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A technology, organisation and environment framework analysis of information and communication technology adoption by small and medium enterprises in Pietermaritzburg

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Background: Information and communication technology (ICT) has been a major contributor to world economic growth. Information and communication technology has played a vital role when it comes to the growth of small and medium enterprises (SMEs). In developed countries, SMEs are making use of ICT to support their business functions, although this has not been the case in most developing countries. The Global Entrepreneurship Monitor argues that the survival rate of newly established businesses is generally poor, with SMEs in developing countries performing even worse than the standard survival rates.

Objectives: This study aims to investigate the determinants that influence the intention to adopt ICT by SMEs in developing countries using Pietermaritzburg in South Africa as an example to understand this phenomenon.

Method: The study made use of quantitative methods as its fundamental research approach. A total of 227 SMEs in Pietermaritzburg were surveyed using a close-ended questionnaire. The technology, organisation and environment framework was used as a lens to understand the study, and a structural equation modelling (SEM) approach was applied to analyse the data from respondents.

Results: The study revealed that the technology context is the most influential determinant with a regression weight of 0.975 and that both technology and organisation contexts (-0.221) are significant determinants that influence the intention to adopt ICT amongst SMEs in developing countries.

Conclusion: Based on the findings of the study, it is evident that SMEs need to pay particular attention to ICTs that are relevant to them, including the characteristics and resources of the organisation to successfully adopt these technologies.

Keywords: ICT adoption; technology; organisation and environment framework; structural equation modelling; small and medium enterprises.

Introduction

Information and communication technology (ICT) is regarded as a core driver of economic growth (Kossaï & Piget 2014). The majority of world's population has access to some sort of ICT. According to Ying and Lee (2016:3), 'ICT is defined as all those technologies that enable the handling of information and facilitate different forms of communication between human beings and electronic systems'. Different organisations rely on ICT to perform their daily duties to maximise the production of their products and services. Information and communication technology is considered as an important solution that improves the generation and processing of information, and it can further transmit and manage information efficiently (Samuelson & Björk 2014:2). According to Miraz and Habib (2016), in this century, most businesses are influenced by ICT and using ICT as their operation tool. Information and communication technology gives rise to different strategies that organisations can use to gain more revenue whilst spending fewer resources.

Diffusion of ICT has increased rapidly in developing countries, reaching even the low-income populations (Makore 2014). Information and communication technology has provided small and medium enterprises (SMEs) with an opportunity to widen their

marketplace, and it enables them to communicate and provide products and services worldwide. Small and medium enterprises are important drivers of the economy and they are the core providers of employment, flexibility and are innovators (Mutula & Van Brakel 2006). It has been suggested that most businesses are classified as SMEs throughout the world, and it is important to understand intentions of these enterprises to adopt ICT (Ramdani, Kawalek & Lorenzo 2009).

Retail business is considered to be one of the most prominent global industries and contributes immensely to the world economy. A large number of retail businesses are considered to be SMEs. The retail industry deals with providing goods to the consumer for personal or household use along with repairing service of the goods (Chinomona & Dubihlela 2014). According to Pantano et al. (2017), the global retail industry in 2014 was responsible for the sales that amounted to $22 trillion and it is estimated that the global retail sales would have reached $28.4 trillion (trn) in 2018. The retail industry is one of the successful businesses throughout the world, and its success has increased the number of shopping centres. Shopping centres are important for development of areas, as they uplift local economy and create employment opportunities that help to eradicate poverty, especially in developing countries.

The adoption of ICT by retail SMEs is considered a significant step towards growth of SMEs, and this research aims to understand the determinants that influence the adoption of ICT by SMEs. According to the researchers, available studies have focused on ICT, but a notable gap is found in these research studies in South Africa. Studies have mainly focused on the adoption of ICT by individuals, governments and big corporate houses, but few studies have investigated the determinants of ICT adoption by retail SMEs.

