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Determinants of mobile application adoption among micro-entrepreneurs

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Background: Since the onset of the global pandemic, unemployment has increased to new levels. As a consequence, the need to stimulate economic growth through the development of the micro-enterprise sector has become a central vehicle to decrease unemployment and stimulate economic growth. The problem, however, is that despite the potential benefits of digitisation, the micro-enterprise sector has been unable to effectively integrate information and communication technologies (ICTs) into the fabric of their operations.

Objectives: The objective of this study was to investigate the factors that influence the adoption and use of mobile applications for micro-enterprise operations in South Africa.

Method: A quantitative methodology using a survey design was used to collect data from a sample of entrepreneurs, with 221 responses.

Results: Performance expectancy (PE) and effort expectancy (EE) positively influence the micro-entrepreneurs' behavioural intention (BI) to adopt and use mobile applications, while social influence (SI) has no impact on the same. Facilitating conditions (FC) and BI are the strongest determinants of mobile application adoption and use for micro-enterprise operations.

Conclusion: All the constructs of the unified theory of acceptance and use of technology (UTAUT) model showed a satisfactory level of reliability and discriminant validity, which was confirmed by testing the measurement model against two competing models. The UTAUT model is a good predictor of the intention to adopt and use mobile applications for micro-enterprise operations.

Contribution: The findings provide parameters to develop a focussed strategy to catalyse the adoption and subsequent use of mobile applications among micro-entrepreneurs. It further informs initiatives to close the gap of a known reluctance in using technology among micro-enterprises.

Keywords: micro-enterprise; information and communication technologies; mobile technologies; micro-entrepreneurs; UTAUT model; mentorship-movement application.

Introduction

In South Africa, like many developing countries, high unemployment has always been a social detraction. This situation has recently been intensified as a result of the global coronavirus disease 2019 (COVID-19) pandemic. The micro-enterprise sector is seen as an important contributor to economic growth even though this sector consists of small businesses where the majority are not registered and trade informally (Mogane & Jokonya 2020; Small Enterprise Development Agency [SEDA] 2017; Van Wyk & Venter 2023). As a result, many researchers have implied that the contribution made by the micro-enterprise sector to economic growth is unclear, and that development in this sector is displaced, as there is no definitive way to measure the contribution made by the micro-enterprise sector (Okon 2015). However, this is contrary to many other researchers that have alluded that more focus should be placed on developing the micro-enterprise sector, as the outcome would result in a greater improvement to socio-economic conditions and also a greater individual participation to the overall growth of the economy (Gherghina et al. 2020; Nair & Dube 2015).

There have been varying interventions to support small business growth. The development of hubs with technology infrastructure, for example, was linked to evidence that technology improves the overall small business practice. Notwithstanding, various sources indicate that the micro-enterprise sector has not been able to fully grasp the benefit of technology for their growth and development (Akpan, Udoh & Adebisi 2022; SEDA 2017).

Increasingly, entrepreneurs have access to a number of software applications that could potentially support management, operational efficiency and data analytical approaches in their businesses. However, entrepreneurs, especially in the micro-enterprise sector, need to fully grasp the potential of adopting and using technology like mobile applications to support business operations and concomitants success outcomes (Afolayan & de La Harpe 2020; Tambotoh, Manuputty & Banunaek 2015). Even though the adoption and effective usage of ICTs are underscored, the lack of ICT knowledge, skill and financial resources still continues to hinder a strategic adoption of mobile applications for micro-enterprise operations (Afolayan & de La Harpe 2020; Bvuma & Marnewick 2020).

Even though the availability of broadband Internet and associated mobile applications has become pervasive, there is still a low uptake in the micro-enterprise sector of mobile applications within their enterprises. Not all micro-entrepreneurs regard technology as an enabler to business growth, which is contrary to various technological initiatives that position technology as a conduit to business growth. This short coming in the use of mobile technology warrants an investigation concerning the low uptake of mobile applications for micro-enterprise operations. While there is some research conducted on the small, medium and micro-enterprise (SMME) sector as a whole, there has been scant investigation into the micro-entrepreneur sub-sector in particular. This paper posits that the use of mobile applications will fast-track the growth in this sector; create more employment; reduce poverty; and allow micro-enterprise business to transition to more formal business entities. This assumption is further reinforced and well documented in literature that the use of technology increases productivity levels, of which the resultant effects benefit entrepreneurs in the micro-enterprise sector economically (Lekhanya 2016; Surya et al. 2021).

In light of the foregoing, the authors aimed to investigate the factors influencing adoption of mobile applications for micro-enterprise operations in South Africa. The research question guiding the study was:

What are the factors influencing the adoption of mobile applications for micro-enterprise operations?

Literature review
Micro-enterprise sector

Micro-enterprises are small businesses that lack formality in their operations (*National Small Business Act 102 of 1996*). Micro-enterprises normally generate an annual turnover of less than R150 000, and usually employ five or fewer individuals. Examples of micro-enterprises include businesses like spaza shops, home-based businesses and minibus taxis. This study focussed on what is referred to as the *survivalist sector* of the micro-enterprise sector, whom according to the *National Small Business Act (102 of 1996)* comprises informal traders, generating income below the

recommended standard of living and beneath the lines of poverty (South Africa 2003). Survivalists include street vendors and hawkers, and therefore, often are seen as part of the micro-enterprise sector.

Given that the micro-enterprise sector is a key contributor to socio-economic growth, the South African government has tasked various governmental bodies and agencies to promote growth of this sector (Nieuwenhuizen 2019; Okon 2015). It is argued that by prioritising technology infrastructure development, sectorial growth and development as well as a greater participation in the economy will be enabled (Twinomurinzi, Phahlamohlaka & Byrne 2012).

