

Sadiq, Olusegun; Hack-Polay, Dieu; Fuller, Ted; Rahman, Mahfuzur

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Article

Barriers to the Effective Integration of Developed ICT for SMEs in Rural NIGERIA

Olusegun Sadiq¹, Dieu Hack-Polay², Ted Fuller¹  and Mahfuzur Rahman^{1,*} ¹ Lincoln International Business School, University of Lincoln, Lincoln LN6 7TS, UK² Department of Graduate Studies, Crandall University, Moncton, NB E1G 3H9, Canada

* Correspondence: marahman@lincoln.ac.uk

Abstract: This study investigated three key factors (technological-related, organisational-related and environmental-related barriers) affecting the adaptation to or integration of developed ICT. It also examined how SMEs in less developed countries can explore the different stages of developed ICT by moving from one stage to the other. The integration of ICT in SMEs is important as technologies have become competitive tools in contemporary business practices. This study is based on a survey of 322 Nigerian SMEs which was successfully validated using the SmartPLS3 software. The quantitative analysis centred on the three hypothesised barriers to measure the extent to which SMEs' internal and external variables could limit their competitiveness in relation to business expansion and organisational growth. The analysis helped explain some of the critical challenges faced by rural SMEs in an emerging economy such as Nigeria despite the literature's previous emphasis on the impacts of ICT on the SMEs' growth and expansion. A major contribution of the study is the development of a distinct model to help SMEs identify the significance of developed ICT and propose a strategy for SMEs to navigate the stages of developed ICT.

Keywords: ICT; SMEs; less developed countries (LDCs); Nigeria; developing country

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1. Introduction

Technologies have become a significant battleground for competitive advantages in the business world. Small and medium-sized enterprises (SMEs) do not escape this dynamic—particularly those in developing economies which are struggling to capture a share of the global marketplace. The contribution of the small and medium-sized enterprises (SMEs) to the development of emerging economies has been significantly reported [1]. Previous studies focused on the factors (barriers) affecting the successful adoption of information and communication technology (ICT) [2,3] and their impact on the SMEs' performance [4], thereby showing the importance of ICT, not only on the SMEs' organisational performance, but also the impact it has on their business expansion within and outside the local market [5]. There have been calls for small businesses to adopt ICTs into their organisational framework by focusing on the owner–manager characteristics [6,7], the ICT knowledge and skills amongst employees [8] and its benefits [9]. However, these studies have been criticised because most of the ICT models were developed to resolve the issues surrounding the effective adoption of ICT amongst SMEs in an advanced economy perspective [10–12], which is different in the context of developing countries [13,14]. Therefore, there is a need for sustained scholarships to identify the factors inhibiting the successful integration of developed ICTs, particularly those operating in the rural framework in less developed countries that have been long neglected [15]. Such studies can provide recommendations to reduce the impact of these challenges [16].

Although many of these challenges have been identified in the literature, most of these barriers are not particular to SMEs in less developed countries [17]. The report submitted by [18,19] revealed that SMEs in less developed countries are faced with more barriers,

preventing them from taking full advantage of developed ICTs. For instance, the growth of SMEs is dependent on each country's national economic agenda which aims to find long-term solutions to issues relating to low GDP, low per capita income, unemployment and distribution of income [20]. According to International Monetary Fund (IMF) [21], most countries classified as low-income economies have often pursued more restrictive measures that are detrimental to SME growth. These restrictive measures are said to be directly related to the low integration of developed ICTs amongst SMEs and more specifically in rural areas [22]. The level of developed ICT integration amongst SMEs is generally dependent on the country's level of economic development [23] which has a greater effect on SMEs than on large firms [24]. Weak government policies tend to affect the level of developed ICT adoption, and particularly amongst the SMEs, towards creating a strong competitive advantage within the markets (i.e., both local and international markets). Where such policies exist, they play a significant role in the successful integration of developed ICTs amongst the SMEs. It is therefore crucial to identify and discuss these barriers in order to create an enabling environment to accelerate SME growth [25].

However, the three key barriers (i.e., the technological-related barriers, the organisational-related barriers and the environmental-related barriers) [26–28] were identified to exert important effects on SMEs as they shape their behaviour regarding whether to adapt to newly developed technologies. The importance of these barriers could be one of the reasons why Nigeria, as the giant of Africa, was rated low by the International Technology Union (ITU) report, which placed it on the 143rd position out of 167 countries in 2020 [29]. However, Agwu [30] argued that the inhibiting factors identified in advanced economies cannot be used as a yardstick to predict the level of developed ICT integration amongst SMEs in less developed countries. Meanwhile, the main policy agenda of the government was to design a policy that would enhance developed ICT integration amongst SMEs so that they may compete with their counterparts around the globe in an appropriate manner [31,32].

The aim of this study is to identify the factors inhibiting the successful integration of developed ICTs in SME business practices in developing countries, using the case of Nigeria. The contribution of this paper is twofold. Firstly, it addresses the research gaps. Although there are number of studies that identify the factors inhibiting the adoption of ICTs, much of this research fails to consider how these factors affect the effective adoption of developed ICTs [33]. Secondly, the findings of this study have policy implications for the successful integration of developed ICTs amongst the SMEs in emerging countries.

The paper is divided into four main sections. The first reviews the literature on the use of technology in contemporary businesses and SMEs and examines the theoretical model used as well as the hypotheses of the research. The second section outlines the methodological frameworks. The third section presents the findings of the survey while the fourth discusses the results in the light of the literature. Finally, we draw the conclusions which also highlight the implications of the research.

2. Literature Review

The theories underpinning this study are the Technology–Organisation–Environment (TOE) framework by [34] and the Stage-of-Growth (SOG) framework by [35]. Although many ICT models have been used to explain the adoption of ICTs in the literature, they cannot be applied to carry out the same investigation in the less developed countries' contexts, due some contextual issues. For instance, this study is focused on the SMEs operating in the rural parts of Nigeria where there is a high concentration of people with no basic amenities (such as roads, electricity, schools and hospitals) [17] which cannot be compared to the rural areas in developed countries such as the United Kingdom and the United States of America [14]. Therefore, the two theories will be firstly discussed in great detail and will secondly be adjusted to suit the contexts of this study.

2.1. Technology–Organisation–Environment (TOE) Framework

The TOE framework was developed by [34] to examine the factors affecting the successful adoption of ICT and its diffusion in SMEs. The framework consists of factors that can be used to explain the adoption of ICT in SMEs and they include: the technological contexts, the organisational contexts and the environmental contexts [36–38]. It was evidenced in the literature related to this study that some adoption characteristics such as the leader's characteristics and the internal and external business characteristics determines the firms' adoption of ICT [39,40]. The leader's characteristics consist of the SME's owner–manager's attitude towards change, the internal characteristics, which include the organisational design and the external characteristics, which relate to the system's openness and the importance of the ICT itself [41]. Similarly, some scholars argued that the owner–manager's characteristics can be viewed as part of the internal characteristics of the firm, which is also one of the main assumptions of Rogers' DOI model, which includes the internal characteristics, the top-management characteristics and the external characteristics [42,43]. In the same vein, the two theories (i.e., the DOI model and the TOE framework) share similarities with the two characteristics of the TAM model: the perceived usefulness and the perceived ease of use.

Despite the contribution of the TOE framework in the literature, the model is not free from criticism. The theory has been criticised on the grounds that it is too static in nature as it focuses on the factors (i.e., drivers and barriers) influencing the successful adoption of ICT alone. Secondly, the theory fails to explain the complexities and the dynamisms involved in the firm's ICT adoption process. Although the TOE framework is quite different from other models discussed previously due to its large number of variables, which makes it richer and very robust, care must be taken when using it to analyse the adoption of ICT in SMEs [44].

2.2. Stages-of-Growth (SOG) Model

The stages-of-growth model was initially propounded by [35], who proposed a four-stage model that was later expanded to a six-stage model by [45,46]. The model was based on the need to align the firm's management strategy with the current stage of developed ICT adaptation [47]. Cieciora et al. [48] also developed a four-stage model, stating that it is not compulsory to work through each element embedded in all the stages, therefore giving the impression that it is possible to choose a particular aspect of the developed ICT to conveniently work with and move forward. These findings were supported by the authors of [49], who validated the submission of the authors of [50]'s stage-of-growth model but did not specify the specific stages. Rustly et al. [51] proposed a five-stage model, stating that every organisation would have a unique learning curve that they would experience during the process of adapting to the newly developed ICTs. This finding was criticised by Shee et al. [52] on the grounds that the model only places an organisation in a certain stage without stating how it can progress from one stage to another.