Small and medium enterprises

Most of the countries in the world consider SMEs as a vehicle of economic growth and employment (Bank 2016), which is also the case with developing countries such as South Africa. The definition of SMEs in South Africa is based on the National Small Business Act 102 of 1996: 'It uses a combination of the number of employees, annual sales turnover, and gross assets excluding fixed property' (Maduku, Mpinganjira & Duh, 2016:2). According to the Banking Association South Africa (TBASA; 2018a), in South Africa approximately 91% of businesses that contribute to the economy are SMEs. They comprise a variety of companies, some of which are registered SMEs, whilst others are not registered and don't contribute towards value-added tax (VAT) (Department of Trade and Industry, Republic of South Africa (DTI) 2005). The informal and non-VAT companies are unlikely to contribute towards the economy, and such companies are mostly for the survival of owner and are unlikely to grow or hire employees.

Contribution of information and communication technology to growth of small and medium enterprises

Information and communication technology is an important infrastructure that connects the world as a whole and is vital for global economic growth. Businesses that use ICT as an operation strategy maximise production and cut costs significantly. According to Ashrafi et al. (2014), there are four ways in which adoption of ICT could contribute in the growth of organisation: (1) recognition of organisation, (2) providing more information to small businesses, (3) towards the organisation exploration of new trade territories, and (4) enabling the enterprise to do business online. According to Niebel (2018), quite a number of studies have examined relationships between ICT effects and economic development in advanced countries, and the majority of studies have shown a positive relationship between the two.

Developing countries trail behind when it comes to adopting ICT, especially for business purposes. Developing countries have less diversified industrial infrastructure which holds back the adoption of ICT (Sadok, Chatta & Bednar 2016). The adoption of ICT in developing countries is hindered by a lot of obstacles such as lack of facilities, technology capabilities and lack of legal determinants (Kossaï & Piget 2014). The majority of developing countries struggle with finances, which impact infrastructure development, and a poorly skilled population to support development. Yousefi (2015) argues that even though developing countries are lagging behind when it comes to ICT penetration, there are evidences that developing countries in the past decade have adopted ICT more than the developed countries.

The arrival of technology such as mobile devices and cloud computing has made it affordable and accessible for businesses to adopt it. ICT allows SMEs to compete with large corporations because of the Internet. According to former studies, there is evidence that shows the positive effect of adopting ICT such as increased revenues, market share and increase in production (Tarutė & Gatautis 2014). The evidence shows that plenty could be gained by SMEs if they adopt ICT. Ashrafi et al. (2014) argue that lack of IT skills is one of the biggest reasons why most SMEs are not adopting ICT even in European countries such as Poland, Portugal and the UK.

Conceptual framework
Technology, organisation and environment framework

The study made use of a conceptual framework whose core constructs were adopted from the technology, organisation and environment (TOE) theoretical framework proposed by Tornatzky, Fleischer and Chakrabarti (1990) consisting of variables which were found to be suitable for the study (Figure 1). Technology, organisation and environment theoretical framework is a classical framework used to
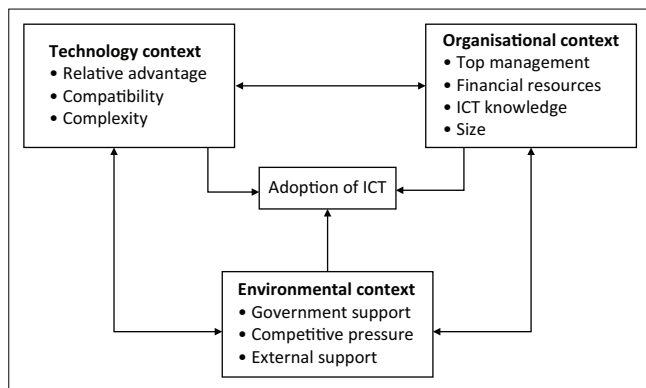
Source: Tornatzky, L.G., Fleischer, M. & Chakrabarti, K., 1990, *Processes of technological innovation*, Lexington Books, Lexington, MA.
ICT, Information and communication technology.

FIGURE 1: Technology, organisation and environment theoretical framework.

predict the firm's intention to adopt an information system (IS). According to Oliveira and Martins (2011), the TOE framework could be used to understand the determinants that influence the adoption of new technology innovation by a firm. The TOE framework consists of the following three constructs: the technological context, the organisational context and the environmental context of the firm. Different studies have used the TOE theoretical framework as a lens to study adoption of technology (Awa, Ojiabo & Emecheta 2015; Baker 2012; Oliveira & Martins 2011).

