Exploring technology readiness for mobile payment app users

Melanie Wiese and Michael Humbani*

Department of Marketing Management, University of Pretoria, Pretoria, South Africa.

*E-mail address: michael.humbani@up.ac.za

E-mail address: melanie.wiese@up.ac.za

Abstract

The study aims to better understand the various technology readiness segments by assessing how their readiness relate to demographics variables and their adoption, attitude, ease-of-use, usefulness and continuance intention to use mobile payment apps using the technology readiness index. Using a convenience sample of 416 from a consumer panel, a two-step cluster analysis shared similarities with three of the original technology readiness segments (pioneers, paranoids and explorers) while the other two segments clustered together into a fourth segment, hesitant-sceptics. The results indicate that South African mobile users are ready to use mobile payment applications, with the 'explorer' emerging as the best segment to target due to optimism levels, while the hesitant-sceptic segment represent the key to unlocking the real potential value of mobile payment apps. Understanding different segments provides marketers with the opportunity to select viable segments and to customise strategies to increase uptake and continued use according to customer needs.

Keywords: Technology readiness index (TRI); mobile payment applications (apps); adoption; usefulness; ease-of-use; attitude; continuance intention; clusters

1 Introduction

Since the introduction of the first handheld mobile device in 1973, mobile phones have been the fastest growing evolution of all time. It is estimated that by end of 2020, there will be more than 500 million mobile users in Sub-Saharan Africa alone (GSMA, 2017). The enormous uptake of mobile phones bears testimony to the fact that mobile phones have become more useful in modern life and that people place an immense importance on them (Goneos-Malka *et al.*, 2014). Given that about 20 million South Africans owned smartphones in 2014 (Business Tech, 2014) that were capable of making mobile payments, suggests that mobile phones will be the possible predominant future payment platform.

Reports indicate that, globally, mobile phone use is growing exponentially. Against this backdrop, consumers in Africa are losing track of the applications (apps) that they download on average per month; although estimates thereof hover around an average of 33 apps per device at any point (Delloitte and Touché, 2016). This rapid adoption of apps might be a game changer surpassing mobile banking in some developed nations (Chawla and Joshi, 2017). Based on these statistics, it is estimated that by the year 2020, mobile payments will become a much larger part of the overall mobile commerce picture (eMarketer, 2017).

According to the Organisation for Economic Co-operation and Development (OECD, 2012), mobile payments are payments for which payment data and instruction are made via mobile phones or other mobile devices. Such payments would include internet payments made by using a mobile device, as well as payments made through mobile network operators (MNOs). This definition incorporates both proximity and remote payments in which proximity mobile payments deduct money from the users' mobile or bank accounts by using quick response (QR) codes (Liu, 2015). In remote mobile payments, money is deducted from the

user's mobile account or credit card through the internet (Liu, 2015). South African consumers use both proximity and remote mobile payments.

Despite the rapid diffusion of mobile phones, the adoption and continued use of mobile payment apps has been surprisingly low in emerging markets. For example, in spite of an increased subscriber base of 903 million in India, only four per cent were using mobile payment apps by 2014 (Upadhyay and Chattopadhyay, 2015). In the same vein, of the 9 million people who owned smartphones in 2014 (Statistica, 2018), only 2.1 million South African subscribers were using QR-based mobile payments to purchase products and services in 2014 (World Wide Worx, 2014). It seems that little has changed, as according to the latest PYMNTS Global Cash Index (2017), cash still powers over 50 per cent of consumer transactions, followed by cards, which account for 58 per cent of the gross domestic product (GDP) in South Africa. Although South Africa is at the forefront in the uptake of mobile phones and the development of an infrastructure for supporting digital payments, mobile payment apps have yet to represent a significant share of the market (Ndwandwe, 2017). This low adoption and usage rate could be attributed to the lack of customer insights.

This slow uptake poses the question: Are South African mobile users indeed ready for a new technology, such as mobile payment apps? And if so, which consumers should be targeted? Market segmentation is often used to uncover the various needs of different customers and to assist brands to provide better need satisfaction by targeting the most profitable segments. (Asmi *et al.*, 2016).

Reports indicate that effective segmentation can be used to personalise mobile payment experiences that can drive conversions and improve marketing efforts (eMarketer, 2018). However, there is little academic research focusing on the segmentation of mobile payment

users, which might be the key to gaining user adoption and the continued use of mobile payment apps.

Few attempts have been made to segment mobile phone usage patterns, such as clusters, based on the mobile phone features (Goneos-Malka *et al.,* 2014), mobile banking adoption (Chawla and Joshi, 2017), mobile lifestyle (Zhu *et al.,* 2009), and behavioural segments in the mobile phone market (Kimiloglu *et al.,* 2010). None of these studies focused on segmenting mobile payment app users, which researchers envisage will outnumber internet users within a few years (eMarketer, 2017).

Mobile payments transcend borders, thereby suggesting that marketers are forced to deal with consumers who might be quite different from one another (Bhatnagar and Ghose, 2004). To this end, a mere segmentation approach, devoid of clustering, is no longer adequate to understand consumer heterogeneity in their adoption and continuance intentions (Bailey *et al.,* 2009). To identify viable markets, clustering is an important tool. According to Wiese *et al.* (2017), segments that arise from clustering can be described in terms of measured behaviour, thereby becoming the basis upon which target marketing can be developed and effectively implemented.

The use of the technology-readiness concept is widespread in business marketing, especially to identify those segments of the markets that are likely to adopt new technologies (Massey *et al.,* 2007). As most studies have reported, the Technology Readiness Index (TRI) is effective for studying consumers' propensity to adopt new technologies (Badri *et al.,* 2014; Parasuraman, 2000). The slow uptake of mobile payment apps and the call for further validation of the TRI (Meng et *al.,* 2010), have served as the impetus for this study.

The TRI developed by Parasuraman (2000) refers to the propensity of an individual to adopt and embrace new cutting-edge technology. The TRI can also be used to segment consumers,

based on their readiness, into five distinct segments: explorers, sceptics, pioneers, hesitators and avoiders or paranoids (Parasuraman, 2000; Parasuraman and Colby, 2015).

Against this backdrop, it would be interesting to know whether the TRI segments will hold true for mobile payment technology and whether the clusters of mobile payment app users can be used to better understand the adoption and the continued use of payment app users to target the most appropriate segment(s), in order to enhance the uptake of mobile payment apps.

2 Literature review

2.1 Clustering and segmentation

User segmentation is crucial for the success of electronic commerce (Bhatnagar and Ghose, 2004), and so are mobile payments. The potential benefits to be achieved through segmentation, such as the ability of marketers to allocate resources efficiently, the ability to compete with limited resources, and the ability to design products and services that closely match the needs of a particular segment, far outweigh the resource implications required to implement a successful segmentation approach (Quinn, 2009; Rix 2006).

Researchers tend to use the terms clustering and segmentation interchangeably. Market segmentation, "consists of detecting, evaluating and selecting homogeneous groups of individuals – whether they are consumers or not – with the purpose of designing and directing competitive strategies towards them" (Sarabia, 1996).

