Routledge
Taylor & Francis Group

Check for updates

Understanding ICT adoption amongst SMEs in Uganda: Towards a participatory design model to enhance technology diffusion

Stephen Kyakulumbye [ID] and Shaun Pather [ID]*

Department of Information Systems, University of the Western Cape, South Africa
Corresponding author. Email: spather@uwc.ac.za

Policy statements by the United Nations, the African Union and most African countries boldly pronounce on the anticipated benefits of the internetworked world and associated ICT to society in general and to the world of business specifically. In terms of the latter, Small and Medium Enterprises (SMEs) are recognized as being critical to the growth of developing economies. There is consensus that this sector has considerable potential for improved business outcomes through the harnessing of Information and Communication Technologies (ICTs). However, a problem of low adoption of ICT in this sector still prevails in Africa and there is a gap in our understanding of the reasons for this. In light of this problem, this paper reports on a survey of Ugandan SME owners in which their ICT pre-usage beliefs and attitudes are explored. The study identified four pre-use factors that are correlated with ICT use. The pre-usage beliefs which significantly influence decisions to adopt and use ICT include Benefit expectation, ICT learnability, User-confidence, and User-friendliness. These are found to be key determinants of ICT adoption. ICT support and ease-of-use on the other hand were factors that did not correlate with decisions to use ICT. However, it is found that there is a low predictive capability (17.7%) of pre-usage beliefs and attitudes in respect of prior use or non-use of ICT among SMEs. As such, this study found that other contextual factors constitute a greater (82.3%) predictive percentage. In light of this, the paper concludes by recommending an ICT participatory design process to mitigate ICT pre-use scepticism among SMEs owners.

Key words: ICT adoption, antecedents, scepticism, technophobia, ICT pre-usage beliefs and attitudes

Introduction

The role of Small and Medium Enterprises (SMEs) in shaping the World's economy is very fundamental and well documented (Ndiaye et al. 2018). For instance, amongst OECD countries, SMEs are the predominant form of enterprise, accounting for approximately 99% of all firms (ILO 2012; OECD 2017). They provide the main source of employment, accounting for about 70% of jobs on average, are major contributors to value creation, generating between 50% and 60% of value added on average, and comprise 45% of total employment and 33% of GDP (IFC 2010; Perkins 2019). Micro-enterprises alone are reported to employ an estimated 80% of the working population of Sub-Saharan Africa (Biekpe 2004; Stein, Ardic, and Hommes 2013; Abisuga-Oyekunle, Patra, and Muchie 2020).

The increasing penetration of the internet and associated ICTs in Africa has led several commentators to argue that these technologies are creating a new economy –an information economy –in which information is the critical resource and basis for competition in all sectors including SMEs (Pather and Abiodun 2017). However, it has been observed that users in the SME sector have perceived the adoption of ICT with 'scepticism,' with some scholars ascribing the phenomena to 'technophobia' (Gilbert, Lee-Kelley, and Barton 2003; Gray 2006; Ion and Andreea 2008; Labrianidis 2017; Rahman et al. 2017; Lew et al. 2019; Panas, Vasiliadou, and Halkiopoulos 2020). This is especially true amongst the smallest category of SME business, commonly known as micro-enterprises (Cataldo, Pino, and McQueen 2020). It has further been observed that such technophobia in relation to ICT use is influenced by users' pre-usage beliefs and attitudes (Chakraborty and Al Rashdi 2018).

In light of the prevailing technophobia, this paper examines the underlying beliefs and attitudes among SMEs owners in Uganda, which to date comprise low adopters. The underlying objective of the paper is firstly to deepen our understanding of the root causes of 'scepticism' of ICTs amongst SME owners in a typical developing country context. Secondly, the paper assesses the influence of SME owners' demographic variables on SME owners' perceptions of ICT and examines how the demographic variables and perceptions influence use or non-use of ICTs. Finally, the findings are used as a basis to recommend a participatory design approach as a means of mitigating technophobia that prevails amongst SME owners.

Literature review
Level of ICT adoption among SMEs
In this study, the term ICTs refers to the use of internet enabled applications via desktop or mobile computing devices to boost business performance (Francis and Willard 2016). Information and communication technologies (ICTs), particularly the use of internet to conduct online business, have been changing the conventional way of doing business among brick and mortar companies (Beynon-Davies 2018). In the SME sector several proponents suggest there is need for early adoption if business sustainability is to be achieved (Beynon-Davies 2018).

The problem of low adoption of ICT amongst this sector is well documented in the literature (e.g. Nguyen 2009; Mramba et al. 2016; Pather and Abiodun 2017). This problem is further compounded in practice wherein SMEs fail to make the connection between ICT adoption and their profit-motive on the one hand and their personal motive gain expectations on the other. However, there is a widely accepted consensus that if SMEs harness ICTs, it is

likely to improve performance, growth and sustainability for more inclusive employment, increased mobility, ability to organize customer information and improved inter-connectedness to other microenterprises (Francis and Willard 2016). It is further observed that the low adoption and use of ICTs among SMEs in developing contexts is due to demographic antecedents and beliefs and attitudes of users in the sector (Pustovrh et al. 2017).

Technology acceptance model (TAM)

Over several years various models and theorizes have been developed to explain the vexing problem of ICT adoption. In this section we briefly assess one of the seminal adoption theories with a view to examine the usage and non-usage contexts of ICT among SMEs in a developing country context.

From an adoption perspective, a widely used theory is the Technology Acceptance Model (Davis 1985, 1993). In the original model Davis (1985), posits that a potential user's overall attitude towards using a given system is assumed to be a major determinant of whether one will or will not use it. Attitude towards use is a cognitive issue for which Davis (ibid.) highlights two dimensions, viz., *perceived usefulness* and *perceived ease-of-use*. Moreover, a cognitive response results into affective response (attitude towards using) which later predicts actual use (Davis 1985, 1993). However, inherent in ease-of-use and usefulness is the concept of perception which is behavioural and attitudinal in nature (Kyakulumbye, Muhenda, and Anaclet 2012; Verma and Sinha 2018; Scherer, Siddiq, and Tondeur 2019). Over the years there have been several studies that render the original TAM variables insignificant. For instance, Sin Tan et al. (2009) found that relative advantage, compatibility, complexity, observability, and security are significant factors influencing internet-based ICT adoption. Other studies have correlated adoption and diffusion challenges among SMEs to ICT design issues (Aleke, Ojiako, and Wainwright 2011). Namankani (2019) has argued that to ensure successful diffusion of innovation, a balance must be maintained between the amount of effort expended in the design of ICT and social factors such as language and traditional life.

Given the foregoing, and taking into account the low explanatory prediction by the originator of TAM that 'Only 36% of variance in the adoption of ICTs is explained by TAM constructs, implying that 64% comprises other cognitive and contextual issues,' (Davis 1993, 475), further extensions have been made to the model. One such extension of TAM, which serves to understand pre-usage issues, is the two-stage information systems continuance model (Venkatesh et al. 2011) and Unified Theory of Use and Acceptance of Technology (UTUAT); (Chakraborty and Al Rashdi 2018). The following section deals with one of the pertinent extensions of pre-usage beliefs and pre-usage attitudes.

