

UNIVERSITY STUDENTS' INTENTION TO USE MOBILE TECHNOLOGY FOR GROCERY SHOPPING: AN APPLICATION OF TECHNOLOGY ACCEPTANCE MODEL

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ABSTRACT

The use of mobile technology for commerce is relatively small in South Africa compared to developed countries. Many consumers including university students still physically visit retailers to purchase groceries, however, on-demand delivery service apps that bring groceries to the doors of customers have started to grow. Based on the Technology Acceptance Model (TAM), the study investigated the intention of university students to use mobile technology (smartphones) for grocery shopping. The study adopted the descriptive research design and the cross-sectional survey method was used for data collection. Descriptive statistics and structural equation modelling (PLS-SEM) were used for data analysis. The results showed significant positive relationships between TAM constructs and behavioural intention. In addition, the study found that attitude mediates the relationship between perceived usefulness and behavioural intention. Research implications are discussed.

Keywords: University Students, Mobile Technology, Smartphones, M-Commerce, Intention, Technology Acceptance Model.

INTRODUCTION

Goga et al. (2019) point out that online platforms and electronic commerce (e-commerce) have transformed retail experience and expanded the opportunities for businesses to reach a wider range of customers. The use of e-commerce by consumers is rapidly increasing. The most well-known type of e-commerce for private consumers globally can be categorised as business to consumer (B2C) and this includes online retail or online shopping. About 1.8 million people worldwide purchased goods online in 2018 with global e-retail amounting to 2.8 trillion United States of America dollars and projected to increase to 4.8 trillion dollars by 2021 (Jimenez et al., 2019; Statista- eCommerce report, 2020). Although, e-commerce has witnessed an impressive rise recently, however, it may not be next real frontier for shopping due to the growing popularity of mobile commerce (m-commerce). While e-commerce involves shopping online through the computer, m-commerce refers to any transaction conducted on a wireless hand held device (Cao et al., 2015; Cullen & Kabanda, 2018). M-commerce involves shopping through a mobile device typically a smartphone or a tablet and the flexibility of mobile shopping services supported by widespread mobile technology appeals to consumers. The transaction value of global m-commerce rose exponentially by over 900% between 2014 and 2018 (Rahman & Sloan, 2015; Gupta et al., 2018; Atkinson, 2019).

E-commerce has also grown rapidly in South Africa but only account for between 1% and 2% of total retail spend. E-commerce in South Africa lags behind developed countries and its growth has been hindered by the poor quality of internet services and high cost of data. However, e-commerce is increasing at a fast pace in South Africa albeit from a small base and can grow faster with the reduction in the cost of data and improved logistics (United Nations Industrial Development Organization, 2017; Goga et al., 2019). According to Picodi (2019), despite the growth of m-commerce globally, South Africans still largely use desktops rather than smartphones for online shopping and only 33% of online transactions were made with a mobile device in 2019. In addition, South Africans tend to spend less when using their smartphones. The use of smartphones for grocery shopping is limited and many consumers including university students still physically visit retailers to purchase groceries. However, on-demand delivery service apps that bring groceries to the doors of customers have started to grow. Electronic retailing (e-retailing) is now encouraged by supermarkets because of the growing rate of smartphone ownership and internet access (Snyman, 2014). The future of retail is mobile and the emerging retail culture is characterised by the use of mobile technologies, high connectivity, and contactless technologies, which enable consumers to experience shopping differently from the traditional in-store service. M-commerce provides a significant opportunity to transform consumers' grocery purchasing experience. In addition, retailers have recognised the importance of this trend and are attracting customers by constantly improving the sales channels. M-commerce should be a critical part of a retailer's omnichannel strategy for improved performance (Yesudas et al., 2014; Fulgoni & Lipsman, 2016; Knežević & Deliđ, 2017; Chao et al., 2019). Therefore, it is important to determine the intention to use mobile technology especially smartphones for grocery shopping.

