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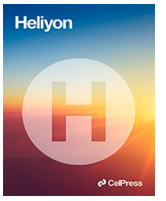

Research article

Analysis of the key factors for small and medium-sized enterprises growth using principal component analysis

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ABSTRACT

Small and Medium-sized Enterprises (SMEs) significantly contribute to national economic development worldwide. However, numerous factors affect the growth of SMEs, particularly in developing economies. Due to the complexity of these variables, it is challenging to determine where to begin improving SMEs. This study aims to identify and analyse the factors that hinder the overall performance of (SMEs) to gain insights into the principal variables constituting problems. A literature survey identified and abstracted 36 variables that influence SME growth. A structured questionnaire was created using the variables and administered to the respondents in the SME sector. We collated and converted the respondents' scores into primary data. The data was analysed using Kendall's Coefficient of Concordance (*W*) and Principal Component Analytics (PCA) tools, and the results were presented. The result of Kendall's Coefficient of Concordance analysis was (W) = 0.52, indicating that the judges strongly agree that the 36 variables affect SME growth. The PCA analysis identified the critical variables affecting SME growth. These variables, along with their corresponding factor loading, include Marketing information = 0.80, Cost of transportation = 0.81, Information technology = 0.83, Economic initiatives = −0.83, Financial constraints = −0.80, Cultural change = 0.80, Technical know-how = 0.822, Economic factors = −0.80, and Business information system = 0.813. The implication of the study's findings for management is that SMEs should begin process improvement for effective overall performance by addressing the problems associated with the critical variables. The perceived limitation of the study is that the respondents' opinions may not reflect 100 % of the opinions of the unsampled population in the SME sector. This study's originality includes (i) holistic documentation of the myriad of variables influencing SMEs, which are fragmented in the literature, and (ii) pinpointing the critical variables affecting SME development with measurable evidence not found in the literature.

1. Introduction

Small and Medium-sized Enterprises (SMEs) are widely acknowledged as crucial contributors to national economic growth and

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sustainability [1]. SMEs have played significant roles in the industrialisation of developed countries throughout history, and emerging economies prioritise the development of SMEs because they are the engine of growth [2]. Strong SMEs are the foundation for creating wealth, job opportunities, and revenue that contribute to a sustainable social environment [1]. According to Ref. [3], SMEs represent about 90 % of businesses and more than 50 % of employment worldwide. Formal SMEs contribute up to 40 % of emerging economies' GDP. Similarly [3], asserted that Micro, small and medium enterprises (MSMEs) in India constitute around 30 % of the GDP and account for 50 % of exports [4]. Notwithstanding all the benefits of SMEs, key factors determine their overall performance.

The study is geographically contextualised in the survival struggles of SMEs in emerging economies in sub-Saharan Africa and Asian countries. It is worth noting that the variables affecting SMEs are universal, but the degree of impact of the variables on SMEs' performance differs depending on the capability of individual SMEs and the level of economic development of individual countries. The scope and focus of the study are to identify and analyse the myriad of variables affecting SMEs' growth to pinpoint the critical variables with measurable evidence to guide practitioners, policymakers, and stakeholders in SME improvement to enhance overall performance.

The efficient performance of SMEs is used to measure their relevance in any economy. However, SMEs can only perform optimally if the numerous variables affecting their efficiency are identified and eliminated. The problem statement is that despite all the benefits of SMEs, their contribution to national economic development is limited because of the myriad of variables affecting their growth. The research questions are,

(i) What are the numerous variables affecting SME growth?
(ii) Do the variables truly affect SME growth or otherwise?
(ii) Among the numerous variables, what are the principal or critical variables that affect SME growth most?

The study aims to answer the research questions, and the objectives are, first, to evaluate the current literature in the topic area to abstract the myriad of variables affecting SMEs' growth. Secondly, to assess the variables using Kendall's Coefficient of Concordance (*W*) (KCC) if they truly affect SME growth, and thirdly, to analyse them using Principal Component Analysis (PCA), a dimension reduction tool, to gain insight into the principal variables that affect SMEs' growth most among the numerous variables to provide SMEs. The significant gaps in the literature on the topic are that authors and researchers over the years have not provided a holistic document on the variables affecting SMEs' growth, which are fragmented in the literature. Secondly, researchers blamed the numerous variables that affect SME growth without providing measurable evidence, making it difficult for management to determine where to begin SME process improvement. These gaps are what the study is set to address by providing a single and holistic document on the variables affecting SME growth and providing measuring evidence on the variables affecting SME by determining the factor loading or variance of each of the variables used in the study. The implication of this study for the management and stakeholders is that the findings will guide where to begin SME process improvement for effective overall performance.