Pre-usage beliefs and pre-usage attitudes

Venkatesh et al. (2011), build upon TAM and UTUAT to take into account the contextual nature of ICT use and user expectations. They advance two other pre-usage constructs, viz., pre-usage beliefs and pre-usage attitudes (Yasmin and Grundmann 2019).

Such extensions to the TAM have improved the explanatory power of ICT diffusion in developing contexts (Chakraborty and Al Rashdi 2018). For example, there are several versions of the frequently cited unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Thong, and Xu 2012) among others used in different contexts. A literature review of 174 articles based on UTAUT has revealed, from the weight analysis of independent variables that variables such as performance expectancy and behavioural intention qualified as the best predictor category (Williams, Rana, and Dwivedi 2015; Chakraborty and Al Rashdi 2018). This supports our argument in this paper, that pre-usage attitudes, pre-usage beliefs and performance related expectations are important elements in understanding ICT adoption amongst SMEs. Such expectations can be in form of tangible or intangible elements (Gomez and Pather 2012; Jawed and Siddiqui 2019).

Tangible and intangible perceived impacts of ICTs

Pre-usage beliefs and attitudes are comprised of both tangible and intangible elements. Effective ICT diffusion among SMEs should result in impacts that transcend tangible benefits and impacts (Consoli 2012; Jawed and Siddiqui 2019). Various studies which reveal the low levels of adoption among the SME sector, have endeavoured to make recommendations in respect of tangible components of ICT adoption. For instance, Arendt (2008) reveals that in Malaysia, despite efforts to improve technology accumulation through education and skills development, SMEs remain on the wrong side of the digital divide. Others have argued that further research is necessary in order to develop a real understanding of the ICT adoption processes in small firms (Martin and Matlay 2001; Hartono and Herman 2019).

Other studies have advocated for increasing awareness among SMEs on the benefits of ICT adoption. For example, Almazroa and Gulliver (2018) argue the need for more ICT training facilities for SMEs, measures to provide ICT products and services at an affordable cost, and free professional advice and consulting. Some critiques have referred to such recommendations as '*Blanket*' approaches to promoting ICT adoption amongst SMEs which regretfully have not made significant differences to the sector (Eze et al. 2019; Cataldo, Pino, and McQueen 2020). Others such as Gomez and Pather (2012) recommend a fundamental paradigm shift in understanding how ICT might have development impacts, by focusing on intangible aspects in relation to usage outcomes, instead of only tangible ones.

Several scholars conceptualize tangible impacts in a manner whereby they are viewed as quantifiable returns to the implementation of ICTs in organizations and among individuals (Jawed and Siddiqui 2019). Other studies have perceived tangibility and intangibility in terms of delivering direct and indirect benefits respectively (Jones 2008; Jawed and Siddiqui 2019).

This study postulates that it is crucial to assess the anticipated tangible and intangible benefits and impacts

of ICTs to the SMEs sector prior to design and deployment of technology. Prior to any intervention to address low ICT adoption, there is a need to understand the underlying perceptual beliefs, attitudes and expectations about ICTs amongst SME owners. This forms the underlying focus of this paper.

Model construction

From TAM, UTAUT, and an extension of TAM which highlights pre-usage beliefs and pre-usage attitudes which can be predominantly be both tangible and intangible elements, the following model is developed:

The model posits that demographic characteristics like age, education level, gender can influence actual ICT use among SMEs. Beliefs and attitudes can be either positive or negative. Furthermore, pre-usage beliefs and attitudes of ICT could influence and determine use of ICTs (Ceresia and Mendola 2019). For instance, when assessing usage of mobile based payments, Almazroa and Gulliver (2018) reveal that personal characteristics have a positive influence on actual ICT use. Similarly, Alruwaie, El-Haddadeh, and Weerakkody (2020) also found that demographic characteristics are crucial in influencing citizens' continuous use of e-government services. Moreover, such expectation beliefs and attitudes may be likened to tangible and intangible elements from technology-based innovations (Jawed and Siddiqui 2019). In terms of negative and positive beliefs influencing ICT usage, Gholami et al. (2013) found a significant positive effect. On the other hand, Verma and Sinha (2018) did not find a significant influence of ICT pre-usage attitudes and beliefs on perceived wellbeing.

Such contradictions in the extant literature were explored in the research that is reported in this paper. In particular we explored why in some studies, the influence is strongly significant while in others, it is not. Consequently, the following objectives formed the focus of the paper:

(a) To identify the underlying factors that determine the negative and positive beliefs among SMEs which in turn influence ICT use.
(b) To establish the relationship between the identified factors and ICT use among SMEs in Uganda.
(c) To assess whether there are any significant differences in ICT use among SMEs in Uganda as influenced by the underlying factors.

Methods

The primary aim of the paper was to ascertain the antecedents and determinants of ICT usage amongst owners of Ugandan Small and Medium Enterprises (SMEs). The objective was to understand the latter so as to inform future interventions that may improve adoption levels amongst SMEs in a resource constrained environment. The study utilized a quantitative cross section survey to test the research hypotheses derived from literature and ICT adoption theoretical underpinnings.

Population and sample size selection

The study sampled SMEs from Mukono Municipality, Uganda. SMEs in this municipality have characteristics of both urbanity and rural. A sample target of 385 respondents was set, based on sampling norms of (Krejcie and Morgan 1970).

Mukono Municipality Register has approximately 20,000 SMEs when stratified according to type of business (National Population and Housing Census 2014). To cater for non-response, we enhanced the sample size by 10% and a total of 425 participants were considered. The unit of analysis was SMEs owners (managers) while the type of business was used for respondent stratification. Stratified convenience sampling (Neneh and Van Zyl 2012) was used to collect the data. Twenty-five research assistants traversed the Municipal zones to collect the data. The businesses which were targeted have diverse operations due to the zones where they belong. Thus, stratifying and zoning them enabled business representation based on location and nature of business.

Survey method

The survey approach utilized a structured questionnaire for collecting perception quantitative (negative and positive pre-usage beliefs and attitudes) data, demographics data and prior use of ICT based on a dichotomous scale of YES/NO. The objective of the survey approach was to obtain a '*snap-shot*' of the situation amongst SMEs which in turn would provide a basis for quantification of ICT pre-usage beliefs and attitudes.

Instrument development and analysis processes

The development of the survey tool was informed by the model (Figure 1). The instrument comprised a section to collect demographic data, followed by a section which ascertained use experience, and finally the core of the instrument comprised statements regarding pre-usage attitudes as guided by the literature and the model. The constructs in the tool comprised cognitive response items. Therefore, questions in relation to pre-usage beliefs and pre-usage attitudes provided for an understanding of the context of ICT use which follows on Venkatesh et al. (2011). The instrument further provided for an assessment of such beliefs and attitudes in terms of both tangible and intangible perceptions of ICT benefits could have influenced prior use or non-use of ICTs.