Kannabiran and Dharmalingham [9] developed a model that gives a complete description of how firms can evolve with regard to the developed ICT adaptation and also demonstrated how the adapting organisations can move from the initial stage to a more advanced stage of maturity. However, this finding was also criticised by Olivera and Martins [53], who found the approach to be slightly complicated and therefore proposed a model that is more beneficial and focuses more on activities rather than outputs, as they are less contextual, because activities provide the decision-makers with some better indicators of what to do at each stage of developed ICT adaptation. Similarly, many authors have proposed different stages of ICT growth models based on these models for a variety of purposes, including: end-users of developed ICTs [54], information centres [55], technology-based new ventures [56], ICT planning [57] and ICT portfolio management [58] and, for the most part, the empirical testing of the stages proposed in these models has been positive.

The advent of developed ICTs such as E-businesses has heralded the development and introduction of several new stages of growth models. Kannabiran and Dharmalingham [9]

proposed a developed ICT model which integrates the authors of [59]'s stage-of-growth model to showcase the activities involved in the developed ICTs processes as well as the traditional ICTs. The stages-of-growth model presumes a progression of levels as the organisation accumulates knowledge, experience, qualification and expertise in ICTs. Contrarily, Duan [60] suggested a four-stage model of the evolution of business-to-business (B2B) developed ICTs like E-commerce, but the model is now considered to be flawed [61]. Davis [62] also proposed a stage-of-growth model which was similar to the one in [63] by stating that organisations do not need to accomplish each stage successfully as they can begin at any stage, they want by skipping some stages; an organisation that is increasingly aware of the newly developed technologies such as E-commerce could begin with a later maturity phase. Some researchers [64,65] also subscribed to the notion that organisations can select which aspects of the developed ICTs to adapt into their organisational framework. Contrarily, Spalinger et al. [66] argued that developed ICT stages cannot be skipped because the experience learned from the previous stages is necessary for the next stage. Teece et al. [67] found that only two growth types (i.e., the strategy and objectives, followed by the focus of the implementation) were consistent when empirically examined across several business profile cases.

The stage-of-growth model has been employed by [68–70] to explore the evolution of ICTs in organisations. For instance, some scholars like, [57,61] stressed that progression can be made even though not all elements are in the same phase, and therefore stages can be skipped. Chege and Wang [71] found that the intranet originally developed in the early stages evolved more rapidly to become critical for day-to-day operations, and extended to integrate the external value chains, which shared some significant similarities with [69]'s stage-of-growth model which later became institutionalised in the organisations. Dahnil et al. [72] also developed a data warehousing stage-of-growth model based on the findings of [51] by emphasising that there is a need to understand the stages so that management is better able to plan and is better positioned to avoid any pitfalls. Kyakulumbye and Pather [73] developed a four-stage knowledge management technology (KMT) model, which was followed by [74], who developed a six-stage (levels 0–5) Knowledge Management Capability Assessment (KMCA) model, and from [75] five-level stage-of-growth models also emerged for E-Government and ICTs in healthcare and education.

Won and Park [76] developed a four-stage E-Government model and similar work by [77] focused on a five-stage model for information architectures in local governmental agencies. Shee et al. [78] suggested that organisations sometimes concatenate stages, and the number of stages may expand as technological advances are made or discontinuities occur, and a new stages-of-growth model may be required. This perspective is similar to that of the authors of [78], who revealed that advances in data warehousing technologies led to a revision of their stages-of-growth model. The E-Government stage-of-growth models, for instance, were later extended into a seven-stage model by Kumar [79], who recommends the stage of adoption once there is consensus that there is value in moving forward. The model also suggests that stages may be skipped. Singh et al. [80] developed a stage-of-growth model to manage the evolution of ICTs in healthcare. Nikou and Mezei [81] developed a five-stages-of-growth model for ICT service outsourcing in higher education. It must therefore be emphasised that the model in [82] was built on [83] five-stage and [80] three-stage maturity models for ICT outsourcing, but neither model was tested.

2.3. Rationale for Using TOE Framework and the Stage-of-Growth (SOG) Model

These models have been employed for several reasons. First, the two models are one of the most popular frameworks and IS researchers have continued to use it to characterise developmental changes in organisational experiences with ICT adoption, even though their limitations may be acknowledged [64]. For instance, Lorente-Martinez et al. [55] propose an integrated model consisting of a TOE framework and a staged model for B2B e-commerce implementation in Australian organisations. The model continues to be intuitively very appealing, largely because aspects of the model ring true to both practitioners

and researchers [72]. Secondly, the two models allow for researchers to sufficiently analyse all the contextual issues affecting the small business firms and how it transforms the entire concept of stages in a person's learning and understanding of something and suits the desire for orderliness and classification [67]. Therefore, a linear model may seem attractive as a simplified way to describe ICTs adoption and use. Kumar [79] argued that the models provide different testable constructs which allow for researchers to have a clear view of how SMEs move from one stage to the other by providing some pragmatic value of the stages' concept in order to map the progression of E-business maturity, which concludes that the stages' concept is useful in a pragmatic sense in that it appeals to managers [61]. Third, the models have proved to be a useful tool for an SME that wishes to classify itself for comparison purposes with its major competitors involved in E-commerce within its own industry or sector, and hence, indicating gaps and leading to strategic actions [72]. A further strength is that they can provide a roadmap to assist companies in determining whether it is sensible to progress to a subsequent stage [37]. For instance, the stages approach is useful in explaining the past, current and future involvement in ICT growth development. Hence, the two models serve as major guidance for analysing the current level of ICT adoption by giving directions as to where to proceed further, as well as where an organisation may focus its goals and resources [16]. Finally, unlike other models, the TOE framework and the SOG model allows for business organisations to reduce the complexity of their ICT initiatives, breaking them into smaller, more flexible and manageable portions.

2.4. Barriers Affecting the Integration of Developed ICTs

Despite the benefits associated with the successful use of developed ICTs in improving the organisational performance of the SMEs as evidenced in the literature, there are still some challenges affecting its successful implementation, particularly in the less developed countries' contexts [24]. Qureshi and York [32] argued that developed ICT integration presents advantages for small businesses. However, the issues surrounding this were more diverse and have been widely discussed in the literature related to this study. For instance, Wixom and Todd [83] emphasised that most large firms which have been able to adapt and deploy developed ICTs into their organisational framework are hereby reaping all its benefits, while SMEs, particularly in emerging countries, are yet to take the advantages developed ICTs have to offer due to some barriers affecting its successful adoption. Although there have been a great deal of studies in the literature that investigate the factors affecting the successful adoption of developed ICTs amongst the SMEs in the developed countries, only a few studies have been conducted in this regard in the context of less developed countries. Furthermore, there have been robust scholarly discussions on the different categories of barriers (i.e., the technological-related barriers, the organisational-related barriers and the environmental-related barriers) in order to help facilitate the comprehensive understanding of these barriers and the relationship between them (see Figure 1 for more details).

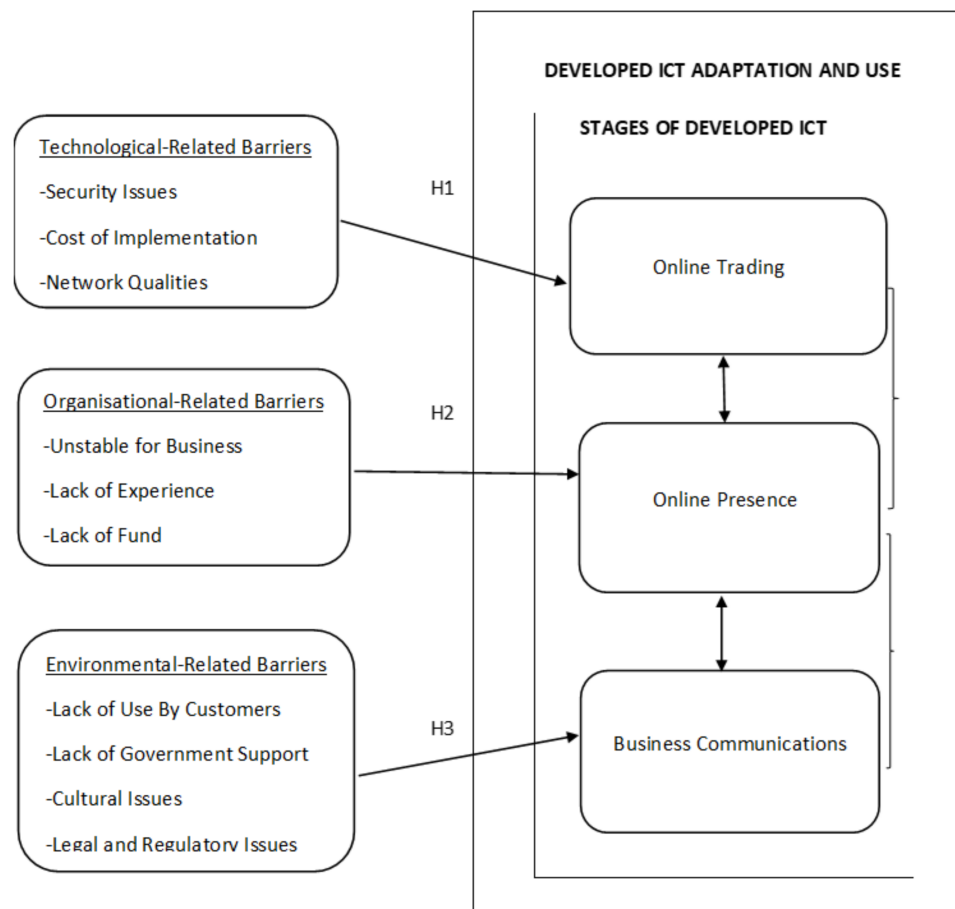


Figure 1. Conceptual Framework (Authors).