Several theoretical frameworks such as the Innovations Diffusion Theory, Social Cognitive Theory, the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the decomposed theory of planned behaviour (DTPB) have been used to explore an individual's intention to use e-commerce. However, the Technology Acceptance Model (TAM) is the most commonly used theory to specify the causal linkages between perceived usefulness, perceived ease of use, users' attitudes, intentions and actual usage (Davis, 1989; Njenga et al., 2016). The aim of this study is to investigate the intention of university students in South Africa to use mobile technology (smartphones) for grocery shopping by applying the TAM. The study will be significant in the following ways. M-commerce has grown to become the dominant form of purchase experience in Europe, United States of America and China, however, the use of m-commerce is relatively limited in South Africa. In addition, m-commerce research that focuses on young consumers (university students) from the South Africa perspective is sparse. University students expected to drive m-commerce in the future. Current university students are tech savvy, heavy users of mobile devices and have grown up in a digital world. In addition, university students need to combine academics with physical grocery shopping and this can lead to time pressure and stress. The study is organised as follows: Section two will provide the review of the literature and the development of the conceptual framework and hypotheses. Section three will focus on the research methodology and measures. The presentation of results and discussion will be done in sections four and five. The conclusion, implications, limitations and areas for further study will be presented in section six.

LITERATURE REVIEW

Smartphone's and Mobile Commerce (m-commerce)

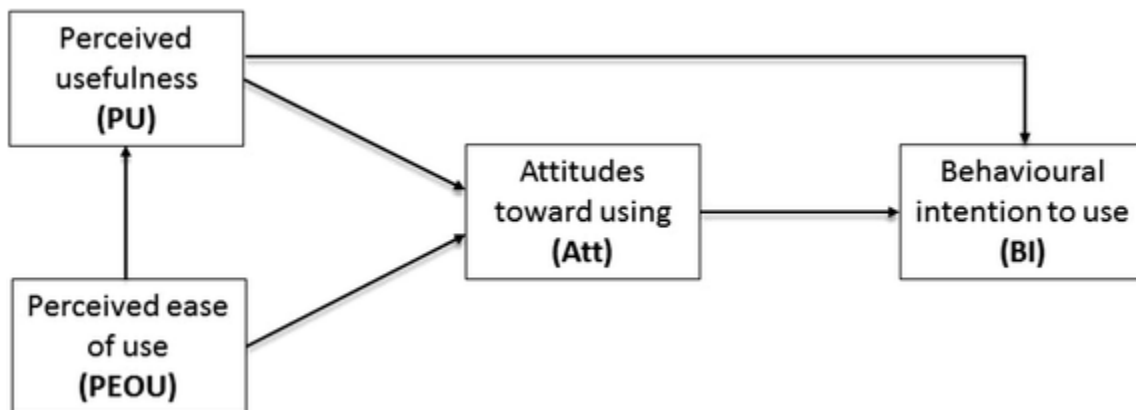
A Smartphone can be described as a mobile device that can perform the functions of a computer and can be permanently connected to the internet. Smartphones are typically touchscreen interface with an operating system that can download applications. Smartphones are hand held, powerful device that emerged in the mid-90s and allow users to talk, text and surf the internet. Smartphones have a great effect on users because of their mobility and immediacy factors. Smartphones combine advanced computing capability, such as internet communication and e-commerce (Litchfield, 2010; Pitichat, 2013; Lundquist et al., 2014). Presently, about 20 to 22 million people in South Africa use smartphones and the number of smartphone users is expected to increase by more than five million by 2023 (Statista, 2020). The Independent Communications Authority of South Africa (2019) state of ICT sector reports that smartphone penetration in South Africa grew from 43.5% in 2016 to 74.2% in 2017 to 81.7% as at the end of September 2018. Smartphones are extremely popular with university students and about 94.8% of students carry their phones intentionally. University students use smartphones for acquiring information and communication (Alsayed et al., 2019). Smartphones enable consumers to experience shopping differently and this has led to the growth of m-commerce (Pantano & Priporas, 2016).