Technology context (Construct 1)

Different theoretical frameworks consider technology as a determinant that influences the adoption of new technology innovations. Baker (2012) argues that for the new technology adoption to succeed, the organisation must have a firm IT infrastructure, employee's technical skills and user time. Organisations that are familiar with technology are more probable to adopt innovations. Existing technology within an organisation set a tone for how much technology adoption can an organisation undertake (Baker 2012). It is not enough for an organisation to have technology resources only. Technology competency is more than just having the equipment; it is important to have innovative and skilful people and people who could keep the organisation ahead of its competitors (Metaxiotis 2009).

Technology context sub-constructs

Relative advantage

The relative advantages of adopting ICT by SMEs are the benefits that the business gains by using ICT. Different types of measures determine that the innovation provides a relative advantage; measures such as financial benefits are important, but convenience, satisfaction and high standard are also crucial measures. Chiu, Chen and Chen (2017) argue that relative advantage is one of the most important determinants that influence the adoption of ICT in Malaysia. The owner/manager of an SME is more likely to adopt an ICT if it is beneficial for the business (Maduku et al. 2016).

Compatibility

If management believes in new technology and its compatibility with the existing systems and business processes, then it is easier to adopt new technology (Borgman et al. 2013). According to Ghobakhloo and Hong Tang (2013), some studies have determined that the adoption and use of ICT, such as e-commerce, are influenced by compatibility. A study in Malaysia on ICT adoption by SMEs has found that compatibility is an influential factor (Chiu et al. 2017).

Complexity

Innovations that are complex to use are more likely to be adopted slowly, whilst innovations that are easy to master are adopted faster. The complexity of technology innovation could be a defining factor between adopting and not adopting of technology because owners believe that complex ICTs could be risky to adopt, and they are more likely to be abandoned (Abualrob & Kang 2016). Owners/managers, especially that of SMEs, may feel that it would be costly to take employees for expensive and long training. Abualrob and Kang (2016) found that complexity is an important determinant that influences the adoption of new technology.

Organisation context (Construct 2)

Organisation context is about defining the determinants of an organisation, for instance organisational size; the centralisation, formalisation and complexity of management structure; and communication channels and decision-making (Angeles 2014). Top executives champion for changes in an organisation, and they hinder progress or encourage the adoption of technology (Angeles 2014). The scope and size of an organisation are important determinants that influence the adoption of technology (Rogers 1995; Tornatzky et al. 1990).

Organisation context sub-constructs

Top management support

Djatikusumo (2014) argues that in SMEs it is important to have managerial support because strategies and organisational objectives are strongly influenced by the owners/managers of a firm. If top management in SMEs find out the potential benefits of using new ICTs and the risks are minimum, then there is a high possibility of adopting new ICT (Ghobakhloo & Hong Tang 2013). Top management support is a key determinant when it comes to understanding the firm's behaviour towards the adoption of a new ICT innovation (Maduku et al. 2016).

Financial resources

Lack of financial resources is a common problem amongst SMEs because of deficiency of effective organisational governance; hence their ICTs are also ineffective (Djatikusumo 2014). In the study conducted by Mpofu, Milne and Watkins-Mathys (2013), most SMEs in South African tourism argue that lack of finances is a major reason that they don't adopt new ICT.

Literature on the adoption of ICTs suggests that the adoption of new ICTs is more likely to be influenced by the availability of financial resources (Nguyen & Petersen 2017).

Knowledge of information and communication technology

Alshamaila (2013) argue that a small portion of SMEs have adequate ICT platforms and employees with necessary ICT knowledge (ITK) that can help them to adopt new ICT innovations. Ability of a firm to adopt innovation lies in its employees' ability to use their existing ICT knowledge (Hung et al. 2016). Tarutė and Gatautis (2014) argue that studies that aim to understand the relationship amongst ICT adoption and ICT knowledge have found that there is a positive impact to have ICT knowledge when it comes to the adoption of an innovation.