Cluster analysis, on the other hand, is a statistical tool for grouping similar objects, or participants and their statistical connections (Cooper and Schindler, 2006). Thus, cluster analysis is a *post hoc* descriptive segmentation method (Franke *et al.*, 2009:275). Since the emergence of the cluster analysis concept in the early 1930s (Tyron, 1939), there has been a growing stream of research incorporating cluster analysis for segmentation purposes (Athanassopoulou, 2000; Franke *et al.,* 2009; Kimiloglu *et al.,* 2010; Wiese *et al.,* 2017).

However, the popularity of cluster analysis is closely linked to the market segmentation approach, because the two approaches are complementary (Franke *et al.,* 2009).

Thus, market segmentation is a process of grouping customers on the basis of their similarities, and clustering is the process of finding similarities in customers – so that they can be grouped together and segmented. A clustering-based segmentation approach will be used to determine whether mobile payment users differ in terms of their propensity to adopt and continue to use mobile payment apps. This is because cluster analysis is used to find structures in a set of items, where these are homogeneous within groups that are created, but they remain separate from one another (Hossain and Amin, 2015).

The few clustering studies that have been reported in the literature relating to mobile payments have been conducted in Asia and developed countries. Upadhyay and Chattopadhay (2015) examined mobile based payment adoption issues in India and they identified four clusters: 'quality of service'; 'ease of use, innovation and value'; 'task fit' and 'technology adoption'. Lamberti *et al*. (2014) identified six clusters, based on the benefits sought by consumers namely: (1) 'unyielding citizens' showing a low propensity to change their habits; (2) 'conservatives' showing an importance attributed to convenience; (3) 'average citizens' characterized by a strong reliance on convenience; (4) 'countryside citizens' placing the emphasis on convenience and perceived advantages; (5) 'on-line multi-channellers' attributed to the control measure; and (6) 'offline multi-channellers' characterised by the highest scores in convenience and control.

2.2 Technology Readiness Index

The relevance of the TRI has been demonstrated in various contexts, but it is important to note that the TRI is not a measure of competence or knowledge, but rather a mind-set that has proven to be a stable consumer characteristic (Badri *et al.,* 2014). Individuals' general belief that

technology and innovation have positive benefits (optimism), and an inherent tendency to want to experiment with the technology (innovativeness) drives technology readiness; while a perceived lack of control over technology (discomfort) and the belief that technology can have negative consequences to the users (insecurity), inhibits technology readiness (Parasuraman, 2000).

Previous studies have identified *optimism* as a driver of new technology adoption. In a qualitative study conducted by Parasuraman and Colby (2015), consumers indicated that they are optimistic about a new technology that allows them to tailor-make things to fit their individual needs. Consumers can use mobile payments apps to make online and point-of-sale purchases, pay their water and electricity accounts, traffic fines; and also to send or receive money from friends and family. Thus, the flexibility and value derived from mobile payments creates a sense of optimism among consumers to positively identify with mobile payment apps. Although consumers may hold optimistic views about a new technology, they may differ in consumption patterns.

Parasuraman (2000) described *innovativeness* as consumers' inclination towards the use of new technology without fear and that such consumers are able to think and act independently. South African consumers can be considered innovative as they have acquired multiple devices. In 2010, about 96% of South Africans owned a smartphone, while 49% owned a laptop, and 52% owned a Tablet (Delloitte and Touché, 2016). These statistics suggests that South Africans are generally technologically savvy.

Discomfort reflects an individual's mentality towards a new technology. The complexity of using a new system, such as a mobile payment system could result in discomfort for the consumer and this would affect his/her usage of the system (Upadhyay and Chattopadhyay, 2015). Mobile payments are still regarded as a new phenomenon in emerging markets resulting

in elevated levels of discomfort. Consequently, until consumers start feeling comfortable with using payment features, mobile payments will not see widespread adoption (Ndwandwe, 2017).

Ramos-de-Luna *et al.* (2015) reported that *insecurity* negatively influences the adoption of mobile payment apps. Insecurity arises from the need for assurance that the product or service will function as expected. However, feelings of insecurity are peculiar to the individual's behavioural disposition towards the technology (Meng *et al.*, 2010).

By utilising the two drivers and two inhibitors briefly highlighted above, five TRI segments can be identified, namely: highly tech-oriented 'explorers', strongly engaged 'pioneers', dispassionate 'sceptics', risk-averse 'hesitators' and tech-resistant 'avoiders' (Parasuraman and Colby, 2001). Explorers tend to score high on optimism and innovativeness and low on discomfort and insecurity. Pioneers have a tendency to score high on all four dimensions while 'sceptics' score moderately on innovations, but low on the other three dimensions. Hesitators are usually optimistic and moderately concerned about discomfort and insecurity but they are not very innovative. Lastly, 'avoiders' are not optimistic or innovative and they are highly insecure and they experience discomfort in using technology and they are often slow to adopt (laggards), when it comes to new technology.

Since optimism and innovation are considered drivers of technology readiness while discomfort and insecurity act as inhibitors (Parasuraman, 2000), a total technology readiness score can be calculated by subtracting the inhibitors' negative scores from the positive scores of the drivers. A positive TRI score suggests that consumers are ready for new technology and it could indicate users that are likely to be the first to adopt a new technology, such as mobile payment apps. However, a negative score suggests that those consumers are not yet ready for the new technology, although they have downloaded payment apps and one could assume that these consumers would have low levels of adoption, like those reflective of 'laggards'.

2.3 Adoption and consumers' continuance intention to use mobile payment apps

With the unabated mobile penetration rates, South Africa is all set to witness a continual surge in the *adoption* of mobile payments in the years to come (Batra and Kalra, 2016). The adoption of mobile payments has become a top priority for banks, mobile network operators and merchants, since scholars are predicting mobile payments to become the main means of paying for goods and services in the future (Pasqua and Elkin, 2013). However, reports from as early as two decades ago indicate that individuals adopt technologies at different levels, reflecting segments, such as innovators, early adopters and laggards (Rogers, 2003).

After the initial download of a mobile payment app and its use (adoption), the usefulness and ease-of-using the mobile app will determine consumers' attitudes towards the app and this would result in either the continued use of the app to make payments, or in the discontinuance thereof.

Perceived usefulness represents the benefits that are enjoyed by users of mobile payment apps and the construct has long been accepted as having a profound impact on the continuance intention (Setterstrom *et al.,* 2013). This is reiterated by Voropanov (2015) that posits that to ensure loyal consumers and attract new ones, consumer productivity and value plays a vital role. However, Hsu *et al.* (2006) reported that consumers' perceptions of usefulness fluctuate across a spectrum of technological and usage contexts.

Researchers have confirmed the impact of *ease-of-use* on the intention to continue using new technologies (Hong *et al.,* 2006; Thong *et al.* 2006). Upadhyay and Chattopadhyay (2015) report that the ease-of-use perceptions of mobile payments in general can be used to segment customers.