Kim et al. (2010) and Baubonienė & Gulevičiūtė (2015) point out that e-commerce involves the delivery of products and services via wireless technologies to enable internet commerce activities without restrictions of time and space. The internet and web browsers provided the conditions for the take-off of e-commerce and mobile telephones connected to digital transmission networks led to m-commerce. M-commerce is a sub-area of e-commerce and allows retail marketing via mobile devices, allowing retailers and consumers to trade and interact on wireless networks using smartphones, iPads, and tablets hence it is also referred to as wireless e-commerce (Agrebi & Jallais, 2015; Gupta et al., 2018). M-commerce has a major effect on business and society. Businesses have benefited from m-commerce through increased turnover and profit and consumers have benefited in terms of convenience, localisation and personalisation (Cullen & Kabanda, 2018).

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) (Davis, 1989) argues that adoption behavior is determined by the intention to utilise a particular system and this is determined by the perceived usefulness and perceived ease of use of the system. The TAM developed from TRA is the most commonly used theory to specify the causal linkages between perceived usefulness, perceived ease of use, users' attitudes, intentions and actual usage (Davis, 1989, Njenga et al., 2016). Venkatesh & Davis (2000) in TAM2 developed a model that extended the TAM by explaining perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes. Taylor & Todd (1995) used the augmented version of TAM that includes social influences and behavioural control and added subjective norm and perceived behavioural control to TAM for a more complete investigation of the predictors of information technology (IT) use. This model is labelled "*Augmented TAM*" or "*Combined TAM*". The Unified Theory of Acceptance and Use of Technology was developed by Venkatesh et al. (2003) is based on four

major determinants (performance expectance, effort expectancy, social influence and facilitating conditions) and moderators such as gender, age voluntariness and experience of key relationships. Venkatesh & Bala (2008) developed TAM3 in order to depict a complete nomological network of the factors that influence IT adoption and use by individuals. Despite these extensions, the original TAM by Davis (1989) is still the most commonly used and extensively validated model for predicting the intention to use an information system especially in the context of m-commerce (Kim et al., 2010; Revythi & Tselios 2019) while Liu & Chen (2009) remark that UTAUT cannot be used to explain the acceptance behaviour of m-commerce. Braun (2013) point out that although, TAM has been criticised by researchers, it is a useful general model to explain the factors that influence intention to use technology by individuals. The reasons for the predominance of TAM for examining the acceptance of technology by individuals are because (1) its particular concentration on information technologies, (2) its established reliability and validity (3) its broad application and widespread use in research (Sharp, 2006; Marangunić & Granić, 2015). Therefore, this study will use TAM (Davis, 1989; Davis et al., 1989) as the model to investigate the intention of university students to use their smartphones for grocery shopping. Figure 1 depicts the conceptual model for the study. The adapted model does not take into consideration external variables. Davis et al. (1989) point out that according to TAM, perceived usefulness and perceived ease of use are two distinct constructs and are of major importance for predicting computer acceptance intention and behaviour.



Note: Adapted from Davis et al., (1989).

FIGURE 1
THE CONCEPTUAL MODEL

Perceived Ease of Use and Perceived Usefulness

Perceived Ease of Use (PEOU) describes the degree to which an individual believes that an information and communication system is easy and requires no effort to use. This is indicated by the intensity and frequency of use and the interaction between users and the system (Davis, 1989; Nasution & Azmin 2018). According to Davis (1989), the indicators of the ease of use of a system include (1) user finds the system easy to learn (2) the system easily does what the user wants (3) the skill of the user increases as the system is used (4) the system is easy to operate. Perceived usefulness (PU) can be defined as an individual's perception with respect to the

improvement in the performance of a task as a result of using a system (Davis, 1989; Agrebi & Jallais, 2015). The empirical results in respect of the application of TAM for e and m-commerce show a significant positive relationship between PEOU and PU (Lane et al., 2014; Shukla & Sharma, 2018; Saprikis et al., 2018). The increase in PEOU leads to an increase in PU because the ease of use of a system improves the productivity and performance of the user of the system. Consequently, it is hypothesised (H1) that there is a positive relationship between PEOU and PU.