2.4.1. Technology-Related Barriers

Technological-related barriers could have some negative effect on the successful implementation of developed ICTs by SMEs. Although there are many barriers identified and discussed in the context of developed countries in the literature, they may be quite different in the context of developing countries [53]. Some of the technological-related barriers identified include the cost of implementation [19], the security and the quality of the Internet provided by the ISPs [56], the lack of adequate hardware and software applications [47] and website-related issues such as privacy and security.

Amongst other barriers, the security issues have been identified as the most significant technological-related barrier affecting the integration of developed ICT in the literature. For instance, Reggi and Gil-Garcia [36] argued that security issues are the main challenge affecting the SMEs' adoption of developed ICTs. Alliance [23] reported that the issues of security and privacy are the main reasons why most business concerns have failed to adapt and use the newly developed technologies, which could lead to the loss of personal information and money due to fraud [51]. It was evidenced in the report submitted by [21] that the adoption of developed ICTs such as E-commerce has been faced with different kinds of security issues such as hacking, fraud and virus attacks. The findings of the study conducted by [16] on the factors affecting the adoption of ICTs amongst SMEs in New Zealand identified the high cost of implementation and the security issues as the two major factors.

Many customers are reluctant to share their personal details such as credit or debit card facilities, names and addresses and even their status online due to the lack of privacy and security issues [7] that are presently affecting the successful integration of developed ICTs amongst SMEs, particularly in the context of developing countries. Igwe et al., [15]

submits that security issues are the major challenges affecting the adoption and use of developed ICTs in less developed countries as both firms and customers feel they are not being protected from fraudsters. Spalinger et al., [66] clearly stated that, although new developments, such as the introduction of smart cards, tend to reduce the crime-related issues affecting the effective implementation of developed ICT, both firms and customers still fail to adapt and use it.

The high cost of implementation is a technological-related barrier identified in the literature. However, the high cost of implementation is said to include the cost of hardware and software applications and the cost of setting-up the internet facilities and maintenance, as cited by some studies attempting to sufficiently analyse the effective implementation of developed ICTs, particularly amongst small business firms [54]. According to Jin and Hurd [27], the high cost of Internet services provided by Internet service providers (ISPs) is one of the factors impeding the effective implementation and usage of developed ICTs amongst SMEs. This is because the small business firms have limited resources and believe that there is a low return on investment for the acquisition of the ICT facilities.

This finding is echoed by several studies [25,34,57] that concluded that the lack of sufficient funds available to the SMEs for the acquisition of newly developed technologies is one of the major challenges related to the low adoption of these technologies amongst SMEs in Cyprus. Orser et al. [39] report revealed that the technological barriers such as security, cost of acquisition and maintenance of ICT facilities are some of the reasons for the low integration of developed ICTs amongst SMEs. The report highlighted that small business organisations would not adapt to newly developed technologies if the benefits were less than the total amount invested in their acquisition and implementation [53].

The quality of the Internet service is one of the important factors identified under the technological-related barriers. This is said to include other factors. For example, the stability/reliability of the network, the speed of the Internet service provided by the Internet service provider and the level of internet access are some of the setbacks identified and discussed in the literature related to this study [71]. The results of many studies in the literature showed that the quality of the Internet service is one of the most significant factors inhibiting the integration of developed ICTs amongst SMEs in less developed countries [41].

The non-availability of good Internet services may inform the SMEs' decision of whether to adapt to the newly developed technologies while the high speed of the Internet, on the other hand, encourages both the firms and their customers to spend more valuable time online. Therefore, slow Internet connections, according to [62], are said to discourage SMEs from adapting and using the newly developed technologies more effectively [70]. However, little research has been conducted in this regard in the developing countries, particularly amongst the rural SMEs [67]. Therefore, the following hypotheses were developed to effectively analyse the relationship between the technological-related barriers:

H1a: *Security issues are positively related to advanced ICT adaptation.*

H1b: *Cost of implementation is positively related to advanced ICT adaptation.*

H1c: *Network quality is positively related to advanced ICT adaptation.*

2.4.2. Organisational Barriers

In the literature, certain factors have been identified as organisational-related barriers. The barriers identified under this category include the lack of resources at the disposal of the firm, the lack of ICT knowledge and skills amongst the employees and the time involved in implementing such technologies [12]. Small business firms may refuse to adapt to the new technology if such technology is not compatible with their existing organisational structures. This was evidenced in [27] which revealed that many business organisations refused to adapt to new technology that does not support their existing structures. Many scholars have echoed this finding in the literature; for instance, [5,39,63] argued that many SMEs would not adapt to or use a newly developed technology if it was too complex and may therefore not support their business growth and expansion. This was supported by [20], who pointed out that most SMEs fail to adapt or use a developed ICT because they

feel it does not support their current business practices. Lim and Trakulmaykee [77] report covering 19 countries in Europe concluded that 40% of small businesses do not use the Internet for any business transactions for this reason.

Limited ICT knowledge and skills amongst employees was identified as one of the organisational-related barriers. The findings of Agbor [14] showed that the most significant factor affecting the implementation of developed ICT amongst SMEs is the lack of knowledge and skills amongst their employees. Shee et al. [52] stressed that the lack of ICT knowledge and skills overlaps with the financial barriers because SMEs are confronted with a lack of resources [31]. However, Karim [6] stated that small business organisations are not only crippled with a lack of resources necessary for the effective implementation of developed ICT but are confronted with a lack of skilled employees, as their employees have little or no ICT knowledge to operate the newly developed technologies. The authors noted that a lack of ICT knowledge and skills amongst employees is the most significant factor affecting the implementation of developed ICTs amongst small business firms [62]. Dassisti et al. [43] argued that the efficient use of newly developed technologies requires some special skill sets that are developed over time through training to fully optimise all the benefits of ICTs, and most of the employees within the small business organisations lack these skills, which is seen as a major setback.

Lack of sufficient time for implementation is another factor identified under the organisational-related barriers in the literature. Many studies have identified and discussed this factor as one of the most significant barriers affecting the adoption of developed ICTs. Adane [22] argued that the lack of implementation time is one of the key reasons for the low integration of developed ICTs, which is a result of not taking time to investigate how the newly developed technology works and how it can be beneficial in both the short and the long run. Therefore, the following hypotheses were developed to effectively analyse the relationship between the organisational-related barriers:

H2a: *Unsuitability for business is positively related to advanced ICT adaptation.*

H2b: *Lack of expertise is positively related to developed ICTs.*

H2c: *Lack of funds for proper implementation is positively related to advanced ICT adaptation.*

2.4.3. Environmental Barriers

Apart from the inhibiting factors discussed above, there are some environmental-related barriers that have been identified in the literature and that are of great significance for the successful integration and use of developed ICTs, particularly amongst small business firms [32]. Many studies have identified and discussed some external-related factors inhibiting the effective implementation of newly developed technologies in the literature related to this study, which include government policies [53], cultural issues and regulatory issues [61]. The findings of most studies in the literature revealed that government policy is the most significant environmental factor affecting the successful integration of ICTs amongst the SMEs in the less developed countries. For instance, Orser et al. [39] argued that government policies are necessary to protect both buyers and sellers of goods and services online from online malpractices such as fraud and unauthorised access to personal information that could be harmful for a business.

The government, through its policies, can encourage a healthier competition in the telecommunication sector, thereby giving more Internet access to SMEs [52]. This result was echoed by Teece and Pisano [67], who concluded after conducting a study on the adoption of ICT amongst SMEs in Botswana that the lack of adequate government support was the reason for its low adoption. Dassisti et al. [43] emphasised that a lack of government support can destabilise the growth of developed ICTs in SMEs, especially when the country does not have standardised policies to regulate and allow for competition to thrive in the telecommunication industry. Agwu [30] submitted the theory that government support can help accelerate the ICT uptake amongst SMEs by encouraging a more open competition within the telecommunication sector. The lack of government support was, however, intertwined with legal and regulatory policies [27].