Firm size

Internet has provided SMEs with a platform to compete with bigger organisations with the aid of an ICT such as e-commerce. According to Nguyen and Petersen (2017), there is a significant relationship between firm size and ICT adoption. Small and medium enterprises are better suited for adopting new ICTs because they are flexible and can adjust quickly, unlike big organisations that are not agile (Kilangi 2012).

Environment context (Construct 3)

The environment aspect looks at the elements of the structure of industry, service providers of the technology, and environment regulations (Baker 2012). Tornatzky et al. (1990) argue that mature and declining industry is less likely to adopt new technology, whilst organisations that are part of fast-growing industries are more likely to adopt technology rapidly. Fast-growing industries adopt technology to maximise production and minimise expenses. Regulators determine whether an organisation could implement certain technology to meet the criteria or not (Angeles 2014).

Environment context sub-constructs

Government support

Government support (GS) is the most important determinant that influences ICT adoption by SMEs (Dahnil et al. 2014). Most governments understand the importance of helping SMEs to grow as most of the SMEs lack resources, so it is important for governments to provide support. There is a delay in the implementation of ICT regulations in most developing countries (Findik 2013). According to Kilangi (2012), government plays an important part as a support system for SMEs by providing rules, regulations and support that help to guide SMEs to success through different organisations such as Small Industries Development Organisation (SIDO).

Competitive pressure

According to Awa et al. (2015), competitive pressure plays a role when it comes to the adoption of ICTs, but it is not very important factor that influences adoption. In industries with high competition, it is important to be ahead when it comes to the adoption of ICT to rip the reward of using ICT (Yoon 2012). A study conducted by Malak (2016) has revealed that there is a relationship between the adoption of cloud computing and competitive pressure. Competitive pressure is mostly observed in developed countries using advance ICTs (Chiu et al. 2017).

External support

Small and medium enterprises rely on external support for implementation and maintenance of ICT because it is expensive to have in-house IT experts. External support is a substantial determinant that influences the adoption of e-procurement and enterprise system, but external support has proved to be more complicated for vendors (Chiu et al. 2017). According to Awa et al. (2015), external support is an important determinant that defines the actual adoption of ICT. External support is very important for SMEs especially when the firms are not familiar with new ICT innovation (Ismail & King 2014).

Research methods and design

This study is a descriptive study and can be explained by three points: describing, explaining and validating the study findings. This study used quantitative approach as its fundamental approach. Quantitative studies have an advantage that they force the thoroughness and intelligence that are fundamental for tending to the measurements and internal consistency that support the adoption of SMEs (Dlodlo & Dhurup 2013). This study used a sample of retail businesses to save time and resources. The study used a non-probability technique, which is also known as a judgement and convenience sampling technique, and the participants were visited at their convenient time. The sample size was determined by using a population size of 533 retail SMEs who operate in Pietermaritzburg with a 5% error margin, 95% confidence level and 50% response distribution, and this provided a minimum sample size of 227 SMEs. The population size was provided by the Msunduzi municipality which had the list of registered SMEs within Pietermaritzburg. The data collection instrument was a self-administered questionnaire. The questionnaire comprised four sections that use a five-point Likert scale with the ratings of 1 as 'strongly disagree' to 5 as 'strongly agree'.

Research Problem

Small and medium enterprises play a major role when it comes to the improvement of national economies in developing countries. According to TBASA (2018b), SMEs are important drivers of an economy as they are significant when it comes to reducing unemployment in South Africa.

Small and medium enterprises have the potential to uplift local economies, and therefore governments invest in the development of SMEs. Small and medium enterprises continue to struggle to survive in the South African economy despite participation of government. According to DTI (Strategies 2006), the majority of SMEs fail at an average of 3.5 years of their establishment. The Global Entrepreneurship Monitor (GEM) argues that most start-up businesses hardly survive and the survival rate of SMEs in developing countries is even less (*Small* Enterprise Development Agency [SEDA] 2016). According to TBASA (2018b), the failure of SMEs in South Africa is mainly caused by the lack of appropriate technology, production capacity and access to markets.