PU, PEOU and Attitude

Attitude towards behaviour measures the degree to which an individual has a favourable or an unfavourable evaluation of the behaviour being measured. A more favorable attitude towards a behavior should produce stronger individual intention to perform the behaviour (Ajzen, 1991). According to TAM by Davis (1989) both PU and PEOU motivate an individual's attitude towards the use of a new technology or system. Prior empirical studies (Nassuora, 2013; Alagoz & Hekimoglu, 2012 ; Yang et al., 2014; Shukla & Sharma, 2018) find that consumers' PU and PEOU positively influence attitude towards m-commerce. In the perspective of online shopping, a consumer will develop a positive attitude towards buying products online when he/she perceives that the system or device connected to the internet is easy to use and useful in purchasing goods online. Thus, consumers' PEOU of online shopping positively influences their attitudes towards purchasing products online. In addition, PU impacts on attitude because the more useful customers perceive online shopping to be, the more favourable will be their attitudes towards online shopping (Nguyen et al., 2019). It is hypothesised that:

- H₂ PU has a positive effect on attitude towards the use of smartphone for grocery shopping;*
H₃ PEOU has a positive effect on attitude towards the use of smartphone for grocery shopping

Attitude and Behavioural Intention (BI)

The TPB by Ajzen (1991) argues that the performance of a specific behaviour by an individual is determined by his/her behavioral intention to perform the behavior. The original TAM model by Davis (1989) show that attitude has a positive effect on behavioural intention. Ramus & Nielsen (2005) find that attitude positively affects consumers' intention to use the internet for grocery shopping. Quevedo-Silva et al. (2016) and Shukla & Sharma (2018) find that attitude is one of the significant antecedents of the intentions to purchase food through the internet while Loketkrawee & Bhatiasevi (2018) find that the predictive value of attitude for online buying intention for groceries is very high. There is a direct correlation between attitude and intention because users' intention to use a technology system is grounded on the positive behaviours towards it (Shen & Chiou, 2010). According to Nguyen et al. (2019), consumers' attitude towards online food purchasing will positively affect their intentions towards online food purchasing. Consequently, it is hypothesised (H4) that attitude towards using smartphone for grocery shopping will have a positive effect on intention to use smartphone for grocery shopping.

PU and Behavioural Intention (BI)

Saprikis et al. (2018) point out that PU as one of the fundamental constructs of TAM has been extensively used for predicting the intention to use m-commerce. Jayasingh & Eze (2009)

in a study on consumer behavioural intention toward mobile coupons in Malaysia find that PU by the consumer has a significant positive effect on the BI toward using m-coupons. Kalinić & Marinković (2016) in a study on the determinants of users' intention to adopt m-commerce find that PU has a direct positive effect on BI. Moorty et al. (2014) find that PU has a positive effect on Generation Y's intention to adopt mobile commerce and Zampou et al. (2012) and Saprikis et al. (2018) find that PU positively affects the BI of m-commerce consumers. Frydenberg & Andone (2017) argue that the relationships among the constructs in the TAM model are not always significant. The results of the study on the attitude of learners toward augmented reality (AR) learning activity show that the intention of using the system is not dependent on PU of the learning tool but on perceived enjoyment. However, if a consumer perceives that a smartphone will be useful and enhance the purchase of goods online, he/she will likely use the smartphone for online grocery shopping. It is hypothesised (H5) that PU has a positive effect on the intention to use smartphone for grocery shopping.