Perceptions about the ease-of-use and usefulness may serve as cognitive antecedents of *attitudes* toward mobile payment apps. Ajzen (1991) described attitudes as the beliefs an individual has related to the results that the adoption of a specific behaviour would offer, and

his/her evaluation of the possible outcomes. For example, Goneos-Malka *et al.* (2014) reported that the majority of the young adult South African consumers have positive attitudes towards mobile phones in general. However, according to Wycech (2015), the amount of academic research concerning consumers' attitudes towards mobile payment apps is rather limited.

Prior research on consumers' intention to continue to use a particular technology confirms the positive influence of ease-of-use and the perceived usefulness on *continuance intention,* as well as the attitude in different contexts, such as mobile banking (Makanyeza, 2017); online payments (Abu-Shamaa *et al.,* 2016); health apps (Cho, 2016) and social commerce (Biucky *et al.,* 2017).

Bhattacherjee (2001) maintains that consumers' consumption experience varies and this might change their initial expectations, depending on the performance of the product or service, leading either to continuance or to the discontinuance thereof. Parasuraman (2000) argued that the relative power and the influence of positive and negative feelings about new technology varies across the population. It may tally with the variations in their propensity to embrace the new technology. Therefore, this study aims to explore the technological readiness of consumers to use mobile payment apps and to determine their technological readiness levels. Furthermore, the study aims to cluster users into the five possible technology readiness segments, as proposed by Parasuraman (2000), and to determine whether the adoption and continuance intention to use mobile payment apps differs between the various segments based on the issue of their technology readiness.

3 Methodology

3.1 Sampling and data collection

The target population comprised of adult South African mobile phone users who had downloaded a mobile payment app at the time of the survey. As downloads are often easy and

free it only represent a first opt-in option. The result is that often consumers download several apps, but never use them. Our interest lies in understanding the adoption and technology readiness within this group of consumers that had the means and motivation to opt-in. After obtaining ethical clearance, the data were collected via an online questionnaire administered to a consumer panel by a research firm. A convenience sample of 416 responses was obtained. There was almost an equal split between males (51%) and females (49%). Of the total participants, 83.6% had a tertiary qualification, representing a fairly educated cohort of participants. In terms of age, 50% were aged between 18 and 29, with an average age of 31, indicating a rather youthful sample. The age of respondents could be the reason why the majority of the respondents earn R15 999 or less (33.4%), followed by 21.2% falling into the R16 000 to R25 999 income bracket; and 13.9% in the R26 000 to R35 000 income brackets. However, about 68.3% of the respondents indicated that they use their mobile payment apps infrequently – either less than once a month, or on a monthly basis. The most popular purchases are mainly food items, such as restaurant meals (37.7%), take-aways (23.3%) and grocery items (21.2%).

3.2 Research instruments and measures

The constructs were measured with a seven-point Likert response format, ranging from 'strongly disagree' (1) to 'strongly agree' (7). In addition, questions related to demographics (age, income, gender, education and income), as well as questions pertaining to the frequency and type of payments made with mobile payment apps, were included. The four constructs of the TRI consisted of four items each and Parasuraman and Colby's (2015)'s scales were used. Continuance intention (3-items), adoption (3-items) and usefulness (3-items) were based on Bhattacherjee's (2001) scales. The four-item attitude scales of Schierz *et al.* (2010) and those of Kim *et al.* (2010) five item ease-of-use scales were used. Where appropriate, some items

were reworded to reflect the context of the study. Before the questionnaire was fielded, it was pre-tested among 30 respondents from the survey population and no major changes were needed.

4 Results

4.1 Reliability and validity

To assess the reliability and validity of the constructs, confirmatory factor analysis (CFA) was conducted. Five items with a factor loadings below 0.5 (Hair *et al.,* 2006) were identified and excluded from further analysis (C1 related to optimism, C7 related to innovativeness, C9 related to discomfort, C16 related to insecurity and C37 related to usefulness), retaining 42 out of 47 items. The obtained fit indices of χ^2 (741) =1335.293 (p=0.00), χ^2/df.=1.802, AGFI=0.841, CFI=0.941, TLI=0.923, and RMSEA=0.44, indicate acceptable model fit. The results in Table 1 indicate that all the constructs had good internal consistency as the Composite Reliability (CR) and Cronbach's Alpha values were all greater than the recommended threshold of 0.7 (Nunnally, 1978; Pallant, 2016). Furthermore, all the factor loadings were significant and greater than 0.5 (Hair *et al.,* 2006). The average variance extracted (AVE) also meets or exceeds the cut-off point of 0.5 (Fornell and Larcker, 1981) suggesting that scale items used are representative of each construct and support convergent validity**.**

Table 1: Factor loadings, CR, Cronbach's Alpha and AVE values

Construct	Items	Factor loadings	CR	Alpha	AVE
Optimism	Optim. C2	0.742	0.756	0.722	0.512
	Optim. C3	0.805			
	Optim. C4	0.582			
Innovativeness	Innov. C5	0.631	0.745	0.738	0.500
	Innov. C6	0.772			
	Innov. C8	0.701			
Discomfort	Discom. C10	0.732	0.738	0.738	0.500
	Discom. C11	0.672			
	Discom. C12	0.682			
Insecurity	Insec. C13	0.613	0.767	0.760	0.529
	Insec. C14	0.865			
	Insec. C15	0.681			
Adoption	Adop C34	0.766	0.776	0.776	0.536
	Adop C35	0.745			
	Adop C36	0.683			
Usefulness	Use C38	0.816	0.791	0.791	0.654
	Use C39	0.801			
Ease of use	Eou C40	0.763	0.877	0.873	0.589
	Eou C41	0.798			
	Eou C42	0.763			
	Eou C43	0.817			
	Eou C44	0.690			
Attitude	Att 52	0.898	0.916	0.868	0.783
	Att 53	0.882			
	Att 54	0.875			
	Att 55	0.737			
Continuance intention	CI C45	0.915	0.936	0.935	0.830
	CI C46	0.927			
	CI C47	0.890			

Discriminant validity was assessed by using the Fornell and Larcker (1981) criterion, in which the square root of the AVE should exceed the shared correlation between each pair of constructs, in order to confirm that the constructs are unique.