The research is structured as follows: the first section introduces and discusses the background of the study, and the second part reviews current literature in the topic area. The third part discusses the methods and materials used to realize the aim of the study. The fourth section presents the results and discussions, and the fifth segment presents the study's conclusion.

2. Previous literature

2.1. Prior research on the variables affecting SMEs' growth

It is worth noting that the Small and Medium-sized Enterprises have mainly performed below expectations because of a combination of glitches summed up as inherent variable factors that are identified and analysed in this study. Preceding researchers on the variables and associated problems affecting SMEs and the causes for their failure include [5,6,7,8]. The contributing factors to SMEs' growth were also examined by Refs. [9,10,11,12]. The recent policy shift regarding SMEs' development was looked into by Refs. [13,14]. Several other scholars have also studied the variables affecting SMEs' performance in diverse spaces worldwide. Some of these works are found in Ref. [15], who researched the challenges facing SMEs in Kenya, while [16] assessed the significance of ICTs in enhancing production throughput and competitiveness of SMEs in some Central American countries. Similarly [17], considered the innovation of SMEs and their economic impact in Pakistan, whereas [18] researched the problems affecting SME growth in Turkey.

Furthermore, other researchers in SMEs include [19,20,21,11,22]. A theoretical structure for the development and efficiency of SMEs has also been studied by notable researchers worldwide. Some of the typical studies include that of [23], who examined the factors limiting SMEs' growth in the manufacturing sector in Egypt. However, he needed to pinpoint the fundamental variables affecting SMEs with proof in the study [24]. projected a structure for determining the efficiency of SMEs in Bandung, Indonesia, without evidence of how the variables impact SMEs. Some variables considered for the SME studies by researchers include entrepreneurial development, human resources capability, inventions, and sustainability using a quantitative approach. The result demonstrates that each variable has a noteworthy association with the efficiency of measurement of SME performance.

Several variables affecting SMEs' development were identified by Ref. [25], and he developed a structure to explain their relationships [26]. conducted an investigation involving the problems affecting the growth of SMEs in Malaysia's manufacturing sector, and the result of the study pointed out a substantial undesirable association between ineffective entrepreneurship and unsuitable human resource management. Furthermore [27], identified numerous variables that affect the success of small and medium-sized enterprises (SMEs) using the contingency method. Some of the internal variables identified by the author include SME features, manager attributes, and manners of performing business. In contrast, the external variables include the nearness of the environment,

which entails market share, customers, suppliers, competitors, relations with employees, and banks.

Table 1 references the variables affecting SMEs' growth. The table presents a comprehensive and holistic document on the variables affecting SME growth, which are fragmented in the literature.

Table 1 depicts a holistic document on the numerous variables affecting SMEs' growth from where stakeholders can learn quickly about the problems.

The forgoing literature appraisal bridged a gap in knowledge by providing a comprehensive and holistic document on the myriad of variables affecting SMEs' growth, as depicted in Table 1, which are fragmented in the literature. Additionally, there is no measurable evidence in the literature to attribute blame to the variables affecting SMEs' growth. This work is set to bridge the gap by using KCC and PCA analytics to provide measurable evidence for ascribing blame to the variables affecting SMEs' performance.

3. Materials and methods

The study extensively assessed the current literature in the topic area to identify the myriad of variables affecting SMEs' growth. The identified variables were used to construct structured questionnaires and administered to the SME sector's respondent population. The respondents' scores were transformed into data for analysis. Fig. 1 depicts a conceptual framework of the study.

Fig. 1 depicts a visual process to assess and identify factors affecting SMEs' performance. In the myriad of variables affecting SMEs, it is difficult to determine from where to begin the improvement process. However, identifying the critical variables among the numerous variables guides the direction of SMEs' overall improvement by eliminating the problems. For the purpose of this study, the variables are identified in the literature. Nevertheless, individual SMEs can be assessed on a case study basis to gain insight into the SME problems by identifying the variables affecting the particular SME. The impact of the variables affecting SMEs varies from one SME to another, depending on the individual SME's capability and the prevailing economic situation. The identified variables are then analysed in the PCA tool, as depicted in Fig. 1, to extract the critical or principal variables based on their factor loadings or variances. The critical variables then guide the stakeholders in intervening by eliminating the problems associated with the variables for efficient SMEs.

Table 1
References of variables affecting SMEs' growth.