Attitude Mediates the Relationship between PU and BI

Attitude has a direct and indirect effect on the intention to use technology. Individuals that believe that using a technology would lead to more positive outcomes, tend to have a more favourable attitude towards the technology. Attitude is a partial mediator of the effect of PU on intention to use and adds casual explanatory power to an individual's intention to use an information system (Davis, 1989). Altawallbeh et al. (2015) find that attitude mediates the relationship between PU and BI. The mediation effect of attitude on the effect of PU on BI is well established in TAM research with most studies supporting a partial mediation (Schaper & Pervan, 2007; Gajanayake et al. 2014; Krishanan et al., 2016; Verma & Sinha, 2017). Consequently, it is hypothesised that:

H₆ The relationship between PU and BI is positively mediated by attitude.

RESEARCH METHODOLOGY

This study followed the quantitative research design and the cross-sectional survey approach was used to collect data from the respondents. South Africa has twenty-six public universities distributed within its nine provinces. The participants in the survey were final year undergraduate students of the Departments of Business Management of two public universities located in the Limpopo and Gauteng provinces of South Africa. Business students were chosen as the study unit for the study because their curriculum includes consumer behaviour and marketing. Because of the difficulty in obtaining the number of final year business management students, the participants were conveniently sampled and the self-administered questionnaire method was used to collect data between July and September 2019. The assistance of lecturers was sought and questionnaires were distributed in class after lecture. The questionnaire was reviewed by three academic experts in the areas of marketing and e-commerce and also pretested with thirty students. Minor adjustments were made to the questionnaire based on the feedback from the reviewers and the pilot study. The questionnaire was divided into two sections (1) biographical details (2) questions related to the TAM model. Descriptive analysis and PLS SEM were used for analysis.

Measures

Scales with acceptable psychometric properties were adapted for all the constructs from previous studies on TAM and m-commerce. The questionnaire items are depicted in Appendix

RESULTS

Response Rate and Biographical Details

Three hundred and thirty questionnaires were distributed and three hundred and eight returned and found usable. The gender composition of the respondents was 52.7% female and 47.3% male. All the respondents were between 20 and 30 years. Independent samples T-test and ANOVA did not indicate any significant gender and age differences in the results.

Structural Equation Modelling

The Partial Least Square Structural Equation modelling (The PLS SEM) was used to examine the research model by using the software package Smart PLS 3.0. The PLS SEM comprises of two sub-models and these are the measurement and structural models (Hair et al., 2019). The measurement model was used to examine the relationship between the latent variables and their measures and the structural model was used to test the relationship between the latent variables.

The Measurement Model

The measurement model included four latent constructs measured by fifteen items. The factor loadings for each item is greater than 0.708 as recommended by Hair et al. (2019). Thus no item was deleted.

Construct	Items	Mean	SD	Item loading	Cronbach's alpha	Composite reliability	AVE
Perceived ease of use (PEOU)	PEOU1	4.580	1.06	0.841	0.724	0.875	0.636
	PEOU2			0.818			
	PEOU3			0.801			
	PEOU4			0.769			
Perceived usefulness (PU)	PU1	4.625	1.13	0.825	0.797	0.792	0.655
	PU2			0.801			
	PU3			0.777			
	PU4			0.738			
Attitude (A)	A1	4.505	1.03	0.826	0.806	0.856	0.664
	A2			0.808			
	A3			0.777			
	A4			0.801			
Behavioural Intention (BI)	BI1	3.850	1.08	0.882	0.719	0.881	0.737
	BI2			0.847			
	BI3			0.782			

The Composite reliability (CR) of constructs ranged from 0.792 to 0.881, above the recommended threshold of 0.6. In addition, Cronbach's alpha values were above 0.70 and are acceptable (Nunally & Bernstein, 1994). Average variance extracted (AVE) values of the constructs ranged from 0.636 to 0.737 and were greater than the recommended 0.5 cut-off. Thus, all the conditions for convergent validity were achieved. Table 1 depicts the measurement model. Furthermore, the square roots of AVEs are depicted on the diagonals and are all greater than the corresponding correlation coefficients within the constructs (Table 2). Therefore, it can be concluded that the measurement model is satisfactory.

