Research Article

Aibi research, management and engineering journal. Volume 14, Number 1, Pag 1-11, January - April 2026, ISSN 2346-030X

Impact of organizational management on profitability in SMEs: a case study of energy sector by-products in Colombia.

José Morelos-Gómez[1], Gustavo García-Cediel[2], Harold Lora-Guzmán[3]

[1]*Universidad de Cartagena, Cartagena - Colombia*

Received: august 17, 2025.
Accepted: december 18, 2025.
Published: january 01, 2026.

***Abstract*—** The purpose of this study is to evaluate the impacto of administrative management on the profitability of SMEs.The methodology involved designing a structured questionnaire for the senior management of 42 SMEs in the energy sector by-products industry in Colombia. Multiple correspondence analysis was employed to identify variables with the highest discriminating capacity, and a multiple linear regression model was defined to correlate management factors with return on assets. The results highlight a direct relationship between the sophistication of administrative management and financial performance in SMEs.

Keywords: business management, financial performance, organizational performance, profitability.

*Corresponding author: jmorelosg@unicartagena.edu.co (José Morelos Gómez).
Peer reviewing is a responsability of the Universidad de Santander.

How to cite this article: J. Morelos-Gómez, G. García-Cediel y H. Lora-Guzmán, “Impact of organizational management on profitability in SMEs: a case study of energy sector by-products in Colombia”, Aibi research, management and engineering journal, vol. 14, no. 1, pp. 1-11 2026, doi: 10.15649/2346030X.4577

I. INTRODUCTION

The importance of SMEs in the Colombian economy is increasingly recognized. Today, they represent approximately 95% of the business structure, generate 73% of employment and 53% of gross production at national level [1]. For this reason, ensuring their survival and even more their sustainable development is an expeditious way to guarantee economic development, which is why the government has drawn up policies to promote their development [2].

Despite this government support, the mortality rate of Colombian SMEs remains high. According to Global Entrepreneurship Monitor (GEM), 70% of companies disappear in the first three years of existence [1]. This mortality rate would decrease if the management carried out since its creation was more efficient and obtained profitability rates higher than market interest rates, because if this does not happen, it is more profitable to close the company and invest in the financial market. Likewise, [3] argues, "a profitability higher than the cost of capital, supported or translated into cash flow, allows the company to last over time" [4].

Given this, and understanding that a company has a great variety of organizational factors, it is key to identify which of these factors have the greatest influence on profitability, in order to draw up strategies to ensure that these factors function optimally and thus generate increases in profitability that will ensure its survival and permanence [4]. In this order of ideas, the question we are trying to elucidate here is which organizational factors have the greatest impact on profitability? This will allow a theoretical approach to the relationship between profitability and management. This article follows [5] who, using the Model of Modernization of Organizational Management (MMGO) methodology, review the effects of organizational management on the profitability of SMEs. The first part reviews the theory on corporate profitability, then the methodology is shown and finally the results, findings and conclusions. In this sense, the article presents the results of a research developed to provide empirical evidence about the relationship between organizational management in small and medium-sized enterprises (SMEs) and their financial results [5], [6].

For the development of the research, it was assumed that organizational management can be understood and analyzed as a set of specialized factors that cover different aspects of the business environment [5]. The specialized factors that were contemplated are [7], [8], [9]: Associativity, Economic Environment, Planning and Strategy, Finance, Production Management, Marketing Management, Logistics, Exports, Imports, Communication and Information Management, Innovation and Knowledge, Human Management, Environment, Organizational Structure, and Organizational Culture.

II. THEORIC FRAMEWORK

Corporate profitability is determined by several factors which can be grouped into internal and external. The external ones have been studied extensively by the Industrial Organization Approach where the explanation of profitability is sought by business differences according to size, sector and market power. The internal ones have been catalogued as Business Strategy, which bases profitability results on management skills and the evolution of different organizational components.