S/N	Variables Affecting SMEs	Reference
1	Financial Constraints	[28,23]
2	Information technology	[16,26,29,30]
3	Marketing information	[31,32,26]
4	Management skills	[23,30]
5	Innovative capacity	[29,33]
6	Government policy	[34]
7	Expatriate market competition	[29]
8	Market orientation	[15,35,36]
9	Organisation Search	[37]
10	Innovative performance	[29,38]
11	Human resource competence	[39,40,26]
12	Monitoring mechanism	[41]
13	Lack of incentives	[42,12]
14	Technical know-how	[11,23,29]
15	Business information system	[36]
16	Entrepreneurs' partnership ability	[43]
17	Risk	[44,45]
18	Marketing strategy	[23,35,46]
19	Employee quality	[27]
20	Power supply	[47,48,49]
21	Patent law	[50,51]
22	Accounting practices	[52,53], [73]
23	Bureaucracy	[54,55]
24	Managerial characteristics	[23]
25	Demographic characteristics	[56,27]
26	Entrepreneurial orientation	[23,27,36]
27	Proximity environment	[57,27]
28	Market constraint	[15]
29	Inadequate infrastructure	[58,59]
30	Human capital	[29]
31	Cost of transportation	[60]
32	Investment environment	[11,27,29]
33	Economic factors	[61,23]
34	Economic initiatives	[61,23]
35	Cultural change	[29]
36	Employee attitude	[43,62]

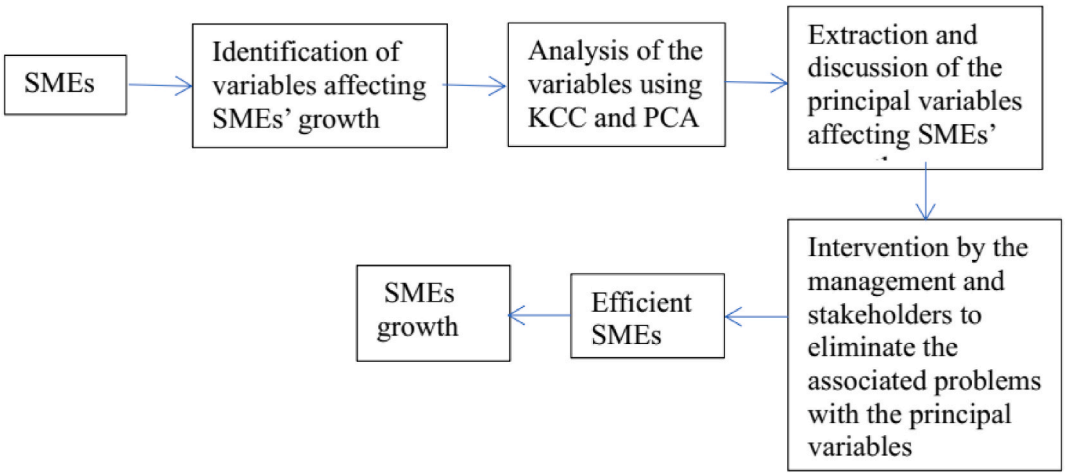

Fig. 1. The framework underpinning the study.

3.1. Kendall's coefficient of concordance (W) (KCC)

Kendall's coefficient of concordance (W) is a statistical tool employed to measure agreement amongst observers. According to Ref. [63], Kendall's Coefficient of Concordance (*W*) measures agreement between several judges who have ranked an ordered set of objects. Correspondingly, we applied KCC (W) to examine the degree of agreement among the judges used in the study to rank the variables used in the analysis to determine if the variables truly affect SMEs' growth or otherwise.

3.2. Principal Component Analysis of variables

According to Ref. [64], the fundamental objective of PCA is to reduce the dimensionality of a set of data, particularly for data sets with many variables that lie in two-dimensional subspaces (planes) [65]. remarked that PCA is used to analyse a set of data representing observations described by some correlated dependent variables whose objective is to extract significant information from the data and to present this information as a set of new orthogonal variables called Principal Components (PCs). An important aspect to be investigated in PCA analysis is how many Principal Components (PCs) sufficiently explain the total variation among the variables studied. It is assumed that the identified PCs are the fundamental sources of variation in the system that is being investigated [66]. further emphasised that PCA is a method for reducing the dimensionality of large datasets to increase the interpretability of the data without loss of information and, at the same time, producing new uncorrelated variables (PCs) that maximise the variance of the data. However, finding such new variables or Principal Components (PCs) requires solving an eigenvalue and eigenvector of the problem.

The justification for using the PCA tool instead of Regression Analysis is that regression analysis relies on dependent and independent variables to predict future occurrences based on linear assumptions. In contrast, the PCA is a robust tool used to reduce large dimensions of variables to principal variables, which explains the actual variance in a system. The focus of the study is to gain insight into the critical variables that cause variance in SME performance. Thus, the PCA tool is suitable for the study.