Despite various technology-related interventions that have been employed by the South African government to promote and facilitate the use of technology in small to medium enterprise sectors, the micro-enterprise sector, in particular, is still seen as reluctant users of technology (Bvuma & Marnewick 2020; Cant, Wild & Hung 2015). This type of behaviour observed in the micro-enterprise sector opposes persuasive evidence that support the use of technology in small business growth and development (Nguyen et al. 2015). The known characteristics of the micro-enterprise sector were considered as a basis to understand their reluctance to use technology; the observed role of mobile technology to micro-operational advancement; and technology adoption.

Characteristics of the micro-enterprise sector

Micro-enterprises are often created out of necessity. The low barriers to entry in this sector make it ideal for entrepreneurs to engage or participate in some or other trade activity. This participation is necessary to both accelerate socio-economic development and increase the general economic participation (Tambotoh et al. 2015). The micro-enterprise sector displays potential to transition to more formal businesses on condition that the sector remains inclusive and not excluded from government growth and development initiatives (Bvuma & Marnewick 2020; Rahou & Taqi 2021). The bureaucracy of formalising micro-enterprise businesses often discourages aspirant micro-entrepreneurs to transition to more formal businesses and often left feeling unsupported (Ismail, Jeffery & Belle 2011; Nieuwenhuizen 2019).

However, small businesses in the micro-enterprise sector are likely to be more successful if they fully utilise the support interventions and initiatives made available by various government agencies (Bvuma & Marnewick 2020; Nomafu, Van Vuuren & Davies 2023). Lack of awareness about the start-up support services available to micro-entrepreneurs is viewed as one of the main reasons for high start-up failures (Rankhumise & Rugimbana 2020; SEDA 2017). Similarly, studies over the years (e.g. Banda, Matumba & Mondliwa 2015; Fernández, Lilenstein & Oosthuizen 2017; Zhang & Ayele 2022) assert that the micro-enterprise sector displays a limited growth and development potential, because of a lack of infrastructure and support. In addition, entrepreneurs in

the micro-enterprise sector are highly unskilled, small business are started because of a lack of employment opportunities which results in high start-up failures (Banda et al. 2015; Fernández et al. 2017; Tambotoh et al. 2015).

Role of information communication and technology in micro-enterprise development

Even though it is acknowledged that the use of information and communications technologies (ICTs) is critical to small business growth, the reluctance to adopt and use technology among micro-entrepreneurs need to be addressed (Eze, Chinedu-Eze & Bello 2018). Access to financial resources; poor infrastructure; lack of ICT skills; lack of business management skills; and onerous policies and legal requirements have been noted as challenges for low uptake of technology for business outcomes (Bvuma & Marnewick 2020; SEDA 2017). The resultant effect is that technology remains underutilised in this sector and as a consequence micro-entrepreneurs are unable to take full advantage of benefits associated with its adoption and use (Yu, Lin & Liao 2017).

The pervasiveness of ICT like mobile phones has enabled individuals to access information, communicate and engage with each other, with service providers and government bodies. This pervasiveness demanded infrastructure changes in order to keep up with modern day economic transformation. Ngek and Smit (2013) argue that the low levels of ICT adoption and lack of innovativeness in the micro-enterprise sector cannot be overlooked as it will remain a key obstacle despite the pervasiveness of ICT. Improved micro-enterprise operations will therefore only be realised once ICT is strategically aligned to the objectives of the micro-enterprise business (Ardjouman 2014; Sandberg & Håkansson 2020).

Role of mobile technology in micro-enterprise business

Mobile technology is seen as the most common and accessible form of technology available to the micro-enterprise sector (Alharthi & Islam 2021). The transformational use of mobile technology is revolutionising the way in which organisations promote their businesses; source new clients and suppliers; improving the customer experience, and enabling various operational process efficiencies (Madzimure 2020). Most South Africans use their mobile phones to connect to the Internet as a source of information and also to engage with one another. This behaviour enables small businesses in the micro-enterprise sector to participate in various trade activities, irrespective of infrastructure needs (Okon 2015). Boateng (2011) suggests that the use of mobile technologies has the ability to influence micro-enterprise operations in an incremental, transformational and on a productivity level.

The incremental use of mobile technology mainly refers to the reduction of transactional costs; the procurement of buyers and suppliers of goods and services; and increased productivity levels (Aker & Mbiti 2010). The transformational use of mobile technology, impacts the client-supplier engagement through the use of emerging and low-cost mobile applications like instant messaging services (Boateng 2011). Transformational use further extends to the marketing of new products and services thus broadening their client prospects. Through the use of mobile technologies, entrepreneurs are thereby enabled to differentiate themselves from their immediate competitors through mobile advertising on social media platforms like Facebook and online advertising platforms like Gumtree (Cheing et al. 2020; Donovan 2013).

For example, Kale (2015) observed that an entrepreneur who sells fruit to clients in a local business district of Lagos, created a WhatsApp group, targeting clients who enjoyed eating fruit salad. The WhatsApp group allows clients to pre-order fruit salad that can either be collected or delivered on a cash-only transactional basis. Those clients who opted to have the fruit salad delivered gave rise to an opportunity to create additional employment in the form of a delivery person, thus expanding the value chain. He further argues that the use of WhatsApp in this business reduced the operational costs as WhatsApp in this instance was used as a marketing platform, a customer ordering platform, and a client engagement platform.

Owoseni and Twinomurinzi (2016) reported on a small laundry business who created a mobile application that served as a job ordering and delivery platform, where clients can book a laundry delivery or collection day. The clients were allowed to make payments via the mobile application based on the services selected. These authors stated that the use of the mobile application streamlined the laundry business and resulted in an increase in revenue and the number of employees within a 6-month period.

There are other similar examples, for example, Malanga and Banda (2021) attesting to the effectiveness of easy-to-use social media platforms in micro-enterprises.

