



RESEARCH ARTICLE

Effect of technological innovation capabilities on the performance of selected manufacturing small and medium enterprises in Lagos State [version 1; peer review: 1 approved with reservations, 1 not approved]

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Abstract

Background: The issue of technological adoption and innovation in businesses as always been a big problem to organizations, especially manufacturing small and medium enterprises (SMEs) in Lagos state, Nigeria. The emphasis has therefore always been on how to adopt new technologies and innovations in improving and scaling profit or the profitability heights in businesses or SMEs.

Methods: The main purpose of this research work is to have an understanding of the effect of technological innovation capabilities on the performance of selected manufacturing SMEs in Lagos State. This research work made use of a descriptive and causal research design as well as survey methods to examine whether technological learning capability affects the profitability of selected manufacturing SMEs in Lagos State and to determine whether resource allocation capability promotes sales growth amongst these manufacturing SMEs.

Results: Findings showed that research and development capability have a significant impact on the value creation of selected manufacturing SMEs in Lagos. The research concluded that technological innovation capabilities have a positive impact on the performance of selected manufacturing SMEs in Lagos. In addition, the study recommended that manufacturing SMEs in Lagos, Nigeria, Africa and the globe should implement technological learning and the use of technology in their production process. Lastly, this research recommended that future research should focus on SMEs in other geopolitical zones or states.

Keywords

Technological Innovation Capabilities, Performance, Profitability, Research and Development Capability, SMEs

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Introduction

Internationally small and medium enterprises (SMEs) comprise the most significant level of job opportunities and national efficiency. SMEs' sustainability and efficiency rely on technological innovation to meet up in this international business stage. The [International Labor Organization \(1999\)](#) stated that SMEs have a labor force of 11 to 50 individuals. For businesses to thrive, it has to be innovative when it comes to technology. Over the past decade, technological innovation has been seen as a causative feature of job loss. Big hopes are currently linked to technological innovation as a significant factor for a country's development and growth, and policymakers view this.

[MacKenzie and Wajcman \(1985\)](#) gave their definition of technology as the mix of an actual item or artifacts, the method of producing the objects, and the significance of the tangible item. In explaining the word technology, every one of the three components should be perceived as being associated together. An adjustment in one part will influence the other portions. It is the information, measure, devices, techniques, and frameworks utilized in producing products and improved services. Lastly, technology is a process needed to accomplish a specific production outcome from certain methods of joining or handling chosen inputs that incorporate manufacturing measures within business designs, executives' procedures, and practices of money management or any of its selection ([Maskus, 2003](#)).

Technological innovation capabilities (TIC) can be defined as the ability and creativity to meet business openings, societal issues, and ecological difficulties. It is a vital aspect of the production industry's central intensity, and central intensity plays a part in encouraging TIC.

The execution of TIC in selected SMEs in Lagos State is essential for Nigeria's financial growth ([Rahayu & Day, 2017](#); [Yunis et al., 2017](#)). Owners of SMEs in Lagos State use technological innovation to have an edge in the international market ([Rahayu & Day, 2017](#); [Tob-Ogu et al., 2018](#); [Zafar & Mustafa, 2017](#)).

Regardless of the development of technology in SMEs in Nigeria, technological innovation capabilities in SMEs in Lagos is very low ([Napitupulu et al., 2018](#); [Rahayu & Day, 2017](#)). The tiny technological innovation capability level by SME owners in Lagos has resulted in low economic growth in Nigeria ([Jones et al., 2014](#); [Rahayu & Day, 2017](#); [Tob-Ogu et al., 2018](#); [Zafar & Mustafa, 2017](#)).

SMEs are an essential piece of development and advancement in an ever-changing economy, so, therefore, they have an integral part to play in employment creation ([Obi, Ibidunni, Tolulope, Olokundun, Amaihian, Borishade & Fred, 2018](#)). In advanced nations like the US and UK, SMEs represent 99% of business owners and offer more than 50% of the nation's gross domestic product (GDP) ([Gbandi & Amissah, 2014](#); [Tobora, 2014](#)). For instance, Ghana's SMEs added about 70% to its GDP and recorded roughly 92% of industries ([Zafar & Mustafa, 2017](#)). In contrast, SMEs in Nigeria had 90% of enterprises and added as little as 10% to its GDP ([Gbandi & Amissah, 2014](#)).

