



Effect of Information and Communication Technologies (ICT) Infrastructure on SMEs Growth in Zamfara State

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Abstract

This research work aimed to investigate the effect of Information and Communication Technologies (ICT) infrastructure on SMEs Growth in Zamfara State. Specifically, the study examined the effect of internet and telecommunication technological infrastructure on SMEs Growth in Zamfara state. The study employed quantitative research approach, in particular survey research design. Sample of the study was determine using Taro Yamane formula and data was collected using 280 registered SMEs in Zamfara state Nigeria, data was analyzed using Structural equation modelling to run the primary data. PLS Algorithm and Bootstrapping was used to test both the stated hypothesis and construct quality. Findings revealed that there is a significant relationship between internet infrastructure usage and SMEs growth in Zamfara State, it was also revealed that there is a significant relationship between telecommunication infrastructure and SMEs growth in Zamfara State. It's recommended that policy makers should invest and expand broadband internet access to underserved rural areas to ensure that SMEs across Zamfara State are covered and upgrading telecommunication networks to provide better coverage, higher quality, and more reliable services throughout Zamfara State.

Keywords: Infrastructure, internet, telecommunication, SMEs and Growth.

1.1 Introduction

Small and Medium Enterprises (SMEs) are critical drivers of economic growth and development, particularly in developing regions. In Nigeria, SMEs contribute significantly to the economy by creating jobs, fostering innovation, and stimulating competition (Gherghina, Botezatu, Hosszu, & Simionescu, 2020). Zamfara State, located in the northwestern part of Nigeria, is characterized by a high concentration of SMEs, which play a pivotal role in the state's economic activities (Elijah & Usaini, 2021). However, the growth and sustainability of these enterprises are often hampered by several challenges, including inadequate of Information Communication Technology (ICT) infrastructure. Internet and telecommunication infrastructure comprises the physical access to internet, Mobile Network Coverage and Telephone lines for accessing the network coverage. The availability and quality of these infrastructures are essential for modern business operations and enhance access to global markets.

Berman, (2012) vent that digital era has transformed traditional business models, making internet and telecommunication technologies indispensable for business growth and competitiveness. For SMEs, these technologies offer numerous benefits, including: enhanced operational efficiency, market expansion, customer engagement and access to information and resources. Despite the acknowledged benefits, the state of internet and telecommunication infrastructure in Zamfara State remains underdeveloped. Many SMEs in the region face challenges such as poor internet connectivity, high costs of telecommunication services, and lack of technical skills to effectively utilize ICT. These barriers limit the potential for SMEs to fully leverage digital tools for growth and competitiveness.

1.2 Statement of the Problem

Despite the critical role of Small and Medium Enterprises (SMEs) in driving economic growth and development in Zamfara State, many of these businesses struggle to achieve sustainable growth and competitiveness (Ussif & Salifu, (2020). One of the key challenges faced by SMEs in this region is the inadequate and underdeveloped internet and telecommunication infrastructure (Gumel, 2023). This deficiency hampers their ability to leverage digital technologies for business operations, market expansion, and customer engagement. Obiakonwa, Nnabuife & Titus, (2021) states that internet and telecommunication infrastructure in Zamfara State is characterized by limited coverage, poor connectivity, and high costs. This significantly impede the efficiency and productivity of SMEs. Limited access to the internet and telecommunication facilities transform into difficulties in depresses SMEs operations in a competitive market. The problem is compounded by the rapid pace of digital transformation globally, which places SMEs in Zamfara State at a competitive disadvantage. While there have been studies on the role of ICT in business growth globally, there is a paucity of research focusing specifically on the unique challenges and opportunities in Zamfara State. This study aims to fill this gap by providing empirical data and insights into the effect of internet and telecommunication infrastructure on the growth of SMEs in Zamfara state.

This study seeks to address the following questions:

- What is the relationship between internet infrastructure and SMEs growth in Zamfara State?
- How does the telecommunication infrastructure affect SMEs growth in Zamfara State?