Technology adoption

Studies concerning the adoption of information technology (IT) commonly involve the application of theories and models which have been developed to predict and explain user behaviour towards the adoption and use of ICTs.

The theoretical assumption of this study is that the micro-enterprise sector can produce products and services more efficiently if the appropriate mobile applications are adopted and used for micro-enterprise operations. This assumption is reinforced in the extant literature which provides evidence that access to, and the appropriate use of technology increases productivity and consequently increases the standard of living of those operating in the micro-enterprise sector (Antonites & Kliphuis 2011; Endris & Kassegn 2022).

Mobile applications adoption

The adoption of mobile applications is a complex process that is influenced by a multitude of factors. Researchers

across different fields have studied the various factors that contribute to mobile application adoption (Msweli & Mawela 2021; Ntsiful et al. 2020; Petersen, Jacobs & Pather 2020; Seat & Pather 2023; Verkijika 2018). Studies in the context of mobile health applications have identified four constructs of the unified theory of acceptance and use of technology (UTAUT) model, namely performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC), that have an impact on mobile health adoption and use (Petersen et al. 2020). In contrast, studies in the context of mobile commerce have found that SI, FC, hedonic motivations, perceived risk, and perceived trust significantly influence the adoption of mobile commerce applications, while PE and EE do not (Verkijika 2018).

For small-holder farmers, several relevant factors have been identified that affect their intentions to adopt ICTs. These factors include EE, PE, SI, FC, price value and perceived trust (Seat & Pather 2023). In Nigeria, SI, perceived usefulness, perceived risk and perceived cost have been found to be important factors that influence farmers' adoption of mobile applications (Victor, Nic & Xiaomeng 2021). In the case of mobile banking applications, PE and hedonic motivation are crucial factors that influence adoption. However, perceived transaction cost, EE, and privacy and information concerns do not have a significant impact on consumers' intentions to adopt mobile banking apps (Ntsiful et al. 2020). Additionally, various barriers such as a lack of information and understanding, security and trust issues, demographic factors, language, complexity of mobile banking applications, and resistance to change have been identified as factors that affect the adoption of mobile banking among the elderly (Msweli & Mawela 2021).

Information and communication technology adoption among micro-enterprises

The adoption of ICT within micro-enterprises is a multifaceted issue. Research conducted by Bvuma and Marnewick (2020) on ICT adoption among township SMMEs revealed that perceptions or attitudes towards ICT adoption vary in this sector. While there is a general consensus on the advantages of ICT adoption, the reasons for non-adoption of ICT encompass high ICT costs, lack of ICT awareness, limited ICT support and insufficient ICT infrastructure. Estébanez, Grande and Espada (2022) also investigated the factors that determine IT adoption and use in micro-enterprises, asserting that management and economic characteristics, as well as employees' education level, play a crucial role in the level of IT adoption and use. Additionally, a study conducted by Kumar et al. (2023) on the adoption of ICT as a business strategy during COVID-19 highlighted different factors, such as business sustainability motives, remote work environment and ease of use, that influence the perceived benefits of organisational performance of micro, small and medium enterprises (MSMEs). Furthermore, it is noteworthy that perceived ease of use is believed to impact the use of e-commerce among rural micro-entrepreneurs (Yusoff et al. 2021). Andaregie

and Astatkie (2021) delved into the determinants of technology adoption by micro and small enterprises. They found that education about technology, access to credit, and provision of government incentives are critical for enhancing the adoption rates of technology. Other factors identified in a study on fintech adoption in the SMME sector include perceived usefulness of applications, concerns of risk, and that of trust (Purwantini & Anisa 2021).

## The conceptual framework and hypotheses development

Given that the use of technology has been globally recognised as an enabler to organisational growth and development, understanding user acceptance and behaviour to technology, is a key factor for the implementation success of new technologies. In understanding behaviour towards technology adoption, a collection of technology acceptance models were identified. Considering the uniqueness of the micro-enterprise sector, this study made use of UTAUT model, which is a combination of eight prominent technology adoption models and theories used to explain behaviour towards the adoption of mandatory information systems (Venkatesh et al. 2003).

In considering the UTAUT model, the literature depicted a broad application of the UTAUT model in various studies that investigated technology adoption among micro-enterprise, for example, Varma (2018); Odoom and Kosiba (2020); Azman and Zabri (2022) and Salimon et al. (2023). Moreover, the model has also been applied in various technology adoption research contexts in South Africa previously such as by Liebenberg, Benade and Ellis (2018); Morrison and Van Belle (2020); Petersen et al. (2020); Nyamubarwa and Chipunza (2021) and Mujinga (2022). This was a further affirmation of the suitability of the UTAUT model as a lens for the empirical investigation of the factors influencing the adoption of mobile applications for micro-enterprise operation.

The UTAUT consists of four key constructs that influence BI of technology and subsequent use behaviour (UB) (Venkatesh et al. 2003). Venkatesh et al. (2003) describe the constructs for BI as being PE, EE and SI. Facilitating conditions and BI are described as direct determinants of UB. The conceptual model on which hypotheses were developed is represented in Figure 1.