The increase in technological innovation acceptance in Lagos' medium-scale enterprises has been tremendous ([Niebel, 2018](#); [Rahayu & Day, 2017](#)). Nonetheless, the technological innovation acceptance rate among small-scale businesses outside Lagos is generally low ([Yunis et al., 2017](#); [Rahayu & Day, 2017](#)). Technological innovation capabilities have enhanced how companies perform, which has given businesses an edge inside the country ([Niebel, 2018](#)). The desire to be successful internationally and the need for triggering progress are convincing reasons why SME owners in Lagos ought to embrace technological innovation ([Niebel, 2018](#); [Rahayu & Day, 2017](#); [Yunis et al., 2017](#)).

According to [Akande and Yinus \(2013\)](#), the effect of TIC on selected manufacturing SMEs' activity execution in Lagos has not been significantly investigated as documents are used to store information and keep records.

Lastly, by doing business with selected manufacturing SMEs in Lagos, big organizations can build up another client base that may not be open to conventional delivery systems. Therefore, SMEs are a dependable means of supply and have a comprehension of the process of acquisition. Therefore, the research objectives are:

- I. Determine whether technological learning capability affects the profitability of selected manufacturing SMES in Lagos State.
- II. To examine if research and development capability promotes value creation of selected manufacturing SMES in Lagos.
- III. Determine whether resource allocation capability promotes sales growth amongst selected manufacturing SMES in Lagos.

- IV. To examine if manufacturing capability results in the reputation of selected manufacturing SMEs in Lagos State.

Literature review

Innovation is a process that integrates economics, management, science and technology in other to achieve innovativeness and increase in the rise of ideas, manufacturing and commercialization (Drucker, 2021). It is viewed as the financial impact of technological change and the utilization of current mix of ready-made production in solving business issues.

Singh and Aggarwal (2021) stated that innovation involves the creation of novel ideas, processes and products, that leads to a constant change in growth and job creation for a nation's economy as well as the generation of profits for innovative companies.

Bhatti, Santoro, Khan and Rizzato (2021) argued that innovation is the knowledge implemented in processes, products and services. They categorize innovation based on technology and organizational features.

Also, Bhatti, Santoro, Sarwar and Pellicelli (2021) see innovation as the means of changing opportunities into new ideas and putting them into practice. Another definition for innovation is that it is a new concept, activity, or object experienced by people or other unit of adoption (Iranmanesh *et al.*, 2020). Wibawa, Widjanarko, Utomo, Suratna and Wahyurini (2020) believe that innovation is defined as the development of a new or improved product, process or service for businesses.

According to Afuah (2020), innovation is defined as the application of modern technological and organizational information and skills in providing new products and services to clients. Mazarrol and Reboud (2020) claimed that innovation involves several dimensions, and they discovered that earlier research on innovation diffusion and adoption indicates multiple characteristics of innovation.

Innovation is defined as the creation of up-to-date concepts and the application of modern goods, methods and services, resulting in the constant change of a countries growth, and companies profit making. It is a once and for all occurrence, but also a protracted and accumulative process involving large amounts of managerial decision-making process, spanning the creation of fresh ideas and execution. innovation is the act of changing an existing thing by introducing a new thing which can be radical and progressive and may be used in every company's product, methods and services.

Marlerba and McKelvey (2020) defined innovation as a tool used by business owners to take advantage of change as an opportunity, and to start new firms or provide new services. It is able to be portrayed as a discipline, which can be learnt and practiced. The use of tools and procedures that changes processes, goods and services, which brings about a new thing for businesses that provides customer value.

Foucart and Li (2021) defined innovation as the way a product is changed by adding something new to that product which offers customer value. It is frequently used together with phrases like invention, creativity and design.

Tykkylainen and Ritala (2021) views innovation as a deliberate and targeted endeavor to change a business economic and social capacity. Lokuge (2021) posit that, because of the competitive advantage innovation gives, it is frequently the foundation upon which entrepreneurship is formed.