Firm size is one of the determinants analyzed in an attempt to explain the evolution of company profits, and different authors have studied empirical evidence on this subject [10]. Thus, for example, Navarrete and Ayala [11], based on an analysis of variance with a sample of 721 companies in Spain, find that as firm size increases, profitability decreases. The same result is found by Goddard and Wilson [12], [13], [14], [15], [16]. The latter author hypothesizes that large companies are able to develop economies of scale, but their rigidity prevents them from reducing costs and adapting quickly to market changes, while small companies adapt more quickly to changes due to their flexible structure, since, in many of these companies, their production is based on the intensity of the labor factor and it is therefore easy for them to reduce costs when they need to do so. Pérez [17], find the opposite effect, i.e., the larger the size of the firm, the higher its profitability [18], [19].

On the other hand, Fernández and Campos [20], Margaretha and Supartika [21], analyze profitability according to sectors, finding that those belonging to the tertiary or service sector are the most profitable and those belonging to the agricultural sector the least profitable [22]. Similarly, Segura [23] conclude that the petroleum, computer and electronics sectors show the highest profitability rates regardless of financial leverage [24], [25]. This study, since it focuses on the same sector (graphic arts) and on companies of similar size (small), will assume that these external factors are controlled by focusing only on internal variables [26].

III. METHODOLOGY OR PROCEDURES

a. Hypothesis

Basically, the analysis attempts to test the hypotheses: a) the more sophisticated the organizational management of an SME, the better its financial results are expected to be in terms of profitability; and b) there are specialized organizational management factors that are more influential than others on the profitability of SMEs.

A more sophisticated organizational management should be understood as a higher degree of maturity or growth in terms of availability of resources and infrastructure, use of modern tools and application of contemporary theories to support management in the company [27], [28], [29].

b. Selected information

A sample of 42 companies out of a total population of 214, identified in the business records with the commercial activity of energy sector by-products in Colombia and meeting the criteria of number of employees to be classified as SMEs under Colombian law (between 11 and 200 employees), was used to collect information.

A questionnaire was used as a data collection instrument and a guided survey was used as an application method. The questionnaire used was designed by the Research Group on Management of Large, Small and Medium Enterprises (GP3yMes) of the School of Business Administration - EAN, located in Bogota (Colombia), and has been applied, reviewed, validated and analyzed since 2006 [7], [27], [30], [31], [32], [33]. The questionnaire is provided in a spreadsheet that assigns a value between 8.33% and 100% to the descriptor selected in each question and by means of arithmetic averages assigns a value in the same range to the variables and organizational factors. This value is used to establish the level of management sophistication of each organizational factor using the following function: values less than or equal to 25% are assigned to level 1, between 26% and 50% inclusive to level 2, values between 51% and 75% inclusive to level 3, and values greater than 75% to level 4.

c. Methodologic process

To test the hypotheses, a methodological process is used based on the analysis and relationship of organizational management factors with the Return on Assets (ROA) proposed by Ortiz and Pérez [31] and [34].

Equation 1 represents the relationship between organizational management factors and the ROA, pointing out that the latter is the result of a combination of these factors (Equation 2).

$$ROA = F(x_1 \dots, x_n), \text{ } x_i \text{ corresponds to a factor and n to the total of 15 factors} \quad (1)$$

$$F(x_1 \dots, x_n) = \alpha + \sum_i^n \beta_i * x_i; \quad \text{where } x_i \geq 0; \quad i = 1, \dots, n \quad (2)$$

In order to contrast the hypotheses, the following steps are followed, being careful in the consideration of relevant aspects for the objectivity of the techniques used:

Step 1: Metric conversion and factor reduction

The relationship presented in Equation 1 has a difficulty and a challenge. In the first case, it is the relationship between qualitative variables (organizational management factors) with metric variables (ROA), and in the second, the consideration of the principle of parsimony that seeks in the construction of models the abstraction and simplification to obtain a simpler model but that fits properly [35], [36], [37].

The two difficulties are overcome by strategically using a qualitative variable dimension reduction methodology (organizational management factors) known as Multiple Correspondence Analysis (MCA). The strategy consists of identifying the organizational management factors independent of each other that are most relevant to the model, selecting those with stronger measures of discrimination on the new dimensions that are constructed with MCA, and assigning new metric scores to the factors based on the composition of the new dimensions.