1.3 Objective of the study

The major objective of this study is to assess the effect of information and communication technologies infrastructure on SMEs Growth in Zamfara State. While the specific objectives are;

- To examine the relationship between internet infrastructure and SMEs growth in Zamfara State.
- To assess the effect of telecommunication infrastructure on SMEs growth in Zamfara State.

2.0 Review of literature

2.1 Information Communication Technology (ICT) infrastructure

Information communication technology refers to the use of electronic devices and software for processing, storing, transferring, and presenting information. It includes a wide range of technologies, such as computers, software applications, internet networks, as well as telephone and fax machines. Information communication technology includes computers, networks, satellite communications, mobile communications, robotics, videotext, cable television, electronic mail (email), electronic games, and automated office equipment (James & Inyang, 2023). Information communication technologies (ICTs) encompass a variety of internet-based, electronic, and digital tools, devices, systems, programs, software, and hardware aimed at enhancing user productivity (Anyadighibe et al., 2023). These technologies facilitate the creation, storage, processing, and transmission of information and communication. Since their introduction into business processes, ICTs have transformed how business organizations function and interact with their stakeholders. Their goal in corporate settings is to enhance communication, boost efficiency, increase productivity, and establish a competitive advantage (James & Inyang, 2023).

ICT infrastructure encompasses the software, hardware, network resources, and various services required for managing and operating an organization's ICT environment. It is viewed as a critical factor in enhancing an organization's competitive advantage through internet network and telecommunication (Lim and Trimi, 2014). Additionally, Kim and Lee (2011) highlighted that ICT infrastructure serves as the backbone for enterprises, enabling them to address contemporary challenges. ICT infrastructure has the ability to assist organizations by providing interconnectivity and access capabilities at any time and from any location. It provides the benefit of facilitating business collaboration and interaction through information exchange. ICT infrastructure plays a crucial role in boosting an organization's performance and is considered essential for gaining a competitive edge in the market and it equally creates numerous successful opportunities for SMEs (Arvanitis and Loukis, 2020). Therefore, ICT infrastructure is connected to an organization's performance by its effectiveness in lowering costs and delivering improved services (Li et al., 2020). According to Mwantimwa (2019), companies with robust ICT infrastructure can enhance their ability to monitor their environment and improve the efficiency of information used in decision-making in their organization, thereby increasing their chances of profitability.

2.2 Internet Network

Internet service is a critical component of modern life, providing essential connectivity that supports communication, access to information, commerce, and entertainment (Ding, Nemati, Ranaweera & Choi, 2020). As technology continues to evolve, the scope and capabilities of internet services are equally expanding, bringing new opportunities. Ensuring equitable access, robust security, and fair regulatory practices will be key to maximizing the benefits of internet services for all users. Internet services have become an indispensable part of modern business operations, offering numerous

benefits that drive efficiency, market reach, and innovation. By effectively integrating internet connectivity into their operations, businesses can enhance communication, streamline processes, and achieve competitive advantages. However, challenges such as cost, cyber security, and digital skills must be addressed to fully leverage the potential of internet services. As technology continues to evolve, the role of internet services in business will only grow, making it essential for businesses to stay adaptive and forward-thinking.

The use of internet technologies can significantly enhance the performance and competitiveness of Small and Medium-sized Enterprises (SMEs). Internet services improve customer service, reduce operational costs, and increase profits for SMEs (Alaqidi, 2022). Internet marketing enables professional service SMEs to improve their competitiveness and pursue internationalization strategies (Vrontis & Thrassou, 2008). Business networks, including personal and institutional connections, play a crucial role in supporting SMEs (Blundel & Smith, 2001). Information and Communication Technologies (ICTs) adoption is critical for SMEs to enhance their competitiveness and access international markets (Ongori & Migiro, 2010). It allows SMEs to implement effective globalization strategies, which would be otherwise impossible due to the complexity of doing business in foreign countries. Overall, the effective use of internet network services and ICTs can significantly impact SMEs' sustainability and competitiveness in the global market. Internet services allow SMEs to establish an effective inter-business collaboration; this is particularly useful for SMEs that normally lack the technical expertise to maintain online communication with their business partners but are desperately in need of establishing such expertise. With respect to the affirmation, this hypothesis will guide and shape the direction of the study.