According to Syed et al. [12], there is a lack of legal and regulatory policies to protect the cross-border transaction surrounding the business to customers (B2Cs), particularly within and outside the geographical location of the SMEs, which has a significant effect on their growth and development. The findings presented by [53] show that the present legal and regulatory system in most developing countries does not support efficient ICT uptake because most of the businesses believe that they are not protected enough to invest in the new technologies. Olivera and Martins [53] reported that there is a need for governments to intervene at every interval by introducing new policies that will help increase the ICT uptake amongst SMEs. Also, Ali [10] commented that the lack of legal and regulatory policy, particularly around online transactions to resolve issues such as fraud, privacy and security, is a reason for the low integration and use of developed ICTs by SMEs. This was also evidenced in the work of Song [75], who stressed that the government needs to respond more rapidly by introducing and implementing new laws and regulations that would serve as a guideline to all parties involved in online transactions and protect consumers in such a way that they may feel more confident to adapt and use newly developed technologies more effectively.

The low usage of developed ICTs by consumers can be a barrier affecting its successful integration, as discussed by some scholars in the literature [4]. For instance, Adane [22] argued that the low usage of developed ICTs by consumers could be attributed to poor Internet access, which is a result of weak and inadequate ICT infrastructures, which is currently one of the biggest challenges in many developing countries when compared to the developed world. Luthra et al. [74] stressed that a weak or inadequate access to the Internet could have a significant effect on the developed ICT uptake amongst business firms within such an economy.

The cultural barriers were identified as one of the environmental-related barriers affecting the advanced ICT's adaptation and usage. This factor was discussed more extensively and indeed gained more attention in the literature related to this study. For instance, Calderia and Ward [59] submitted that the low integration of developed ICTs, particularly amongst SMEs, could be attributed to cultural factors (i.e., social and psychological) affecting the effective implementation and usage of developed ICTs in Egypt. This finding was supported by [37] and [3] from their studies of SMEs in Wales and New Zealand. Therefore, the following hypotheses were developed to effectively analyse the relationship between the environmental-related barriers:

H3a: *Low use by customers and suppliers is positively related to advanced ICT adaptation.*

H3b: *Lack of government support and policies is positively related to advanced ICT adaptation.*

H3c: *Cultural issues are positively related to advanced ICT adaptation.*

H3d: *Legal and regulatory issues are positively related to advanced ICT adaptation.*

H3e: *Lack of awareness is positively related to advanced ICT adaptation.*

H3f: *Other factors (such as issues of electricity and multiple taxation) are positively related to advanced ICT adaptation.*

3. Methodology

The data were collected from the owners/managers through a postal survey of rural SMEs in Nigeria. The survey was deployed in this way instead of using the telephone, email or online survey in order to maximise the return rate [83]. Four rural localities (Alimosho, Agege, Ojo and Badagry) were targeted (see Table 1). The period of data collection was from December 2018 to February 2019. Using a cluster sampling technique, 1200 questionnaires were equally distributed amongst each of the research participants. The area-wise cluster sampling was employed in this study. This is because the sampling strategy ensures that all the SMEs operating in the different sectors of the economy are duly represented. A systematic random sampling technique was duly observed to ensure that all the formal SMEs within these areas had equal chances of being selected. However, out of the 1200 questionnaires distributed, only 357 questionnaires were received. Of these,

only 322 questionnaires were acceptable. Due to significant numbers of missing data, 25 questionnaires were unsuitable.

Table 1. Demographic Profiles of Participants.

Particulars	Category	%	Particulars	Category	%
Gender	Male	85.09	Sector of business	Primary	31.50
	Female	14.91		Manufacturing	53.70
				Service	14.80
Area	Alimosho	23.6	Business Type	Sole trader	28.94
	Agege	28.88		Partnership	24.22
	Ojo	36.95		Family	34.78
	Badagry	10.56		Co-operative	19.88
			Private Limited	2.17	

The table above shows that of the 322 valid questionnaires, the percentage of male and female participants was 85.09% and 14.91%, respectively, which shows that the SME sector in Nigeria is still male-dominated. The percentage of SMEs that participated in the study was showcased in each sector of the economy, for instance, 31.5% of SMEs operating in the primary sector, 53.7% in the manufacturing sector and 14.8% in the service sector. The percentage of SMEs operating in different areas within the research contexts are represented as follows: 23.6% for Alimosho; 28.88% for Agege; 10.56% for Badagry and 36.96% for Ojo. The types of business were showcased as 18.94% sole traders, 24.22% partnership businesses, 34.78% family businesses, 19.88% cooperatives and 2.17% private limited companies.

All the items in the questionnaire were carefully selected from previous studies during the systematic literature review. The five-point Likert scale (wherein 1 is a low level of advanced ICT adaptation and 5 is a high level of advanced ICT adaptation) was used to determine the level of advanced ICT adaptation based on their responses on each item. The structure and wordings of the questionnaire were later finalised based on the findings of the pre-test. The pre-test was conducted amongst 10 owners of SMEs and 5 academics to verify the suitability and appropriateness of the questionnaire.

3.1. Hierarchical Reflective Model

The hierarchical reflective model was a combination of the composite and reflective measurement that was used for capturing the overall reflections that are associated with the latent variables [84]. The hierarchical model was employed because it is a non-parametric method that is suitable for analysing all the factors identified in this study [85]. It was deduced in the literature that in the reflective model, the co-variation is the measurement which is caused by different reflective variations included in the latent variable factors [86]. However, all of this was taken into consideration when conducting a thorough examination of the factors inhibiting the successful integration of developed ICTs amongst the SMEs in rural Nigeria. In the end, all the constructs of the model showcased all the three barriers (i.e., the technological-related barriers, the organisational-related barriers and the environmental-related barriers) identified in this study. One of the assumptions of a reflective construct as stated by [86] is that there must be a strong correlation between two measures in order to prove the reliability and validity of the data [87]. This finding is supported by [88], who emphasised that the reflective indicators of the latent constructs must be fully correlated. It was depicted in the diagram (i.e., Figure 2) that the reflective model in this research is a second-order reflective model. In the same vein, the first-order constructs highlighted the three key barriers (i.e., the technological-related barriers, the organisational-related barriers and the environmental-related barriers) as highlighted in the conceptual model in the previous section, while the second order includes all other related variables under each of the factors (i.e., the technological-related barriers (security issues, costs of implementation and network quality), the organisational-related barriers

(unsuitable for business, lack of expertise and lack of funds for implementation) and the environmental-related barriers (low use by customers and suppliers, lack of government support and policies, cultural-related issues, legal and regulatory issues, lack of awareness of developed ICTs and other factors such as lack of electricity and multiple taxation)).

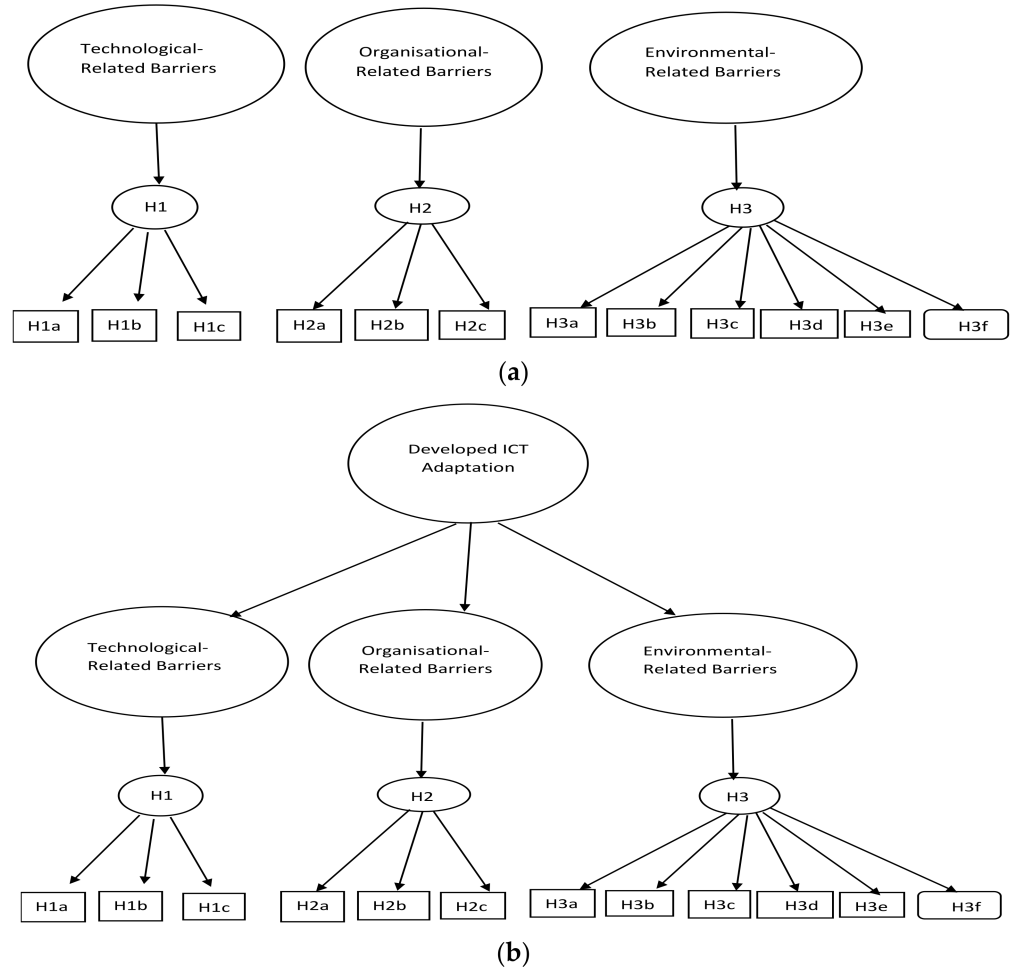


Figure 2. (a) First-Order Constructs; (b) Second-Order Constructs (Barriers affecting the adoption of Developed ICTs).