3.2.1. A brief theoretical framework to eigenvalues in PCA analytics

In Principal Components Analysis (PCA), the principal components (PCs) are the eigenvalues of the covariance matrix. During varimax rotation, the eigenvalues guide factor extraction, distinguishing similarities from dissimilarities [64]. Previous research reported that eigenvalues measure the variance of the variables loaded by factors and, therefore, define the number of factors to be extracted in the PCA analysis [67].

The preceding explanations, combined with a brief theoretical overview of Eigenvalue in Principal Component Analysis (PCA), demonstrate the suitability of PCA in analysing numerous variables affecting SME growth. This is because the method can reduce the size of variables to smaller principal variables, whose variance explains the impact of all the variables affecting SMEs' growth. Reducing the size of variables to fewer principal variables guides SMEs' process improvement by addressing the issues associated with the principal variables.

3.3. Research survey

A survey approach was employed to obtain responses from SME practitioners about their perception of the variables affecting SMEs' performance. The method considers the SME community's sampling, data collection, data processing and cleaning of errors and data analysis.

3.3.1. Sampling procedure

The small and medium-sized enterprise (SME) owners were the target respondents of the study. The study participants' contacts were obtained in 2021 from the National Bureau of Statistics (NBS) and the Manufacturers Association (MA), which has a database of SMEs. Other participants' contacts were obtained online. They were contacted via email, personal visits, and telephone calls. The respondent sample size was determined by using equation (1). Questionnaires on SME growth variables were administered to 184 respondents. 152 respondents returned the scored questionnaires within three months. Among the returned questionnaires, 131 were satisfactory, and the remaining were discarded for lack of merit. However, scores of 120 respondents were selected for the analysis as the required sample size. The respondents participated voluntarily without any form of incentive.

3.3.2. Sampling

The goal of sampling is to obtain the knowledge of the larger SME population on the variables affecting SMEs' growth. Therefore, generalising the information concerning the variables depends on the opinion of the sampled SME representatives. The determination of sample size for the KCC analysis is ambiguous in the literature; therefore, 21 judges were used to rank the variables in order of merit.

In the PCA analysis, it is important to determine the sample size of the respondent population to validate an adequate population size for the study. According to Ref. [68], the sample size equation is given as

$$Sample\ \ \text{Size} = \frac{p(100-p)z^2}{E^2} \tag{1}$$

where, p is the percentage proportion in the population,

E is the percentage maximum error required.

z is the value corresponding to the level of confidence required.

The sample size of the population used in the PCA analysis of the variables was determined at a 95 % confidence level and 5 % error margin. The 95 % confidence level was chosen to ensure that the respondent population size used in the study is sufficient to reflect the opinion of the SME population.

3.4. Data collection

The scored questionnaires were retrieved from the respondents. The questionnaires that were not adequately scored were discarded. The appropriately scored questionnaires were processed and cleaned of errors for analysis.

3.4.1. Data analysis

The retrieved respondents' scores were collated and transformed into a data matrix. The data was used in Kendall's Coefficient of Concordance (W) and PCA analytical tool. In Kendall's Coefficient of Concordance (W) analysis, 21 judges ranked the variables affecting SMEs' growth in descending order of importance. A chi-square (χ^2) test statistic was used to evaluate the consistency of the judges' ranking. The statements of hypothesis employed are expressed as,

H_0: The ranking by the 21 judges is discordant.

H_1: The ranking by the 21 judges is consistent.

Decision Rule: if $\chi^2_{cal} > \chi^2_{tab}$, we reject the null hypothesis, H_0.

if $\chi^2_{cal} < \chi^2_{tab}$, we accept the null hypothesis, H_0.

The ranking by the judges was pooled together to obtain a sequence of regimented variables using Kendall's coefficient of concordance given by,

$$W = \frac{S}{\frac{1}{12}K^2\left(N^3 - N\right)} \tag{2}$$

were,

$$S = \sum\left(R_j - \frac{\sum R_j}{N}\right)^2$$

chi-square (χ^2) equation is given by:

Table 2
Rensis Likert's 5-point attitudinal scale.

S/N	Response option	Weight
1	Completely agree	5
2	Agree	4
3	Undecided	3
4	Disagree	2
5	Completely disagree	1

$$\chi^2_{cal} = K\,(N-1)\,W \quad (3)$$

The source of equations (2) and (3) is [14].

The result of Kendall's Coefficient of Concordance (W) was obtained by using equation (2) and substituting the value in equation (3) to yield $\chi^2_{cal} = 382.2$.

Similarly, the PCA analysis utilised the respondents' scores obtained from the questionnaire using Rensis Likert's 5-point attitudinal scale, as illustrated in Table 2.