Table 2: Results of discriminant validity

	Opt	Inno	Disco	Insec	Att	Ado	Use	EOU	Cont
Opt	**0.716**								
Inno	0.441	**0.707**							
Disc	0.077	0.077	**0.707**						
Insec	0.313	0.136	0.352	**0.728**					
Att	0.520	0.352	0.62	0.188	**0.885**				
Ado	0.566	0.494	0.130	0.236	0.593	**0.732**			
Use	0.612	0.378	0.062	0.182	0.684	0.756	**0.809**		
EOU	0.423	0.440	0.177	0.134	0.555	0.606	0.692	**0.767**	
Cont	0.513	0.373	0.035	0.221	0.799	0.688	0.731	0.542	**0.911**

The results in Table 2 show that most diagonal values exceeded the inter-construct correlations; and they therefore confirm discriminant validity. An additional procedure was used to determine the discriminant validity, for adoption and usefulness, showing somewhat weak validities with the Fornell and Larcker (1981) approach. The difference in the Chi-square values between the unconstrained CFA model and the nested CFA model were determined (96, *df* =1) and the resultant Chi-square value was greater than the threshold of 3.84; consequently, the constructs were thus deemed unique (Bagozzi and Phillips, 1982). Additionally, the confidence intervals for the estimated correlation between the pair of constructs was estimated as 0.621 and 0.831; and these values did not show unity (Bagozzi *et al.*, 1991).

4.2 Technology readiness score

A total technology readiness score was calculated by subtracting the inhibitors' scores from the scores of the drivers. Based on the method employed by Lee *et al.* (2009) and Badri *et al.* (2014), a negative score is an indication of non-ready consumers; while a positive score indicates readiness. The results showed that 16.6% of the respondents were not-ready while 83.4 % were ready. However, on closer inspection of the results, it was evident that there was a large variance in the positive TR scores (M = 2.79, SD 2.76) of the 'ready' group, ranging

from 0 to 12 (maximum based on a 7-point Likert scale). A decision was taken to distinguish between users that were ready to an extent (score ranging from 0 – 3) and ready (4+), based on the mean score, thereby resulting in 48.1% being ready to an extent and 35.1% being ready for a new technology. In addition, a cluster analysis was conducted to address the primary objective of the study by identifying the various technology readiness segments.

4.3 Cluster analysis

Cluster analysis is well suited to this research being an exploratory multivariate statistical procedure that creates a classification by forming groups, uncovering associations between various data objects and, lastly, assisting in outlining structures that may not have been clear previously (Alderfer and Blashfield, 1984; Madhulatha, 2012; Romesburg, 2004). Several methods exist, such as the K-means cluster where the number of clusters is specified in advance. The Hierarchical cluster is the most common method as it can cluster variables together in a manner somewhat similar to factor analysis. However, as the two-step cluster uses a cluster algorithm upfront, it can handle large data sets that would take a long time to compute with hierarchical cluster methods. In this respect, it is a combination of the previous two approaches. Two-step clustering can handle scale and ordinal data in the same model, and it automatically selects the number of clusters and therefor deemed the most appropriate method.

Two-step cluster analysis identifies groupings by running pre-clustering first and then by running hierarchical methods. Because it uses a quick cluster algorithm upfront, it can handle large data sets that would take a long time to compute with hierarchical cluster methods. In this respect, it is a combination of the previous two approaches. Two-step clustering can

handle scale and ordinal data in the same model, and it automatically selects the number of clusters.

The four dimensions (innovativeness, optimism, insecurity and discomfort) of the TRI were used to form clusters by using the SPSS version 22 and, specifically, a Two-Step Cluster method. The remainder of the variables pertaining to demographics, as well as the adoption and continuance intention, were used as descriptive and evaluative criteria.

Initially, the data did not cluster well, forcing a five-cluster solution, as suggested by the TRI. Therefore, the general guidelines for selecting the optimal number of clusters were followed – by using the number of clusters that resulted in the best combination of: (a) low (but not necessarily the lowest), the Bayesian Information Criterion (BIC), (b) the high ratio of distance measures, (c) the high ratio of BIC changes, and (d) potentially meaningful explanation, as suggested by the TRI. The Auto-Clustering statistics that were used to assess the optimal number of clusters is shown in Table 3.

Table 3: Auto-clustering statistics

Number of clusters	Bayesian Information Criteria (BIC)	Ratio of BIC Changes	Ratio of Distance Measures
1	1199.64		
2	1031.40	1	1.449
3	930.27	.601	1.717
4	891.31	.230	1.777
5	890.76	.004	1.027

Using the rules as specified, and taking cognizance of the five TRI segments stipulated in the literature, a four-cluster solution seemed optimal.

Multivariate analysis of variance (MANOVA) testing was used to assess the differences among the four identified clusters concerning their adoption and the continuance intention to use (‘Evaluative criteria’ in Table 5) mobile payment apps. The variables, collectively rather

than individually, were used to avoid the risk of an inflated Type-1 error, by conducting a whole series of analyses using univariate tests. There was a statistically significant difference between the four clusters on the combined dependent variables, F (15, 1126) =10.79, p = 0.000; Wilk's lambda = 0.000; partial eta squared = 0.116.

The results for the dependent variables all showed statistical significance with small effect sizes (adoption=0.218; attitude=0.215; ease-of-use=0.184; usefulness=0.208; continued intention=0.162) (Cohen, 1988). Scheffé's *post hoc* tests were conducted to reveal the clusters that differed from one another. The four clusters, as well as the demographics, descriptive and evaluative variables for each cluster, and the Scheffé *post hoc* results, are shown in Table 4.

From Table 4, it is evident that three of the original TR segments (Parasuraman, 2000; Parasuraman and Colby, 2015) are confirmed (pioneers, paranoids or avoiders and explorers); while the other two segments 'sceptics' and 'hesitators' clustered together into the fourth segment, 'hesitant-sceptics'. It is not uncommon to fail to find an exact match for the five clusters, as outlined in Parasuraman and Colby (2001). Victorino *et al*. (2009) explored the use of the TRI for hotel-customer segmentation, and they found four clusters. Tsikriktsis (2004) also found four clusters, after replicating the Parasuraman and Colby (2001) taxonomy with a United Kingdom sample. The different results suggest that consumer readiness to adopt and use new technology may very well depend on the context.

Table 4: Cluster distribution results

	CLUSTERS			
	Pioneers	**Explorers**	**Hesitant-sceptics**	**Paranoids**
Size of each cluster	20% (83)	15.6% (65)	39.7% (165)	24.8% (103)
CLUSTER VARIABLES: TRI PROFILES				
Discomfort	5.40 (H)	2.47 (L)	3.58 (M)	3.97 (M)
Insecurity	5.89 (H)	2.93 (L)	4.93 (M)	5.41 (H)
Innovativeness	5.94 (H)	5.97 (H)	5.92 (H)	4.44 (M)
Optimism	6.40 (H)	6.57 (H)	6.20 (H)	5.08 (H)
DEMOGRAPHIC VARIABLES				
Gender				
Male	48.2 %	58.5%	60%	35%
Female	51.8%	41.5%	40%	65%
Age				
18-29	15.7%	18.5%	20%	15.5%
30-49	71.1%	63.1%	65.5%	65%%
50+	13.3%	18.5%	14.5%	19.4%
Income				
R15999 or less	41.0%	23.2%	35.8%	30.1%
R16000-R45999	33.7%	41.5%	37.0%	29.1%
R46000-R55999	16.9%	29.2%	16.4%	12.6%
R56000+	8.4%	6.2%	10.9%	28.2%
Education				
School	16.9%	18.5%	17.0%	13.6%
Degree/Diploma/Certificate	59.0%	50.8%	65.5%	66.0%
Postgraduate qualifications	24.1%	30.8%	17.6%	20.4%
DESCRIPTIVE VARIABLES				
Frequency of use				
Daily	12.0%	9.2%	6.7%	1.9%
Weekly	25.3%	35.4%	26.7%	14.6%
Monthly	31.3%	35.4%	33.9%	34.0%
Less than once a month	31.3%	20.0%	32.7%	49.5%
TRI readiness				
Not ready	14.5%	0%	0%	77.5%
Somewhat ready	79.5%	0%	32.7%	14.5%
Ready	6.0%	100%	67.3%	1.0%
EVALUATIVE VARIABLES				
Adoption	5.68^{a}	6.04^{ab}	5.75^{c}	4.88^{abc}
Ease-of-use	6.06^{a}	6.27^{b}	6.16^{c}	5.39^{abc}
Usefulness	6.22^{a}	6.29^{b}	6.19^{c}	5.34^{abc}
Attitude	6.04^{a}	6.24^{b}	6.06^{c}	5.14^{abc}
Continuance intention	6.04^{a}	6.26^{b}	6.11^{c}	5.13^{abc}