In the above Table 2, y_i represents the first order of the model, η_j represents the latent variable, Δy represents factor loadings and ϵ_i represents error term. The second equation's expression reflects the first-order of the factors (i.e., η_j) as an expression of the second order of the latent variables (i.e., ξ_k) and the error term was expressed as (ζ_j) for the first-order factor and second-order latent variables loadings (Γ). Meanwhile, it was later concluded by the researcher that the partial least square-structural equation modelling (PLS-SEM) analysis may be employed to carry out this analysis. Hair et al. [87] stressed that the partial least square-structural equation modelling (PLS-SEM) analysis is very suitable for estimating models with hierarchical constructs. Therefore, the three key barriers were examined using the higher reflective model as pointed out by [62], thereby using different indicators and dimensions throughout the analysis. The main reason for doing this was to entirely avoid all the limitations of the structural equation modelling (SEM) which revolves around the sample size and other measurements [89].

Table 2. The Equational Model.

Model	Particulars
First Order $Y_i = \Delta_y \cdot \eta_j + \varepsilon_i$	y_i = manifest variables Δ_y = loadings of first-order latent variables η_j = first-order latent variables (Technology–Organisation–Environment-related barriers) ε_i = measurement error of manifest variables
Second Order $\eta_j = \Gamma \cdot \xi_k + \zeta_j$	η_j = first-order factors (e.g., technology-related barriers) Γ = loadings of second-order latent variables ξ_k = second-order latent variables (environmental-related barriers) ζ_j = measurement error of first-order factors

3.2. Partial Least Square-Structural Equation Modelling Results

3.2.1. Scrutinising the Measurement Model

The partial least square-structural equation modelling (PLS-SEM) analysis was employed using the PLS graph 3 to carry out a relevant examination of the factors inhibiting the successful integration of developed ICTs as offered by [87] in the literature related to this study. The application of the PLS graph 3 was used to sufficiently evaluate the hierarchical model through the PLS path modelling by substantiating and validating the path weighing measures of the model under review [89]. Therefore, the non-parametric bootstrapping technique was employed to measure the presence of the error term in the estimates by efficiently scrutinising it, and thereby making 500 replications during the entire processes. In the same vein, this study adapted the application of repeated indicator approaches from the previous studies in order to estimate the higher-order latent variables in an attempt to critically analyse the significant relationship between each identified factor [90]. This process was duly observed in the analysis of the second order of the entire constructs without making any alterations to the directions of the indicators of the three factors in the first order.

During the PLS analysis, the confirmatory factor analysis (CFA) was examined to test the validity and reliability of the model as suggested by [90]. The result of the analysis shows that each of the individual items is higher than 0.7, which indicates that their level of significance is very strong, as highlighted in Table 3. Again, the composite reliability (CR), Cronbach alpha and the average variance extracted (AVE) were used to examine the reliability of the scale of measurement as pointed out by the author of [91,92]. Undoubtedly, the results showcased in Table 3 reveal that all the values for the CR and Cronbach alpha concern the three key barriers (i.e., technological-related, organisational-related and environmental-related barriers) and are significantly higher than the normal threshold of 0.7 as suggested by [88]. They therefore validate the scale of each individual item. Hypothetically, the average variance extracted (AVE) for the three key barriers is higher than the normal threshold of 0.5, which means that all the constructs possess the adequate variance, therefore making all the constructs of the model unique. Hence, the analysis confirmed the convergence validity of all the scales employed in the model assessment. However, the convergence validity is dependent on the average variant extracted (AVE) value which was more than 0.5 in this context for all the three constructs of the model, thereby showing the absolute reliability of the entire model. Interestingly, the values presented as the square root of the AVE also proves the discriminant validity of the entire construct [88].

Table 3. Psychometric properties for first-order constructs.

Constructs	Items summary	Loadings	CR	CA	rho_A	AVE
Technology (H1)	Security issues	0.869	0.890	0.815	0.817	0.731
	Cost of implementation	0.866				
	Network quality	0.828				
Organisation (H2)	Lack of expertise	0.831	0.883	0.801	0.805	0.716
	Lack of funds	0.813				
	Unsuitability for business	0.834				
Environment (H3)			0.925	0.901	0.902	0.668
	Lack of use by customers	0.829				
	Lack of government support	0.815				
	Cultural-related issues	0.849				
	Legal and regulatory issues	0.805				
	Lack of awareness	0.787				
Other factors	0.817					

3.2.2. Evaluation of Higher-Order Model

In order to determine the minimum number of items, the p -values and R-values were used as determining factors which must be greater than 0.5 to ascertain their level of significance. Therefore, the research suggests the existence of the three barriers to the implementation of developed ICTs by SMEs in rural Nigeria. Some of the identified and tested barriers include the technological-related barriers (security issues, costs of implementation and network quality), the organisational-related barriers (unsuitable for business, lack of expertise and lack of funds for implementation) and the environmental-related barriers (low use by customers and suppliers, lack of government support and policies, cultural-related issues, legal and regulatory issues, lack of awareness of developed ICTs and other factors such as lack of electricity and multiple taxation).

All the items that measure the twelve (12) variables were found to have higher loadings than 0.5, which represents these dimensions. Table 3 shows that the R-values 0.815, 0.883 and 0.925 indicate that there is a high degree of confidence in all the items identified and measured as related to the barriers inhibiting the effective implementation of developed ICTs. Hence, the table below highlights the full representation of all the twelve items.

3.2.3. Assessment of Structural Model and Hypothesis Testing

The partial least square-structural equation modelling (PLS-SEM) analysis was employed to assess the appropriateness of the questions developed to determine the barriers affecting the effective implementation and adoption of developed ICTs from the SMEs' point of view. Hence, these results will be used to identify the key barriers affecting the successful integration of developed ICTs by SMEs in the context of rural Nigeria.

As stated earlier, the smartPLS software was used to establish the appropriateness of the variables (i.e., barriers) identified for the PLS-SEM analysis using the R-values. The R-values for the barriers affecting the advanced ICT adaptation was 0.907, 0.888 and 0.963 for the technological-related barriers, organisational-related barriers and environmental-related barriers, respectively, which indicates a high level of significance, as specified by [92], as one of the conditions to consider (please see Table 4). This model is significant as the R value is well above the minimum threshold of 0.5 [88].

Table 4. Analysis of Structural Model Path Coefficients (Mean, STDEV, T-Values).

	Original Sample Coefficient	Sample Mean Coefficient	Standard Deviation (STDEV)	p Values	T Statistics
Dev. ICTs-Env.	0.981	0.981	0.003	0.000	385.812
Dev. ICTs-Org.	0.942	0.943	0.007	0.000	128.673
Dev. ICTs-Tech.	0.952	0.952	0.006	0.000	152.759

4. Discussion

4.1. Key Themes and Hypothesis Testing

The main purpose of this study is to identify the factors (i.e., barriers) affecting the successful integration of developed ICTs amongst the SMEs in rural Nigeria. Accordingly, the study therefore aimed at identifying the factors (i.e., barriers) by developing and validating a higher-order reflective model of the barriers affecting the successful integration of developed ICTs amongst the SMEs in rural Nigeria. Similarly, the partial least square-structural equation modelling (PLS-SEM) analysis was employed to carry out an assessment on the barriers in the hierarchical model which was one of the techniques that are often used to sufficiently analyse the complex relationship amongst the variable factors better than the previous research methods [43]. This model was then used to classify the 12 indicators or variables into three dimensions (i.e., the technological-related barriers, the organisational-related barriers and the environmental-related barriers). Hence, the objective of this study was to provide comprehensive insights into the factors (i.e., barriers) that are affecting the successful integration of developed ICTs amongst the SMEs. The findings are consistent with other previous studies in the literature [17–19], thereby emphasising the identification of all the barriers impeding the SMEs from adapting to the developed ICTs effectively. This paper presents the ranking of the different barriers with the application of the hierarchical reflective model which, in the long run, strengthened all the constructs of the model as suggested in the literature. However, the results of this analysis therefore show that the environmental-related barriers' score is 0.937, whereas the organisational-related barriers and the technological-related barriers' scores are 0.930 and 0.881, respectively (see Figure 3). Therefore, it can be concluded that that the environmental-related barriers (i.e., low use by customers and suppliers, lack of government support and policies, cultural-related issues, legal and regulatory issues, lack of awareness of developed ICTs and other factors such as lack of electricity and multiple taxation) which relate to all the barriers outside the firm that are more significant as the barriers affecting the successful integration of developed ICTs amongst the SMEs in rural Nigeria. To offer long-lasting solutions to this problem, the two other barriers must be given attention as the difference between them is small.