The adoption of ICT is known to improve the status quo of SMEs by providing them competitive advantage (Pillay 2016). The benefits of ICT could assist the sustainability of retail SMEs in South Africa. South Africa is amongst the developing nations of Africa that have a high penetration of ICT adoption (International Telecommunication Union [ITU] 2016). According to Nuamah-Gyambrah, Agyeiwaa and Offei (2016), ICT has helped many businesses in lowering communication and transaction costs, increasing production and widening the market base. According to the United Nations (UN), technological progress is the solution to world economic problems (Sustainable Development Goals [SDGs] 2017). Small and medium enterprises must be educated about the benefits of using ICT as part of their business strategy.

Study objective

The study objective is to investigate determinants that influence the intention to adopt ICTs by SMEs in developing countries and determine the suitability of the theorised model for ICT adoption by SMEs.

This objective is investigated through the lens of a conceptual framework which adopts the TOE theoretical framework constructs by Tornatzky et al. (1990) and applying the framework in the context of a developing nation, that is, South Africa. This framework is well known as a preferred choice when it comes to investigating the adoption of innovation at firm's level.

Analysis

Sampling adequacy

The Kaiser–Meyer–Olkin (KMO) sampling adequacy test was employed to determine the measure of the proportion of variance amongst variables that might be common variance. The recommended value of the KMO test is suggested to be from 0.7 and higher, and the Bartlett's test value is considered significant if $p < 0.05$ (Kilangi 2012). The KMO test for this study is 0.924, which is acceptable, thus the data are correlated.

The data collected was composed in a form of five-point Likert scale, and it was crucial to test the reliability of data (Table 1). Cronbach's alpha (α) test was employed to measure data reliability. According to Abualrob and Kang (2016), the value of 0.70 is considered to be an acceptable value of Cronbach's alpha. The observed values of Cronbach's alpha were between 0.75 and 0.963, which are considered to be good to excellent values. The internal consistency of the variables is good, which suggests that there is a correlation amongst variables.

Table 2 shows the correlations between the variables of TOE theoretical framework because the data were not distributed normally and the Spearman's rho (ρ) test was conducted. The correction results show that there was a positive correction between the TOE variables, and all the correlations were significant at $p < 0.01$.

Table 3 shows the regression weight estimates between independent variables, technological context, organisational context and environmental context and the dependent variable Adopt_ICT. The regression estimate between technology context and Adopt_ICT was 0.975 and it was significant at $p < 0.05$. The regression estimates between

TABLE 1: Test of reliability of technology, organisation and environment constructs.

Construct	Number of items	Sample reliability using Cronbach's alpha (α)
Technology context	**19**	**0.923**
Relative advantage (RA)	8	0.922
Complexity	5	0.862
Compatibility	6	0.834
Organisation context	**16**	**0.945**
Top management (TM)	5	0.816
Financial resources (FR)	5	0.918
ICT knowledge (ITK)	6	0.888
Environment context	**17**	**0.873**
Government support (GS)	4	0.750
Competitive pressure (CP)	6	0.802
External support (ES)	7	0.939
Intention to adopt	**3**	**0.963**
Total alpha (α)	**55**	**0.923**

Note: The bold values represent alpha values.

TABLE 2: Correlations of technology, organisation and environment theoretical framework.

Spearman's Correlation	TOE Constructs	Technology context	Organisation context	Environment context
Spearman's rho (ρ)	Technology context	1.000	-	-
	Organisation context	0.723**	1.000	-
	Environment context	0.552**	0.658**	1.000

TOE, technology, organisation and environment.
**, Correlation is significant at 0.01 level (two-tailed).

TABLE 3: Regression estimates.

Dependent variable		Independent variables	Estimate	SE	CR	*p*
Adopt_ICT	←	Technology context	0.975	1.204	1.766	*
Adopt_ICT	←	Organisation context	-0.221	0.848	-0.381	*
Adopt_ICT	←	Environment context	-0.014	0.380	-0.078	0.938

*, $p < 0.05$.

organisation context and Adopt_ICT was -0.221 and it was significant at $p < 0.05$. The regression table further shows that the regression estimate between the variable environment context and Adopt_ICT was -0.014 with a p-value of 0.938, which was greater than 0.05, which means the regression was not significant between the two variables.