Performance expectancy

Performance expectancy is 'the degree to which the user expects that using a system will help or her attain gains in job performance' (Venkatesh et al. 2003:447). In the context of this study, the PE construct was used to investigate the micro-entrepreneurs' likelihood to adopt mobile applications if they are of the belief that the use of mobile applications would improve the operational capabilities and effectiveness of their business.
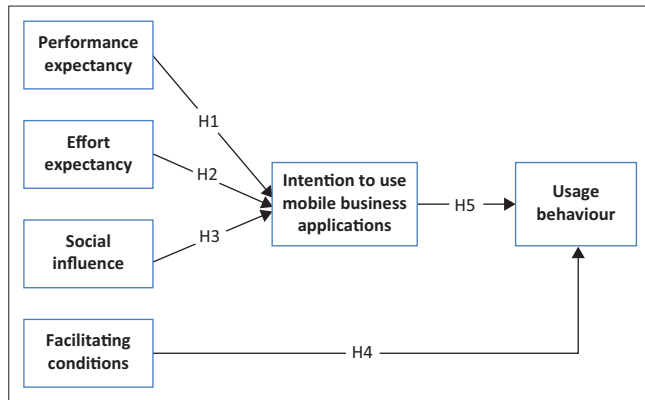
FIGURE 1: The determinants of Intention and Usage behaviour.

On this basis. the first hypothesis was developed:

H1: *Performance expectancy directly influences the micro-entrepreneurs' intention to use mobile applications for micro-enterprise operations.*

Effort expectancy

Effort expectancy is 'the degree of ease associated with the use of the system' (Venkatesh et al. 2003:450). The EE construct was used to investigate micro-entrepreneurs' perceptions of mobile applications in respect of being easy to use and level of difficulty to understand the application. Their perceived effort will therefore indicate the micro-entrepreneur's intention to either make use of mobile applications or to reject mobile applications that are complex and difficult to use.

On the basis of the above. the second hypothesis was developed:

H2: *Effort expectancy directly influences the micro-entrepreneurs' intentions to use mobile applications for micro-enterprise operations.*

Social influence

Venkatesh et al. (2003:451) define SI as 'the degree to which an individual perceives that important others believe he or she should use the new system'. The SI construct was therefore used to investigate the extent to which the micro-entrepreneurs' decision to adopt and use mobile applications would be influenced by individuals whom they believe are important to them.

On the basis of the above, the third hypothesis was developed:

H3: *Social influence directly influences the micro-entrepreneurs' intentions to use mobile applications for micro-enterprise operations.*

Facilitating conditions

Venkatesh et al. (2003:453) define FC as 'the degree to which an individual believes that an organisational and technical infrastructure exist to support the use of the system'. According to Venkatesh et al. (2003), it is expected that organisations would provide technical support to assist users

in overcoming any difficulty in using a technology, this would in turn increase utilisation. This observation was also supported by Kohnke, Cole and Bush (2014) and Herrington, Kew and Mwanga (2017).

On the basis of the above, the fourth hypothesis was developed:

H4: *Facilitating conditions influences the micro-entrepreneurs' usage behaviour of mobile applications for micro-enterprise operations.*

Behavioural intention and use behaviour

Behavioural intention refers to the degree to which an individual is inclined to make use of technology (Venkatesh et al. 2003). Use behaviour is the value that the individual attaches to the use and re-use of a technology (Turpin 2018; Venkatesh et al. 2003). In the context of this study, it was hypothesised that if a micro-entrepreneur's behaviour exhibits an intention to use a mobile application, they would consequently engage in actual use and re-use of such applications for their micro-enterprise operations.

On the basis of the above, the final and the fifth hypothesis was developed:

H5: *Behavioural intention directly influences use behaviour in respect of the use of mobile applications in micro-enterprise operations.*

Research methods and design

A quantitative research methodology was adopted. A structured questionnaire was used to collect data. Given that the objective was to measure the relationship between the independent and dependent variable(s) as they are observed, without controlling the independent variable, a non-experimental correlation design (Lavrakas 2008) was used.

Population of this study

The population of this study was micro-entrepreneurs who are registered users of a mobile mentoring application created by the National Mentorship Movement (see https://mentorshipmovement.co.za/). The choice to use this population was pragmatic, based on convenience and permission received for access to the entrepreneur database. The micro-entrepreneurs, through the use of the *mentorship-movement* application, are enabled to develop their entrepreneurial skill set, and also to advance their business practices through peer group and mentor engagements. Registering as mentee is voluntary and free of charge. The entrepreneurs are matched with mentors, based on their user profiles they created and also the development areas they have indicated. Mentors, being experts in their associated fields of study and industry, then connect with the entrepreneurs through individual or peer group consultations. Consultations are primarily facilitated using the *mentorship-movement* application or any other online mediums that would support ease of communication and

interaction. For micro-entrepreneurs starting their businesses, the *mentorship-movement* provides a cost-effective method to connect with experts and learning material. The total number of subscribed micro-entrepreneurs was 809 at the time of data collection.

Sample and sampling technique

The entire population of micro-entrepreneurs subscribed on the National Mentorship Movement database was sampled, which means each population member had an equal opportunity of being selected and responding to the questionnaire. Population sampling therefore suggests that the respondents are accepted as representative of the target population (Thomas, Singh & Gaffar 2013).

Measuring instrument and data collection strategy

A closed-ended questionnaire was distributed to the micro-entrepreneurs to collect data relevant to the key variables of the study and also themed to align with the research hypotheses. The questionnaire was modelled upon the instrument of Venkatesh et al. (2003) given that their instrument has been validated in a number of technology adoption related studies. The items in the questionnaire were left unchanged apart from changing the referent to ensure contextual alignment with the subject matter. For instance, where the UTAUT would refer to 'in my job', the referent was changed to 'my business'. Furthermore, references to the 'system' was changed to 'mobile applications'. An example item that was changed refers: 'Using the system would enhance my effectiveness on the job' to 'Use of mobile applications enhances the effectiveness of my business'.

Items relating to the dimensions (PE, EE, SI and FC) were measured on a five-point agreement Likert scale. Some demographic questions were included to assist in describing the sample.

A total number of 809 questionnaires were distributed of which 221 were returned. Four questionnaires were discarded as incomplete, leaving 217 fully completed questionnaires that was used in the study.