The items in the instrument included a measure of negative and positive ICT pre-usage beliefs and attitudes with a total of 14 items (7 negative and 7 positive pre-usage expectations). For all constructs, the authors asked respondents to rate their ICT usage attitudes and beliefs, using a Likert scale of 1–5 (1=strongly disagree and 5=strongly agree).

Results and discussions

This section reports the demographic antecedents of the SME owners as they were deemed to be critical for usage attitudes and beliefs. A total of 425 usable responses were received. This implies that study had an acceptable response given that it was over the recommended statistical threshold of 377 for a population of ≥20,000 (Krejcie and Morgan 1970, 608) and 392 (Israel 1992) for the same population at a 5% level of precision.
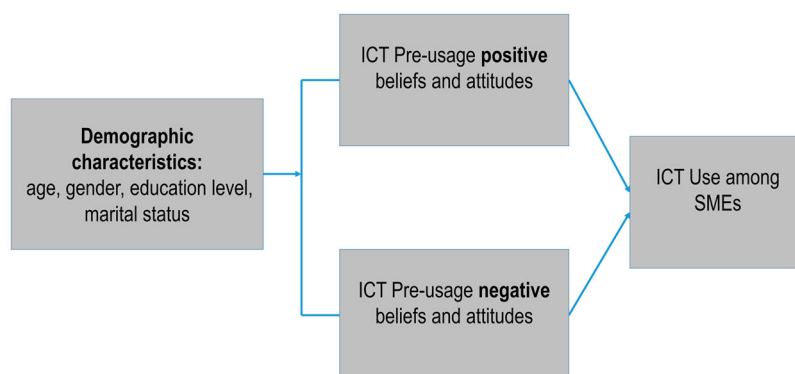
Figure 1: ICT pre-usage beliefs and attitudes and Actual Use of ICTs.

Table 1: SME category.

SME category	Frequency	Percent
Carpentry	30	7.1
Medical Centre	70	16.5
Drug shop	15	3.5
Pharmacy	65	15.3
Restaurant	50	11.8
Retail shop	50	11.8
School	60	14.1
Veterinary shop	20	4.7
Welding	65	15.3
Total	**425**	**100.0**

SME category and demographics of respondents

The Table 2 reveals the SME business type and demographic data. This provides the basis to examine variations in beliefs and attitudes among the different SME business sector types (Table 1).

The results reveal that SMEs in Mukono Municipality comprise small businesses ranging from those that deal with health-related products and services, pre-schools, to artisanal type businesses such as welding. The next table presents the demographics of the SMEs participants that responded to the survey in Table 2.

After accounting for missing data, it was excluded from the analysis. Female respondents represented 43.5%, while male respondents accounted for 56.5%. This suggests male

Table 2: Demographics of respondents.

Gender	Frequency	Percent
Female	185	43.5
Male	240	56.5
Total	425	100.0

Marital status	Frequency	Percent
Single	130	30.6
Married	265	62.4
Divorced	20	4.7
Widowed	5	1.2
Total	420	98.8
System	5	1.2
Total	425	100.0

Age category	Frequency	Percent
Age <35 years	240	56.4
>35	185	43.6
Total	425	100.0

Education level	Frequency	Percent
less than primary	10	2.4
Completed O-level	30	7.1
Completed A-level	40	9.4
Completed tertiary education certificate	55	12.9
Ordinary diploma	55	12.9
Advanced diploma	55	12.9
Bachelor's degree	120	28.2
Postgraduate diploma	20	4.7
Master's degree	35	8.2
Total	420	98.8
Non-response (dropped)	5	1.2
Total	425	100

Table 3: Use of ICT in the SME business or for any other purpose.

Have you ever used a desktop or laptop computer in your business?		Frequency	Percent
Valid	No	290	68.2
	Yes	135	31.8
	Total	425	100.0

Have you ever used a desktop or laptop computer for any other purpose other than business?		Frequency	Percent
Valid	No	325	76.5
	Yes	35	8.2
	Total	360	84.7

dominance in SMEs, and this may hold true since, culturally in Central Uganda, men are regarded as the breadwinners and must find alternative means of survival in the absence of formal employment (Svensson and Wamala Larsson 2016). Based on the model guiding the study, the study hypothesizes that demographics are linked to use or non-use of ICTs among SME sector owners.

Use of ICTs among SMEs

We assessed the extent of use of ICT by SME owners in the business itself or for any other purpose.

The data in Table 3 reflects the low levels of use of computers amongst SMEs. Of the participants, 68.2% of SME owners have never used a computer in their business and 76.5% have never used a computer in any other non-business context. This supports the premise of the paper in respect of the low levels of ICT diffusion in this sector that underlying pre-usage beliefs and attitudes regarding ICT use therefore need further investigation. This result renders support to the diffusion of innovations as it affirms that most SMEs constitute late majority and laggards (Rogers 1971, 2010; Meyoki and Kavindah 2019).

SMEs owners' pre-usage beliefs and attitudes of ICTs

The results from the fourteen items in the pre-usage questionnaire were sub-divided into negative and

positive beliefs and attitudes which constitute behavioural expectations from ICTs. The results are presented in Table 4.

In Table 4, missing data was sifted out and the mean results provided are for the responses recorded from 380 study participants. The mean results tending towards one (1) reveal a strong disagreement, whereas those towards five (5) reveal a strong agreement. The result indicates that respondents have positive perceptions about most constructs. For instance, they strongly disagree that computer use is a waste of time. However, they do not believe that most people can learn how to use a computer system, which tallies with their other belief that they are not confident using the computer system. To establish what these factors were, a factor analysis was undertaken.

Factor analysis to examine the pre-usage beliefs and attitudes of ICTs use among SMEs

To understand the factors that influence ICTs use among SMEs in Mukono, Uganda, the items in the tool were subjected to exploratory factor analysis to assess the extent of their loading. The results are presented in Table 5.

Table 5 depicts the rotated Eigen values. This indicates that there are six (6) significant factors for this study. The results in Table 5 imply that the fourteen (14) items which comprised in the instrument are categorized into **six (6)**

Table 4: Descriptive statistics on the pre-system usability issues.

		Negative perception	Positive perception	Mean	Std. Dev.	Analysis N
1	I think using system can improve my business		✓	3.89	1.178	380
2	Use of a computer system can improve my well being		✓	3.74	1.057	380
3	Computer use is not a mere wastage of time		✓	4.04	.967	380
4	I think the computer system is not so complex		✓	2.71	1.308	380
5	I think I would like to use a computer system frequently		✓	3.50	1.166	380
6	I think I can gain something from the use of computers		✓	3.91	.977	380
7	I imagine that most people can learn to use the computer system		✓	4.01	.981	380
8	I do not feel very confident using the computer system	✓		3.46	1.411	380
9	I think the computer system is not easy to use	✓		3.38	.726	380
10	I need support from another person to use a computer system	✓		4.00	1.090	380
11	I need to work with somebody technical before use	✓		4.26	.993	380
12	There might be too much inconsistencies in a computer system	✓		1.95	1.257	380
13	I think the functions of the computer system are not well integrated	✓		1.71	1.158	380
14	I guess the computer system is very cumbersome to use	✓		3.21	1.372	380

Table 5: Total variance explained.