*Scheffé post hoc tests are indicated with subscript a and/or b. All mean values containing the same letters differ significantly from one another. All mean values containing different letters indicate that these groups do not differ significantly from one another

5 Discussion

Mobile phone users are generally optimistic about new mobile technologies (M=6.02; SD=0.846), implying that they have a positive view of mobile technology and a belief that it

offers increased control, flexibility and efficiency in their lives, as well as showing an innovative (M=5.56; SD=0.988) tendency. Mobile phone users generally also experience low levels of discomfort (M=3.86; SD=1.227) with mobile technology and consequently, they do not really experience a lack of perceived control over mobile technology, and they do not feel overwhelmed by it.

Mobile phone users do, however, experience insecurity (M=4.92; SD=1.245) to some extent; have a distrust in mobile technology, and are sceptical about its ability to work effectively and efficiently as promised. Furthermore, it seems as if mobile phone users are adapting to mobile payment apps (M=5.56; SD=0.879), since they have positive attitudes towards mobile payment apps (M=5.86; SD=0.879) and they view them in general as easy-to-use (M=5.97; SD=0.784) and very useful (M=6.00; SD=0.836). This results in the intention to continue to use them (M=5.88; SD=0.879).

Although in general a very positive picture emerges it is important to take a closer look at the various segments to see whether this positive outlook is consistently evident throughout; since this rosy outlook is not supported by the slow uptake reported in industry. It is also of concern that only 30 % of respondents - that downloaded a payment app - uses a payment app on a regular bases (daily or weekly). The infrequent use by the majority (70%) of respondents, is concerning for a payment app that is 'suppose' to replace cash or credit cards in future. Caution should also be taken when interpreting the technology-readiness results, which indicate that 83.4% of the respondents were ready to an extent to adopt new technology since many factors play a role, as is evident in Table 4.

Taking a closer look at the various clusters, the results suggest that 'explorers' represent the smallest segment and they rate low on discomfort and insecurity, but high on innovativeness and optimism towards new technology. The largest segments consist of 'hesitant-sceptics' and these are optimistic and innovative, but moderately concerned about security and their ability

to use and understand new technology. As expected, 'paranoids' are the least optimistic and innovative and they also score the highest on discomfort and insecurity of all four clusters while the 'pioneers' score high on all four dimensions.

5.1 Pioneers

Pioneers represent the early adopters of mobile payments apps, making up 20% of the sample, with almost an equal split between males and females. Surprisingly the cluster is reflective of a more mature consumer, with 71.1% of the cluster aged between 30 and 49 years. When compared with other clusters, 'pioneers' are motivated users of mobile payments, 12% of whom use mobile payment apps daily, 25.3% weekly, while 31.3% use the apps monthly. Although the pioneers have a positive attitude and view mobile payment apps as useful and easy-to-use, their enthusiasm is hampered by their insecurity and discomfort and this is holding back the majority of this segment to embrace mobile payment apps. They need help and reassurance to ensure they not only move along the adoption curve, but more importantly that they continue to use the apps once they have been downloaded. The challenge that service providers face is to devise ways of overcoming high levels of insecurity and discomfort among the consumers in this cluster.

5.2 Explorers

Explorers (15.6%) are the most techno-ready consumers among all the clusters and not surprisingly, the smallest as they are the innovators. This segment consists of the forerunners of adoption and they can serve as the evangelists of mobile payment apps. The sample profile of explorers are skewed towards males (58.5%), with 63.1% aged between 30 and 49, and falling into a slightly more affluent income bracket with the largest groups of all their clusters with postgraduate qualifications (30.8%). Although only 9.2% use mobile payment apps daily,

almost 36% of them use the apps on a weekly and monthly basis, thereby suggesting a vibrant segment of mobile payments. Similar to the findings of this study, Badri *et al.* (2014) and Parasuraman and Colby (2001) claim that 'explorers' are an attractive group to present with a new technology as they are highly innovative and optimistic. They also have the highest adoption, the most positive attitudes and they score the highest on continued intention, making this cluster the most promising.

5.3 Hesitant-sceptics

Hesitant-sceptics represent the largest cluster (39.7%; N=165) and similar to the explorer-segment, males (60%) dominate. Hesitant-sceptics are also a more youthful segment, with 20% of respondents in the 18-29 age group. It is important to note that the 30-49-year age group represented half of the sample in total, so they are likely to make up a reasonable percentage of each segment. Hesitant-sceptics are not far behind the pioneers, however they are less concerned with the discomfort and insecurity of a new technology, but because they scored lower on innovativeness and optimism, they may need a little more convincing to adopt and use a new technology continually. On a positive note, this group scored the second highest in techno-readiness, with 32.7% ready to an extent and 67.3% ready, making this large segment an ideal segment, due to its size and readiness. Although 'hesitant-sceptics' are positive about mobile payment apps and ready to adopt and intend to continue to use their apps, they may need some motivation and convincing due to their hesitant nature, as is evident in their infrequent use of mobile payment apps currently (66.6% using mobile payment apps only monthly or less often).

5.4 Paranoids

Interestingly, the paranoid segment consists mainly of women (65%) and older consumers, and are the second largest (103) of all four clusters. This group is also the most educated of all four clusters. They are not true 'laggards' or 'avoiders' as they are not completely resistant to using new technologies as evident in the initial opt-in by downloading the payment app. As expected, almost 50% of the cluster seldom use mobile payment apps. Although they appear not to be totally uncomfortable (M=3.97) or lacking innovativeness (M=4.44), their experience of insecurity (M=5.41) are making them paranoid about the possible risk involved in using mobile payment apps. Consequently, 77% of this cluster are not ready for new technology. As expected, 'paranoids' scored the lowest in terms of adoption and continuance intention to use mobile payment apps and they are not as convinced as the other segments about mobile payment apps' benefits, such as ease-of-use (M=5.39) and usefulness (M=5.34). They also have the least positive attitude (M=5.14) when compared with the other segments. This cluster believes in the technology benefits but is constrained by a high level of insecurity. It is evident that 'paranoids' are insecure and resistant, they are likely to be the last to adopt and use mobile payment apps, hence, they might not be the ideal segment to target initially.