Instrument validity and reliability

The measurement instrument as developed by Venkatesh et al. (2003) was validated in a number of technology adoption related studies, for example, the cross-cultural validation of universities (Simeonova et al. 2010); acceptance of e-government services (Alshehri, Drew & AlGhamdi 2013); factors affecting the use of English in e-learning website (Tan 2013); and the adoption of e-government technologies for food distribution (Chopra & Rajan 2016). The construct validity of the instrument was assessed by using confirmatory factor analysis (CFA) (Scotland 2012).

Previous research reported acceptable reliability for the dimensions of the UTAUT items (Venkatesh et al. 2003),

ranging from 0.73–0.91 (Alshehri et al. 2013; Chopra & Rajan 2016; Simeonova et al. 2010; Tan 2013; Venkatesh et al. 2003).

Data analysis

The data collected for this study were analysed by using Structural Equation Modelling (SEM) in MPlus 8.2 (Muthén & Muthén 2017). Biographical data was calculated with the IBM Statistical Package for the Social Sciences (SPSS 2017), including means, standard deviations (SDs) and Cronbach alpha coefficients for latent variables. Statistical significance was set at 95% level for all parameters, i.e., $p \leq 0.05$.

Ethical considerations

Ethical clearance to conduct this study was obtained from the Humanities and Social Science Research Ethics Committee of the University of the Western Cape. No risks were posed to survey respondents in the research. No personal data were collected; confidentiality of all collected data was observed throughout the data collection, analysis and reporting stages of the research.

Results and discussion

In this section, the characteristics of participants are presented after which the quantitative results are depicted and discussed.

Characteristics of the sample

The characteristics of the sample was extracted from the survey. The data (Table 1) revealed that most of the sample was under the age of 40 indicating that younger persons dominate the population group, affirming SEDA (2017) that more small businesses were formed by individuals in the age group 25–34.

The ethnicity of the sampled group of micro-entrepreneurs is line with the report of SEDA (2018) that the majority of small business owners in South Africa were black-owned

TABLE 1: Characteristics of the sample (*N* = 217).

Group	Sub-group	Number	% represented
Age (in years)	20–30	107	49.3
	31–39	71	32.7
	40–49	33	15.2
	50+	6	2.8
Gender	Male	110	50.7
	Female	107	49.3
Ethnicity	White people	15	6.9
	Black people	182	83.9
	Coloured people	10	4.6
	Indian people	6	2.8
	Other people	4	1.8
Highest educational achievement	Did not matriculate	3	1.4
	Matric	45	20.7
	Diploma	65	30.0
	Degree	52	24.0
	Honours Degree	32	14.7
	Master's Degree	20	9.2

(reported at 74.9%), followed by white-owned businesses (17.3%), coloured (3.9%) and Indian or Asian business owners representing about 4% of the small business owner make-up in South Africa (SEDA 2018).

The education level is considered a valuable determining factor of the micro-entrepreneurs' ability to make use of mobile applications for business. The data revealed most of the sampled entrepreneurs (50.7% of the micro-entrepreneurs) had either a diploma (30.0%) or a matric certificate (20.7%). Of the remaining micro-entrepreneurs, 24.0% achieved a degree; 14.7% achieved an honours degree, and 9.2% achieved a master's degree. The data also revealed that about 1.4% of the micro-entrepreneurs did not matriculate.

Descriptive statistics

The dimension scores of the UTAUT model were calculated by averaging their related elements. The mean score of the constructs were averaged from 1 (strongly agree) to 5 (strongly disagree). Table 2 shows that the average responses for PE and EE were between the *strongly agree and agree* Likert scale anchors: M = 1.6882 (SD = 0.68984) and M = 1.6452 (SD = 0.67170), respectively. The average responses for SI and FC were between *agree and undecided*; M = 2.1585 (SD = 0.78767) and M = 2.2750 (SD = 0.84539), respectively. Lastly, the average responses for BI and UB were between *strongly agree and agree*; M = 1.5929 (SD = 0.65475) and M = 1.8687 (SD = 0.83474), respectively.

The average responses of strongly agree to agree for BI and UB, could be a result of the sampled micro-entrepreneurs being more likely to be tech-savvy and familiar with the use of mobile applications. Moreover, the average response of *agree to undecided* for SI and FC could also in the same way be viewed as the sample group of micro-entrepreneurs being more tech savvy and thus also more open to experimenting with emerging technologies.

In the present study, the results (presented in Table 2) indicate that all of the constructs, except FC reported a high reliability. Facilitating conditions, however, had a reliability score of less than 0.7, at α = 0.686. Additional analysis revealed that the reliability can be enhanced to 0.785 by deleting the third item of the FC scale. According to Yong and Pearce (2013) and Osborne (2015), using factor items fewer than three may result in a generally weak and uncorrelated factor when conducting Structural Equation Modelling (SEM). This informed the decision not to delete the third item.

Measurement model fit assessment

Confirmatory factor analysis was used to verify the most appropriate representation of relationships among variables and their fit to the observed data. Three possible measurement models were tested; *Model 1* was specified as per the theoretical understanding of the UTAUT model (see Table 3); *Model 2* differed from the first model in that PE, EE and SI items grouped into one latent variable measured by 9 observed items, other items remaining unchanged; and Model 3, all the observed items (19 items) were grouped into one latent variable. The fit indices are reported in Table 3.

According to Kline (2005) and Osborne (2015), the Chi-square values (χ^2) of the primary structural model (Model 1) need to be compared with the two competing models (Models 2 & 3). As illustrated in Table 3, the fit indices of all three models were comparable, demonstrating that all three models had equal explanatory ability. Based on the principle of parsimony, the fit indices were used to determine the less complicated model (Vandekerckhove, Matzke & Wagenmakers 2015).