Construct	1	2	3	4
BI	0.858			
PEOU	0.608	0.797		
PU	0.576	0.538	0.809	
A	0.612	0.633	0.541	0.815

Note: Diagonals in bold signify the square root of the AVE while the other figures depict the correlations.

Structural Model Assessment

The assessment of the structural model includes common method bias, the R^2 , the Q^2 and the evaluation of the path coefficients (Hair et al., 2019). The likelihood of common method bias (CMB) was examined as the data was self-reported. CMD can be identified through the variance inflation factors (VIFs) that are obtained through a full collinearity test. VIFs that are greater than 3.3 indicate pathological collinearity and are a signal that a model may be contaminated by CMB. However, if the VIFs are equal to or lower than 3.3, the model can be assumed to be free of CMB (Henseler et al., 2015). The VIFs for the constructs of the study ranged from 1.308 to 2.522 suggesting that that the model is free of CMD. The R^2 shows the proportion of variance in the dependent variable that can be explained by the independent variable. R^2 values are 0.25 (weak), 0.50 (moderate) and 0.75 (substantial) (Kock, 2015).

Hypothesised path	Standardised Beta	T-statistics	Decision
H1: PEOU → PU	0.253	5.247**	Accepted
H2: PU → A	0.329	4.129 **	Accepted
H3: PEOU → A	0.233	3.708**	Accepted
H4: A → BI	0.195	3.409*	Accepted
H5: PU → BI	0.206	2.948**	Accepted
H6: A mediates the relationship between PU and BI	Partial mediation		Accepted

Note: * $p < 0.01$; ** $p < 0.05$; Source: Author's research

This study obtained a R^2 of 0.692 implying that the total variance of behavioural intention that is explained by the model is 69.2%. To determine if the model adequately explains the empirical data, the goodness of fit test (GOF) was used. The values of the GOF range from 0 to 1 with 0.10 considered small, 0.25 medium and 0.36 large. The GOF is 0.682 suggesting that the empirical data satisfactorily fits the model and has a good predictive power in comparison to baseline values. In addition to the size of the R^2 , a recommended test is the predictive relevance of the model (Q^2). The two prediction techniques for the Q^2 are the cross validated communality

and cross validated redundancy with Chin (2010) suggesting the use of the former. A $Q^2 > 0.5$ is considered a predictive model and a Q^2 of 0.64 obtained by this study is indicative of a highly predictive model. The effect size (f^2) shows the effect of one construct on another construct and values are 0.02 (small), 0.15 (medium) and 0.35 (large). The effect size, f^2 , ranged from 0.163 to 0.362 indicating that the effect sizes of different endogenous constructs on the exogenous constructs ranged from medium to large. The results path coefficients and T-statistics using the bootstrapping technique are depicted in Table 3.

Hypothesis one proposes that there is a positive relationship between PEOU and PU. The results ($\beta = 0.253$, $T = 5.247$, $p < 0.005$) show a significant positive relationship between PEOU and PU. H1 is accepted. Hypothesis two proposes that PU has a positive effect on attitude (A) towards the use of smartphone for grocery shopping. The results ($\beta = 0.329$, $T = 4.129$, $p < 0.005$) depict a significant positive relationship PU and A. H2 is accepted. Hypothesis three proposes that PEOU has a positive effect on attitude (A) towards the use of smartphone for grocery shopping. The results ($\beta = 0.233$, $T = 3.708$, $p < 0.05$) show a significant relationship between PEOU and A. H3 is accepted. Hypothesis four proposes that attitude towards using smartphone for grocery shopping will have a positive effect on intention to use smartphone for grocery shopping. The results ($\beta = 0.195$, $T = 3.409$, $p < 0.01$) support a significant positive relationship between A and BI. H4 is accepted. Hypothesis five proposes PU has a positive effect on the intention to use smartphone for grocery shopping. The results ($\beta = 0.206$, $T = 2.948$, $p < 0.05$) show a significant relationship between PU and BI. H5 is accepted. Hypothesis six proposes that the relationship between PU and BI is positively mediated by attitude. The study followed the recommendations for mediation as highlighted by Hair et al. (2013) and Carrión et al. (2017). The results revealed that there are statistically significant direct paths and the inclusion of attitude as a mediator is meaningful.