H₀₁; There is no relationship between internet infrastructure usage and SMEs growth in Zamfara State.

2.3 Telecommunication infrastructure

Telecommunication infrastructure refers to the physical and organizational structures necessary for the operation of communication services. It encompasses a wide range of systems, technologies, and components that enable the transmission of data, voice, and video across various distances. Telecommunications infrastructure plays a crucial role in promoting economic growth and the development of small and medium enterprises (SMEs). Studies have shown a significant positive correlation between telecommunications infrastructure investment and economic growth in both developed and developing countries (Onakoya et al., 2012). Telecommunication infrastructure is essential for connecting people, businesses, and devices, facilitating communication and data exchange globally. It supports various services, from basic telephone calls to advanced internet applications, and plays a crucial role in the digital economy. However, this research is more concerned about the relevance of telephone call on business activities.

Telephone calls play a vital role in various aspects of business growth, including customer service, sales, internal communication, relationship building, and market research. They provide a personal and immediate means of communication that can enhance customer satisfaction, drive sales, and improve overall business efficiency. Telephone communication plays a significant role in business operations. Call centers are integral to many businesses, serving as sociotechnical systems where customer and employee behavior intertwine with performance measures (Gans et al., 2003). In business, telephone calls account for a substantial portion of local and international transactions, with studies showing that nearly 70% of business transactions are conducted by telephone (Bayar, Gavriletea & Păun, 2021). Micah, (2022). Theorized that GSM facilitates economic development as it provides easy and effective communication, which stimulates and promotes trade between Nigeria and its foreign partner's all over the world. These views hypothesized that;

H₀₂; There is no relationship between telecommunication infrastructure and SMEs growth in Zamfara State.

2.4 SMEs Growth

SMEs play a vital role in economic growth, but their growth is influenced by a complex interplay of factors, including access to ICT infrastructure, finance, market opportunities, innovation, and regulatory environment. SMEs play a crucial role in economic growth and development, representing a significant portion of businesses and employment in many countries (Adeosun & Shittu, 2022). Their growth can be conceptualized through stage models, which provide a framework for understanding SME development (Paul, 2020). Factors influencing SME growth include traditional aspects like firm size and age, as well as specific factors such as internal financing, business planning, and productivity (Gjini, 2023). Growth strategies can be categorized as organic or non-organic, with differences in scale of operation, firm age, founders, and product and customer structures. Digital technologies and global value chains offer new opportunities for SME growth and innovation, but many SMEs lag behind in digital adoption (Cusmano, 2018). To foster SME growth, a conducive business environment, access to entrepreneurship competencies, management skills, technology, and Information communication technology are essential (Cusmano, 2018). Understanding these factors can inform policy-making and support SME contributions to inclusive economic growth.

2.5 Theoretical review

This research work is anchored in Technophilic Theory, which posits that ICTs positively impact economic growth and development. The theory holds that in various communities and sectors of the economy, ICTs will expand productivity, improve employment opportunities, and upgrade the quality of work in many occupations. Moreover, ICTs will offer numerous opportunities for small-scale, independent, and decentralized forms of production.

Regarding developing countries like Nigeria, technophiles believe that technology will enable these nations to bypass traditional stages of development (Castells, 1999). Technophilic Theory refers to the belief in and promotion of technology as a positive force for society and future prosperity. Proponents of technophilia are enthusiastic about the potential of technology to advancement.

2.6 Empirical review

A number of related empirical literatures have probed into the subject of ICT infrastructure on enhancing the growth of SMEs.