Step 2: Development of the model that associates the level of sophistication of organizational management factors with the ROA

Based on the theoretical model proposed by Ortiz and Perez [31], it is proposed as a means to develop a model that incorporates the relationships indicated in Equation 1 and Equation 2, the estimation of the stochastic econometric model of the room 3 using the methodology of the least squares from the values of the factors. Transformed intro metric variables and the ROA of the 138 companies.

$$ROA_t = \beta_o + \sum_{i=1}^n \beta_i * x_i + \mu; \text{ where t=1, …, T.} \quad \text{with T = number of companies} \quad (3)$$

The estimation of the model of Equation 3 must meet as fit criteria: a) obtain a correlation coefficient (R2) greater than 0.8 [38], [39]; and b) the values of βi must not be close to zero to prevent its incidence or contribution to ROA from being negligible [40]. This last criterion is met when the value of the maximum significance level to accept the hypothesis test of zero equality of βi values must be less than 0.10.

Step 3: Propose a complementary model

The proposal of Ortiz and Pérez [31], includes the consideration in the analysis of a complementary model based on the estimation of Equation 4. This model has the characteristic that by including the term, it tends to zero when the level of sophistication of the organizational management factors increases, therefore, it is possible to know the behavior of the variation of ROA when sophistication is incipient and when it reaches the maximum posible.

$$VarROA = \beta_o + \sum_{i=1}^{n} \beta_i * \frac{1}{x_i} + \mu \quad (4)$$

IV. RESULTS

Reduction of factors and conversion of variables

In the first instance, the challenge of simplifying the number of factors is addressed through the selection of mutually independent factors and the subsequent application of the MCA; the latter, also used for the conversion of the factors from qualitative variables to metric variables.

A multiple correlation analysis between the organizational management factors yielded the following results: the factors Production Management, Planning and Strategy, Logistics, Human Resources, Marketing Management, Finance, and Economic Environment presented,

when contrasted with other factors, seven or more correlation coefficients (R2) with values greater than 0.7. Under this criterion, these would be the factors to be eliminated from the model, leaving as a partial result eight factors for the subsequent MCA.

Table 1 presents the statistical results of the MCA with the eight organizational management factors remaining for the model. The Cronbach's Alpha coefficient as a measure of reliability or internal consistency of the variables within the model yielded an acceptable value of 0.962 [41], [42], [43].

TABLE I
SUMMARY OF MCA STATISTICIANS.

Dimension	Cronbach Alpha	Explained variance	
		Total (Self-values)	Variance (%)
1	,926	5,264	65,800
2	,045	1,042	13,020
Total	,962a	6,306	78,820

Source: Calculations with software SPSS.

When listing the organizational management factors in descending order by their measure of discrimination in each of the dimensions of the MCA (Table 2), it is observed that in dimension 1 the organizational management factors that are best discriminated by the companies are: Communication and Information Management, Innovation and Knowledge, Organizational Culture, and Environment; and in the case of dimension 2 they are: Associativity, Organizational Structure, Communication and Information Management, and Organizational Culture. Some factors are common to both dimensions.

TABLE II
RANKING OF DISCRIMINATION MEASURES IN THE DIMENSIONS 1 Y 2 DEL MCA.

Dimension 1		Dimension 2	
Link	0,913	Associality	0,506
InnovaYKnow	0,892	StructureOrg	0,499
OrgCulture	0,889	Link	0,261
Environment	0,809	OrgCulture	0,062
Exports	0,732	InnovaYKnow	-0,158
Associality	0,729	Environment	-0,353
StructureOrg	0,725	Imports	-0,394
Imports	0,552	Exports	-0,399
Variance (%)	65,8	Variance (%)	13,02

Source: Calculations with software SPSS.

If we take the difference in the values of the discretionary measure of each factor between dimension 1 and dimension 2, we can obtain a value that reflects the factor's capacity to discriminate the companies in one or the other dimension (Table 3). The results show that the discrimination values of the factors in dimension 1 are always higher than the values obtained in dimension 2, so it does not seem necessary to consider the discrimination values obtained by the factors in dimension 2 for the selection of factors to be included in the model.