The scores were collated and transformed into $(m\,x\,n)$ data, which serves as input data to the StatistiXL software analytics to determine the Eigenvalues of the variables to guide extraction of the Principal Components (PCs) that constitute critical variance to SMEs growth among the myriad of variables. The PCA analysis generated a scree plot and eigenvalues of the variables from where three principal factors whose eigenvalues ($\lambda \geq 1$) were extracted. Fig. 2 illustrates a step-by-step procedure for the PCA analysis of the variables affecting SMEs' growth.

The steps in Fig. 2 demonstrate the process to obtain the Principal Components (PCs) that limit SMEs' growth.

4. Results and discussion

The study results are presented in the following order. Kendall's Coefficient of Concordance (W) outcome is 0.52. Which corresponds to $\chi^2_{cal} = 382.2 > \chi^2_{tab} = 49.76$. Hence, we reject the null hypothesis (H_0). It is therefore concluded that the ranking of the 36 variables by the 21 judges is in agreement and consistent. Table 3 shows the order of importance of SME variables ranked by 21 judges, where R_j indicates the ranking coefficients.

Kendall's Coefficient of Concordance (W) analysis established that the 36 variables used in the study genuinely affect SMEs' growth. However, previous researchers in the topic area [63,69,54,26,17] did not provide numerical or measurable values in their findings to ascertain whether the variables affect SMEs, as demonstrated in Table 3.

Similarly, the results of the PCA analysis are presented in this section. Fig. 3 illustrates the Scree plot, which determines the number of significant variables in the analysis. The plot shows the eigenvalues of the principal components in a downward curve from the largest to the smallest eigenvalue, which decreases at the elbow of the graph, where the eigenvalues level off smoothly.

The scree plot identified three significant components under which the variables are loaded. The components are extracted, creatively labelled, and discussed in Tables 4–6.

Table 4 is labelled "SMEs' Performance Index" and tagged as factor 1. It loaded 50 % of the variables studied with varying positive factor loadings. The factor loading measures each variable's sensitivity, representing the variables' variance in SMEs' performance.

The positive factor loadings of variables in Table 4 indicate how SMEs' performance will improve by eradicating the problems associated with the variables respectively. Technical expertise is the most significant variable, with a meritorious factor loading of

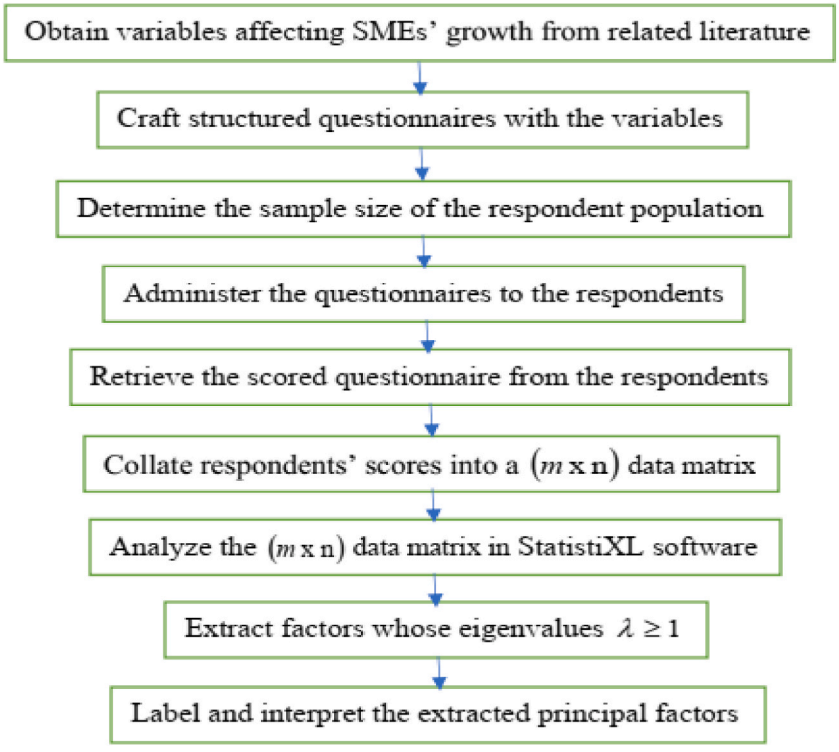

Fig. 2. A step-by-step procedure for the PCA analysis of variables.

Table 3
Order of merit of the 36 variables affecting SMEs' Growth using KCC.