Suleiman (2016) conducts a study on Assessment of ICT on the performance of SMEs in Ilorin, employing a cross-sectional survey research design, with A sample size of 100 SMEs was selected within the state capital using regression method to analyze the data. The result showed that there is a significant relationship between the independent variable (adoption of ICT) on dependent variable (SMEs performance) ($R = .663$, $R^2 = .440$; $P < .05$). Findings from the analysis of the data indicate that SMEs have gained a significant advantage using ICTs particularly in the areas of communication and customers' satisfaction, marketing efficiency, market penetration and promptly responding to market changes.

Charles & Frank (2012) carried out research on the impact of Information and Communication Technologies (ICT) on Small and Medium Scale Enterprises (SMEs) in the Kumasi metropolis. Adopting survey study design, engaging 40 SMEs. Using regression method of analysis and results of the study show that Most of the SMEs have reported a positive performance and other benefits by utilizing ICT in their businesses.

Diyaolu & Oso (2023) in their study titled Conceptual Model for Assessment of the Use of ICT among Small and Medium Scale Enterprises (SMEs) in Oyo State, Nigeria. with aims to propose a conceptual model for assessing the influential factors of ICT use among the SMEs. Survey approach was used in the study a total number of Seventy-three (73) SMEs operators were randomly selected as the sample size. The descriptive statistics which includes frequency counts and percentages were used to describe the sample and to assess ICT use. Regression analysis was used to assess the relationship. The findings revealed that ICT use has significant positive relationship with the constructs of the TOE Framework.

3.0 Methodology

3.1 Research Design

This study is an empirical study that engaged survey study. The population of this study constitutes one thousand two hundred and two (1202) SMEs registered with SMEDAN in Zamfara state. However, it was cumbersome and unrealistic to cover all SMEs business owners in the whole state; therefore, due to large area of this study, there is a need to select reasonable sample size which can adequately capture the views of the entire population necessary for this research work.

3.2 Sample Size and Sampling Techniques

Taro Yamani's formula was used in determining the sample size of this study.

$$n = \frac{N}{1 + Ne^2} = \frac{1202}{1 + 1202(0.005)^2} = \frac{1202}{1 + 3.005} = \frac{1202}{4.005} = 300$$

Where: n= sample size

N=Population

e =significance level

n= 300

3.3 Instruments and Method of Data Collection

Data for the study was collected through primary source. The primary data was collected using structured questionnaires that were administered to 300 registered SMEs in the study area. The choice of using the questionnaire was based on the fact that it is more convenient for the researcher and the respondent as it was administered directly through give and pick method.

A purposive sampling technique was used to select the sample, seven local government areas were purposely chosen based on the number of registered SMEs in the state. To ensure an equal chance of selection, the list was arranged in ascending order, and 45 SMEs were selected from each of the seven local government areas, this is to cover unexpected that may occur. The result of the recovery is 280 questionnaires, making 93% rate of returned.

3.4 Research model

$$SG = F(IT \& TC) \dots \dots \dots (1)$$

$$SG = \beta_0 + \beta_1 IT + \beta_2 TC + \mu \dots \dots \dots (2)$$

Were

SG= SMEs Growth

IT = Internet

TC=Telecommunication

Table 1

3.5 Construct Validity and reliability

| | Code | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|-------------------|------|------------------|-------|-----------------------|----------------------------------|
| Internet | IT | 0.869 | 0.882 | 0.911 | 0.719 |
| SMEs Growth | SG | 0.958 | 0.961 | 0.964 | 0.749 |
| Telecommunication | TC | 0.891 | 0.899 | 0.920 | 0.700 |

Source; Ringle Smart PLS 3 output 2024.

Table 1 above presents various metrics related to the reliability and validity of constructs measured in a study.

