

KNOWLEDGE COMPLEXITY AND COST EFFECTIVENESS OF TECHNOLOGY ADOPTION ON SMEs PERFORMANCE IN SELECTED LOCAL GOVERNMENT AREAS OF PLATEAU STATE

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Abstract

This study examined the effects of knowledge complexity and cost effectiveness on performance of Small and Medium Enterprises (SMEs) in selected local government areas, of Plateau State. 448 registered small and medium enterprises situated in Jos South and Pankshin Local Government Areas were used in this study. Multiple Linear Regression approach was used to determine the effect of knowledge complexity and cost effectiveness on SMEs Performance in Jos South and Pankshin Local Government Areas of Plateau State. The result revealed that knowledge complexity does not significantly affect the performance of SMEs in Jos South/Pankshin Local Government Areas; however, increased cost-effectiveness of technology adoption significantly impacts on the performance of SMEs in Jos South/Pankshin Local Government Areas. The study

concludes that some of the SMEs have not fully embraced technology in terms of Knowledge Complexity but they have to some extent adopted its cost effectiveness. This study recommended among other things that every SMEs in the two LGAs must engage themselves in different aspects of technology and should not be limited in just one aspect. Engaging in different aspects will improve skills, and expertise required for the successful adoption and integration of new technologies within SMEs. The ability of SMEs to effectively manage and navigate knowledge complexity will be essential for the successful implementation of technology adoption strategies.

Keywords: Knowledge complexity, Cost Effectiveness of Adoption, Technology Adoption, Performance of SMEs

Introduction

Small and Medium Enterprises (SMEs) are businesses that have a limited number of employees and certain level of annual turnover. SMEs vary according to country and industry, but they are characterised by some key features: smaller number of employees and a lower turnover compared to large enterprises. The ownership and management is carried out by individuals and decisions are flexible and adaptable as it allows them to innovate and adapt quickly.

SMEs make significant contributions to the global economy by providing diverse range of goods and services. They account for a significant proportion of businesses and contribute substantially to GDP. In most emerging countries, small and medium-sized businesses are one of the key contributors to economic growth (Mazanai & Fatoki 2011).

Elegunde et al. (2023) opine that the majority of enterprises in most economies form the basis of a nation's economy and often have the highest potential for job growth. They suggest that SMEs contribute to economies worldwide, by accounting for 50% of employment worldwide which highlights the need for SMEs to receive

more attention on a global scale. In Nigeria, SMEs have provided around 7.64% of the country's total exports, 76% of all jobs, and 49.79% of the country's GDP (National Survey of SMEs, 2021). However, SMEs often face numerous challenges that hinder their performance and ability to compete favourably in the areas of lack of expertise. Also complex technology may be perceived as not useful as well as limited resources where SMEs may not see the value in investing in technologies. Some critical factors that are very beneficial and can significantly influence SME performance are knowledge complexity and cost effectiveness.

Several researches have been carried out on knowledge complexity, cost effectiveness, technology adoption, performance of SMEs, but none has been carried out on the effect of knowledge complexity and cost effectiveness of technology adoption on the performance of SMEs in Jos South and Pankshin local government of Plateau State and this research fills the gap.

Knowledge complexity refers to the intricacy and depth of understandings required to operate and innovate within a particular industry or market (Davies & Sumara, 2006). As industries evolve and technologies advance, SMEs must adapt and acquire new knowledge to remain viable in the market. Knowledge complexity often involves the need for a deep understanding of underlying principles, theories, and concepts within a given field (Davis & Sumara, 2006). This requires more than just a mere surface level knowledge or familiarity of

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the technology involved or to be adopted but rather a comprehensive grasp of the subject matter of the technology. Knowledge complexity may also stem from the dynamic nature of certain fields, new discoveries, among others, that reshape the understanding (Davis & Sumara, 2006). However, the acquisition and application of complex knowledge can be a daunting task for SMEs, especially when it comes to meeting up with the competitive edge.

Cost effectiveness is also critical for Small and Medium Enterprises, as they often operate on thin profit margins and have limited financial resources. SMEs must know how to weigh the need to invest in knowledge acquisition, innovation, and growth with the need to maintain cost effectiveness and ensure financial sustainability. The task for SMEs is to be able to point out and implement cost effective strategies that enable them to purchase and apply complex knowledge without compromising their financial stability.