S/N	R_j	SMEs Variables	S/N	R_j	SMEs Variables
1	92	Financial Constraints	19	418	Entrepreneurs partnership ability
2	102	Management skills	20	420	Marketing strategy
3	103	Human resource competence	21	421	Accounting practices
4	123	Monitoring mechanism	22	431	Power supply
5	187	Government policy	23	446	Demographic characteristics
6	197	Technical know-how	24	451	Bureaucracy
7	237	Information technology	25	482	Lack of incentives
8	247	Market orientation	26	483	Entrepreneurial orientation
9	263	Market constraint	27	515	Innovative performance
10	271	Patent law	28	534	Proximity environment
11	301	Expatriate market competition	29	538	Organization Search
12	329	Marketing information	30	551	Inadequate infrastructure
13	358	Innovative capacity	31	557	Investment environment
14	363	Business information system	32	572	Economic factors
15	373	Managerial characteristics	33	573	Cost of transportation
16	395	Human capital	34	631	Economic initiatives
17	400	Employee quality	35	639	Employee attitude
18	416	Risk	36	661	Cultural change

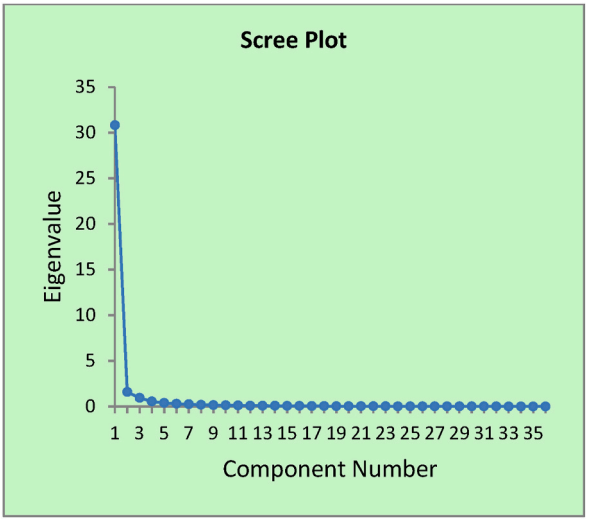

Fig. 3. The Scree plot of the PCA analysis of the variables.

0.822. Other important variables with commendable factor loadings are Business information systems = 0.813, Cost of transportation = 0.809, Marketing Information = 0.800, and Cultural change = 0.800, respectively. This result validates the assertion by Refs. [36, 29] that SMEs' development and performance index hinges on technical competence and market knowledge. However, the authors made claims without providing measurable evidence to support their claims. Similarly, other variables with factor loadings between 0.781 and 0.713 affecting SMEs' growth include Accounting practices, Demographic characteristics, Market constraints, Marketing strategy Government policy, Human capital, Market orientation, and Innovative capacity [57]. supported the argument that these variables affect SMEs' growth without evidence.

Furthermore, Proximity, Bureaucracy, and Lack of incentives wielded 0.671, 0.641, and 0.662 factor loadings, respectively. The factor loadings indicate the extent to which the variables impact the growth of SMEs. In this cluster, the variables that have a moderate impact are Innovative Performance and Managerial Characteristics, with factor loadings of 0.572 and 0.504, respectively. Significantly, Table 4 shows how each variable affects SMEs' growth by the amount of the variables' factor loadings.

Table 5 shows Factor 2, labelled "Business Management System", which loaded 17 variables with negative factor loadings. The negative factor loadings indicate how negatively the variables will impact SMEs' growth if the problems associated with the variables are not addressed. The principal variables in this cluster include Information technology = −0.827 and Economic initiatives = −0.827. The negative factor loading value validates the claim by Ref. [29] that inadequate information technology poses a serious threat to the growth of Small and Medium-sized Enterprises.

For SMEs to fully realize their potential and play their expected role effectively in the competitive market, they cannot ignore the application of information technology, which enhances smooth performance and effective decisions and communication within the

Table 4
Factor 1 – SMEs' performance index.

S/N	Variables	Factor Loading
3	Marketing Information	0.800
5	Innovative capacity	0.713
6	Government policy	0.733
8	Market orientation	0.730
10	Innovative performance	0.572
13	Lack of incentives	0.662
14	Technical know-how	0.822
15	Business information system	0.813
18	Marketing strategy	0.751
22	Accounting practices	0.784
23	Bureaucracy	0.641
24	Managerial characteristics	0.504
25	Demographic characteristics	0.754
27	Proximity in environment	0.671
28	Market constraint	0.776
30	Human capital	0.728
31	Cost of transportation	0.809
35	Cultural change	0.800

Table 5
Factor 2 - business management system.