TABLE III
DISTANCE BETWEEN MEASURES OF DISCRIMINATION OF ORGANIZATIONAL MANAGEMENT FACTORS (DIMENSION 1 - DIMENSION 2).

Component	Distance
Imports	1,166
Environment	1,162
Exports	1,131
InnovaYKnow	1,05
Imports	0,946
OrgCulture	0,827
Links	0,652
StructureOrg	0,226
Associality	0,223

The ranking of the factors of dimension 1 in Table 2 allows the decision to start the analysis of the model using the factors with the highest discrimination values in this dimension; it was decided to take the following factors: Communication and Information Management, Innovation and Knowledge, Organizational Culture, Environment, and Exports. In this way, the challenge of obtaining simplicity in the model is overcome, a simplicity whose assertiveness will be corroborated later on.

The conversion of organizational management factors from qualitative variables (ordinal scale) to metric variables is done by calculating the new factor values as a function of the contribution values of dimensions 1 and 2 [38], [39].

Development of a model that relates the level of sophistication of organizational management factors to ROA.

The model is developed by estimating the model of Equation 3, in which those defined in the previous section and expressed in Equation 3 were incorporated as factors (x) and are represented in Equation 5.

$$ROA = \beta_o + \beta_1(Communication) + \beta_2(InnovationKnowledge) + \beta_3(OrganizationalCulture) + \beta_4(Environment) + \beta_{5n}(Exports) \quad (5)$$

In order to obtain a model that meets the criteria of correlation coefficient (R2) greater than 0.8 and significant βi, the least squares estimation methodology was used using the backward elimination technique, that is, those factors with a significance level of the hypothesis test of βi = 0 of less than 10% were eliminated, until a model that meets the established criteria was obtained.

The process yielded four models (Table 4), during which three factors were eliminated: Communication, InnovaYKnow, and Environment. Communication obtained in the first model an estimated βi of 0.006 with a significance level of 0.802; it was followed by InnovaYKnow in the second model with an estimated βi of -0.017 and a significance level of 0.649; in the third model the factor Environment was eliminated with a βi of 0.055 and a significance level of 0.196.

TABLE IV
MODELS GENERATED BY LEAST SQUARES ESTIMATION USING THE BACKWARD ELIMINATION TECHNIQUE.

Model		Unstandardized coefficients		Typified coefficients	1	Sig.
		B	Typ. Error	Beta		
1	(Constante)	,261	,489		,534	,597
	Communication	,006	,025	,016	,253	,802
	InnovaYKnow	-,022	,042	-,044	-,518	,607
	OrgCulture	,062	,026	,140	2,372	,023
	Environment	,051	,039	,071	1,292	,205
	Exports	,507	,029	,858	17,569	,000
2	(Constante)	,235	,472		,498	,622
	InnovaYKnow	-,017	,038	-,034	-,459	,649
	OrgCulture	,064	,025	,145	2,603	,013
	Environment	,053	,038	,073	1,382	,175
	Exports	,506	,028	,857	17,920	,000
3	(Constante)	,296	,448		,662	,512
	OrgCulture	,055	,015	,125	3,654	,001
	Environment	,046	,035	,065	1,318	,196
	Exports	,502	,026	,849	19,013	,000
4	(Constante)	,583	,395		1,479	,147
	OrgCulture	,064	,014	,143	4,593	,000
	Environment	,527	,018	,892	28,567	,000

Source: Calculations with software SPSS.

The fourth model met the requirements for a good model fit: (a) the correlation coefficient in the least squares estimation is greater than 0.8, exactly 0.977 (Table 5); (b) the two organizational management factors incorporated have a significant impact on ROA (Table 4); (c) the Durbin-Watson value close to 2 in model 4 certifies the absence of autocorrelation (Table 5); and d) the p-value of the F-test contrast for the joint significance of the estimated parameters of said model is less than 0.05, so the hypothesis that all the coefficients of regression model four are zero cannot be rejected and therefore it is assumed that the model is statistically appropriate (Table 6).

TABLE V
ADJUSTMENT OF THE DIFFERENT MODELS DURING THE BACKWARD ELIMINATION PROCESS.