The root mean square error of approximation (RMSEA) values for both models 2 and 3 were greater than 0.1, which indicates poor model fit (Field 2017). A RMSEA value of 0.08 or less is considered a reasonable fit and therefore at 0.083, model 1 was considered a reasonable fit based on the RMSEA value (Field 2017).

Moreover, when comparing the standardised root mean squared residual (SRMR) values, model 1 (SRMR = 0.054) indicates a good fit when comparing it to the competing models 2 (SRMR = 0.076) and 3 (SRMR = 0.090) (Kline 2005). A comparative fit index (CFI) value of 0.90 and above is indicative of a good fit (Baglin 2014). Model 1 therefore displayed a good fit at a CFI value of 0.916, where the

TABLE 2: Descriptive statistics of the variables (*n* = 217).

Dimensions	α	M	SD	Skewness Statistic	SE	Kurtosis Statistic	SE
Performance expectancy	0.873	1.688	0.690	1.264	0.165	2.596	0.329
Effort expectancy	0.885	1.645	0.672	1.281	0.165	2.596	0.329
Social Influence	0.778	2.158	0.788	0.536	0.165	0.782	0.329
Facilitating conditions	0.686	2.275	0.845	0.544	0.165	0.046	0.329
Behaviour Intent	0.886	1.593	0.655	1.807	0.165	6.075	0.329
Use behaviour	0.890	1.869	0.835	1.424	0.165	2.890	0.329

α, Cronbach alpha reliability; M, mean; SD, standard deviation; SE, standard error.

TABLE 3: Measure model results.

Measurement model	Chi square	*df*	*p*	RMSEA	SRMR	CFI	TLI	AIC	BIC
1	331.033	137	0.0000	0.083	0.054	0.916	0.895	7928.706	8167.610
2	615.002	149	0.0000	0.124	0.076	0.798	0.769	8188.674	8387.761
3	917.225	152	0.0000	0.157	0.090	0.669	0.627	8484.897	8674.030

df, degrees of freedom; RMSEA, root mean square error of approximation; SRMR; standardised root mean squared residual; CFI, comparative fit index; TLI, Tucker-Lewis index; AIC, Akaike information criterion; BIC, Bayes information criterion.

competing models displayed poor fit (model 2 [CFI = 0.769]; model 3 [CFI = 0.669]).

When comparing competing models and determining good model fit, the model with the lesser Akaike information criterion (AIC) and Bayes information criterion (BIC) values should be considered as the best fit model (Vrieze 2012). Model 1 was therefore considered the preferred model (AIC= 7298.708; BIC = 8167.610).

Based on the results measurement model 1 displayed an acceptable level of fit and therefore shows evidence of discriminant validity.

Structural model assessment and result

After evaluating the measurement model, the structural model was evaluated in order to assess the theoretical (hypothesised) model. The aim in testing the hypotheses is to establish which predictors offer a more meaningful contribution to the explanation of the dependent variables (Hair et al. 2017). The criteria for the model fit indices were similar to the criteria used when the measurement model was assessed. The structural model showed acceptable fit with RMSEA = 0.087, SRMR = 0.054, CFI = 0.907 and TLI = 0.887.

In considering the path coefficients for the relationships between the variables (depicted in Figure 1), PE positively influenced BI and was statistically significant (β = 0.319, p = 0.005); therefore, H1 was accepted. This outcome confirmed that the micro-entrepreneurs' BI to use mobile applications for micro-operations is directly influenced by PE. This indicates that the micro-entrepreneurs believe that the tasks and activities of their micro-operations will improve; therefore, they are far more likely to adopt and use other mobile applications towards achieving desired business outcomes. This observation is in line with many other previous studies (Venkatesh, Thong & Xu 2012; Ramadani 2015).

Effort expectancy positively influenced BI and was statistically significant (β = 0.235, p = 0.020); therefore, H2 was accepted. This outcome confirmed that the micro-entrepreneurs' BI to use other mobile applications for micro-operations is directly influenced by EE. The outcome indicates that the perceived level of difficulty or ease of use of mobile applications will influence the micro-entrepreneurs' intention to adopt and use other mobile applications for businesses. In this regard, a further inference is that the micro-entrepreneurs would be more inclined to make use of a less complicated mobile application, one that will place a lesser demand on their time and ability to accomplish any given task or transaction. This observation was in line with many other previous studies (Ramadani 2015; Venkatesh et al. 2012).

The relationship between SI and BI, however, was found to be statistically insignificant (β = 0.193, p = 0.051); therefore, H3 was rejected. The preferences and beliefs of society have

a tendency to change the views and opinions of others (Rana, Dwivedi & Williams 2015). The expectation was that SI would significantly influence the BI of the micro-entrepreneurs. Such an observation would then have been in line with studies conducted by Chen and Lin (2018) and Rana et al. (2015). However, the observed outcome implies that family, peers and society in general have no direct effect on the micro-entrepreneur's decision to adopt and integrate other mobile applications within their businesses.