Correlations and regressions of environment context variables

Table 3 revealed that regression estimates of environment context towards Adopt_ICT were insignificant, and this finding was further explored so that the results of environment context variable could be understood in a better way. The environment context variables were positively correlated: government support and competitive pressure had a correlation of 0.155, which was significant at $p < 0.05$; government support and external support had a correlation of 0.380, which was significant at $p < 0.01$; and competitive pressure and external support had a correlation of 0.283, which was significant at $p < 0.01$.

Table 4 shows regression estimates of environment context variables. The findings of regression estimate on environment context found that government support was insignificant when it comes to influencing the adoption of ICT with a p-value of 0.906. Competitive pressure and external support were significant when it comes to influencing the adoption of ICT with a regression estimate of 0.00, which was significant at $p < 0.05$.

Model-fit index

Table 5 shows the result of a model fit. According to Hu and Bentler (1999), it is recommended to use a combination of comparative fit index (CFI) and Standardised Root Mean Square Residual (SRMR), with a measure of CFI close to 0.95 and that of SRMR close to 0.08 when the sample size is less or equal to 250. Table 5 shows that CFI = 0.929, which was close to 0.95 and

TABLE 4: Regression analysis of environment context variables.

Model	Coefficients†	Unstandardised coefficients		Standardised coefficients: β	T	Significance
		β	Std. error			
1	(Constant)	-0.448	0.382	-	-1.171	0.243
	GS	0.008	0.072	0.006	0.118	0.906
	CP	0.844	0.087	0.528	90.752	**0.000**
	ES	0.327	0.077	0.242	40.259	**0.000**

†, Dependent variable: Adopt_ICT.
GS, government support; CP, competitive pressure; ES, external support; Std., standard.

Table 5: Model-fit index.

Measure	Estimate	Threshold	Interpretation
CMIN/*df*	4.500	Between 1 and 3	Acceptable
CFI	0.929	> 0.95	Acceptable
SRMR	0.070	< 0.08	Excellent
RMSEA	0.074	< 0.06	Acceptable

CMIN/*df*, Chi-square/degrees of freedom; CFI, comparative fit index; SRMR, Standardised Root Mean Square Residual; RMSEA, Root Mean Square Error of Approximation.

was recommended by Hu and Bentler (1999), and SRMR = 0.07, which was close to 0.08. The Root Mean Square Error of Approximation (RMSEA) = 0.074, which means that the model fit was acceptable according to Hu and Bentler (1999). The model fits the data.

Figure 2 shows that the factor loadings for the observed variables were above 0.6, and there was only one variable below 0.6 with a value of 0.31. Government support has the lowest loading, which suggests that this variable was less correlated with other variables. Further, Figure 2 also shows the regression estimates with the technology context having the highest regression of 0.97 towards the adoption of ICT (Adopt_ICT), and this regression estimate was significant. The regression estimate for organisation context was -0.22 towards intention to adopt ICT and was significant at $p < 0.05$. The environment context had a regression estimate of -0.01 towards intention to adopt ICT, which meant that the path was insignificant at $p < 0.05$. The regression weight analyses from structural equation modelling (SEM) revealed that only technology context could be considered the best predictor for intention to adopt ICT by SMEs with a weightage of 0.97, which was above the suggested threshold of 0.80 (Jeyaraj, Rottman & Lacity 2006).