From the definitions above it can be generally viewed that innovation assists business in growing, and growth is frequently assessed in terms of profit and revenue. It is the act of changing an established thing into a new thing. As a result, innovation can be used in organizations process, products and services. Innovation can occur at different business levels, from employee level, to management level and other departmental levels in the organization. It is also used and studied by quite a number of disciplines such as science, business, engineering, and economics.

Hypothesis of the study

- I. Technological learning capability has no significant impact on the profitability of selected manufacturing SMEs in Lagos State.
- II. Research and development capability has no significant impact on the value creation of selected manufacturing SMEs in Lagos.

- III. Resource allocation capability has no significant influence on the sales growth of selected manufacturing SMEs in Lagos State.
- IV. Manufacturing capability has no significant impact on the reputation of selected manufacturing SMEs in Lagos.

Theoretical model

The researchers presented a schematic model based on the literature that demonstrates the relationship amongst TIC and performance of selected manufacturing SMEs in Lagos State.

Figure 1 above shows the schematic model of the study showing both the independent and the dependent variables made use of in the research work.

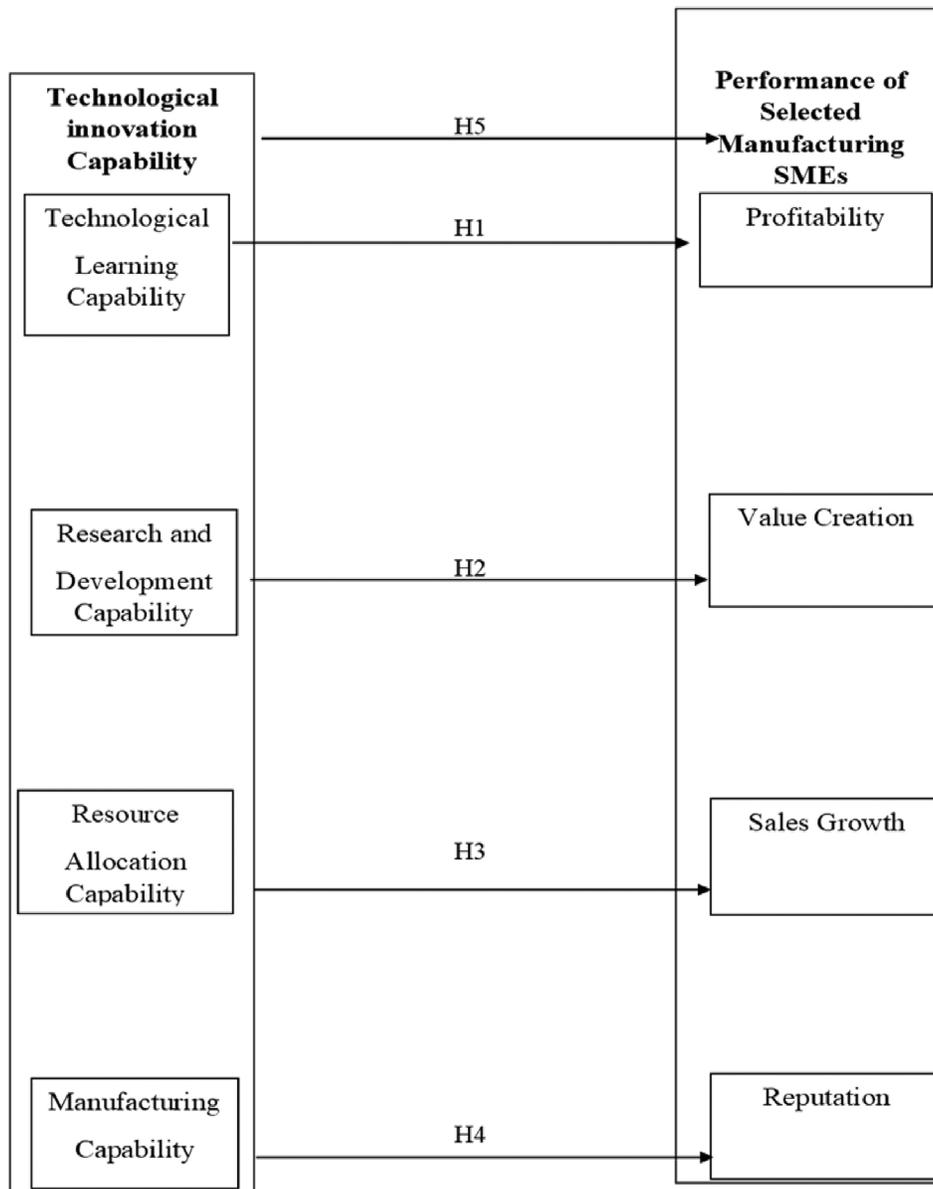


Figure 1. Schematic model. Source: authors compilation.

Methods

The main purpose of this research work is to have an understanding of the effect of technological innovation capabilities on the performance of selected manufacturing SMEs in Lagos State. Technological innovation capabilities were derived using the OSLO manual dimensions propounded by the organization for economic co-operation and development (OECD), which are technological learning capability, research and development capability, resource allocation capability and manufacturing capability. A descriptive explanatory research design was used for this research work and this is because it focused on the event of interest and is intended to provide simple and scientific answers to the inquired questions regarding the various assessments of variables.

This research population consists of manufacturing owners of selected SMEs in Lagos. The sample size of 234 research participants was derived from a population of 562 manufacturing owners of selected SMEs in Lagos State using the purposive sampling technique. In total, 234 survey research questionnaires were distributed, and 200 questionnaire copies were retrieved, leading to an 85.47 percent response rate. The questionnaires (survey research questions) were distributed to the manufacturing owners of selected SMEs in Lagos using Google forms. Regression, and analysis of variance (ANOVA) was used through Stata 15.1 to examine the relationship between technological innovation capabilities and performance of manufacturing selected SMEs. The significant test of values indicates that there is a positive impact variance amongst the involved group (significant $p < 0.05$) (Ary *et al.*, 2018).