Facilitating conditions positively influenced UB and was statistically significant (β = 0 .448, p = 0.000); therefore, H4 was accepted. The study outcome revealed that FC have a significant and direct influence on the micro-entrepreneurs UB of mobile applications for micro-operations. From a South African perspective, FC would include, but are not limited to, ICT infrastructure, broadband connectivity that is both accessible and affordable, the availability of technical support services, the cost of mobile data, and any other support initiatives that will enable the micro-entrepreneurs to adopt and use mobile applications for micro-operations. This outcome is therefore in line with several previous studies (Kohnke et al. 2014).
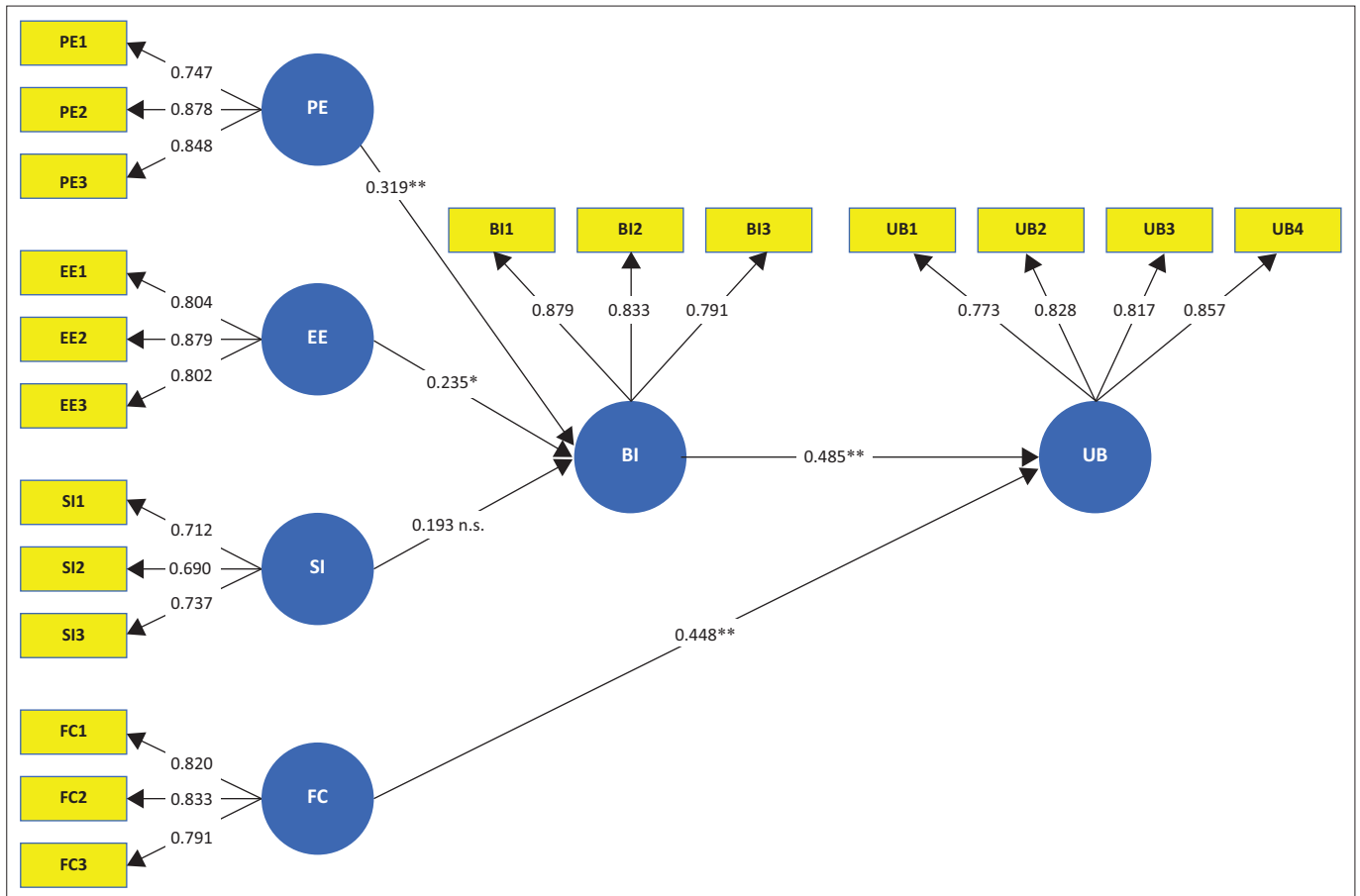
Behavioural intention positively influenced UB and was statistically significant (β = 0.485, p = 0.001); therefore, H5 was accepted. The study revealed that BI has a significant influence on UB, meaning that BI is more likely to predict the micro-entrepreneur's intention to use and their subsequent use of mobile application for micro-operations. This outcome is in line with several studies, supporting BI as a direct determinant of UB (Chen & Lin 2018; Kohnke et al. 2014).

The predictors of BI, PE and EE explained a bigger proportion of the variance in BI. Venkatesh et al. (2003) describe both constructs (PE and EE) as the users' view of how technology will improve their job performance and the level of difficulty or simplicity in using such a technology. Social influence on the other hand considers the views of others in relation to whether or not a technology should be used or not (Venkatesh et al. 2003). Seeing that the observation of this study revealed SI to be an insignificant predictor of BI, it can be inferred that the micro-entrepreneurs' BI to adopt and use other mobile applications for business outcomes, are more influenced by their own experiences or views, as opposed to what others believe.

Given the findings as shown in Figure 2, four out of the five path coefficients (hypotheses) were significant from a statistical point of view, and therefore considered meaningful. Table 4 presents a consolidated summary of the findings.

Conclusion

Given the extant literature available on mobile application adoption and use in South Africa, this study adds to the body of knowledge in relation to adoption and use of

PE, performance expectancy; EE, effort expectancy; FC, facilitating conditions; SI, social influence; UB, use behaviour; BI, behavioural intention.

* $p < 0.05$; ** $p < 0.01$; n.s. = not significant.

FIGURE 2: Structural model with standardised path coefficients.

TABLE 4: Summary of findings.