It is also shown in Figure 2 that the covariance correlation with a relationship between technology context and organisation context has a correlation of 0.96. The correlation between technology context and environment context was 1.09. The relationship between organisation context and environment context had the highest correlation of 1.10.
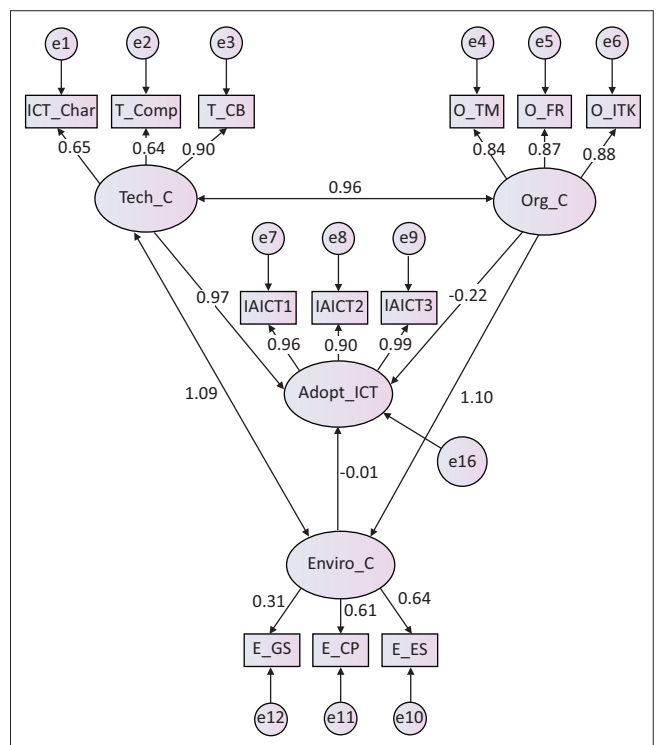

FIGURE 2: Standardised residual covariance.

Discussion

The technology context consists of three variables: relative advantage, complexity and compatibility. The analysis shows that these variables are correlated, and compatibility has the highest loading factor. The technology context is correlated with environment context and it was correlated with organisation context. The technology context has a positive correlation and a significant regression estimate towards intention to adopt ICT, which means that technology context is a significant determinant of intention to adopt ICT. According to Jeyaraj et al. (2006), a predictor that has a regression of 0.08 and above is considered to be the best predictor. The technology context is the most influential determinant for intention to adopt ICT by SMEs. Gareeb and Naicker (2015) argue that the technology context determinant is influential when it comes to the adoption of broadband technology by SMEs, with relative advantage and compatibility as the most significant contributors. Gono, Harindranath and Özcan (2016) echo the same sentiments about technology context being a significant determinant, and relative advantage and compatibility being the important players that influence the intention to adopt ICT.

The second determinant of the TOE framework is organisation context. The organisation context consists of four variables: top management support, financial resources, IT knowledge and size of the firm. The analysis shows that the variables of organisation context are highly correlated, and they have a high loading factor compared with the majority of TOE framework's variables except for firm size. The firm size had a low loading factor of below 0.3, and keeping the firm size causes the model to become unfit for data. Loading factor for a sample size of less than 300 should have a value of greater or equal to 0.3 (Yong & Pearce 2013). The firm size was deleted from the model because it had a loading factor of less than 0.3. The organisation context is highly correlated with environment context and it is correlated with technology context. The regression towards ICT adoption intention from organisation is negative but significant. This finding suggests that organisation context is influential towards the adoption of ICT, and the negative regression suggests that as the negative value decreases, the ICT adoption increases. The organisation context is a determinant of ICT adoption. The organisation context is an influential determinant of broadband technology adoption by retail SMEs and top management support has the maximum effect (Gareeb & Naicker 2015). The organisation context is the most influential determinant of mobile marketing technology with top management support having the highest loading factor (Maduku et al. 2016).

The environment context consists of three variables: government support, competitive pressure and external support. The analysis shows that all the variables of environment context are correlated. The loading factor of government support is 0.3, which shows a weak correlation with other variables, whilst the other two variables have loading factors that are just above 0.6, which is significant. The regression estimate towards ICT adoption intention from environment context is negative and insignificant. The environment context is not a significant determinant of ICT adoption in SMEs. This finding suggests that the environment context is not influential towards the adoption of ICT. According to Gareeb and Naicker (2015), the environment context has minimum impact on the adoption of broadband technology because of the government's lack of providing support to businesses. Malak (2016) argue opposite to the findings of Gareeb and Naicker (2015) and observes that the environment context is significant in the study of Cloud adoption.