6 Managerial implications

The TRI segments are applicable in profiling mobile users' overall technology-readiness. Furthermore, understanding the TRI segments to which mobile users belong is important as this provides marketers with the opportunity to select the most attractive segment(s) and to tailor-make strategies to increase the uptake and the continued use of mobile payment apps for each of the segments, according to their needs. The TRI segments also assist in identifying a profile of the most technology-ready consumer segments. This is critical for communication.

Identifying the technology-ready consumers who can serve as brand advocators would expedite the diffusion process.

It is evident that the majority of South African mobile users are indeed ready for a new technology, such as mobile payment apps; and this is promising. However, marketers can easily fall into the trap of overestimating the market attractiveness, if they only look at mobile phone users in general, and ignore the very evident differences between the various segments within these groups of mobile payment app users. This may also explain why mobile payment apps are not taking off as was expected, some of which are discontinued after a short period of being introduced in the market.

'Explorers' are highly innovative, optimistic and extremely positive in their uptake and continued use of mobile payment apps, resulting in being the most attractive segment to target. This cluster needs little convincing, regarding the benefits of using the payment apps or any reassurance and they should respond well to marketing strategies highlighting the 'newness' and 'innovation' associated with payment apps. Yet, another marketing approach could be to implement a reward system (such as vouchers, discounts or in-app add-ons), for sharing the mobile payment app within their network with 'tell-a-friend' or 'refer-a-friend' campaigns, as explorers' highly innovative and optimistic nature makes them the perfect mobile payment app ambassadors.

These consumers are often seen as the first to adopt and considered experts on the latest products and services and they serve as opinion leaders. Consequently, creating a positive user experience for explorers could serve to attract other segments. Unfortunately, due to its small size, targeting this segment on its own may not be sufficient to significantly increase the adoption rate of mobile payment apps.

'Hesitant-sceptics' can be an attractive segment, due to size, readiness to adopt new mobile technologies and their low levels of discomfort and insecurity. In contrast with pioneers, they

scored lower on innovativeness and optimism and as a result, they may need a little more convincing about the benefits of mobile payments apps. For example, banks, retailers and mobile payment app developers could engage explorers as the opinion leaders to effect positive word-of-mouth communication through 'testimonial messages' to attract the hesitant-sceptics that represent the larger share of the market. Both segments are also dominated by males, which suggests that a more muscular appeal could be used in marketing strategies aimed at this segment. The momentum gained from the explorers, together with hesitant-sceptics, would ensure that the innovation diffuses faster.

'Pioneers' are also very optimistic and innovative and not resistant to new technology. However, their high levels of discomfort and insecurity, resulting in a significantly lower adoption as the previous two segments, provides challenges for marketers. Although the pioneer segment may not be the target market of choice at this stage of the diffusion of mobile payment apps, they may be swayed by the enthusiasm in the uptake of the explorers and hesitant-sceptics. Additional help and support is needed for this segment – to ensure that they become comfortable in using the payment method. For example, the endorsement by banks of mobile payment apps as a safe payment alternative, could help to reduce their insecurities. They may also need some encouragement initially to ensure that they are comfortable with using the apps, for example, short Youtube training videos or step-by-step instructions or assistance by retail personnel when using the app for the first time.

Unfortunately, the second largest segment of 'paranoids' is not currently the best segment to target when compared with the other segments, as they may need some time to adjust to the idea of using mobile payment apps. Paranoids are the most resistant and conservative and they are averse to change and risk and as a result, they are less likely to download and use mobile payment apps. They could, therefore, be viewed as 'laggards' to a certain extent. Laggards is a term used for those consumers who are the last to adopt an innovation (Rogers, 2003), but

for our study we are using the term to refer to the segment of consumers that opted-in by downloading the app but displays ‘laggard type of behaviour’ as they are the most resistant to using or trying out the app. As a result, they are often considered to be an irrelevant segment by marketers and they seem to be ignored by both academics and practitioners (Goldenberg and Oreg, 2007). However, laggards are too large a part of any segment to be ignored (often between 16-20 per cent of the market) (Parasciuc, 2010) and research suggests that laggards could indeed become innovators in some cases (Goldenberg and Oreg, 2007).

The key to the paranoid segment is to highlight the market acceptance of mobile payment apps across the other customer segments. Additionally, it is important to focus on how mobile payment apps could improve their current/traditional payment process with minimal change. Marketers need to understand and communicate how the benefits of mobile payment apps would align with the paranoid segments’ needs and wants.

Understanding customer segments is imperative as a basis to determine the success of mobile payment app adoption and its continued use. One common mistake companies tend to make is to assume that the majority of users will download and use an app as soon as it is launched. Instead, a more staggered approach would work better where the mobile payment app is incrementally adopted across the various segments, starting with ‘explorers’, then ‘hesitant-sceptics’, ‘pioneers’ and eventually ‘paranoids’.

As the South African market continues to advance, the balance between the share of digital payments and cash is likely to reach a point of equality and hopefully this will tip the scale eventually towards mobile payment apps. But this will not happen overnight, or without the appropriate marketing effort from the industry for each segment. As is evident in the various identified segments, there is a ‘familiarity-willingness’ gap, since some segments are familiar with the technology (comfortable to use it securely), but they are not necessarily convinced of the benefits (willingness) of using the app, and vice versa. As a result, the various segments

require different marketing approaches. For example, education may help with the familiarity problem while a clear value proposition might be the solution to increase the willingness to adopt and use this technology.

The future for mobile payment apps is bright as South African mobile users are ready for new mobile technologies, supported by an even more synergised digital system. Enhancing the uptake and use could lead to mobile payment apps being the next stage of the payment revolution. However, this will require mobile network operators, banks, and retailers continuance investment in research and development, but more importantly, in the effective targeting of the most appropriate segments.

7 Limitations and future research

Despite the contribution of the study to the limited understanding of the low adoption rate of mobile payment apps in South Africa and the use of the TRI in an emerging country context, a few limitations have become evident. Due to the non-probability sampling, the generalizations of the findings are limited and future research could consider a probabilistic approach. The one-country context could also be expanded to other emerging economies to compare the usability of the TRI, as a segmentation tool for mobile payment apps. As this study focus specifically on the adoption of mobile payment apps after downloading the application(s), future studies could investigate the 'pre-adoption' stage before even downloading the app.

References

Alderfer, M. and Blashfield, R. (1984), *Cluster Analysis*, Thousand Oaks, Sage, California.

Ajzen, I. (1991), "The theory of planned behaviour", *Organisational Behaviour and Human Decision Processes*, Vol. 50 No. 2, pp.179-211.