What are the factors influencing the adoption of mobile applications for micro-enterprise operations?	
Research Hypothesis	Findings
H1: *Performance expectancy (PE) directly influences the micro-entrepreneurs' intention to use mobile applications for micro-enterprise operations*	**The research finding validates H1.** The outcome of PE in relation to BI was significant and therefore indicates the micro-entrepreneurs intention to use other mobile applications for business. This means that if the micro-entrepreneurs believe that the tasks and activities of their micro-operations will improve, they are far more likely to adopt and use other mobile applications towards achieving desired business outcomes
H2: *Effort expectancy (EE) directly influences the micro-entrepreneurs' intentions to use mobile applications for micro-enterprise operations.*	**The research finding validates the H2.** The outcome of EE in relation to BI was significant and therefore indicates that the perceived level of difficulty or ease of use of mobile applications will influence the micro-entrepreneurs intention to adopt and use other mobile applications for businesses. This could also be further translated that the micro-entrepreneurs would be more inclined to make use of a less complicated mobile application, one that will place a lesser demand on their time and ability to accomplish any given task or transaction
H3: *Social influence (SI) directly influences the micro-entrepreneurs' intentions to use mobile applications for micro-enterprise operations.*	**The research finding rejects H3.** The study outcome revealed that social influence has an insignificant influence on the behavioural intention of the micro-entrepreneurs decision to adopt and use other mobile applications for business outcomes. As a result, H3 was rejected. The observed outcome can therefore be translated that family, peers and society in general have no direct effect on the micro-entrepreneurs decision to adopt and integrate other mobile applications within their businesses
H4: *Facilitating conditions (FC) influences the micro-entrepreneurs' usage behaviour of mobile applications for micro-enterprise operations.*	**The research finding supports H4.** The study outcome revealed that FC have a significant and direct influence on the micro-entrepreneurs use behaviour (UB) of mobile applications for micro-operations. The outcome therefore supports H4 that FC directly influences the subsequent UB of the micro-entrepreneurs to continue using mobile applications for business. From a South African perspective, FC would include, but are not limited to, ICT infrastructure, broadband connectivity that is both accessible and affordable, the availability of technical support services, the cost of mobile data and any other support initiatives that will enable the micro-entrepreneurs to adopt and use mobile applications for micro-operations.
H5: *Behavioural intention (BI) directly influences use behaviour in respect of the use of mobile applications in micro-enterprise operation*	**The research finding supports H5.** The study revealed that BI has a highly significant influence on UB, meaning that BI is more likely to predict the micro-entrepreneurs intention to use and their subsequent use of mobile application for micro-operations. The outcome therefore supports the H5. Seeing that the observation of this study revealed SI to be an insignificant predictor of BI, it can be further translated that the micro-entrepreneurs' BI to adopt and use other mobile applications for business outcomes, are more influenced by their own experiences or views, oppose to what others believe.

ICT, information and communications technology.

mobile applications for micro-enterprise operations. All the constructs of the UTAUT model showed a satisfactory level of reliability and discriminant validity, which was confirmed by testing the measurement model against two competing models, which then formed the basis of the structural model as a result of the satisfactory fit indices. These results affirm the use of the UTAUT model as a good predictor of the intention to adopt and use mobile applications for micro-enterprise operations. This reinforces other previous studies using the UTAUT model to investigate mobile technology adoption and use (Attuquayefio & Addo 2014; Tan & Leby Lau 2016). The study offers insights through the use of the UTAUT model, to improve mobile application adoption among micro-entrepreneurs in South Africa, by isolating and recognising the key factors influencing mobile application adoption and use for business outcomes.

The findings of the study are also of value to governmental support cooperatives, mobile application developers and those who enforce ICT policy, both in private and public. The empirical investigation of this study is of value to improving mobile-application adoption and use in the micro-enterprise sector. For example, the individual perception or view when it comes to adopting mobile applications is a stronger predictor of their BI to adopt and use mobile applications, than the opinions of others (SIs). Furthermore, the study provides an analysis of the factors influencing mobile application adoption and use from the view of a delineated group of micro-entrepreneurs who utilise mobile applications within their micro-operations.

Moreover, the study offers a deeper insight to the key factors influencing the intention to use mobile applications as well as the subsequent UB of mobile application for micro-enterprise operations, based on the exploration and examination of the survey research and a delineated group of micro-entrepreneurs. The outcome of the study is useful in that it can inform governmental initiatives promoting sectorial mobile technology adoption and solve or rather close the gap of a known reluctance in using technology for growing and developing small, medium and more specifically micro-enterprise businesses.

Research limitations

Firstly, the study was limited by being a single cross-sectional study; and also limited by the number of micro-entrepreneurs participating in the study. However, a cross-sectional study was necessary to allow for the amount of time allocated to conduct the study. The data were collected at a single point in time, as a result BI and UB of mobile applications for micro-enterprise operations were only assessed once, thus discarding a change in these variables over time. Secondly, a delineated group of micro-entrepreneurs were used, all of whom have registered with the National Mentorship Movement and therefore might not be representative of entrepreneurs within the micro-enterprise sector in South Africa. As registration on this platform is done electronically, these individuals may be biased to accept and use technological methods. Partnering with the National Mentorship Movement, presented the study with easier access to a number of micro-entrepreneurs, therefore discounting valuable input of those who do not access organisations like the National Mentorship movement and other support cooperatives. It is therefore recommended that future research to be more inclusive and representative of the micro-enterprise sector, mobile application developers, support cooperatives, and policy makers in order to further delve into the factors influencing the adoption and use of mobile applications for micro-enterprise operations.

Recommendations

It is recommended that before any interventions are made or support is implemented, all factors that influence the adoption of mobile applications for micro-enterprise operations must be addressed. Even though there have been numerous interventions to stimulate growth and development in the micro-enterprise sector by the government and other support cooperatives, a low uptake of technology for business still exists. Therefore, it is important to have guidelines that will encourage and facilitate the adoption of mobile technologies in the micro-enterprise sector. The micro-enterprise undoubtedly is a key vehicle that will grow the general economic participation and should therefore not be left behind when it comes to trading in an economy that is gearing to be more digitally inclined. Implementing the right guided interventions therefore becomes imperative to growth and development in the micro-enterprise sector.

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Disclaimer

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