Further exploration of environment context shows influential variable. The results show that external support is significant, thus it is influential when it comes to the adoption of ICT. Competitive pressure is also shown to be significant and influential when it comes to adopting ICT. Government support is insignificant, and this means that it is not influential when it comes to the adoption of ICT by SMEs. The government's lack of assistance has been the most notable problem when it comes to assisting SMEs in South Africa. Gareeb and Naicker (2015) echo similar sentiments about the lack of government assistance. The government of South Africa has a lot of policies that aims to assist SMEs, but it lacks follow through on its promises to the public. Mpofu et al. (2013) found that the government of South Africa plays a significant role when it comes to assisting the tourism industry, but there is still more that the government can do to uplift the industry. According to Gono et al. (2016), the government should play a better role in providing ICT support to SMEs and developing business personnel's ICT skills.

Understanding the determinants that influence adoption assists SMEs and the government to understand what needs to be exercised to influence the adoption of ICT by SMEs. This study used the TOE theoretical framework as a tool to study influential determinants. The theoretical framework consists of technological context, organisational context and environmental context. The analysis shows that the determinants that influence the intention to adopt ICT are technology context and organisation context. The technology context positively influences the intention to adopt ICT, whilst the organisation context influences the intention to adopt ICT negatively. The study revealed that the environment context was not an influential determinant for the adoption of ICT in SMEs. Further analysis of the environment context revealed that its sub-construct government support was an insignificant variable, whilst two other sub-constructs, competitive pressure and external support, were found to have a significant influence on the adoption of ICT by SMEs in developing countries. Government support is the variable that causes problems, and Gareeb and Naicker

(2015) have found lack of government agents, including policy challenges, to be some of the reasons that SMEs have challenges in adopting mobile marketing technology. Lutfi, Idris and Mohamad (2016) argue the opposite of what this study has revealed about government support; in Malaysia, government support is influential when it comes to ICT adoption. The Malaysian context could be explained by its government's liberalisation of telecommunications sector and opening it up to private service providers. This coupled with high investment in the ICT sector lead it to be ranked 56 in the global ICT development index, with the world average at a ranking of 159. Malaysia outranked countries such as China, 76, India, 117, the Philippines, 90 and Indonesia 107 (Hill, Yean & Zin 2013).

Technology context is the only determinant with a regression above 0.08; thus, according to Jeyaraj et al. (2006), it is the only determinant which is considered to be a predictor. Technology context is the most influential determinant. The technology context variables are highly correlated, which are relative advantage, compatibility and complexity. These variables are considered by many studies as important determinants of ICT adoption (Gareeb & Naicker 2015; Gono et al. 2016). Understanding the benefits and compatibility of ICT is important as it makes participants decisive about their intention to adopt ICT.

The TOE theoretical framework is an established framework being used in many studies by researchers. Throughout its existence, various changes have been made to this framework to accommodate for the evolving scenarios and contexts and thereby allowing for the analysis of these different contexts. Use of TOE in this study was based on a previous research that has applied the same framework on firm-level studies (Malak 2016). The model fits the data when tested, thus the TOE framework is a suitable model and can be considered for studying the intention to adopt ICT by SMEs in Pietermaritzburg. This developed theoretical framework assists to understand the relationship between the determinants of intention to adopt ICT.

Conclusion

This study provided empirical evidence concerning the investigation of determinants that influence the adoption of ICT in SMEs in developing countries. The study used a conceptual framework whose core constructs were adopted from the TOE theoretical framework comprising the following constructs: technological context, organisational context and environment context, each of these has sub-constructs extracted from various studies and found to be suitable for this study: complexity, relative advantage, compatibility, top management support, financial resources, ICT knowledge, firm size, government support, competitive pressure and external support. The use of TOE framework allowed for understanding of ICT adoption by SMEs at firm level in

developing countries. Although there still is a need to conduct a more comprehensive research to understand ICT adoption by SMEs for growth in developing countries, this study revealed that both technology context and organisational context have a significant influence on ICT adoption by SMEs. The study further revealed that technology context was the most important determinant that influences SMEs' intention to adopt ICT in developing countries such as South Africa. An analysis of environment context revealed that sub-constructs competitive pressure and external support had a significant influence on ICT adoption by SMEs, although the sub-construct government support showed that it did not have a significant influence. One of the main findings of this study was that the model for ICT adoption by SMEs used here fit the data well and could be used to inform the future research.

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