As Table 5 indicates, all the hypotheses were supported.

The findings are significant for all the stakeholders (i.e., owners of SMEs, IT professionals, ISPs providers, governments and research communities) in the developing countries and particularly in Nigeria, as the significance of advanced ICT's adaptation and usage in business cannot be over-emphasised. For instance, the government can enhance the low level of advanced ICT's adaptation and usage by formulating policies [33] that may facilitate its continuous integration within rural SMEs.

However, the integrated conceptual model could provide significant strategies towards improving the advanced ICT's adaptation and usage. For instance, the additional incentives to be given can include some financial support [6], technical support [11] and educational/training support [21]. The government of Nigeria is now allowing the importation of ICT equipment, which means that all the afore-mentioned points discussed above may help minimise the cost of acquisition and implementation [57], thereby increasing the level of Internet connectivity amongst the rural SMEs in Nigeria. In so doing, all the SMEs should be informed in order to avoid the possibilities of discouraging fair competition in the market. Therefore, the best approach was to make loans available to all the SMEs, irrespective of their locations, since most of them do not have collateral.

The findings revealed that a lack of ICT readiness affects the extent to which the government can support the rural SMEs' initiatives towards adapting and using the developed ICTs amongst the rural SMEs in Nigeria. Therefore, the Nigerian government can design a website through which it can effectively communicate with the rural SMEs, thereby encouraging them to adapt and use the developed ICTs. Apart from the website communications, the government should create a very solid awareness through effective adverts in both newspapers and online media to encourage the use of developed ICTs among Nigerian rural SMEs [2]; in this way, all the benefits of adapting and using the developed ICTs can be known to them.

The government's website design should focus on rural SMEs with a more positive drive towards encouraging them to adapt and use the developed ICTs. The government can subsidise some ICT-related programs organised by some tertiary institutions (such as conferences and seminars) to encourage the rural SMEs to fully participate in them [54]. In the same vein, all the educational institutions should be encouraged by the government to include ICT-related subjects and courses into the educational curriculum in order to facilitate the knowledge and skills required to make use of the developed ICTs, because most of the rural SMEs, as shown in the findings, are still at the early stage of ICT adoption [39]. Therefore, this study encourages a social relationship between the educational institutions and the government, thereby organising conferences and seminars on the benefits of adapting to the developed ICTs amongst rural SMEs.

The study has shown that there is a low adoption of developed ICTs amongst the rural SMEs. Therefore, governments and other stakeholders should try to encourage the integration of the latest technologies by reducing the cost of the Internet connectivity [13]. Presently, the cost of acquiring the developed ICT facilities is lesser than in recent decades [2], but the cost of operating it is on the high side [63]. Therefore, the government should subsidise the cost of connecting to the Internet, particularly for the rural SMEs. This would encourage the rural SMEs to benefit from the newly introduced fibre connectivity and the universal communication access projects. This study encourages the government to give some directories to the financial institutions within the country to facilitate the electronic-banking business where all the sellers and buyers can execute business transactions online without any fear.

The findings evidenced the differentiated drivers of the developed ICTs. As put forward by the empirical analysis in this study, the developed ICT's adaptation and usage are differently influenced by the TOE factors. Therefore, the government should design differentiated intervention strategies that may have strong implications at both the implementation and usage levels of developed ICTs. This study discourages all stakeholders, including the government, from employing the same intervention strategies for all the SMEs, as it was evidenced in some countries [29]. Therefore, the government should design differentiated intervention strategies that may fit in properly to the needs of the SMEs within the country.

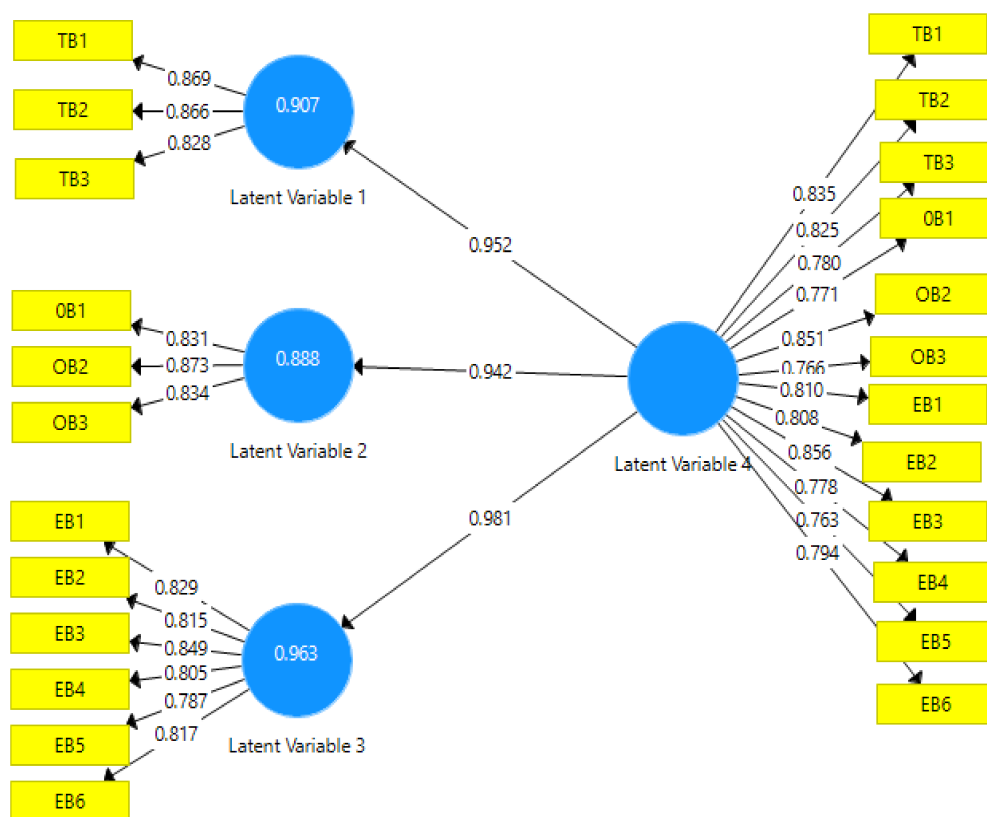


Figure 3. Main Loading of the Model of the Key Barriers Affecting the Successful integration of Developed ICTs.

Table 5. Results of the Hypotheses’ Tests.

Hypotheses	Path Coefficient	t-Value	Conclusion
H1a: Security issues is positively related to advanced ICT adaptation.	0.869	44.822	Supported
H1b: Costs of implementation is positively related to advanced ICT adaptation.	0.866	42.016	Supported
H1c: Network quality is positively related to advanced ICT adaptation.	0.828	28.192	Supported
H2a: Unsuitability for business is positively related to advanced ICT adaptation.	0.831	30.309	Supported
H2b: Lack of expertise is positively related to advanced ICT adaptation.	0.873	45.787	Supported
H2c: Lack of funds is positively related to advanced ICT adaptation.	0.834	28.927	Supported
H3a: Low use by customers is positively related to advanced ICT adaptation.	0.829	26.714	Supported
H3b: Lack of government support is positively related to advanced ICT adaptation.	0.815	23.804	Supported
H3c: Cultural issues is positively related to advanced ICT adaptation.	0.849	35.008	Supported
H3d: Legal and regulatory issues is positively related to advanced ICT adaptation.	0.805	23.486	Supported
H3e: Lack of awareness is positively related to advanced ICT adaptation.	0.787	20.807	Supported
H3f: Other factors is positively related to advanced ICT adaptation.	0.817	24.114	Supported

4.2. Technological-Related Barriers

Some of the barriers identified by the participants were classified under the technological-related factors affecting the successful adaptation to and usage of developed ICTs in Nigeria. However, the three barriers found to be significant under this group are security, costs of implementation and network quality. It was evidenced in the ICT literature that the technological-related barriers are among the major challenges affecting the successful adaptation to and usage of developed ICTs. For instance, Okundaye et al. [32] stressed that technological-related barriers are amongst other factors inhibiting the efficient adaptation to and usage of developed ICTs all over the world. It was evidenced in the literature related to this study that the non-availability of web security and online payment services in Nigeria are presently two of the greatest challenges that need to be resolved more rapidly in order to facilitate the developed ICT adaptation within the country [12]. These findings were echoed by [13], whose findings revealed that most of the SMEs in Saudi Arabia prefer to use the developed ICTs for business communication and information gathering rather than for online transactions due to a lack of security. This finding was supported by [19], who established that the security issues are one of the most significant barriers affecting the successful adaptation to and usage of developed ICTs amongst the SMEs in Eastern Europe. Similarly, Ali [10] identified the security issues as one of the major setbacks affecting the developed ICT adaptation amongst SMEs in less developed countries. Surprisingly, the findings of some studies do not align with those presented earlier.