Cronbach's Alpha is a measure of internal consistency or reliability of a set of scale or test items. It indicates how closely related a set of items are as a group. Value of 0.869, 0.958 and 0.89 for Internet, Telecommunication and SMEs Growth respectively. All constructs have values well above 0.7, with SMEs Growth showing the highest internal consistency.

rho_A is a measure of internal consistency reliability, specifically a composite reliability measure. It adjusts for the potential underestimation of reliability by Cronbach's Alpha in the presence of congeneric measurements. Value of 0.882, 0.961 and 0.899 for Internet, Telecommunication and SMEs Growth respectively. rho_A values for all constructs are above 0.7, indicating strong reliability. SMEs Growth again shows the highest values.

Composite Reliability (CR) measure similar to Cronbach's Alpha but usually considered more precise, especially in the context of structural equation modeling (SEM). It assesses the overall reliability of a collection of heterogeneous but similar items. Value of 0.911, 0.964 and 0.920 for Internet, Telecommunication and SMEs Growth respectively. These values are high, showing that the construct reliably measures what it is intended to measure.

Average Variance Extracted (AVE) measures the level of variance captured by a construct versus the level due to measurement error. It is an indicator of convergent validity. Value of 0.719, 0.749 and 0.700 for Internet, Telecommunication and SMEs Growth respectively. This indicates good convergent validity, as the construct explains a significant portion of the variance in its items. All constructs have AVE values above the threshold of 0.5, indicating that the constructs explain a substantial amount of variance in their indicators.

These results suggest that the measurement model is well-specified and that the constructs are measured reliably and validly. This supports the overall credibility and robustness of the data in the study.

4.0 Data analysis

Table 2

R Square

| | R Square | R Square Adjusted |
|-------------|----------|-------------------|
| SMEs Growth | 0.906 | 0.904 |

Source; Ringle Smart PLS 3 output 2024.

Table 2 above show R Square also known as the coefficient of determination, measures the proportion of variance in the dependent variable (in this case, SMEs Growth) that can be explained by the independent variables in the model. An R Square value of 0.906 means that 90.6% of the variance in SMEs Growth can be explained by the predictors used in the model. This indicates a very strong model fit, as a high percentage of the variation in the dependent variable is accounted for by the independent variables.

Adjusted R Square adjusts the R Square value for the number of predictors in the model, providing a more accurate measure of model fit when multiple predictors are involved. It penalizes the addition of non-significant predictors to the model. An adjusted R Square value of 0.904 suggests that, after adjusting for the number of predictors, 90.4% of the variance in SMEs Growth is still explained by the model. The small difference between R Square and Adjusted R Square indicates that the model does not include many non-significant predictors, reinforcing the model's strength and validity.

These metrics suggest that the model used to predict SMEs Growth is both strong and reliable, with a very high proportion of the variance explained by the independent variables.

Table 3.

Path Coefficients

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values | Result |
|----------------------------------|---------------------|-----------------|----------------------------|--------------------------|----------|-----------------------|
| Internet->SMEs Growth | 1.193 | 1.152 | 0.172 | 6.939 | 0.000 | Reject H ₀ |
| Telecommunication -> SMEs Growth | 1.251 | 1.209 | 0.177 | 4.415 | 0.001 | Reject H ₀ |

Source; Ringle Smart PLS 3 output 2024.

Given the first null hypothesis (H₀₁) that there is no relationship between internet infrastructure usage and SMEs growth in Zamfara State. With Path Coefficient (Original Sample - O) of 1.193 post positive value indicates a positive relationship between Internet infrastructure usage and SMEs growth. Sample Mean (M) of 1.152 which is close to the original sample coefficient, suggesting consistency in the estimation. Standard Deviation (STDEV) of 0.172 indicates low variability in the estimates. T Statistics (|O/STDEV|) 6.939 of the T statistic is significantly greater than 2, which is a common threshold for significance. P Values of 0.000 with a p-value much less than 0.05 indicates strong evidence against the null hypothesis.

Given the very low p-value and high T statistic, we reject the null hypothesis. The data provides strong evidence to support the alternative hypothesis that there is a significant relationship between internet infrastructure usage and SMEs growth in Zamfara State.