Abu-Shamaa, R., Abu-Shanab, E. and Kwasawneh, R. (2016), "Payment methods and purchase intention from online stores: an empirical study in Jordan", *International Journal of E-Business Research*, Vol. 12 No. 2, pp.31-44.

Athanassopoulos, A.D. (2000), "Customer satisfaction cues to support market segmentation and explain switching behaviour", *Journal of Business Research*, Vol. 47 No. 3, pp.191–207.

Asmi, F., Zhou, R. and Wu, M. (2016), "Measuring e-readiness among non-users of internet banking in Pakistan: by TAM with CRM as external factor", *European Journal of Business and Management*, Vol. 8. No. 29, pp.131-143.

Badri, M.A., Al Rashedi, A., Yang, G., Mohaidat, J., and Al Hammandi, A. (2014), "Technology readiness of school teachers – an empirical study of measurement and segmentation", *Industrial Engineering and Management*, Vol. 2 No. 4, pp.257-275.

Bagozzi, R.P. and Phillips, L.W. (1982) "Representing and testing organizational theories: a holistic construction", *Administrative Science Quarterly*, Vol. 27 No. 3, pp.459–89.

Bagozzi, R.P., Yi, Y. and Phillips, L.W. (1991) "Assessing construct validity in organizational research", *Administrative Science Quarterly*, Vol. 36 No. 3, pp.421–458.

Bailey, C., Baines, P.R., Wilson, H. and Clark, M. (2009), "Segmentation and customer insight in contemporary services marketing practice: why grouping customers is no longer enough", *Journal of Marketing Management*, Vol. 25 No. 3-4, pp.227-252.

Batra, R. and Kalra, N. (2016), "Are digital wallets the new currency?", *Apeejay Journal of Management and Technology*, Vol. 11 No. 1, pp.1-12.

Bhatnagar, A. and Ghose, S. (2004), "A latent class segmentation analysis of e-shoppers", *Journal of Business Research*, Vol. 57 No. 7, pp.758-767.

Bhattacherjee, A. (2001), "Understanding information systems' continuance: an expectation-confirmation model", *MIS Quarterly*, Vol. 25 No. 3, pp.351-370.

Biucky, S.T., Abdolvand, N. and Harandi, S.R. (2017), "The effects of perceived risk on social commerce adoption, based on the TAM model", *International Journal of Electronic Commerce Studies*, Vol. 8 No. 2, pp.173-196.

Business Tech. (2014), "The number of smartphones users in SA", [online] https://businesstech.co.za/news/mobile/59175/the-number-of-smartphone-users-in-sa/ (Accessed 19 May 2017).

Chawla, D. and Joshi, H. (2017), "Consumer perspectives about mobile-banking adoption in India–a cluster analysis", *International Journal of Bank Marketing*, Vol. 35 No. 4, pp.616-636.

Cho, J. (2016), "The impact of post-adoption beliefs on the continued use of health apps", *International Journal of Medical Informatics*, Vol. 87, pp.75-83.

Cohen, J. (1988), "*Statistical Power Analysis for the Behavioural Sciences*", Hillsdale, Erlbaum, New Jersey.

Cooper, D.R. and Schindler, P.S. (2006), "*Marketing Research*", McGraw-Hill Irwin. New York.

Delloite & Touché. (2016), "Game of phones African mobile consumer survey", [online] https://www2.deloitte.com/content/dam/Deloitte/za/Documents/technology-media-telecommunications/ZA_Deloitte-Mobile-consumer-survey-Africa-300816.pdf (Accessed 13 January 2016).

eMarketer, (2017), "Smartphone use headed for a new milestone in the UK: narrow lead predicted for phones' place in daily time spent online", [online] https://www.emarketer.com/Article/Smartphone-Use-Headed-New-Milestone-UK/1016444 (Available 10 April 2018).

eMarketer. (2018), "If you're speaking to everyone, you're speaking to no one", [online] https://www.vibes.com/personalization-and-the-era-of-individualized-mobile-experiences/?utm_medium=Newsletter&utm_source=eMarketer&utm_campaign=2017_

Q4_RPT_MOBILE_PERSONALIZATION&utm_term=eMarketer (Accessed 15 November 2017).

Fornell, C. and Larcker, D.F. (1981), "Structural equation models with observable variables and measurement errors", *Journal of Marketing Research*, Vol. 18 No. 1, pp.39-50.

Franke, N., Reisinger, H. and Hoppe, D. (2009), "Remaining within cluster heterogeneity: a meta-analysis of the "dark side" of clustering methods", *Journal of Marketing Management*, Vol. 25 No. 3-4, pp.273-293.

Goldenberg, J. and Oreg, S. (2007), "Laggards in disguise: resistance to adopt and the leapfrogging effect", *Technological Forecasting & Social Change*, Vol. 74 No. 8, pp.1272–1281.

Goneos-Malka, A., Strasheim, A. and Grobler, A.F. (2014), "Conventionalists, connectors, technoisseurs and mobilarti: differential profiles of mobile marketing segments based on

phone features and postmodern characteristics of consumers", *Journal of Retailing and Consumer Services,* Vol. 21 No. 6, pp.905-916.

GSMA. (2017), "The mobile economy – Sub-Saharan Africa 2017", [online] https://www.gsma.com/mea/mobile-economy-2017-sub-saharan-africa-2017 (Accessed 13 December 2017).

Hair, F.H., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2006), "*Multivariate Data Analysis",* 6th ed., Pearson-Prentice Hall.

Hong, S.J., Thong, J.Y.L. and Tam, K.Y. (2006), "Understanding continued information technology usage behaviour: a comparison of three models in the context of mobile internet", *Decision Support Systems,* Vol. 42, pp.1819-1834.

Hossain, T., and Amin, M.S. "Innovative mobile marketing strategies for tourism sector using segmentation for targeted and effective marketing programs, Full Papers Proceedings of the International Conference on Business Management & Information Systems."

In *Proceedings of the International Conference on Business Management & Information Systems*. 2015, pp.1-10.

Hsu, M.H., Yen, C.H., Chiu, C.M. and Chang, C.M. (2006) "A longitudinal investigation of continued online shopping behaviour: an extension of the theory of planned behaviour", *International Journal of Human-Computer Studies*, Vol. 64 No. 9, pp.899-904.

Kim, C., Mirusmonov, M. and Lee, I. (2010), "An empirical examination of factors influencing the intention to use mobile payment", *Computers in Human Behaviour*, Vol. 26, pp.310-322.

Kimiloglu, H., Nasir, V.A and Nasir, S. (2010), "Discovering behavioural segments in the mobile phone market", *Journal of Consumer Marketing*, Vol. 27 No. 5, pp.401-413.

Lamberti, L., Benedetti, M. and Chen, S. (2014), "Benefits sought by citizens and channel attitudes for multichannel payment services: evidence from Italy", *Government Information Quarterly*, Vol. 31 No. 4, pp.596-609.