The local government areas (LGAs) in Nigeria and especially in Plateau State provide a unique context for examining the impact of knowledge complexity and cost effectiveness on SME performance. The local government areas are crucial focal points for SME activity, with many business owners transacting within these areas. However, SMEs in local government areas often face significant challenges including financial issues, inadequate infrastructure and intense competition. It is against this backdrop, that this study aims to investigate the impact of knowledge complexity and cost effectiveness of technology adoption on the performance of SMEs in selected local government areas of Plateau State.

Literature Review

Conceptual Clarification Performance Of Small And Medium Enterprises' (SMEs)

The performance of SMEs refers to the outcome of firms' business activities (Kotane & Kuzimina – Merlino, 2017). Yildiz et al. (2014) suggest that the performance of an SME is the extent to which the target task of the enterprise was accomplished in comparison to the final output at the end of a business period. Performance of SMEs means that a firm has evaluated its work, finished and has measured its competitiveness. Yucesoy and Barabasi (2016) refer to the performance of SMEs as the totality of objectively measurable achievements in a certain domain of activity. The performance of an SME can be measured quantitatively or qualitatively.

The performance of small and medium-sized business (SMEs) is a complex term that includes a range of other factors, such as market competitiveness,

operational effectiveness, financial performance, and sustainability.

Technology Adoption

Wahab, Rose, and Osman (2012) define the phrase 'technology adoption' as having multiple meanings and concepts. Adopting new technologies into an organisation is referred to as technical innovation, according to Tornatzky & Fleischer (1990). They define it as “the situationally new developments and introduction of knowledge derived tools, artefacts, devices by which people extend and interact with their environment.” Technology adoption is the process by which people and organisations accept and use new technologies. It involves learning and adapting to new technologies.

Technology Adoption refers to the process by which individuals, organisations, or societies accept and integrate new technologies into their daily lives, workflows, or operations.

Knowledge Complexity

Knowledge Complexity refers to the intricacy and depth of information within a particular domain or field of study (Davis and Sumara, 2006). Knowledge complexity also refers to the intricate and multifaceted nature of technological information, skills, and expertise required for the successful adoption and utilisation of new technologies that include tacitness, specialisation and interconnectedness (Damanpour, 1991). The ability of SMEs to effectively manage and navigate knowledge complexity is essential for the successful implementation of technology adoption strategies (Makkonen, Olkkonen, & Inkinen, 2007). The level of knowledge complexity within SMEs influences the decision-making process, resource allocation, and organisational capacity to adapt to technological changes (Simpson, Docherty, & Hill, 2004).

It encompasses various aspects such as the depth of understanding required, the interconnectedness of concepts, the degree of uncertainty or ambiguity present, and the level of abstraction involved. The depth of understanding involves the need for a deeper understanding of underlying principles, theories, and concepts within a given field (Davis & Sumara, 2006). This requires more than just surface level familiarity but rather a comprehensive grasp of the subject matter or the technology involved. Davis and Sumara (2006) in addition stress that highly abstract concepts may require significant cognitive effort to comprehend and apply, particularly for individuals who are not deeply immersed in the domain. Li et al (2021) suggest that higher complexity can be a barrier to technology adoption,

potentially due to the difficulty in understanding and managing the technology. This complexity he noted can hinder the translation of new technologies into usable products and services.

Cost Effective Of Technology Adoption

Cost effectiveness denotes the relative costs of achieving per unit of outcomes, and can be calculated by dividing the cost by the benefits (UNEP, 2019). Cost Effectiveness is the efficiency with which resources—such as time, money, or effort—are used to accomplish desired results or advantage (Drummond et al., 2015). Evaluating the financial viability and return on investment of implementing and adopting new technology is a component of cost effectiveness consideration in the context of technology adoption. Small and medium-sized businesses, as well as individuals, evaluate the cost-effectiveness of adopting new technologies by taking into account many aspects, including the initial cost of acquisition, continuing maintenance and support costs, possible increases in productivity, and long-term advantages or savings.

A technology that offers substantial benefits relative to its costs is more likely to be perceived as cost effective and therefore more attractive for adoption. Cost effectiveness involves evaluating the economic feasibility associated with adopting the technology.

Theoretical Review

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was proposed in 1989 by Fred Davis as a way to predict how likely people are to adopt new technologies. TAM is a theoretical model that explains how users form attitudes and intentions towards using a new technology. The model is based on the theory of reasoned action and the theory of planned behaviour. The model suggests that people's intentions to use new technology are influenced by their perceptions of how easy it is to use a technology and how useful a technology is. TAM emphasises that users perceptions are key, not the creator's beliefs about the technology. The model suggests that technology adoption is a three-stage process. It implies that if an application is expected to be easy to use, the more likely it is that it will be considered useful for the user and the more likely that this will stimulate the acceptance of the technology (Davis, 1989; Davis, 1993; Araujo, 2020). TAM can be used to predict how likely people adopt new technologies in a group or organisation. The model can be used to understand also, why people accept or reject new technologies.