Model	R	R-squared	Corrected R-squared	Standard error of the estimate	Durbin-Watson
1	,989[a]	,978	,975	1,167930	
2	,989b	,978	,976	1,153064	
3	,989c	,978	,976	1,141030	
4	,988d	,977	,976	1,151749	2,345

Source: Calculations with software SPSS.

TABLE VI
ANOVA TEST PERFORMED ON MODEL FOUR.

Model	R	R-squared	Corrected R-squared	Standard error of the estimate	Durbin-Watson
1	,989[a]	,978	,975	1,167930	
2	,989b	,978	,976	1,153064	
3	,989c	,978	,976	1,141030	
4	,988d	,977	,976	1,151749	2,345

Source: Calculations with software SPSS.

TABLE VII
ANOVA TEST PERFORMED REGRESSION RESIDUAL.

Model		Sum of squares	gl	Mean square	F	Sig.
4	Regression	2203,537	2	1101,768	830,567	,000d
	Residual	51,735	39	1,327		
	Total	2255,271	41			

Source: Calculation with software SPSS.

To summarize the result of this analysis, model four allows us to establish that the relationship between the level of sophistication of the organizational management factors in the selected sample of companies and their ROA can be explained by management in Exports and Organizational Culture using Equation 6.

$$ROA = 0{,}583 + 0{,}064 * Orgqanizational Culture + 0{,}527 * Exports \quad (6)$$

Complementary model approach

To estimate the model of Equation 4, the least squares method was used together with the backward elimination technique. The same procedure was used to develop the model in the previous section. The estimation process was started by including the 15 organizational

management factors taking the calculated values as metric variables. Eight iterations or eliminations were required to arrive at a model with a good fit according to the same criteria used in the previous section (Table 7).

TABLE VIII
MODEL GENERATED IN THE EIGHTH ITERATION OF THE LEAST SQUARES ESTIMATION OF THE EQUATION 4 MODEL.

Model		Unstandardized coefficients		Typified coefficients	1	Sig.
		B	Typ. Error.	Beta		
8	(Constante)	10,734	1,417		7,574	,000
	Communication	-37,182	18,272	-,157	-2,035	,050
	OrgCulture	-83,704	43,996	-,175	-1,903	,066
	Exports	-219,989	28,429	-1,202	-7,738	,000
	Asociality	184,581	57,916	,266	3,187	,003
	Finance	-81,840	28,294	-,199	-2,892	,007
	Marketing	88,453	39,568	,190	2,236	,032
	Imports	53,805	23,244	,307	2,315	,027

Source: Calculation with software SPSS.

These results generate an estimated model that is presented in Equation 7. In this estimated model, the organizational components of Organizational Culture and Exports appear again, but in this case, not as explanators of ROA but as differentiators of the variation of ROA when their management levels change. New organizational management factors appear in this reciprocal model: Communication and Information Management, Associativity, Finances, Marketing Management and Imports.

$$VarROA = 10{,}734 - 37{,}182\frac{1}{Communication} - 83{,}704\frac{1}{OrgCulture} - 219{,}999\frac{1}{Exports} + 184{,}581\frac{1}{Asociality} - 81{,}840\frac{1}{Finance} + 88{,}453\frac{1}{Marketing} + 53{,}805\frac{1}{Imports} \quad (7)$$

The fit and goodness of fit of the Equation 6 model is as follows: a) the correlation coefficient (R2) is equal to 0.943, a value high enough to be confident that the data fit very closely to the established model (Table 9); b) the Durbin-Watson coefficient close to the value of 2.0 certifies the absence of autocorrelation (Table 8); c) the p-value of the ANOVA test is almost zero, therefore there is a high joint significance of the model coefficients (Table 8).

TABLE IX
ANOVA TEST STATISTICS IN THE COMPLEMENTARY MODEL.

Model		Sum of squares	gl	Mean squares	F	Sig.
8	Regression	2126,501	7	303,786	80,210	,000h
	Residual	128,771	34	3,787		
	Total	2255,271	41			

Source: Calculation with software SPSS.