Duan [60] stressed that security issues are not a significant barrier affecting the successful adaptation to developed ICT in Nigeria. The cost and quality of the networks is another barrier identified by the participants. Although there are many challenges confronting the rural SMEs in relation to the successful adaptation to and usage of developed ICTs in Nigeria, the quality of the Internet is still very poor, which is due to the lack of adequate ICT infrastructures [78]. According to Karim [6], most of the countries categorised as low-income countries suffer from poor ICT infrastructures. Therefore, the availability of good Internet connections may influence the decision of small business firms to swiftly adapt to the developed ICTs, but high-speed Internet would help to facilitate its efficient usage amongst SMEs, particularly those within the rural parts of the country, thereby allowing them to compete very well with other firms in local and international markets. It was established in the IMF report [21] that the liberalisation policy adapted by the Nigerian government may help strengthen the available ICT infrastructures and allow for more infrastructural facilities (e.g., the introduction of the new optic fibres or ISDN lines). This is because the lack of a good-quality network provided by the Internet service providers can result in poor Internet connectivity. For instance, the findings of the authors of [28] show that the lack of effective policy is a major setback for the growth and development of the ICT sector in Nigeria.

Again, in the literature related to this study, the cost of training the firm's employees was identified as one of the barriers affecting the efficient adaptation to and usage of developed ICTs. For instance, Jin and Hurd [27] concluded that the lack of financial investment is one of the most significant barriers affecting the developed ICT adaptation amongst SMEs in Indonesia and Sweden. Alliance [23] reached the same conclusion for the SMEs in New Zealand, and it was the same for the SMEs in Saudi Arabia [29]. From the Nigerian perspective, some authors found the cost of implementation to be one of the most significant barriers affecting the developed ICT adaptation amongst the SMEs [8,56,74]. Ongori and Migiro [93] established that the lack of bank finance was the major challenge affecting the efficient adaptation to and usage of developed ICTs by the SMEs. Surprisingly, Ndemo [11] noted that the cost of implementation is not, however, significant in the Middle East.

4.3. Organisational-Related Barriers

The research identified some barriers which are classified under the organisational-related factors. The three barriers identified were the lack of ICT knowledge and skills,

the incompatibility with the business and the lack of time for implementation. All these barriers were tested one after the other in this study, with the first one being the most significant. It was reported in the literature related to this study that most of the small business organisations are not reaping the full benefits of the developed ICTs due to their lack of ICT knowledge and skills. Saad et al. [54] posit that a lack of ICT knowledge and skills amongst the firm's employees may further affect the adoption and usage of developed ICTs. Based on the limited resources facing the SMEs, most of them cannot afford to recruit or train employees on how to use the developed ICTs, and this has negative implications for the SMEs' organisational performance, such as low productive capacities, low profits and high overhead costs [16]. There is a need for more campaigns on the importance of developed ICTs by the government and other stakeholders, as this would help create more training platforms and awareness amongst the owners of the SMEs. In essence, new training platforms must be introduced to include the development of some special sets of skills needed to effectively use the newly developed technologies. This finding echoed that of [22], who concluded that the lack of ICT knowledge and skills is one of the major setbacks affecting the successful adaptation to and usage of developed ICTs amongst SMEs in Pennsylvania, USA. Similarly, the findings of the authors in [84] reached the same conclusion for the SMEs in New Zealand. Singh et al. [81] reached the same conclusions for the SMEs in Sri Lanka, as did the authors of [18] for the SMEs in Ghana.

Awa et al. [13] stressed that regular and immediate government intervention and support would go a long way in assisting the SMEs in the implementation of developed ICTs. This finding was supported by [85], who noted that the lack of time for implementation is one of the greatest barriers affecting the successful adaptation to and usage of developed ICTs. The participants identified the non-compatibility of the developed ICTs for their business as insignificant. This is because the newly developed ICT applications could be used to streamline any business process, and that is why the top-management decisions to adapt and use the developed ICTs made such considerations irrelevant [10].

Another argument around it is that most of the rural SMEs are fully aware of all the benefits of the developed ICT, although they may not be sufficiently utilising it to its full capacity, which is one of the reasons for its low adaptation and usage as established in the literature [16]. Dahnil et al. [72] found the non-compatibility of developed ICTs as insignificant. This result was contradicted by [56], who concluded that the developed ICT is not compatible for some businesses, irrespective of the sectors.

4.4. The Environmental-Related Barriers

Most of the participants have confirmed that the lack of good government policies, the cultural problems, the legal and regulatory issues and a low customer base are some of the most significant barriers that are particular to the Nigerian context, with the first factor identified as the most important. However, it is not surprising that governments in less developed countries are duly responsible for ensuring the smooth flow of all business transactions, investment decisions and Internet-related activities. Most participants have identified the political barriers to be the most significant factor affecting the successful adaptation to and usage of the developed ICTs. The role the government plays, particularly in the provision of ICT infrastructures and embarking on some policies that would ensure that the cost of broadband and Internet services is offered at much reduced costs to all users, including the SMEs, is not so encouraging. Karim [6] argued that there are no well-structured policies in place to reduce the costs of the Internet subscriptions, coupled with the unsuccessful diffusion of the developed ICTs amongst rural SMEs in Nigeria. This is because the small business organisations, due to their limited resources, look to the government to formulate some policies that would help create more awareness on developed ICT, which would stimulate its adaptation and usage. According to Nikou and Mezei [82], most of the small business organisations, particularly those in rural Nigeria, continue to miss out on the significant opportunities related to online transactions by not

creating adapted policies and procedures to protect the transparency, privacy and security underlining such activities.

Similarly, Matarrazzo et al. [37] contends that government policy is a key determinant factor in facilitating the adaptation to and usage of developed ICTs in Sri Lanka. In the Nigerian context, Ali [10] identified the lack of government intervention and support in formulating the right policies as one of the most significant factors inhibiting the efficient adaptation to and usage of developed ICTs amongst SMEs. Again, the cultural factors were identified as significantly affecting the successful adaptation to developed ICTs by the participants. Goodman and Green, cited by the author of [27] in one of their publications, argued that cultural barriers have some considerable effect on the developed ICT adaptation in SMEs.

The cultural factor was a common determinant factor controlling the business perspectives in most developing countries. This is because people still prefer face-to-face buying and selling to online shopping, based on their own traditional beliefs. For instance, Fu et al. [63] concluded, after conducting a study on the role of the cultural acceptance of developed ICTs in the Middle East, that the cultural factor is one of the most prominent barriers affecting their efficient adaptation and usage amongst SMEs in that region. According to Ongori and Migiro [93], the cultural factor is the most significant factor inhibiting the successful adaptation to and usage of developed ICTs in most of the countries in the Arab world, due to the family and social orientation that was over-clouded by the Islamic culture and its belief system. The lack of security and ICT infrastructural facilities is identified as one of the barriers that could affect the smooth applications of developed ICTs.

Chatterjee et al. [3] argued that there is a need for security of private data and transactions such that it would give people the self-confidence they need to use online services, in order to further stimulate the developed ICT's adaptation and usage, particularly amongst rural SMEs. Indeed, most of the countries in the less developed world are challenged with a lack of developed ICT infrastructures, which is detrimental to their growth and development [81]. This finding echoes the findings of [2], who concluded that the lack of security and ICT infrastructural facilities could cause serious setbacks for SMEs in their adaptation to and usage of developed ICTs. Zhang and Li [19] stressed that, in order to facilitate the successful adaptation to and usage of developed ICTs in a culturally driven environment such as the one experienced in the Middle East region, more measures should be taken to minimise the uncertainty within such an environment. Many small business organisations, particularly in the less developed countries, refuse to change their old, traditional ways of doing business to adapt to new ways of doing business [37].

The lack of a legal and regulatory framework was identified by the participants as one of the environmental-oriented barriers affecting the successful adaptation to and usage of developed ICTs amongst the SMEs. This factor was identified as the fundamental constraint hampering the successful adaptation to and usage of developed ICTs in Nigeria, which is a result of the government's inability to introduce a new legal framework to regulate the adaptation to and usage of developed ICTs within the country. Eze et al. [17] stressed that many business organisations are still reluctant to conduct their business activities online due to the lack of a comprehensive legal framework, particularly in relation to contractual enforcement, intellectual property protection, liability, jurisdictions, privacy and security. This problem is very common in many less developed countries, and results in a low level of adaptation to and usage of developed ICTs [31]. Syed et al. [12] emphasised that, due to the lack of a good legal framework, many business organisations and their customers refuse to conduct any business transactions online.