Lee, W., Chiu, W., Chiang, M. and Chiu, C. (2009), "Technology readiness in the quality-value-loyalty chain", *International Journal of Electronic Business Management*, Vol. 7 No. 2, pp.112-126.

Liu, Y. (2015), "Consumer protection in mobile payments in China: a critical analysis of Alipay's service agreement", *Computer Law & Security Review*, Vol. 31 No. 5, pp.679-688.

Madhulatha, T.S. (2012), "An overview on clustering methods", *IOSR Journal of Engineering*, Vol. 2 No. 4, pp.719-725.

Makanyeza, C. (2017), "Determinants of consumers' intention to adopt mobile banking services in Zimbabwe", *International Journal of Bank Marketing*, Vol. 35 No. 6, pp.997-1017.

Massey, A., Khatri, V. and Montoya-Weiss, M. (2007), "Usability of online services: the role of technology readiness and context", *Decision Sciences*, Vol. 38 No. 2, pp.277-308.

Meng, J., Elliot, K. and Hall, M. (2010), "Technology readiness index (TRI): assessing cross-cultural validity", *Journal International Consumer Marketing*, Vol. 22 No. 1, pp.19-31.

Ndwandwe, V. (2017), "ByPYMNTS. In South Africa, cash is consumers' hands-down choice", [online] https://www.pymnts.com/cash/2017/south-african-consumers-pick-cash/ (Accessed 10 June 2018).

Nunnally, J.C. (1978), "*Psychometric Theory"*, 2nd ed., McGraw-Hill, New York.

OECD. (2012), "Report on consumer protection in online and mobile payments", OECD digital economy papers, No. 204, OECD Publishing, Paris. http://dx.doi.org/10.1787/5k9490gwp7f3-en (Accessed 15 July 2017).

Pallant, J. (2016), "*SPSS Survival Manual: A Step-by-Step Guide to Data Analysis Using the SPSS Program"*, 4th ed., Crow's Nest, Allen & Unwin, NSW.

Parasciuc, P. (2010), "Why laggards are important", [online] https://marketing-and-branding.knoji.com/why-laggards-are-important/ (Accessed 8 October 2017).

Parasuraman, A. (2000), "Technology readiness index (TRI): a multiple-item scale to measure readiness to embrace new technologies", *Journal of Service Research*, Vol. 2 No. 4, pp.307-320.

Parasuraman, A. and Colby, C.L. (2015), "An updated and streamlined technology readiness index: TRI 2.0.", *Journal of Service Research*, Vol. 18 No. 1, pp.59-74.

Pasqua, R. and Elkin, N. (2013), "*Mobile Marketing: an Hour a Day",* John Wiley & Sons, Inc. Indianapolis, Indiana.

PYMNTS. (2017), "The global cash index", PYMNTS.COM, [online] https://www.pymnts.com/global-cash-index/ (Accessed 10 June 2018).

Quinn, L. (2009), "Market segmentation in managerial practice: a qualitative examination", *Journal of Marketing Management*, Vol. 25 No. 3-4, pp.253-272.

Ramos-de-Luna, I., Montoro-Ríos, F. and Liébana-Cabanillas, F. (2016), "Determinants of the intention to use NFC technology as a payment system: an acceptance model approach", *Information Systems and e-business Management*, Vol. 14 No. 2, pp.293-314.

Rix, P. (2006), "*Marketing: A Practical Approach"*. 5th ed., McGraw-Hill, Australia.

Rogers, E.M. (2003), "Elements of diffusion", *Diffusion of innovations*, Vol. 5 No.1, pp.1-38.

Romesburg, C. (2004), "*Cluster Analysis for Researchers",* Lulu Press, North Carolina, USA.

Sarabia, F. (1996), "Model for market segments evaluation and selection", *European Journal of Marketing*, Vol. 30 No. 4, pp.58-74.

Schierz, P.G., Schilke, O. and Wirtz, B.W. (2010), "Understanding consumer acceptance of mobile payment services: an empirical analysis", *Electronic Commerce Research and Applications*, Vol. 9, pp.209-216.

Setterstrom, A.J., Pearson, J.M. and Orwig, R.A. (2013), "Web-enabled wireless technology: an exploratory study of adoption and continued use intentions", *Behaviour & Information Technology*, Vol. 32 No. 11, pp.1139-1154.

Statistica (2018), "Number of smartphone users in South Africa from 2014 to 2022", [online] https://www.statista.com/statistics/488376/forecast-of-smartphone-users-in-south-africa/ (Accessed 10 June 2018).

Thong, J.Y.L., Hong, S.J. and Tam, K.Y. (2006), “The effects of post-adoption beliefs on the expectation-confirmation model for information technology continuance”, *International Journal of Human-Computer Studies*, Vol. 64 No. 9, pp.799-810.

Tsikriktsis, N. (2004), “A technology readiness-based taxonomy of customers: a replication and extension”, *Journal of Service Research*, Vol. 7 No. 1, pp.42-52.

Tryon, C.M. (1939), "Evaluations of adolescent personality by adolescents." *Monographs of the Society for Research in Child Development*, Vol. 4 No. 4, pp.1-83.

Upadhyay, P. and Chattopadhyay, M. (2015), “Examining mobile based payment services adoption issues: a new approach using hierarchical clustering and self-organizing maps”, *Journal of Enterprise Information Management*, Vol. 28 No. 4, pp.490-507.

Victorino, L., Karniouchina, E. and Verma, R. (2009), “Exploring the use of the abbreviated technology readiness index for hotel customer segmentation”, *Cornell Hospitality Quarterly*, Vol. 50 No. 3, pp.342-359.

Voropanova, E. (2015), “Conceptualizing smart shopping with a smartphone: implications of the use of mobile devices for shopping productivity and value”, *The International Review of Retail, Distribution and Consumer Research*, Vol. 25 No. 5, pp. 529-550.

Wells, R., Kleshinski, C.E. and Lau, T. (2012), "Attitudes toward and behavioural intentions to adopt mobile marketing: comparisons of gen y in the United States, France and China", *International Journal of Mobile Marketing*, Vol. *7 No.* 2, pp.5-25.

Wiese, M., van Heerden, G. and Maree, T. (2017), "Dynamite in small packages: the engaged elite as an emerging Facebook niche market", *African Journal of Information Systems*, Vol. 9 No. 1, pp.36-61.

World Wide Worx (2014), "The SnapScan effect: How mobile payments made QR codes relevant in South Africa", [online] http://memeburn.com/2015/05/the-snapscan-effect-how-mobile-payments-made-qr-codes-relevant-in-south-africa (Accessed 18 November 2016).

Wycech, S. (2015), "An investigation of attitudes towards mobile payments", *Masters dissertation*, University of Dublin, Republic of Ireland.

Zhu, H., Wang, Q., Yan, L. and Wu, G. (2009), "Are consumers what they consume? Linking lifestyle segmentation to product attributes: an exploratory study of the Chinese mobile phone market", *Journal of Marketing Management*, Vol. *25 No.* 3-4, pp.295-314.