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.830	27.354	27.354	3.830	27.354	27.354	3.239	23.133	23.133
2	1.764	12.598	39.952	1.764	12.598	39.952	1.508	10.768	33.902
3	1.284	9.171	49.123	1.284	9.171	49.123	1.440	10.289	44.190
4	1.173	8.381	57.504	1.173	8.381	57.504	1.405	10.039	54.229
5	1.118	7.986	65.490	1.118	7.986	65.490	1.349	9.638	63.867
6	1.071	7.652	73.142	1.071	7.652	73.142	1.298	9.275	73.142
7	.892	6.370	79.512						
8	.680	4.855	84.367						
9	.617	4.404	88.771						
10	.460	3.289	92.060						
11	.349	2.492	94.552						
12	.307	2.194	96.746						
13	.264	1.884	98.630						
14	.192	1.370	100.000						

Extraction method: Principal Component Analysis

factors. The rotated factor matrix which aids factor naming is presented in Table 6.

From the above factor loadings and matching, the next section provides the rationale of naming of the factors taking into account their context in relation to the reality of ICT pre-use expectations.

Factors that that are associated with the pre-usage beliefs and attitudes of ICTs among SMEs owners

Some scholars advocate that the naming of factors is more of an 'art' as there are no rules for naming, except to give names that best represent the variables within the factors (Costello and Osborne 2005). Other scholars suggest that naming can come from the from the investigator's prior theoretical understanding of the phenomenon under study (an a priori approach) as the factors get loaded to a component (Ryan and Bernard 2003). Following on a combination of such suggestions, the naming of the factors was based on the above factor loadings, labelling used in common practice, the research context and theoretical lenses that were used in the background to this study and joint combined knowledge of the researchers.

Factor 1: Benefit expectation
The first factor has three items which relate to an expectation that using computers can improve business that it does not constitute a wastage of time, and that traders would like to use a computer more frequently.

These issues align well with the notion of **business benefit expectations**. The other issues seem to relate to **personal benefit expectations** from use of computers, which include the notion that the use of computers would improve well-being. We therefore cast both these into *benefit expectation*. However, we note from the communalities table, that well-being expectations were more prominent.

Factor 2: ICT learnability
The second set of three items comprising Factor 2, are related the perceived ability of individuals to learn to use

Table 6: Rotated factor matrix

Rotated component matrix[a]

	Component					
	1	2	3	4	5	6
I think using system can improve my business	.815					
Use of computer system can improve my well being	.787		.322			
Computer use is not a mere wastage of time	.720				−.360	
I do not feel very confident using the computer system	.712					−.401
I think I can gain something from the use of computers	.644	−.354				
I think the computer system is not easy to use	.448					.457
I think the computer system is not so complex		.858				
I think I would like to use a computer system frequently	.464	.688				
I need support from another person to use a computer system			.815			
I do need to work with somebody technical before use			.745			
I imagine that most people can learn to use the computer system				.826		
There might be too much inconsistencies in a computer system				.740	.318	
I think the functions of the computer system are not well integrated				.652	.889	
I guess the computer system is very cumbersome to use						.860

Extraction Method: Principal Component Analysis
Rotation method: Varimax with Kaiser Normalization.
[a] Rotation converged in 8 iterations.

Table 7: Factor correlation table and use of ICTs among SMEs.

		Benefit expectations	ICT learnability	ICT support	Ease-of-use	User-centredness	User-confidence	Actual Use
		Correlations						
Benefit expectation	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	405						
ICT Learnability	Pearson Correlation	.762**	1					
	Sig. (2-tailed)	.000						
	N	405	420					
ICT Support	Pearson Correlation	.467**	.104*	1				
	Sig. (2-tailed)	.000	.042					
	N	380	385	385				
Ease-of-use	Pearson Correlation	.425**	.178**	−.108*	1			
	Sig. (2-tailed)	.000	.000	.036				
	N	400	400	380	400			
User-centredness	Pearson Correlation	.636**	.256**	.036	.748**	1		
	Sig. (2-tailed)	.000	.000	.479	.000			
	N	405	405	380	400	405		
User-confidence	Pearson Correlation	.245**	.118*	−.130*	.507**	.516**	1	
	Sig. (2-tailed)	.000	.016	.011	.000	.000		
	N	405	415	385	400	405	415	
Actual use	Pearson Correlation	−.266**	−.365**	.005	−.075	−.134*	−.126*	1
	Sig. (2-tailed)	.000	.000	.932	.169	.014	.018	
	N	340	355	320	335	340	350	360

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

ICT. These are associated with latent variables in respect of feeling an aptitude to learn something of value through ICT use, perceiving computers as not being complex and the need to use computers frequently.

Factor 3: ICT support
For factor three, we consider two key items since one of the variables loaded highly on to the first factor. These are: needing support from another person to use a computer system and not needing somebody technical before use, thereby implying any peer who can offer support can enhance usability. These are issues related to **anticipated ICT support** as an expectation before use.

Factor 4: Ease-of-use
The fourth factor comprised of latent variables in relation to the ease of which a trader is able to learn to use computers, and that during use there is an expectation of inconsistencies in the system. These are system design related issues, and are therefore labelled as **Ease-of-use.**

Factor 5: User-friendliness
The latent variables associated with this factor appear to be closely related to Factor 4. These include an expectation of inconsistencies in the system (which also loaded in Factor 4) and the expectation of computer systems to be well integrated. These appear to be premised on notions of user-centred design. The researchers labelled this factor **user-friendliness.**

Factor 6: User-confidence
Finally, the sixth factor relates to a perception that ICT is cumbersome to use as revealed with one of the variables loading highly with 0.86. This is coupled with a perception of not being easy to use and issues related to lack of confidence. We label this factor as **User-confidence**.

Correlation of identified factors with ICT use
After naming the factors, the underlying constructs that were inherent in each factor were aggregated into an average index measure. For ICT use, the averaged measures ranged from 1 (low or no use), 1.5 (moderate use) and 2 (high use) of ICTs among the SMEs. The correlation results are shown in Table 7.

The above results show that apart from ICT support (sig=0.932) and ease-of-use (sig. = 0.169), the other four factors were significantly correlated to the use of ICTs among SMEs. The correlation results contradict the TAM model which espouses that ease-of-use is a very strong positive significant predictor of actual use. Based on the correlation results, we reconfigure our model of ICT use among SMEs as follows (Figure 2).

