b>		
<b>Item</b>	<b>Content</b>	<b>Loading</b>
2	An online retailer that provides assistance when I need it influences me to shop online.	.705
3	An online retailer that provides guidance when I need it influences me to shop online.	.887
4	An online retailer that is willing to help when I need it influences me to shop online.	.771
5	An online retailer that provides accurate information when I need it influences me to shop online.	.446
12	An online retailer that is empathetic towards my situation if something goes wrong during the shopping process, influences me to shop online.	.451
13	An online retailer that provides individualised solutions to my problems experienced during the shopping process, influences me to shop online.	.757
14	An online retailer that shows that they care about my situation if something goes wrong during the shopping process, influences me to shop online.	.701
15	An online retailer that gives personalised responses instead of generic auto-replies influences me to shop online.	.455

Source: Author's own research results.

Factor 1 consists of items which relate to the efficiency and reliability of services from online retailers along with confidence or trust in online retailers. The highest loading items on the factor were 'An online retailer that performs their services right the first time influences me to shop online', 'An online retailer that is efficient in providing services influences me to shop online' and 'An online retailer that keeps to their fulfilment promises influences me to shop online'. Considering the elements of reliability and the notion of efficiency associated with this, along with the element of

confidence and trust contained within the content of the items, the factor was labelled 'Efficiency & Assurance' (see table 26).

Items which load significantly onto Factor 2 relate primarily to customer inputs in terms of reviews and ratings of services in the light of follow-up service. The highest loading items on the scale were 'An online retailer that encourages customer reviews influences me to shop online' and 'An online retailer that encourages product/service ratings influences me to shop online'. The factor was thus labelled 'Follow-up Service' (see table 26).

The final factor consisted of items relating to the provision of support and guidance by online retailers as well as online retailers displaying empathy and care. This is further coupled with the notion of an individualised/personalised approach by online retailers. Items which loaded the highest on the factor were 'An online retailer that provides guidance when I need it influences me to shop online', 'An online retailer that is willing to help when I need it influences me to shop online' and 'An online retailer that provides individualised solutions to my problems experienced during the shopping process, influences me to shop online'. Taking the various elements of the item content into account, with support and guidance coupled with empathy and care, the factor was labelled 'Responsiveness & Empathy' (see table 26).

In terms of correlation between the factors, a very strong positive correlation ( $\geq .7$ ) was found between Factor 1 (Efficiency & Assurance) and Factor 3 (Responsiveness & Empathy), with a moderate positive correlation ( $\geq .3$ ) between Factor 2 (Follow-up Service) and Factor 3 (Responsiveness & Empathy). Only a weak positive correlation was found between Factor 1 (Efficiency & Assurance) and Factor 2 (Follow-up Service) (see table 27).

**Table 27.** *Factor correlation matrix for Service Quality Factors scale (exploratory)*

	Factor 1	Factor 2	Factor 3
Factor 1	1		
Factor 2	.163	1	
Factor 3	.742	.304	1

Source: Author's own research results.

Table 28 below provides the Cronbach's Alpha reliability coefficients for each of the factors identified. All the factors showed good internal consistency and reliability with all the Cronbach's Alpha coefficients  $> 0.6$  (Field, 2005; Hair, Black, Babin & Anderson, 2010).

**Table 28.** *Cronbach's alpha coefficients per factor Service Quality Factors scale*

	Label	Cronbach's Alpha
Factor 1	Efficiency & Assurance	.942
Factor 2	Follow-up Service	.811
Factor 3	Responsiveness & Empathy	.918

Source: Author's own research results

## Discussion

From the data it is clear that the original hypothesised models for all three scales did not provide an adequate fit for the data. Findings from the confirmatory factor analyses indicated that model fit for the Information Quality Factors scale, the System Quality

Factors scale and the Service Quality Factors scale was problematic, despite significant factor loadings which were deceptively high for each of the respective scales. Although the Information Quality scale and the System Quality scale were close in achieving adequate fit, they still did not meet the fit criteria.