The Cronbach's alpha test was used to determine the reliability of the research instrument. According to research literatures, permissible reliability should be between 0.70 and 0.80, but 0.60 may be allowed. A high Cronbach's alpha value indicates that the instrument used in measurement is very stable, reliable, and certain (Sharma, 2017). The construct reliability score produced a Cronbach's alpha of 0.9966 as shown in Table 1, while in order for the research validity to be determined, content and construct validity were used. The various questions posed to research participants are used to determine the research instrument validity (Nayak and Singh, 2021). Experts in the field of innovation and performance examined the research instrument. These experts were professionals in such fields.

Ethical considerations

Researchers made sure that participant's details were private, stayed away from misleading questions and statement throughout the period of the study. Ethical approval was granted by the owners of the selected SMEs and received by the researchers. Also, a letter was sent to the participants regarding the aim and purpose of their participation in the study and the likelihood of their data being published. Lastly, ethical approval was granted by Covenant University

Discussions and results

The research findings (results) have been retrieved from the data analysis carried out in line with the research hypothesis (Okpalaoka, 2022; rb715, 2022). The variables were considered throughout the analysis based on the data retrieved from the research participants in the field of study. Four hypotheses were conducted (tested) using regression method and frequency tables. The empirical findings are as follows

Hypothesis one

H₀: Technological learning capability has no significant impact on the profitability of selected manufacturing SMEs in Lagos State

In Table 2, the r-coefficient demonstrates a significant and strong relationship amongst profitability and technological learning capability, at 1.043. Likewise, the r^2 value tells the level to which technological learning capability explains profitability. As indicated in the summary model table, the r^2 of 0.875 (87.5%) shows that up to 87.5% of technical learning capability can explain profitability.

Decision rule: if the relevant result is less than 0.05, the null statement can be dismissed. If the relevant result is greater than 0.05, the null statement should be acknowledged.

The regression models greatly determine the dependent variable (profitability), as seen in the ANOVA table. The related F-value is 455.52, and the p-value is 0.000. Since the p-value is smaller than the significance conventional level of

Table 1. Statistics of reliability.