Given the second null hypothesis (H₀₂) that there is no relationship between telecommunication infrastructure and SMEs growth in Zamfara State. Path Coefficient (Original Sample - O) of 1.251 show positive value that indicates a positive relationship between telecommunication infrastructure and SMEs growth. Sample Mean (M) of 1.209 that is close to the original sample coefficient, suggesting consistency in the estimation. Standard Deviation (STDEV) of 0.177 Indicates low variability in the estimates. T Statistics (|O/STDEV|) of 4.415 for the T statistic is significantly greater than 2, which is a common threshold for significance. P Values of 0.001, a p-value less than 0.05 indicates strong evidence against the null hypothesis.

Given the low p-value and high T statistic, we reject the null hypothesis. The data provides strong evidence to support the alternative hypothesis that there is a significant relationship between telecommunication infrastructure and SMEs growth in Zamfara State.

4.2 Discussion of Findings

Based on the first data analysis result of low p-value and high T statistic, we reject the null hypothesis. The data provides strong evidence to support the alternative hypothesis that there is a significant relationship between internet infrastructure usage and SMEs growth in Zamfara State. This study is in line with the study of Sani, Khan, & Noor, (2019), Shaibume, Unande, & Apinega (2021) and Ladan, (2016). They are of view that internet infrastructure creates a leverage for SMEs growth at all level and this enhance SMEs dispersal in the state.

On the second data analysis with low p-value and high T statistic, we reject the null hypothesis. The data provides strong evidence to support the alternative hypothesis that there is a significant relationship between telecommunication infrastructure and SMEs growth in Zamfara State. This result is similar to the study of Shaibume, Unande & Apinega (2021) and Ebitu, Glory & Alfred, (2016). This posited that telecommunications instruments like telephone hand set have enhance business activities in so many ways, the simplicity in its operation and manipulations enable its usefulness in the society.

5.1 Conclusion

Based on the analysis of the data regarding the relationship between internet and telecommunication infrastructure and SMEs growth in Zamfara State, the study arrives at the following conclusions:

Internet Infrastructure and SMEs Growth. The study found a strong positive relationship between internet infrastructure usage and SMEs growth, with a path coefficient of 1.193, T statistic of 6.939 and a p-value of 0.000 provide strong evidence that this relationship is statistically significant. Therefore, an investment in internet infrastructure is likely to significantly enhance the growth of SMEs in Zamfara State.

Telecommunication Infrastructure and SMEs Growth: The study also identified a strong positive relationship between telecommunication infrastructure and SMEs growth, with a path coefficient of 1.251, T statistic of 4.415 and a p-value of 0.001 indicate that this relationship is statistically significant. Therefore, enhancing telecommunication infrastructure will likely have a substantial positive impact on the growth of SMEs in Zamfara State. The study provides robust evidence that both internet and telecommunication infrastructures are crucial determinants of SMEs growth in Zamfara State.

These findings underscore the transformative potential of digital infrastructure in driving economic growth and development in Zamfara State. By focusing on these key areas, policymakers and stakeholders can create an enabling environment for SMEs to thrive, contributing to broader economic development goals.

5.2 Recommendation

Given the significant positive relationships between internet and telecommunication infrastructure and SMEs growth in Zamfara State, the following recommendations are proposed for the policy maker:

1. **Enhance Internet Infrastructure:** Investing and expanding broadband internet access to underserved and rural areas to ensure that SMEs across Zamfara State can benefit from improved internet connectivity. Upgrading the existing internet infrastructure to provide higher speeds and more reliable connections, which are crucial for efficient business operations. Moreover, offering subsidies or incentives to SMEs to reduce the cost of internet services, making them more affordable and accessible.
2. **Improve Telecommunication Services:** Investing and upgrading telecommunication networks to provide better coverage, higher quality, and more reliable services throughout Zamfara State. Encourage the expansion of mobile network coverage, particularly in rural and remote areas, to ensure that all SMEs have access to essential communication services. Work with telecommunication providers to develop affordable plans tailored to the needs of SMEs, ensuring they have access to necessary services at reasonable costs.

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