TABLE X
FIT AND GOODNESS OF FIT OF THE COMPLEMENTARY REGRESSION MODEL.

Model	R	R-squared	Corrected R-squared	Standard error of the estimate	Durbin-Watson
8	,971h	,943	,931	1,946117	2,104

Source: Calculation with software SPSS.

Equation 6 was shown to be a good fit model to explain the incidence of the level of sophistication of organizational management on the ROA of the companies used in the sample. During the process of obtaining the model, some organizational management factors were eliminated.

The first proposal was to eliminate from the model the organizational management factors: Production Management, Planning and Strategy, Logistics, Human Resources, Marketing Management, Finance, and Economic Environment; a decision based on a multiple correlation analysis, which may also generate the perception of sacrificing the validity of the model for the sake of simplicity, but it is important to understand that there are two criteria that regain confidence: (a) these factors are management activities that permeate the entire organization and therefore it is logical to think that their effects are represented in the effects of the factors that remain; and (b) the high values of the correlation coefficient with other factors corroborate the previous statement.

To obtain another point of view in the analysis of this decision and to trust that the model is enriched by it, the dispersion of the clouds presented by the location of the companies in the quadrants generated by dimensions 1 and 2 of the MCA was compared, both the MCA already performed with the elimination of the proposed factors, and the additional MCA performed considering all the factors (Figure 1)

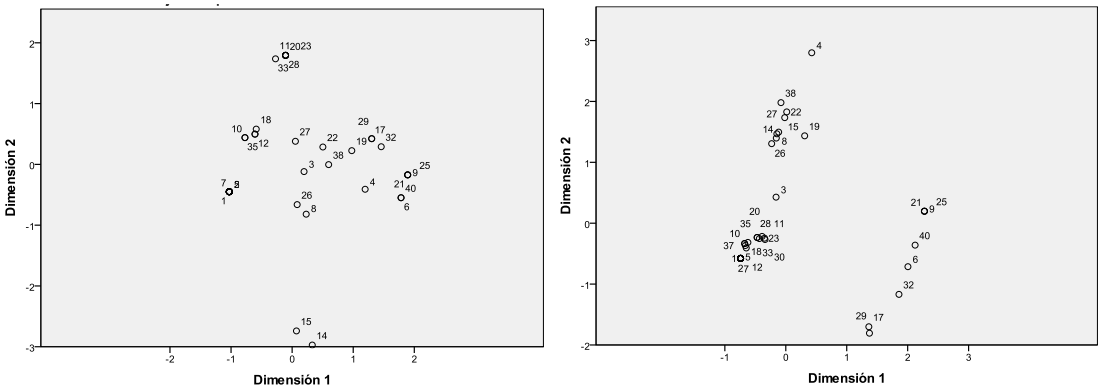

Fig. 1: Placement of companies in a quadrant elaborated with dimensions 1 and 2 of the MCA: (Left) using the chosen organizational management factors; (Right) using all factors.
Source: Calculation with software SPSS.

A comparison of the two graphs in Figure 1 shows that if all the organizational management factors are used, the interdependence between factors makes it difficult to discriminate differences between one company and another (left side of Figure 1), while limiting the model to mutually independent factors make it possible to discriminate differences between companies as accurately as possible (right side of Figure 1). This evidence proves the assertiveness of the decision to eliminate interdependent factors.

Other factors were eliminated from the model when analyzing the best fit for the estimation of Equation 5. These factors were Communication and Information Management, Innovation and Knowledge, and Environment. The elimination of these factors was due to the fact that their contribution to ROA is considered negligible.

Thus, the best fit of the model of Equation 5 is Equation 6, which only includes the factors of organizational management Exports and Organizational Culture, since they are considered mutually independent and their impact on ROA is considerable with respect to other factors. With this it is possible to contrast the validity of the hypothesis that "there are specialized factors of organizational management that are more influential than others on the profitability of SMEs", even in Equation 6 itself the management of Exports is more influential on ROA than the Management of Organizational Culture.

The inclusion of these factors in Equation 6 can be further interpreted by comparing the behavior of the five mutually independent factors in terms of the dispersion of their data (Figure 2) and their scatter plot with the ROA (Figure 3).