Cronbach's alpha	No of items
.9966	50

Table 2. Hypothesis one: technological learning capability has no significant impact on the profitability of selected manufacturing small and medium enterprises in Lagos State.

Model	R	R square	Adjusted R square	Std. error of the estimate	
1	1.043 ^a	.875	.874	.02803	
Model	Sum of squares	Df	Mean square	F	Sig.
Regression	371.081	4	92.770	455.52	.000 ^b
Residual	39.714	195	.203		
Total	410.795	199			
Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	Beta	Standard error	Beta		
(Constant)	.141	.081		1.74	.000
TECHLC	1.043	.028	.935	37.22	.083

TECHLC-technological learning capability. DF-degrees of freedom. F-ratio of two mean square values.

^aIndependent variable: technological learning capability.

^bDependent variable: profitability.

(p 0.05), this means that the result is significant. Therefore, we dismiss the null hypothesis and conclude that technological learning capability has a significant impact on the profitability of selected manufacturing SMEs in Lagos State.

Interpretation: More detail is required to access the effect of technological learning capability on profitability as seen from the coefficient value. Technological learning capability has a significant impact on profitability as an improvement in technological learning capability contributes to over 100 percent increase in profitability as shown by the coefficient value of 1.043.

According to the findings in the tables' above, technological learning capability has a significant positive impact on profitability of the selected manufacturing SMEs in Lagos.

Hypothesis two

H₀: Research and development capability has no significant impact on the value creation of selected manufacturing SMES in Lagos State

In Table 3, r-coefficient of 0.679, the dependent variable (value creation) and independent variable (research and development capability) have a positive and strong relationship. In addition, the R-Square value indicates how much the

Table 3. Hypothesis two.

Model	R	R square	Adjusted R square	Std. error of the estimate	
1	.679 ^a	.757	.756	.02731	
Model	Sum of squares	Df	Mean square	F	Sig.
Regression	231.628	4	57.907	311.15	.000 ^b
Residual	36.291	195	.186		
Total	267.92	199			
Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	Beta	Std. error	Beta		
(Constant)	.146	.084		1.74	.000
RADC	.679	.027	.935	24.96	.083

RADC-research and development capability. DF-degrees of freedom. F-ratio of two mean square values.

^aIndependent variable: technological learning capability.

^bDependent variable: profitability.

independent variable will explain the dependent variable. The r-square of 0.757 (75.7%) in the model description table above indicates that 75.7% of the changes in value creation is explained by research and development capability.

Decision rule: if the relevant result is less than 0.05, the null statement can be dismissed. If the relevant result is greater than 0.05, the null statement should be acknowledged, meaning that the regression models greatly determine the dependent variable (value creation), as seen in the ANOVA table above. The related F-value is 311.15 and the p-value is 0.000. Since 0.000 is smaller than 0.05, this suggests that the result is significant. As a result, the null hypothesis is dismissed, and we can infer that research and development capability has a significant impact on value creation.

Interpretation: more detail is required to assess the effect of the independent variable (research and development capability) on the dependent variable (value creation) as seen in the coefficient table above. Research and development capability has a significant impact on value creation, as shown by the coefficient of 0.679, as an improvement in research and development capability leads to a 67.9 percent increase in value creation.

Based on the data in the tables above, R and D capability has a huge positive impact on value creation of the selected manufacturing SMES in Lagos, Nigeria.

Hypothesis three

H₀: Resource allocation capability has no significant influence on the sales growth of selected manufacturing SMEs in Lagos State

In Table 4, r-coefficient of 1.012, the dependent variable (sales growth) and independent variable (resource allocation capability) have a positive and strong relationship. In addition, the R-square value indicates how resource allocation capability describes sales growth. The r-square of 0.9068 (90.68%) in the model overview table above indicates that 90.68 percent of the changes in sales growth was described by resource allocation capability.

Decision rule: if the relevant result is less than 0.05, the null statement can be dismissed. If the relevant result is greater than 0.05, the null statement should be acknowledged.