A critical assumption of the Technology Acceptance

Model (TAM) is that its belief constructs—perceived ease of use (PEOU) and perceived Usefulness (PU), which fully mediate the influence of external variables on technology.

The Technology Acceptance Model (TAM) is highly relevant to this study because it helps explain how SMEs form attitudes and intentions towards adopting new technologies, which is crucial for understanding the impact of knowledge complexity on technology adoption. SMEs may perceive technologies as useful if it provides solutions to their business problems, which can positively influence their adoption's intentions. TAM can also help explain how technology adoption influences SMEs' performance, including their financial, operational and competitive performance.

Diffusion Of Innovation Theory

Diffusion of innovation theory developed by Everett Rogers in 1962 is the process by which innovations spread over time among members of a social system through specific routes (Rogers, 2003). Oliveira and Martins (2011), states that the diffusion of innovation theory explains the how, why, and the rate at which new concepts and technological adoptions permeate cultures at the individual and corporate levels. Rogers (2003) uses the terms 'technology' and 'innovation' interchangeably (Sahin, 2006). Diffusion of innovations attempt to explain how a population embraces innovation. Furthermore, Rogers (2003) suggests five characteristics that influence an innovation's ability to propagate successfully: comparative advantage, accordance with accepted norms and values, simplicity and usability, trial proficiency and measurable outcomes since each person has a different level of desire to accept innovation. It is often observed that over time, the percentage of the population that adopts an innovation assumes a normal distribution (Rogers, 2003). This normal distribution can be split into the following groups: innovators, early adopters, early majority, late majority, laggards, to create a category of individual innovativeness spanning from earliest to latest adopters (Rogers, 2003). The theory is crucial in understanding the cost effectiveness of technology adoption and performance of SMEs and by applying the DOI theory, SMEs can make informed decisions about technology adoption, reduce costs, and improve performance.

EMPIRICAL REVIEW

Muslichah, Wiyarni and Nursasi (2019) investigated knowledge complexity on performance of small and medium-sized enterprises. A questionnaire survey was employed in the study to gather information from a few

SME owners. Quota sampling method was employed. This study was carried out in four Indonesian cities in the province of East Java. Thirty SME owners were selected as responses to be part of the program in each of these cities. In this survey, a total of one hundred and twenty (120) owners of SMEs took part. The findings suggest that knowledge complexity can influence SMEs' intention to prepare integrated reports, which in turn impacts their overall performance. They found that SMEs which proactively acquire new knowledge share knowledge with employees, and utilise knowledge effectively tend to have higher performance and greater market share. The result is positive and significant.

Rosulj, Petrovic & Arsic (2024) explored knowledge complexity and the performance of small and medium enterprises (SMEs) in Serbian. The study included a sample of 370 companies, conducted during the period of the initial 6 month of 2023. A theoretical research was provided by different experts, followed by a quantitative analysis performed through principal component analysis (PCA). Findings suggest that SMEs enhance their performance by focusing on interactions between strategic, managerial and operational aspects of knowledge complexity that have a positive influence on SMEs performance. The research is positive and significant.

Audretsch and Belitski (2021) investigated knowledge complexity and the performance of SMEs. Primary data was gathered between 2012 and 2015 and between 2010 and 2020 from 102 European small and medium-sized enterprises (SMEs) in Belgium, Bulgaria, Denmark, Spain, and the United Kingdom (UK). The analysis of linear regression was applied. The results showed that SMEs' adaptability and resilience are crucial for maximizing the impact of knowledge on SMEs' performance. It was found that resilience and agility in SMEs are important to leverage the effect of knowledge complexity on firm performance. The outcome is positive and significant.

Khoirina and Sisprasodjo (2018) investigated cost effectiveness of technology adoption and SMEs' performance. The research methodology is quantitative in nature. Data was gathered using an incidental sampling strategy and an online and offline survey questionnaire from 265 Indonesian housewives who sell online. Statistical analyses were conducted. To test the theories, structural equation modeling, was employed. The research found that cost effectiveness has a strong positive impact on the use of Instagram. The research is positive and significant.