In investigating the further dimensionality of the respective scales through exploratory factor analyses, both the Information Quality Factors scale and the System Quality Factors scale yielded a similar factor structure to the original hypothesised model as was used in the confirmatory factor analyses. Instead of a theorised five-factor structure, the scales yielded a four-factor structure with the originally hypothesised factors largely being maintained. The fourth factor in both these scales, following the exploratory factor analyses, was a combination between two of the dimensions in the original hypothesised model.

With regards to the Service Quality Factors scale, the exploratory factor analyses revealed a slightly altered dimensionality than the original hypothesised model used in the confirmatory factor analysis. Three factors emerged from the analysis which ultimately stemmed from a combination of the original factors in the hypothesised model. With closer examination it is clear that the extracted factors still reflect the underlying theory, yet poignantly illuminates the relationships between the various factors/elements. 'Responsiveness & Empathy,' for example, emerged as a factor following the exploratory factor analyses. While these elements were separated in the original hypothesised model into separate factors, the fact that they ultimately emerged as elements of the same dimension may allude to the fact that while online shoppers want support and guidance, they also want this support and guidance to be individualised and to be empathetic. Similar arguments can be made for the other factors which resulted from the exploratory factor analyses.

Overall, strong relationships were found between the various factors underlying the hypothesised models in the confirmatory factor analyses as well as the extracted factors in the exploratory factor analyses. While this may be the case, if the item content is examined in line with the underlying theoretical framework, this makes sense both practically and theoretically.

Finally, although the confirmatory factor analyses confirmed a poor fit for the hypothesised models for each of the examined scales respectively, the exploratory factor analyses seemed to support the basic underlying theoretical framework for the model with slight adjustments to the original postulation and dimensionality, yet with the basic elements of the theoretical framework largely maintained to some degree.

## Limitations

The primary limitation of the study centres around the sample included. Firstly, due to the utilisation of convenience sampling, the sample consists predominantly of respondents from the Gauteng area and respondents with a higher level of qualification. The results from the study may thus not be applied to the broader South African population. The lack of demographic data regarding the racial distribution of the sample may further restrict the generalisation of the results.

Secondly, the sample size in the study, in light of the statistical methods utilised, may also warrant some consideration. While the minimum requirements with regards to sample size were met for both the confirmatory factor analyses (minimum sample size = 100 with  $\leq 5$  constructs, each with more than 3 items and high communalities) as well as the exploratory factor analyses (sample size = to 5 respondents per item) and

the effect of sample size was somewhat controlled for by the use of more stringent cut-off criteria in terms of fit and significant factor loadings, a larger sample may provide more stable solutions (Field, 2005; Hair et al., 2010; Hu and Bentler, 1995, 1998, 1999).

## Conclusion

This study contributes online shopping literature relating to quality factors influencing online shopping; particularly from a South African perspective. The study provides a general outline for online retailers operating in South Africa on the quality factors that should be taken into consideration with regards to their shopping website. The study examined the construct validity of three respective scales related to website quality factors, namely; the System Quality Factors scale, the Information Quality Factors scale and the Service Quality Factors scale. While the confirmatory factor analyses found poor fit for the original hypothesised models for each of the scales, further exploratory factor analyses revealed slightly different dimensionalities underlying the scales, yet these were still somewhat aligned with the theoretical framework from which the original scales were derived. Ultimately the study found that the construct validity of the scales in their current form were problematic. Based on the results, it is clear that the dimensionality underlying the System Quality Factors scale, the Information Quality Factors scale and the Service Quality Factors scale warrants further investigation. The results from the study provide an initial platform for the revision of original scales to be further tested on a larger, representative sample to ensure the construct validity of the scales, the generalisation of the findings and ultimately the development of valid scales to measure System Quality Factors, Information Quality Factors and Service Quality Factors in relation to website quality factors in the online shopping environment. In conclusion,

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