Interpretation: the coefficient table above provides additional detail that can be used to calculate the effect of the independent variable (resource allocation capability) on the dependent variable (sales growth). The coefficient of 1.012 indicates that resource allocation capability has a significant impact on sales growth, as an increase in resource allocation capability brings about over 100 percent increase in sales growth.

According to the findings in the tables above, resource allocation capability has a substantial positive impact on sales growth of the selected manufacturing SMEs in Lagos, Nigeria.

Hypothesis four

H₀: Manufacturing capability has no significant impact on the reputation of selected manufacturing SMEs in Lagos

Table 4. Hypothesis three.

Model	R	R square	Adjusted R square	Std. error of the estimate	
1	1.012 ^a	.9068	.9063	.0230	
Model	Sum of squares	Df	Mean square	F	Sig.
Regression	402.673	4	100.668	672.25	.000 ^b
Residual	29.201	195	.149		
Total	431.875	199			
Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	Beta	Std. error	Beta		
(Constant)	.246	.068		3.59	.000
RACAP	1.012	.023	.952	43.89	.000

RACAP-resource allocation capability, DF-degrees of freedom, F-ratio of two mean square values.

^aIndependent variable: technological learning capability.

^bDependent variable: profitability.

Table 5. Hypothesis four.

Model	R	R square	Adjusted R square	Std. error of the estimate		
1	0.819 ^a	.873	.872	.0221		
Model	Sum of squares	Df	Mean square	F	Sig.	
Regression	280.632	4	70.158	509.19	.000 ^b	
Residual	26.867	195	.137			
Total	307.5	199				
Model	Unstandardized coefficients		Standardized coefficients		t	Sig.
	Beta	Std. error	Beta			
(Constant)	-.099	.0734		-1.36	.176	
MACAP	.8192	.0221	.934	36.91	.000	

MACAP-manufacturing capability. DF-degrees of freedom. F-ratio of two mean square values.

^aIndependent variable: technological learning capability.

^bDependent variable: profitability.

In **Table 5**, the r-coefficient is at 0.819, and the dependent variable (reputation) and independent variable (manufacturing capability) have a positive and strong relationship. In addition, the R-Square value indicates how much the independent variable will describe the dependent variable. The r-square of 0.873 (87.3%) in the model overview table above indicates that 87.3 percent of the changes in reputation is explained by manufacturing capability.

Interpretation: more detail is required to calculate the impact of manufacturing capability on reputation, as seen in the coefficient table above. The coefficient of 0.81 indicates that manufacturing capability has a significant impact on reputation, with a rise in manufacturing capability resulting in an 81% increase in reputation.

According to the findings in the tables' above, manufacturing capability has a positive effect on the reputation of selected manufacturing SMEs in Lagos.

Based on the results (findings), technological advancement is been tracked on a regular basis by selected manufacturing SMEs in Lagos State, Nigeria. In other words, majority of the survey respondents agree that selected manufacturing SMEs in Lagos State track trends in technological advancement on a regular basis. Furthermore, the findings also revealed that the research respondents agree that technological learning capability upgrades the firm's technology.

Also, research and development capability help selected manufacturing SMEs select specialized experts to acquire diverse innovative ideas. In other words, most survey respondents agree that research and development capability help selected manufacturing SMEs select specialized experts to acquire diverse innovative ideas, which leads to the collaboration amongst selected manufacturing SMEs in Lagos state.

Furthermore, the majority of the research respondents were of the opinion that selected manufacturing SMEs selects key employees to allocate and manage resources. The research findings also indicated that selected manufacturing SMEs maximizes its resources and external technologies. This is in line with the findings of [Arok, Kirimi, and Munga \(2019\)](#) who conducted research on resource allocation and management innovation amongst business owners (entrepreneurs).

Lastly, the results shows that manufacturing capability monitor the advancement of technology of selected manufacturing SMEs on a systematic basis which introduces external technologies and takes into account their long-term development strategy and core technology level.

Recommendations

The following recommendations are offered in light of the research work (study) findings:

- I. The study indicates (shows) that technological learning capability has a positive impact on the profit (profitability) of selected manufacturing SMEs in Lagos. Therefore, manufacturing SMEs in Lagos, Nigeria, Africa and the globe should implement technological learning and the use of technology in their production process.