5. Conclusions

The integration of developed ICTs in rural parts of Nigeria is still a new explorative area that is currently gaining momentum. The findings of this study show that the technological-, organisation- and environmental-related factors have significantly contributed to the determination of factors influencing the successful integration of developed

ICTs by rural SMEs in Nigeria. It was discovered that the developed ICTs uptake was majorly encouraged by the private organisations. Above all, the research study presents empirical studies about rural SMEs, advanced ICT adaptation and its usage in Nigeria.

The findings of this study give clear insights into the advanced ICT adaptation models by examining not only integration alone but also the level of usage of new technologies amongst the rural SMEs. In light of these facts, the study produces clear justifications on the diffusion of innovations within both the developed and less developed countries. In essence, this section discusses the conclusions, implications, limitations and suggestions for further research based on the research objectives stated at the very beginning of this study.

It was concluded based on the research findings that the theoretical framework guiding this study provides a good explanation for the adoption and use of developed ICTs amongst the rural SMEs in Nigeria. The findings of this study are significant to both the description and hypothesis based on the research objective addressed in this study. In the same vein, both the theoretical and empirical implications drawn from the findings of this study massively contributed to the studies on ICTs and SMEs and provides a foundation for the intervention programmes from the government and other stakeholders, thereby filling the gaps in the literature. This paper provides a step forward by providing conceptual clarity and severity on the key barriers that affect the effective implementation of developed ICTs amongst SMEs in the less developed countries.

Similar to all the empirical studies conducted in the context of developing countries in the literature; this study has some limitations. First, this study lacks a sampling framework which motivated the need to employ the snowball sampling methods which could be a source of bias in the research study. This means that the generalisations of the findings as shown throughout the study should be established with absolute care. The study was conducted in less developed countries, which means that its findings may be difficult to generalise, particularly in the context of developed countries due to contextual issues and technological differences. On the contrary, some findings can be generalised to some countries that are within the same region, particularly those in the western part of Africa (e.g., Ghana, Sierra Leone, and Togo).

The self-reporting strategies adopted wherein the participants' views, knowledge and previous learning/experience that were gathered during the interviews were considered as the only measures of assessing the level of implementation of developed ICTs amongst the rural SMEs. Consequently, the researcher interviewed only one participant per SME. Therefore, it may be very advisable for the future researchers to use other ways of measuring the level of implementation of developed ICTs, e.g., through the websites of the SMEs. This means that these websites can be used with some self-reporting strategies to confirm the information they are presented with. The research study only considered the factors affecting the successful integration of developed ICTs amongst the rural SMEs. Future researchers could consider other areas of the economy in the future.

It was suggested that future studies should be conducted on the effect of the Internet access on mobile phones in the perspective of developing countries such as Nigeria. Despite the increasing use of mobile phones to gain access to the Internet in Nigeria, it was suggested that future researchers should replicate the integrated model (i.e., the stage growth model and the TOE framework) proposed by this study to analyse the factors influencing the integration of developed ICTs and use in a diversity of contexts.

6. Theoretical Implications

This research study contributes to the latest streams of ICT research studies at every level. This study conducted a thorough analysis of the factors affecting the successful adaptation to and usage of developed ICTs. The study examined the existing relationships between the factors (i.e., barriers) inhibiting the successful adaptation to and usage of developed ICTs. It was argued that the adaptation to developed ICTs can be observed as individual ICT adoption by starting at the lowest level of the adoption ladder and progressing to more sophisticated or developed ICTs such as E-Commerce. However, the

research perspectives are quite different to previous ICT studies in the literature, which looked at singular adoptions of ICT within a particular group. This study stresses the need to examine the developed ICT usage amongst rural SMEs because the previous adoption studies, particularly in the developed countries, treated the developed ICT adaptation as a necessity at all levels.

Subsequently, based on the research methodology contributions, this study can be used as a template for other future studies because there is currently no sampling framework for SMEs in Nigeria. The findings increase the robustness of the integrated model (i.e., the stage growth model and the TOE framework). The study employed a multi-data analysis strategy to analyse data, which is not very popular amongst the previous studies in the literature. However, the systematic results present the reliability and validity of the study conducted in the context of less developed countries (LDCs). Similarly, this study further adapted multi-dimensional levels of measurement which were used to measure the levels of developed ICT adaptation by extending the commonly used measurement means to sufficiently analyse the level of developed ICT adaptation amongst SMEs in rural Nigeria. Additionally, this research study extends the level of developed ICT adaptation to email, online services, online transactions, online payments and online trading. This study extends the usage of developed ICTs to business communications, online presence and online trading. The adoption of multi-dimensional levels of measurement creates an avenue to distinguish between the reported levels of adoption and the used applications. The study demonstrates that the factors influencing the lower stage are different from the factors influencing the usage of developed ICTs at the higher stage.

6.1. Practical Implications

The practical implications could be described as the extent to which the results or research findings can be used appropriately for managerial applications. Hence, the findings of this study are very crucial not just for the rural SMEs but for other stakeholders (such as the government, ISPs, ICT professionals and financial organisations) as well.

6.1.1. Implications for Rural SMEs

The findings of this study revealed that the developed ICT is highly influenced by compatibility, the available ICT resources and competitive pressures. Therefore, in an attempt to facilitate the effectiveness and availability of such factors, this study provides more business acumen and ICT knowledge for the rural SMEs. Therefore, it was argued that the rural SME owners should effectively allocate more resources to investing in ICT programmes that could facilitate the deployment of developed ICTs into their organisational framework. This study suggests the importance of the factors influencing the developed ICT usage to rural SME owners. Similarly, the compatibility of the ICT knowledge shows that the rural SME owners need to gradually improve on the perceived relative advantage of the developed ICTs such as email services and other web technologies in their organisational framework. This study encourages the rural SME owners to attend formal or informal trainings on how to use the developed ICT applications to reduce any related ICT complications.

6.1.2. Implications for Educational Institutions and Training Communities

The empirical findings of this study show that the factors influencing the adaptation to developed ICTs and their usage involve the availability of ICT resources, top-management support, compatibility, complexity, perceived relative advantages, technical support and competitive pressure. This study suggests that unique training designs must be organised to fit the basic needs of the SMEs. Training institutions should continuously collaborate with both the government and non-governmental agencies to organise training seminars and workshops, thereby introducing some ICT developmental courses that will meet the different needs of the rural SMEs. There is a need for organised forms of education to help rural SMEs towards achieving relevant training on the use of developed ICTs. In-house training could be introduced through trade associations.

6.1.3. Implications for the Government

The findings have some great implications for the governments of developing countries, particularly in Nigeria, as the significance of the developed ICT's adaptation and usage in business cannot be overemphasised. The low level of adaptation to and usage of developed ICT amongst rural SMEs could be enhanced by providing them some incentives for adapting to it. The incentives could include all the characteristics highlighted in this study. However, the integrated conceptual model could be the best strategy towards improving the developed ICT's adaptation and usage. For instance, the additional incentives to be given could include some financial support, technical support and educational/training support. The government could make loans available to SMEs, irrespective of their location, since most of them do not have collateral. As put forward by the empirical analysis in this study, the developed ICT adoption and usage are differently influenced by the TOE factors. Therefore, the government should design differentiated intervention strategies that would have strong implications at both the adaptation and usage level of developed ICTs.

6.2. Limitations of the Study

Similar to all the empirical studies conducted in the context of developing countries in the literature, this study has some limitations. First, this study lacks a sampling framework, which motivated the need to employ snowball sampling methods, which could be a source of bias in the research study. This means that generalisation should be approached with some caution. The study was conducted in a less developed country, which means its findings will be difficult to generalise, particularly in the context of developed countries due to some contextual issues and technological differences. A self-reporting strategy was adopted wherein the participants' views, knowledge and previous learning/experience that were gathered during the interviews were considered as the only measures of assessing the level of adaptation and usage of developed ICTs amongst the rural SMEs. The researcher interviewed only one participant per SME.

6.3. Future Research

It was suggested that future studies should be conducted on the effect of Internet access on mobile phones in the perspective of developing countries such as Nigeria. In the previous section, it was established that there is an increasing rate in the use of mobile phones to gain access to the Internet in Nigeria. It was however suggested that future researchers should replicate the integrated model (i.e., the stage growth model and the TOE framework) proposed by this study to analyse the factors influencing the adaptation to developed ICTs and their usage in a diversity of contexts. Future studies could consider using other variables to examine the existing relationships between the factors influencing the adaptation to developed ICTs. Future studies could consider using other variables to examine the existing relationships between the factors influencing the integration of developed ICTs. This study has examined the rural sector of the economy, which means that other sectors can be considered as well. Therefore, future studies could compare the level of developed ICT adaptation within two different sectors (for example, the manufacturing and servicing sectors) within the country.

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