S/N	Variables	Factor Loading
2	Information technology	−0.827
4	Management skills	−0.515
7	Expatriate market competition	−0.782
9	Organisation Search	−0.652
11	Human resource competence	−0.782
15	Monitoring mechanism	−0.627
16	Entrepreneurs partnership ability	−0.766
17	Risk	−0.603
19	Employee quality	−0.778
20	Power supply	−0.778
21	Patent law	−0.722
24	Management characteristics	−0.561
26	Entrepreneurial orientation	−0.687
29	Inadequate infrastructure	−0.554
32	Investment environment	−0.699
34	Economic initiatives	−0.827
36	Employee attitude	−0.515

Notable variables in this group include Expatriate market competition = −0.782, Human resources competence = −0.782, Entrepreneur's partnership ability = −0.766, Employee quality = −0.778, Power supply = −0.778, and Patent law = −0.722. It is expected that addressing the problems associated with the variables will lead to a positive upturn in SMEs' overall performance.

Table 6
Factor 3 – limited resources.

S/N	Variable	Factor Loading
1	Financial Constraints	−0.800
33	Economic Factors	−0.800

system [36]. Additionally, expatriate market competition and human resource competence have the potential to limit SMEs' growth because local businesses cannot compete with foreign ones in terms of exposure and competence. However, other variables with medium factor loadings ranging from −0.699 to −0.515 must not be overlooked. These variables harm SMEs individually based on the strength of their respective factor loadings or variances.

Factor 3, as "Limited Resources", is presented in Table 6. This is a meritorious factor with negative bi-variables that affect SMEs' growth by the same measure of factor loading of −0.800. The similarity between the two variables suggests that addressing the problems associated with one variable would solve the problem associated with the other variable.

Inadequate finance and lack of economic factors influence SMEs' growth, particularly financial constraints, which [23] argued negatively affect SMEs' survival and performance prospects due to severe financial shortages. Financially constrained firms generate low revenue and employment growth in an economy. Likewise, the lack of economic factors negatively affects businesses and often

hinders SMEs from achieving their objectives. According to Refs. [61,28], economic factors commonly affecting SMEs include consumer behaviour, interest rates, and inflation.

Table 7 summarises the principal variables obtained from the plethora of analysed variables. These principal variables constitute critical variance in SME performance because of their high factor loadings among the variables analysed. Therefore, to achieve efficient SME performance, management must eliminate the problems related to these variables.

However, it is essential to consider variables with middling factor loadings for sustainable SME development, as they cannot be ignored entirely.

Further to the results obtained from the PCA analysis of the variables, descriptive statistics of the Likert scale mean and standard deviation of the variables were also computed. The Likert scale's mean and standard deviation reinforce the validity and reliability of a questionnaire. The Likert's 5-point scale was used as follows: 5 = Strongly Agree (SA), 4 = Agree (A), 3 = Undecided (UD), 2 = Disagree (D), and 1 = Strongly Disagree (SD). Also, $\overline{\boldsymbol{X}}$ = mean and $\boldsymbol{\sigma}$ = standard deviation of the variables. The respondents' scores were collated, and each variable's mean and standard deviation were computed using Excel software. The results are presented as illustrated in Table 8.

In Table 8, the mean score of greater than 3 represents a positive attitude of the respondents towards the variable, and a mean score of less than 3 represents a negative attitude towards the variable. As shown in Table 8, 100 % of the variables have a mean value greater than 3. This result advocates that the SME operators are aware and positive that the variables truly affect and hinder the growth of their businesses. On the other hand, the low levels of the standard deviation of the variables validate the agreement among the respondent samples that the variables truly affect SME performance. The consistency of agreement by 21 judges used in the KCC analysis and the low level of standard deviation of the variables' scores in the questionnaire by 120 respondents in the PCA analysis validate that the 36 determine SMEs' efficiency.

5. Conclusion

The study identified and presented a comprehensive and holistic document on the numerous variables affecting SMEs' growth. The document offers an overview of variables that are fragmented in the literature. Kendall's coefficient of Concordance (W) value of 0.52 shows that the 21 judges who ranked the 36 variables unanimously and strongly agreed that the 36 variables used in the study truly influence the overall efficiency of SMEs' performance.

The PCA analysis helped identify the principal or critical variables that constitute high variance in SMEs' overall performance among the myriad variables bedeviling the sector. The 36 variables were loaded under three factors, namely, (i) SMEs' Performance Index, (ii) Business Management System, and (iii) Limited Resources, which loaded correlated variables with varying factor loading values. Among the critical variables are Marketing information = 0.80, Cost of Transportation = 0.81, Information technology = 0.83, Business information = 0.813, Technical know-how = 0.822, and Cultural change = 0.800, Economic initiatives = −0.83, Financial constraints = −0.80, and Economic factors = −0.800.