Regression results of the pre-usage beliefs and attitudes and ICT use
The next section presents ordinary least squares regression results to examine the predictive power of the pre-usage factors to ICT use (Table 8).
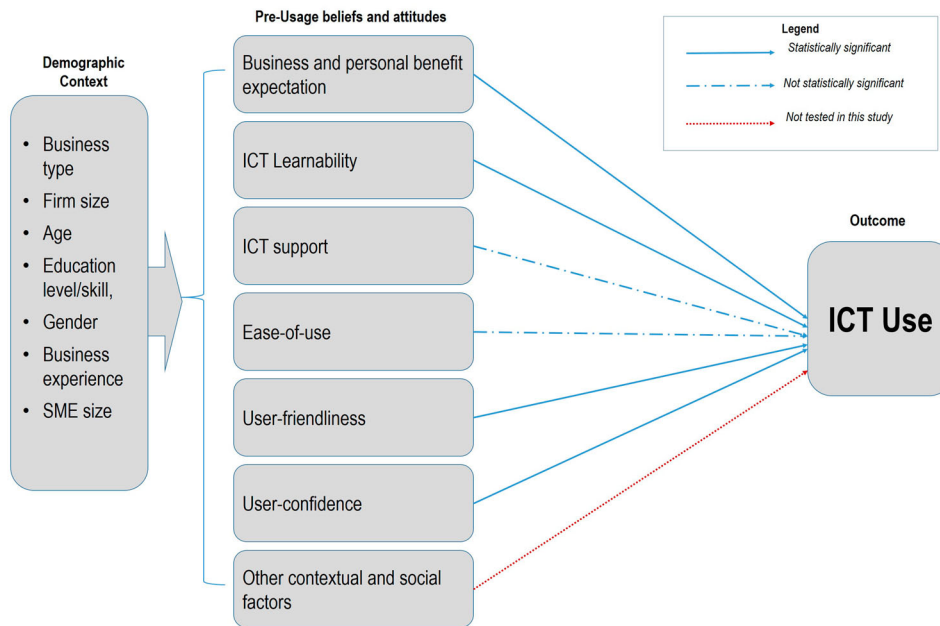
Figure 2: ICT pre-usage beliefs and attitudes and Actual Use of ICTs.

From the model summary in Table 8, the results show that the identified factors significantly predict use of ICTs among SMEs. However, the coefficient of determination R-squared is only 13%. This implies that actual use of ICTs among SME owners studied is explained by only 13% of the six (6) factors. The rest of the usage expectations is explained by 87% of other factors which could be contextual factors. This implies that other methods are needed to thoroughly understand SME expectations of ICTs. We therefore posit that such factors could be revealed during a participatory design process, which involves SME users. This is supported by others, such as Aleke, Ojiako, and Wainwright (2011) who argue that to ensure successful diffusion of an innovation, a balance must be maintained between the amount of effort expended in the design of ICT and that of other social factors.

Analysis of variance identified factors and ICT use among

In this section we probe the identified factors (pre-usage beliefs and attitudes) to ascertain whether there are differences between the two main groups of respondents in the study, viz., users and non-users of ICT. The results of the One-way ANOVA are given in Table 9.

From the results, there is a statistically significant difference between the two groups in relation to the following factors: *Benefit expectations* (One-way ANOVA $(F(2,337) = 13.357$, $p = 0.000)$; *ICT learnability* (One-way ANOVA $(F(2,352) = 27.647$, $p = 0.000)$;

Ease-of-use (One-way ANOVA $(F(2,332) = 3.393$, $p = 0.035)$; and *User-friendliness* (One-way ANOVA $(F(2,337) = 3.442$, $p = 0.033)$. There were no statistically significant differences in respect of the factors related to *ICT support* and *User-confidence*. This reveals that SME owners, in the main, are influenced by their use experience in terms of their perceptions of ICTs as there were significant differences in respect of four of the six factors. The data here also indicates, that regardless of ICT use experience, SME owners have similar perceptions about the level of support they need, and also in their own level of confidence to use ICTs.

Towards a participatory design model to mitigate negative beliefs and attitudes towards ICTs among SMEs

This study renders support to several other scholars who recommend that there is need for participatory design mechanisms in order to influence user acceptance within applied contexts (Davis 1993; Aleke, Ojiako, and Wainwright 2011; Gumbi and Mnkandla 2015). For instance, the community informatics literature reveals that with the design of applications, projects and activities within a community informatics framework that would be most supportive of local 'effective use' would be 'participatory design' (Gurstein 2003). Participatory design is a well cited recommended strategy (Porter 1991; Qureshil, Kamal, and Wolcott 2009; Wyche 2015) and several fruits have been documented to date in respect of its application. It is a methodological approach that recognizes that

Table 8: Regression results

Model summary				
Model	R	R square	Adjusted R square	Std. error of the estimate
1	.361[a]	.130	.113	.28956

[a] Predictors: (Constant), USER_CONFIDENCE, LEANABLE, SUPPORT, EASE_OF_USE, USER_FRIENDLINESS, BENEXP

Table 9: One-way ANOVA: Assessment of differences among SMEs based on factors.

		df	F	Sig.
Benefit expectations	Between Groups	2	13.357	.000
	Within Groups	337		
	Total	339		
ICT learnability	Between Groups	2	27.647	.000
	Within Groups	352		
	Total	354		
ICT support	Between Groups	2	.008	.992
	Within Groups	317		
	Total	319		
Ease-of-use	Between Groups	2	3.393	.035
	Within Groups	332		
	Total	334		
User-friendliness	Between Groups	2	3.442	.033
	Within Groups	337		
	Total	339		
User-confidence	Between Groups	2	2.811	.061
	Within Groups	347		
	Total	349		

ideas develop slowly over time, can help discover confounding demi-regularities (Lawson 1997; Lee, Olson, and Trimi 2012) called contextual factors. It could also mitigates pre-usage beliefs and attitudinal expectations and helps to clearly understand generative mechanisms (Van Aken 2005; Andriessen 2006; Jagosh et al. 2012).

In light of the foregoing we recommend the need to harness a participatory design paradigm to overcome negative perceptions of ICTs, and at the same time to consolidate positive perceptions which prevail. This would involve, as a first step, the development of a framework that incorporates the pre-usage findings to foster an environment for undertaking participatory design of ICT applications with SMEs. The ultimate goal of undertaking participatory design when developing ICT artefacts would be to confirm or disconfirm SMEs' pre-usage ICT expectations and to reinforce benefits and any other determinants for use as presented in the figure below (Figure 3).

The results of this study identified several pre-usage beliefs and attitudes, viz., Benefit expectations, Learnability, ICT support, Ease-of-use, User-friendliness, User-confidence and other contextual and social factors. The green diamond implies that during an artifact participatory design process, the expectations can be confirmed or disconfirmed through collaborative working. It is anticipated that the mental convergence of ICT designers and systems users would lead to improved adoption and better usage outcomes.