Hypothesised path	Path coefficient	Direct effect	Indirect effect	SD	Total effect	VAF	T	Results
PU→ A→BI	0.081	0.2896	0.3359	0.09318	0.6255	53.7%	3.605	Partial mediation

Note: ** $p < 0.05$

Table 4 presents the summary of the mediation results. The significance of the indirect path is needed in order to confirm if attitude mediates the relationship between PU and intention. The t value of the indirect path (PU→A→BI) is ($T = 3.605$, $\beta = 0.094$; $p = 0.016$). Thus it can be concluded that attitude mediates the relationship between PU and BI. The strength of mediation is determined using the variance accounted factor (VAF). The VAF (indirect effect/total effect x 100) is obtained by dividing the indirect effect by the total effect. If $VAF < 0.2$, there is no mediation; $0.2 \leq VAF \leq 0.8$, partial mediation and $VAF > 0.8$, full mediation. The VAF is 51.3% of the effect of PU on BI is explained via attitude (Hair et al., 2013). The results indicate that attitude partially mediates the relationship between PU and BI. The direct and the indirect effects are significant and positive and complimentary mediation is assumed. H6 is accepted

DISCUSSION

The study investigated the university students' intention to use mobile technology (smartphones) for grocery shopping by applying the technology acceptance model. The findings indicated that PEOU has a significant positive relationship with PU. The increase in PEOU leads to an increase in PU because the ease of use of a system improves the productivity and performance effectiveness of the user of the system. H1 is accepted. The findings are consistent with those of similar empirical studies. Lane et al. (2014) Shukla & Sharma (2018) and Saprikis et al. (2018) find a significant positive relationship between PEOU and PU. The findings indicated that PU and PEOU have significant positive relationships with attitude. H3 and H3 of the study are accepted. Davis et al. (1989) remark, that both perceived usefulness and perceived ease of use are two distinct constructs and are of primary significance in predicting behavioural intention.

Nguyen et al. (2019) contend that consumers' PEOU of online shopping positively influences their attitudes towards purchasing products online. In addition, PU impacts on attitude because the more useful customers perceive online shopping to be, the more favourable will be their attitudes towards online shopping. Prior empirical studies (Yang et al., 2014; Shukla & Sharma, 2018) also find that consumer PU and PEOU positively influence consumer's attitude towards m-commerce. The findings indicate that attitude has a positive effect on behavioural intention. The findings are consistent with H4 of the study is supported. Users' intentions to use a technology system are grounded on positive behaviours towards it. The original TAM model by Davis (1989) show that attitude has a positive effect on behavioural intention. According to Nguyen et al. (2019), consumers' attitude towards online food purchasing will positively affect their intentions towards online food purchasing. Empirical studies such as Quevedo-Silva et al. (2016); Shukla & Sharma (2018) and Loketkrawee & Bhatiasevi (2018) reached similar conclusions. The findings revealed that a significant positive relationship between PU and behavioural intention. H5 of the study is supported. If a consumer perceives that a smartphone will be useful and enhance the purchase of goods online, he/she will likely use the smartphone for online grocery shopping. Similar empirical studies (Moorty et al., 2014; Kalinić & Marinković, 2016; Saprikis et al., 2018) have similar empirical conclusions. The findings show that the relationship between PU and BI is partially mediated by attitude. H6 of the study is supported. Attitude has a direct and indirect effect on the intention to use a technology. Attitude is a partial mediator of the effect of PU on intention and adds casual explanatory power to an individual's intention to use an information system (Davis, 1989). The findings are consistent with similar empirical studies (Gajanayake et al., 2014; Verma & Sinha 2017) that attitude partially mediates the relationship between PU and BI. The findings show that the adapted technology acceptance model can be used to predict the behavioural intention by university studies to use Smartphone's for grocery shopping.