Furthermore, the Likert's scale mean ($\overline{\boldsymbol{X}}$) values demonstrate that the SME owners know that the 36 variables affect their growth because 100 % of the variables investigated have mean values greater than 3. Likewise, the low standard deviation ($\boldsymbol{\sigma}$) values of the variables) suggests that SME operators unanimously agree that the variable truly determines the sector's efficiency. The study's results answered all the research questions and, thus, provided direction for stakeholders to prioritise SMEs' overall performance.

Implications: The implication of the study's findings for practitioners, policymakers, and management is that the stakeholders can begin SMEs' improvement for overall efficient performance by addressing the problems associated with the identified critical variables. In terms of transportation costs, for instance, the government can alleviate the cost of transportation by investing in sustainable transport infrastructure or subsidising the cost of transportation of goods manufactured by SMEs as an incentive. Similarly, the government or policymakers can address financial and information technology (IT) constraints by building reliable IT infrastructure and providing economic incentives for SMEs. On the other hand, the SMEs can engage in continuous training and skill acquisitions to address the problems associated with technical know-how. It is worth noting that stakeholders should not neglect the middling and weakling variables identified in the study because they also constitute performance losses based on the degree of variance they wield in the analysis.

The key contributions of the study to knowledge include (i) the presentation of holistic documentation on the variables affecting SMEs' overall performance, which are fragmented in the literature, (ii) the novel contribution of the study is identifying the critical

Table 7
Principal variables affecting SMEs' growth.

S/N	Variables	Factor loadings
1	Marketing Information	0.800
2	Technical know-how	0.822
3	Business information system	0.813
4	Cost of transportation	0.809
5	Cultural change	0.800
6	Information technology	−0.827
7	Economic initiatives	−0.827
8	Financial Constraints	−0.800
9	Economic Factors	−0.800

Table 8
The mean and standard deviation of the Likert's 5-point scale scores.

S/N	Variable	$\overline{X}$	σ	S/N	Variable	$\overline{X}$	σ
1	Financial Constraints	4.333	3.868	19	Employee quality	3.608	3.214
2	Information technology	4.766	4.258	20	Power supply	3.7	3.286
3	Marketing information	4.425	3.924	21	Patent law	3.208	2.935
4	Management skills	4.208	3.728	22	Accounting practices	4.25	3.794
5	Innovative capacity	4.008	3.544	23	Bureaucracy	3.825	3.368
6	Government policy	3.991	3.554	24	Managerial characteristics	3.808	3.373
7	Expatriate market competition	3.15	2.875	25	Demographic characteristics	3.166	2.834
8	Market orientation	4.216	3.728	26	Entrepreneurial orientation	3.791	3.447
9	Organization Search	3.391	3.082	27	Proximity environment	4.65	4.147
10	Innovative performance	4.383	3.924	28	Market constraint	4.191	3.708
11	Human resource competence	4.066	3.600	29	Inadequate infrastructure	4.266	3.785
12	Monitoring mechanism	3.7	3.319	30	Human capital	3.933	3.488
13	Lack of incentives	4.433	3.953	31	Cost of transportation	3.866	3.497
14	Technical know-how	3.841	3.418	32	Investment environment	3.95	3.535
15	Business information system	4.241	3.772	33	Economic factors	3.9	3.526
16	Entrepreneurs' partnership ability	4.591	4.090	34	Economic initiatives	4.483	4.008
17	Risk	4.05	3.607	35	Cultural change	4.075	3.623
18	Marketing strategy	4.008	3.554	36	Employee attitude	3.941	3.497

variables among the numerous variables affecting SMEs growth with measurable evidence of the variables' variance which is not in the existing literature in the subject area.

Limitations: The perceived primary limitation of the study is that the respondents' opinions may not reflect 100 % of the opinions of the unsampled population in the SME sector. Though the variables affecting SMEs are universal, in the geographical context of Sub-Sahara Africa and Asian countries, for instance, the opinion of SMEs in India concerning a particular variable may not be the same opinion of SMEs in Nigeria due to individual SME capabilities and the difference in the level of economic development of the different countries.

Future Research Suggestions: We suggest future research to develop a quantitative data scheme to study the variables affecting SME growth for precise insight into the variables affecting SMEs.

Data availability statement

The data associated with this study is available under the supplementary file of the manuscript's submission to Heliyon.

CRediT authorship contribution statement

Samson Oyaka Ongbali: Writing – original draft, Validation, Supervision, Methodology, Investigation, Conceptualization. **Samuel Ayodeji Omotehinse:** Writing – review & editing, Software, Resources, Methodology, Formal analysis. **Collins Ogadi Adams:** Writing – review & editing, Project administration, Formal analysis, Data curation. **Enesi Yekini Salawu:** Writing – review & editing, Visualization, Software, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e33573.

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