The rationale for participatory design is premised on an assumption that there is a need for carefully planned interventions to convince the SME population to infuse technology in their businesses. The literature indicates that lived experiences such as financial insecurity, social insecurity, unstable future will lead to scepticism and phobia of ICT (Gumbi and Mnkandla 2015). Further there is evidence that according to Rogers' diffusion of innovation theory a combination of external and internal
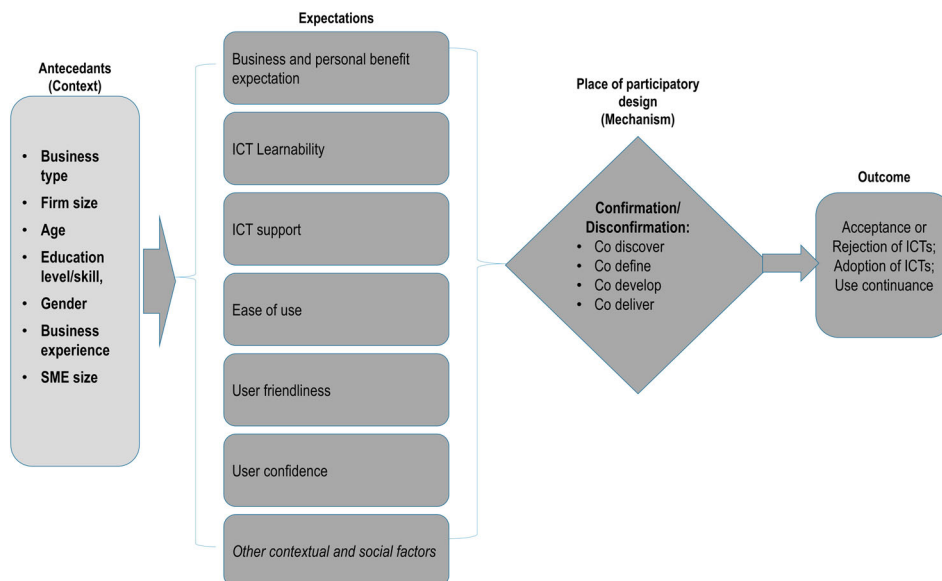

Figure 3: Towards ICT pre-usage expectations through participatory design.

influences of a system much work in a dialectical manner in order to influence the diffusion process (Lundvall 1988; Zenko and Mulej 2011; Cajaiba-Santana 2014). This study postulates that to aid effective decision-making of technological acceptance, co-creation can be of potential value of creating such social and behavioural change.

Conclusion

This paper, in recognizing the critical role of SMEs in developing economies, has responded to the problem of the relatively low levels of uptake of ICTs. This study builds upon prior findings in the extant literature, which have demonstrated the value proposition of ICT to SMEs in terms of improved business operations and efficiencies. The findings provide insight into the attitudes of SME owners towards ICTs. The study has shown that perceptions of ICTs are both positive and negative. Further the study identified four pre-use factors that are correlated with ICT use. The pre-usage beliefs which significantly influence decisions to adopt and use ICT include Benefit expectation, ICT learnability, User-confidence, and User-friendliness. These are found to be key determinants of ICT adoption. ICT support and ease-of-use on the other hand were factors that did not correlate with decisions to use ICT.

However, the study also found that other factors such as social and contextual factors also affect ICT adoption. As such the study proposes a strategy to mitigate negative ICT pre-usage beliefs which are responsible for low ICT adoption in the sector. Our proposed co-design recommendation responds to scholars of similar thought that have argued that '*there has been a bias to action, not a bias to knowledge. We are changing the world without interpreting or understanding it,*' (Heeks 2010, 625). Similarly, Gomez and Pather (2012) seem to wonder whether evaluators and designers of ICT4D ask the right questions. Based on the findings of this study, we envisage that participatory design of ICT applications has the ability to orchestrate this mutual interpretation, ask the right questions, create mutual understanding, and ensure improved adoption of ICTs.

Through a co-design process, we envision that the negative factors identified in this study together with other myths, beliefs, attitudes and expectations shall be mitigated during the process. Once those issues are disconfirmed from a participatory design perspective, we anticipate user satisfaction, improved post-usage beliefs and attitudes and hence usability and continuance for use of designed systems amongst SMEs.

In terms of theoretical implication, this study contributes to the need to integrate demographic antecedents when planning ICT applications for the SME sector. During the design of such systems, there is need to understand the inherent variables that are not observable and measurable through a participatory design process. Other theoretical implications of this study relate to developing further underlying understandings of the principles that must inform the development of ICT design approaches that are appropriate for the African continent. This paper takes a first step in this regard.

In terms of policy, we advocate that public-private partnerships must be fostered to catalyze the endeavour to produce user centric systems for SMEs. Most governments in the African continent have SME development foremost on their development agenda. However, much more needs to be done to ensure that both emergent and established SMEs benefit from the digital revolution that is replete in statements of the African Union and most African governments. Such work needs to promote technology diffusion among SMES, and thereby ensure that they are able to access and successfully use ICTs towards improved business outcomes. The results of this study provide a basis to understand low ICT adoption. As such policy interventions may take these findings into account in the development of interventions to support the SME sector.

Finally, future research should entail action research that will entail working dialectically with SMEs sector to disconfirm the negative pre-usage beliefs and attitudes while at the same time consolidating the positive beliefs towards ICTs. To this end the participatory design model proposed herein, and which draws primarily upon Kyakulumbye (2020), must be subjected to further testing such that the African continent begins to understand the reality of implementing true bottom-up processes to ensure enhanced technology diffusion into the SME sector.

ORCID iDs

Stephen Kyakulumbye http://orcid.org/0000-0002-4275-9483
Shaun Pather http://orcid.org/0000-0002-4667-222X

References

Abisuga-Oyekunle, O. A., S. K. Patra, and M. Muchie. 2020. "SMES in Sustainable Development: Their Role in Poverty Reduction and Employment Generation in sub-Saharan Africa." *African Journal of Science, Technology, Innovation and Development* 12 (4): 405–419.

Aleke, B., U. Ojiako, and D. W. Wainwright. 2011. "ICT Adoption in Developing Countries: Perspectives from Small-Scale Agribusinesses." *Journal of Enterprise Information Management* 24 (1): 68–84.

Almazroa, M., and S. Gulliver. 2018. "Understanding the Usage of Mobile Payment Systems-The Impact of Personality on the Continuance Usage." In *2018 4th International Conference on Information Management (ICIM)*, 188–194, IEEE, May.

Alruwaie, M., R. El-Haddadeh, and V. Weerakkody. 2020. "Citizens' Continuous use of EGovernment Services: The Role of Self-Efficacy, Outcome Expectations and Satisfaction." *Government Information Quarterly* 37 (3): 101485.

Andriessen, D. 2006. "Combining Design-Based Research and Action Research to Test Management Solutions." In *7th World Congress Action Research*, August.

Arendt, L. 2008. "Barriers to ICT Adoption in SMEs: How to Bridge the Digital Divide?" *Journal of Systems and Information Technology* 10 (2): 93–108.

Beynon-Davies, P. 2018. "Characterizing Business Models for Digital Business Through Patterns." *International Journal of Electronic Commerce* 22 (1): 98–124.

Biekpe, N. 2004. "Financing Small Businesses in Sub-Saharan Africa: Review of Some key Credit Lending Models and Impact of Venture Capital Provision." *Journal of African Business* 5 (1): 29–44.