- II. The study indicates that research and development capability impact positively on the creation of value (value creation) of selected manufacturing SMEs in Lagos. So therefore, it is important that manufacturing SMEs adopt and implement research and development so as to create value to customers or consumers, the business environment and society at large.
- III. The study shows that resource allocation capability substantially impacts the sales growth of selected manufacturing SMEs in Lagos state in a positive way. As a result, it is vital that manufacturing SMEs properly allocate resources in its organization in other to have or experience sales growth.
- IV. Manufacturing SMEs in Nigeria need to understand and know how to adopt to unforeseen changes in technology and also learn how to use and implement modern technological processes that will meet future consumer needs.
- V. To increase profitability, owners and managers of manufacturing SMEs and businesses needs to adopt and educate its workers in the use of technology and technological processes which will lead to a quick increase in production.
- VI. Based on the descriptive statistics, selected manufacturing SMEs gives high priority to human capital which leads to their sales growth. So therefore, businesses and organizations (SMEs) need to invest in human capital which in turn will lead to sales increase.

Conclusion

This study's research (research work) conclusion is based on the inference review of hypothesis checking. The variables were defined and analyzed in conformity (agreement) with the goals and objectives of the research, likewise how the controlled variables have an impact on the dependent variable. The study concludes that technological innovation capabilities have a great impact on selected manufacturing SMEs performance in Lagos, Nigeria.

Data availability

Underlying data

OSF: raw survey results. <https://doi.org/10.17605/OSF.IO/6E4UG> (Okpalaoka, 2022)

This project contains the following underlying data:

- Respondents answers.csv

Extended data

Zenodo: rb715/raw: raw. <https://doi.org/10.5281/zenodo.5874198> (rb715, 2022)

This project contains the following extended data:

- APPENDIX.docx (results from analysis)

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

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George Oppong Appiagyei Ampong

Ghana Communication Technology University, Accra, Greater Accra Region, Ghana

The topic for the study is relevant and interesting for academic inquiry. However, I have the following few comments:

1. Can the authors explain how the business performance constructs were derived just as the source for the technological capabilities was explained.
2. Citation must be provided for the OECD proposition for the technological capabilities construct.
3. It is good to indicate the source for reputation as dependent variable other than mediating variable in the performance of manufacturing SMEs.
4. Good if explanation is provided on how the purposive sampling technique was used to select the sample 234 size from the 562 population of SME owners. Could there be a multi-stage sampling technique involved in any way?
5. However a good number of literature was reviewed, their evaluation was not strong enough. A critical analysis of the reviewed literature is required to well ground the study hypothesis.
6. Theoretical implications must be clearly discussed and strengthened in addition to the practical implications.
7. Good to discuss the limitation of the study and recommendation for future research.
8. Good to let a statistical expert confirm the statistical analysis presented.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?

No source data required

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Strategy management, SME development, entrepreneurship issues, organizational leadership

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 17 March 2022

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Dragana Radicic

Lincoln International Business School, Lincoln, UK

The study explores how various aspects of technological innovation capability affect SME performance in Lagos State, in Nigeria. The following comments could improve the study.

In the introduction, contributions of the study should be identified and briefly elaborated.

What are the arguments that have led to the formulation of the second hypothesis? Why would R&D capability have no effect on value creation in SMEs?

Similarly, what are the arguments that have led to the formulation of the third hypothesis? Why would resource allocation capability have no effect on the sales growth?

A table with summary statistics and variable description is missing.

The model presented in Table 2 suffers from omitted variable bias, because it is assumed that technological learning capability is potentially the only factor affecting SME profitability. A similar comment can be made about other empirical results as well.

What are the theoretical and/or managerial and/or policy recommendations of the study?

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

No

Are sufficient details of methods and analysis provided to allow replication by others?

No

If applicable, is the statistical analysis and its interpretation appropriate?

No

Are all the source data underlying the results available to ensure full reproducibility?

No

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Econometric analysis, firm-level innovation, innovation in SMEs, open innovation, environmental innovation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

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