Yulisa, Utama and Ruslim (2021) examined cost effectiveness of technology adoption and the

performance of SMEs. 65 respondents who operate small and medium-sized culinary businesses in southern Jakarta, Indonesia, made up the study's sample. Purposive sampling, was the method of sampling that was employed. A Likert scale was used in this study to measure the replies of the respondents. The findings showed that cost effectiveness of technology does not influence the social media consumption and usage. The outcome was unfavourable and insignificant

Luthen and Soelaiman (2021) investigated cost effectiveness and small and medium-sized enterprises performance. One hundred SMEs using TikTok in Jakarta served as the study's sample. Purposive sampling, which is based on predetermined criteria, was the sampling technique used in this study to obtain the relevant data that the research required. Smart PLS was used to process the data. The findings demonstrated that cost effectiveness of technology have a positive and significant effect on the use of TikTok. The use of TikTok has a positive and significant effect on SMEs performance. The outcome was significant and positive.

Soelaiman, Herwindati and Payangan (2023) investigated cost effectiveness and the performance of SMEs. Purposive sampling was used to pick the 200 SMEs that made up the sample. Data was analysed using Partial Least Squares Multi-group Analysis (PLS-MGA). The study discovered that cost effectiveness had a positive impact on the performance of SMEs. The finding was positive and significant.

Research Gaps

Despite the growing body of research on technology adoption and SME performance, there is a notable gap in understanding the interplay between knowledge complexity and cost-effective in the context of technology adoption among SMEs. Specifically, few studies have explored how knowledge complexity influences the cost effectiveness of technology adoption and its subsequent impact on the performance of SMEs. Furthermore, existing research often focuses on large enterprises or specific industries, leaving a knowledge gap regarding the unique challenges and opportunities faced by SMEs in diverse sectors. This study aims to address this research gap by investigating the relationship between knowledge complexity, cost effectiveness and the performance of SMEs, providing insights that can inform strategies for SMEs to leverage technology adoption for improved performance.

Methodology

This study applied the quantitative research design, which is particularly suitable in survey researches. The

target population of the study is estimated at 448 of chief executives of SMEs (PLASMEDA, 2021). The simple random technique was adopted in this study, in which SMEs within Jos South and Pankshin Local Government Areas were qualified to respond to the questionnaire.

The primary data used in this study are from the questionnaires and the secondary sources of data are from academic journals, articles, magazines, reports, textbooks, online databases, government statistics, industry associations, research institutions, research papers, systematic reviews, among others.

A five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree), was used to organise the questions. Hence, the purpose of the questionnaire was to gather data on the problem-related dependent and independent variables. The reliability of the items in the instrument was established using Cronbach's Alpha.

The Multiple Linear Regression approach was used in this study to ascertain how knowledge complexity and cost effectiveness of technology adoption affects the performance of SMEs in Jos South and Pankshin Local Government Areas of Plateau State.

Model Specification

The multiple regression equation is stated thus:

$$SP_i = \beta_0 + \beta_1 KnC_i + \beta_2 CoT_i + \varepsilon_i$$

Where; SP = the dependent variable (SMEs Performance), β_0 = Constant or intercept, β_{1i} , and β_{2i} = Coefficients of the independent variables, KnC_i = the independent variable (knowledge complexity), CoT_i = the independent variable (cost effectiveness of technology adoption), ε_i = Error term

Results and Discussion of Findings

Four hundred and Forty-Eight copies of questionnaire were distributed but only Two hundred and Twenty-One (221) copies of the questionnaire were retrieved giving a sample response rate of 61.56%. The Cronbach Alpha was calculated using the SPSS software and the values for each construct were 0.930, 0.947, and 0.948. This suggests that the instrument is dependable and reliable. The correlation matrix in Table 1 shows that there are no variables that have excessive correlations between them, since the coefficient values do not have a value of 0.9.

SMEsP	KnC	CoT
SMEsP		
KnC	.602**	
CoT	.730**	.648**

Source: SPSS 26.0

Table 1 showed the result of the correlation coefficients for the dependent and independent variables, all of the variables and SMEs Performance (SMEsP) are positively correlated. KnC, and CoT, were found to correlate, respectively, with SMEs Performance (SMEsP) by 60.2%, and 73.0%.