Cajaiba-Santana, G. 2014. "Social Innovation: Moving the Field Forward: A Conceptual Framework." *Technological Forecasting and Social Change* 82: 42–51.

Cataldo, A., G. Pino, and R. J. McQueen. 2020. "Size Matters: the Impact of Combinations of ICT Assets on the Performance of Chilean Micro, Small and Medium Enterprises." *Information Technology for Development* 26 (2): 292–315.

Ceresia, F., and C. Mendola. 2019. "Entrepreneurial Self-Identity, Perceived Corruption, Exogenous and Endogenous Obstacles as Antecedents of Entrepreneurial Intention in Italy." *Social Sciences* 8 (2): 54.

Chakraborty, M., and S. Al Rashdi. 2018. "Venkatesh et al.'s Unified Theory of Acceptance and Use of Technology (UTAUT) (2003)." In *Technology Adoption and Social Issues: Concepts, Methodologies, Tools, and Applications*, edited by Mehdi Khosrow-Pour, 1657–1674. Hershey: IGI Global.

Consoli, D. 2012. "Literature Analysis on Determinant Factors and the Impact of ICT in SMEs." *Procedia-Social and Behavioral Sciences* 62: 93–97.

Costello, A. B., and J. Osborne. 2005. "Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most from your Analysis." *Practical Assessment, Research, and Evaluation* 10 (1): 1–9.

Davis, F. D. 1985. "A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results." Doctoral dissertation, Massachusetts Institute of Technology.

Davis, F. D. 1993. "User Acceptance of Information Technology: System Characteristics, User Perceptions and Behavioral Impacts." *International Journal of Man-Machine Studies* 38 (3): 475–487.

Eze, S. C., S. Olatunji, V. C. Chinedu-Eze, A. O. Bello, A. Ayeni, and F. Peter. 2019. "Determinants of Perceived Information Need for Emerging ICT Adoption." *The Bottom Line* 32 (2): 158–183.

Francis, M. M., and M. Willard. 2016. "Unlocking the Potential of Information and Communication Technology for Business Sustainability by Small, Micro and Medium Enterprises in Vhembe District, South Africa." *IADIS International Journal on Computer Science & Information Systems* 11: 41–48.

Gholami, R., A. B. Sulaiman, T. Ramayah, and A. Molla. 2013. "Senior Managers' Perception on Green Information Systems (IS) Adoption and Environmental Performance: Results from a Field Survey." *Information & Management* 50 (7): 431–438.

Gilbert, D., L. Lee-Kelley, and M. Barton. 2003. "Technophobia, Gender Influences and Consumer Decision-Making for Technology-Related Products." *European Journal of Innovation Management* 6 (4): 253–263.

Gomez, R., and S. Pather. 2012. "ICT Evaluation: Are We Asking the Right Questions?" *The Electronic Journal of Information Systems in Developing Countries* 50 (1): 1–14.

Gray, C. 2006. "Absorptive Capacity, Knowledge Management and Innovation in Entrepreneurial Small Firms." *International Journal of Entrepreneurial Behavior & Research* 12 (6): 345–360.

Gumbi, L. N., and E. Mnkandla. 2015. "Investigating South African Vendors' Cloud Computing Value Proposition to Small, Medium and Micro Enterprises: A Case of the City of Tshwane Metropolitan Municipality." *The African Journal of Information Systems* 7 (4): 1.

Gurstein, M. 2003. "Effective use: A Community Informatics Strategy Beyond the Digital Divide." *First Monday* 8 (12). doi:10.5210/fm.v8i12.1107.

Hartono, H., and R. T. Herman. 2019. "A Study on Competitiveness of ICT Adoption and Entrepreneurship Orientation on SMEs in Indonesia." In *2019 International Conference on Information Management and Technology (ICIMTech)*, Vol. 1, 53–57, IEEE, August.

Heeks, R. 2010. "Do Information and Communication Technologies (ICTs) Contribute to Development?" *Journal of International Development* 22 (5): 625–640.

IFC. 2010. *Scaling-Up SME Access to Financial Services in the Developing World, International Finance Corporation*. Washington, DC: World Bank Group. http://www.enterprisedevelopment.org/wpcontent/uploads/ScalingUp_SME_Access_to_Financial_Services.pdf.

ILO publication (International Labour Organization). 2012. *Youth Employment Interventions in Africa*. A Mapping Report of the Employment and Labour Sub-Cluster of the Regional Coordination Mechanism (RCM) for Africa.

Ion, P., and Z. Andreea. 2008. "Use of ICT in SMEs Management Within the Sector of Services." *The Journal of the Faculty of Economics-Economic, University of Oradea, Faculty of Economics* 4 (1): 481–487.

Israel, G. D. 1992. Determining Sample Size.

Jagosh, J., A. C. Macaulay, P. Pluye, J. Salsberg, P. L. Bush, J. Henderson, E. Sirett, et al. 2012. "Uncovering the Benefits of Participatory Research: Implications of a Realist Review for Health Research and Practice." *Milbank Quarterly* 90 (2): 311–346.

Jawed, I., and D. A. Siddiqui. 2019. "What Matters for Firms' Performance: Capabilities, Tangible or Intangible Resources? Evidence from Corporate Sectors on Pakistan." *Evidence from Corporate Sectors on Pakistan, December 28*.

Jones, S. 2008. "Social Dimension of IT/IS Evaluation: Views from the Public Sector." In *Evaluating Information Systems: Public and Private Sector*, edited by Zahir Irani and Peter Love, 236–256. New York: Butterworth-Heinemann.

Krejcie, R. V., and D. W. Morgan. 1970. "Determining Sample Size for Research Activities." *Educational and Psychological Measurement* 30 (3): 607–610.

Kyakulumbye, S. 2020. "A Framework for Developing Citizen-Centric E-Government Application in Developing Contexts: The Design-Reality Gaps in Uganda." An unpublished Doctoral thesis, University of the Western Cape, South Africa.

Kyakulumbye, S., M. Muhenda, and N. Anaclet. 2012. "Information Communication Technology (ICT) Utilization in Uganda Local Governments; Why Low Uptake?." In *Proceedings of 18th International Business Research Conference 2012*, June 20. SSRN: https://ssrn.com/abstract=2186371 or http://dx.doi.org/10.2139/ssrn.2186371.

Labrianidis, L., T. Kalogeressis, A. Kourtessis, and S. Skordili. 2017. "Technology, Peripherality and Rurality." In *The Future of Europe's Rural Peripheries*, edited by Lois Labrianidis, 114–136. New York: Routledge.

Lawson, T. 1997. Economics and Reality.

Lee, S. M., D. L. Olson, and S. Trimi. 2012. "Co-innovation: Convergenomics, Collaboration, and Co-Creation for Organizational Values." *Management Decision* 50 (5): 817–831.