CONCLUSION

The use of mobile technology for shopping is limited despite the growth of m-commerce globally. University students need to combine academics with physical grocery shopping and this can lead to time pressure and stress. M-commerce can help to reduce the stress and transform grocery purchasing experience. In addition, current university students are heavy users of mobile devices and have grown up in a digital world. Therefore, it is important to determine

the intention to use mobile technology (smartphones) to purchase grocery by university students as this can help to promote e-commerce in South Africa. M-commerce in order to promote the growth of m-commerce and its associated benefits. The findings indicated that the adapted technology acceptance model can be used to predict the behavioural intention of university students to use smartphones for grocery shopping. Theoretically, the findings of the study confirmed the applicability of the technology acceptance model in predicting behavioural intention in respect of the use of mobile technology for m-commerce. Empirically, the study deepens the knowledge on the determinants of m-commerce. The findings show that perceived usefulness and perceived ease of use positively affect both attitude and intention. Therefore, retailers need to design websites that are user friendly and operational at all times as this will reduce the effort associated with online grocery purchase. Awareness of the existence of applications that can help to purchase groceries online need to be created by retailers. Students also need to use mobile technology for grocery purchase as this will save time and enable new experiences in respect of shopping. Retailers must commit themselves to transformation by pursuing an omnichannel strategy that can help to promote a perfectly seamless shopping experience. Discounts and rewards can be given by retailers to university students for mobile purchases in order to promote m-commerce. The study has some limitations. Data was collected from only two universities and this limits the generalisability of the findings of this study. The dependent variable of the study is behavioural intention and not actual usage. Despite the fact that intention predicts behaviour, other studies should investigate if the TAM model leads to actual usage. In addition, studies can add external variables to improve the explanatory power of the TAM with respect to m-commerce.

APPENDIX

Appendix A: Questionnaire

Construct	Items	Question type	Adapted from
Perceived ease of use	<ol style="list-style-type: none"> 1. Learning to use my smartphone to shop online is easy for me 2. I find it easy to use my smartphone to obtain information on groceries from mobile shopping websites 3. It is easy for me to become skilful at shopping online for groceries. 4. I am of the opinion that it will be easy to use a smartphone to buy groceries on line. 	Five point Likert Scale with “ <i>1 strongly disagree and 5 strongly agree</i> ”	Kim et al., 2010; Shukla & Sharma 2018
Perceived usefulness	<ol style="list-style-type: none"> 1. Shopping for groceries online with my smartphone will improve my performance regarding my shopping tasks. 2. Shopping for groceries online with my smartphone will improve my productivity. 3. I find that shopping for groceries with my smartphone will be more convenient for me than online shopping through desk top computers. 4. Shopping for groceries online with my smartphone will enhance my effectiveness regarding my shopping tasks. 	Five point Likert Scale with “ <i>1 strongly disagree and 5 strongly agree</i> ”	Kim et al., 2010; Shukla & Sharma 2018

Attitude	<ol style="list-style-type: none"> 1. I believe that it would be advantageous to use my smartphone for grocery shopping 2. I think that it would be a good idea to use my smartphone for grocery shopping 3. I think that it would be positive to use my smartphone for grocery shopping. 4. I think that it would be positive to use my smartphone for grocery shopping 	Five point Likert Scale with “1 strongly disagree and 5 strongly agree”	Kim et al., 2010; Shukla & Sharma 2018
Intention	<ol style="list-style-type: none"> 1. In the future, I am willing to use smartphone to buy my groceries. 2. In the future, I plan to use smartphone to buy my groceries. 3. In the future, I intend to use smartphone to buy my groceries. 		Kim et al., 2010; Shukla & Sharma 2018

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