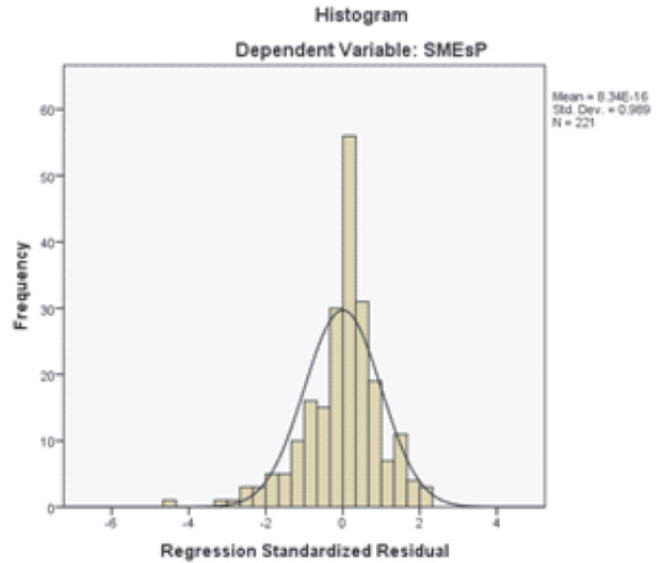


Figure 1: Normality Test

Normality test which is one of the assumptions of the linear regression model must be achieved. Given that the histogram diagram is symmetrical, that is the skewness of the diagram is equal on both the left and on the right, it is concluded that the normality assumption is achieved.

Table 2: Regression Result

Variable	Coefficient	Standard Devia	T-test	P-value
Constant	0.163	0.207	0.786	0.432
Knowledge Complexity (KnC)	0.019	0.069	0.270	0.788
Cost Effectiveness of technology adoption (CoT)	0.305	0.072	4.231	0.000**
R ²	0.673			
F-Test	88.376			0.000**
Df=	219			

Dependent variable: **SMEs Performance (PER)** * ** *** 1%, 5% and 10%
Source: SPSS version 26.0

The coefficient of determination, $R^2 = 0.673$, indicates that 67.3% of the variation in SMEs performance (PER) can be attributed to changes in Knowledge Complexity (KnC), and cost effectiveness (CoT). The regression

model was found to be of good-fit, given that the F-statistic's p-value of 0.000.

As can be seen in Table 2, the standardised regression result for Knowledge Complexity (KnC) on the performance of SMEs (PER) is 0.019, with a p-value of 0.788 at 5% level of significance. This indicates that KnC has an insignificant positive impact on SMEs' PER. It can be inferred that in spite of the use of Knowledge Complexity technology, these SMEs' performance improved, though not at a noteworthy pace.

This result conflicts with the findings of Audretsch and Belitki's (2021) investigation of the relationship between knowledge complexity and the performance of SMEs in Europe. The results showed that SMEs' adaptability and resilience are crucial for maximising the impact of knowledge on their performance. The outcome is noteworthy and favourable. On the contrary, the result agreed with the study of Muslichah, Wiyarni, and Nursasi (2019) who investigated the influence of knowledge on Small and Medium Enterprises. The results indicated that knowledge does not affect the intention to prepare integrated reporting.

The standardised regression result for the Cost Effectiveness of technology adoption on the performance of SMEs (PER) is 0.305 with a p-value of 0.000, as indicated in Table 2. This indicates that cost effectiveness has a substantial and positive impact on the performance of SMEs (PER). It can be inferred that SMEs' performance increased significantly as a result of applying technology cost effectiveness, rising to 30.5% when cost effectiveness increased by 1%. This is in line with a study by Khoirina and Sisprasodjo (2018) and Luthen and Soelaiman (2021). On the contrary the findings of this study failed to agree with that of Yulisa, Utama, and Ruslim's (2021).

Conclusion and Recommendations

This study examined the effect of knowledge complexity and cost effectiveness on the performance of small and medium-sized businesses in the Plateau State LGAs of Jos South and Pankshin. The findings indicated that the knowledge complexity has not affected the performance of small and medium-sized businesses in the Plateau State's Jos South and Pankshin LGAs. But cost effectiveness significantly influenced performance of SMEs. This study recommends that there is need for every SMEs in the two LGAs to engage themselves in technology adoption strategies. Engaging technology will improve skills, and expertise required for the successful adoption and integration of new technologies within SMEs. The ability of SMEs to effectively manage and navigate knowledge complexity will be essential for

the successful implementation of technology adoption strategies.

Contribution to Knowledge

This study has significantly advanced information in a number of ways about the use of technology and the performance of small and medium-sized enterprises in Jos South and Pankshin LGAs of Plateau State. Theoretically, the study approach and subsequent findings would be sufficient to direct future studies in the area of practicability. The findings of the research will be beneficial to the public and the government at large by developing guidelines that will help providers, in delivering appropriate technology adoption measures that will appeal to SMEs consumers. In the areas of policymaking, understanding of technology adoption will aid policy makers to work out better policies that will help improve the performance of SMEs.

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