Lew, Y. L., T. C. Toh, K. L. Lim, F. Y. Y. Yan, and L. P. Yow. 2019. "A Study on the Constraints of Implementing Information and Communication Technology (ICT) in Malaysian Construction Industry." In *IOP Conference Series: Earth and Environmental Science*, Vol. 385, No. 1, 012005, IOP Publishing, November.

Lundvall, Bengt-Ake. 1988. "Innovation as an Interactive Process: From User-producer Interaction to the National System of Innovation." In *The Learning Economy and the*

Economics of Hope, edited by Bengt-Ake Lundvall, 61–83. London: Anthem Press.

Martin, L. M., and H. Matlay. 2001. "'Blanket' Approaches to Promoting ICT in Small Firms: Some Lessons from the DTI Ladder Adoption Model in the UK." *Internet Research* 11 (5): 399–410.

Meyoki, N. L., and L. Kavindah. 2019. "Exploration of Adoption of Information Communication Technology by Tourist Camps in Maasai Mara, Narok County, Kenya." *International Journal of Current Aspects* 3 (VI): 291–308.

Mramba, N., M. Apiola, A. E. Kolog, and E. Sutinen. 2016. "Technology for Street Traders in Tanzania: A Design Science Research Approach." *African Journal of Science, Technology, Innovation and Development* 8 (1): 121–133.

Namankani, H. M. S. 2019. "Exploring Social Media Adoption Processes and Factors." Doctoral dissertation, University of Liverpool.

National Population and Housing Census. 2014. Area Specific Profiles-Mukono District, Published on April 2017, Uganda.

Ndiaye, N., L. A. Razak, R. Nagayev, and A. Ng. 2018. "Demystifying Small and Medium Enterprises'(SMEs) Performance in Emerging and Developing Economies." *Borsa Istanbul Review* 18 (4): 269–281.

Neneh, N. B., and J. H. Van Zyl. 2012. "Achieving Optimal Business Performance Through Business Practices: Evidence from SMEs in Selected Areas in South Africa." *Southern African Business Review* 16 (3): 118–144.

Nguyen, T. H. 2009. "Information Technology Adoption in Smes: An Integrated Framework." *International Journal of Entrepreneurial Behaviour & Research* 15 (2): 162–186.

OECD. 2017. Enhancing the Contributions of SMEs in a Global and Digitalised Economy; Meeting of the OECD Council at Ministerial Level, Paris.

Panas, G., S. Vasiliadou, and C. Halkiopoulos. 2020. "Data Analysis Evaluation of Web Technologies Enhancing Communication in Tourism Industry: Case Study in Kefalonia Island." In *Cultural and Tourism Innovation in the Digital Era*, edited by Vicky Katsoni and Thanasis Spyriadis, 171–187. Cham: Springer.

Pather, S., and O. P. Abiodun. 2017. "The Adoption of Cloud Computing amongst Micro-Enterprises." In *ECISM 2017 11th European Conference on Information Systems Management*, 262. Academic Conferences and publishing limited, September.

Perkins, G. 2019. "Exploring the Mechanisms Through Which Strong Ties Impact Upon the Development of Ideas in SME Contexts." *Journal of Small Business Management* 57 (4): 1464–1484.

Porter, M. E. 1991. "Towards a Dynamic Theory of Strategy." *Strategic Management Journal* 12 (S2): 95–117.

Pustovrh, A., M. Jaklič, S. A. Martin, and M. Rašković. 2017. "Antecedents and Determinants of High-Tech SMEs' Commercialisation Enablers: Opening the Black Box of Open Innovation Practices." *Economic Research-Ekonomska Istraživanja* 30 (1): 1033–1056.

Qureshil, S., M. Kamal, and P. Wolcott. 2009. "Information Technology Interventions for Growth and Competitiveness in Micro-Enterprises." *International Journal of E-Business Research* 5 (1): 117–140.

Rahman, A. A., H. B. Singhry, M. H. Hanafiah, and M. Abdul. 2017. "Influence of Perceived Benefits and Traceability System on the Readiness for Halal Assurance System Implementation among Food Manufacturers." *Food Control* 73: 1318–1326.

Rogers, E. M. 1971. "Incentives in the Diffusion of Family Planning Innovations." *Studies in Family Planning* 2 (12): 241–248.

Rogers, E. M. 2010. *Diffusion of Innovations*. New York: Simon and Schuster.

Ryan, G. W., and H. R. Bernard. 2003. "Techniques to Identify Themes." *Field Methods* 15 (1): 85–109.

Scherer, R., F. Siddiq, and J. Tondeur. 2019. "The Technology Acceptance Model (TAM): A Meta-Analytic Structural Equation Modeling Approach to Explaining Teachers' Adoption of Digital Technology in Education." *Computers & Education* 128: 13–35.

Sin Tan, K., S. Choy Chong, B. Lin, and U. Cyril Eze. 2009. "Internet-Based ICT Adoption: Evidence from Malaysian SMEs." *Industrial Management & Data Systems* 109 (2): 224–244.

Stein, P., O. P. Ardic, and M. Hommes. 2013. Closing the Credit Gap for Formal and Informal Micro, Small, and Medium Enterprises.

Svensson, J., and C. Wamala Larsson. 2016. "Situated Empowerment: Mobile Phones Practices among Market Women in Kampala." *Mobile Media & Communication* 4 (2): 205–220.

Van Aken, J. E. 2005. "Management Research as a Design Science: Articulating the Research Products of Mode 2 Knowledge Production in Management." *British Journal of Management* 16 (1): 19–36.

Venkatesh, V., J. Y. Thong, F. K. Chan, P. J. H. Hu, and S. A. Brown. 2011. "Extending the Two-Stage Information Systems Continuance Model: Incorporating UTAUT Predictors and the Role of Context." *Information Systems Journal* 21 (6): 527–555.

Venkatesh, V., J. Y. Thong, and X. Xu. 2012. "Consumer Acceptance and use of Information Technology: Extending the Unified Theory of Acceptance and use of Technology." *MIS Quarterly* 36 (1): 157–178.

Verma, P., and N. Sinha. 2018. "Integrating Perceived Economic Wellbeing to Technology Acceptance Model: The Case of Mobile Based Agricultural Extension Service." *Technological Forecasting and Social Change* 126: 207–216.

Williams, M. D., N. P. Rana, and Y. K. Dwivedi. 2015. "The Unified Theory of Acceptance and use of Technology (UTAUT): A Literature Review." *Journal of Enterprise Information Management* 28 (3): 443–488.

Wyche, S. 2015. "Exploring Mobile Phone and Social Media Use in a Nairobi Slum: A Case for Alternative Approaches to Design in ICTD." In *Proceedings of the Seventh International Conference on Information and Communication Technologies and Development*, 12. ACM, May.

Yasmin, N., and P. Grundmann. 2019. "Pre-and Post-Adoption Beliefs About the Diffusion and Continuation of Biogas-Based Cooking Fuel Technology in Pakistan." *Energies* 12 (16): 3184.

Zenko, Z., and M. Mulej. 2011. "Diffusion of Innovative Behaviour with Social Responsibility." *Kybernetes* 40 (9/10): 1258–1272.