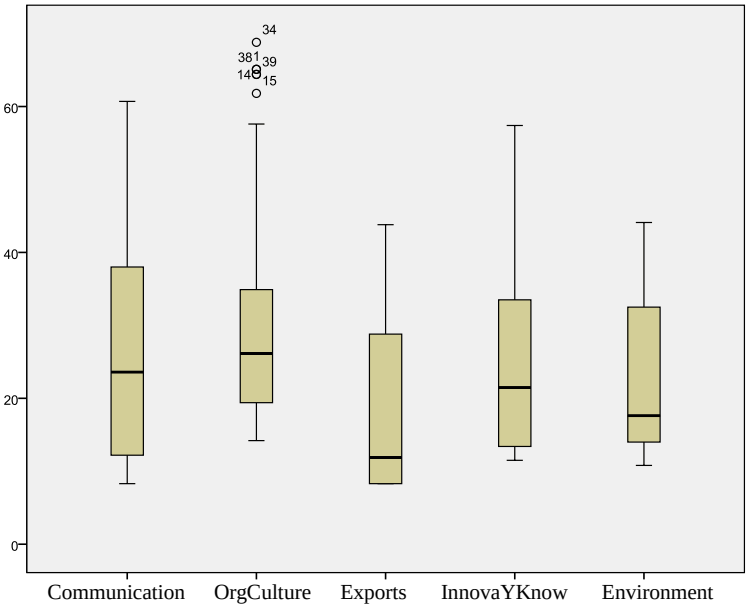

Fig. 2: Box-and-whisker plot of the five mutually independent factors in Equation 5.
Source: Calculation with software SPSS.

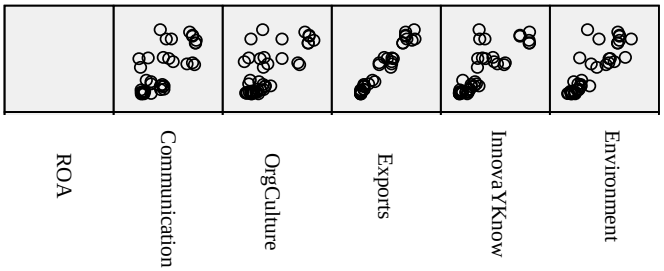

Fig. 3: Individual scatter plots between factors and ROA.
Source: Calculation with software SPSS.

The above figures 2 and 3 allow us to find a particular and outstanding characteristic in the Organizational Culture and Exports factors. The Organizational Culture factor is the one with the greatest variability in its data, even the only one with outliers, and the Exports factor is the one with the most compact or least "scattered" dispersion cloud. These particularities allow us to explain the role that each of these factors plays in the model of Equation 5.

The greater variability in the data for the Organizational Culture factor and its lower value in the coefficient β=0.064 indicate that its higher levels of sophistication have a low incidence on ROA but that its importance within the model lies in its discriminating capacity since the differences in the management of Organizational Culture among companies are wide and therefore a company with the best sophistication in the management of this specialized aspect should show some difference in ROA with respect to another with a minimum level of sophistication.

In contrast, the lower variability of the values of the management factor Exports indicates that firms apply more similar levels of sophistication but the lower "dispersion" in the dispersion cloud and its considerable coefficient β=0.527 point to the role of Exports in the model as reflecting the priority of improving this specialized aspect within the sample firms if considerable increases in ROA are to be obtained. This last observation is consistent with the levels of exporting among Cartagena firms, where the Export Openness Rate reported by the city's Chamber of Commerce is 2%, i.e., that the potential for improvement of firms via exports is a "virgin reserve".

The fact that the Export and Organizational Culture factors were also included in the complementary model reaffirms their importance in the impact on the financial results of the group of companies analyzed.

To interpret the results of the complementary model (Equation 7), a two-dimensional graph is prepared where the scale for the organizational management factors (metric variables) is located on the abscissa axis and the Variation in ROA (VarROA) on the ordinate axis (Figure 4). Only four management factors (Exports, Market Management, Associativity and Organizational Culture) were included in the graph, the behavior of the other factors is deduced.

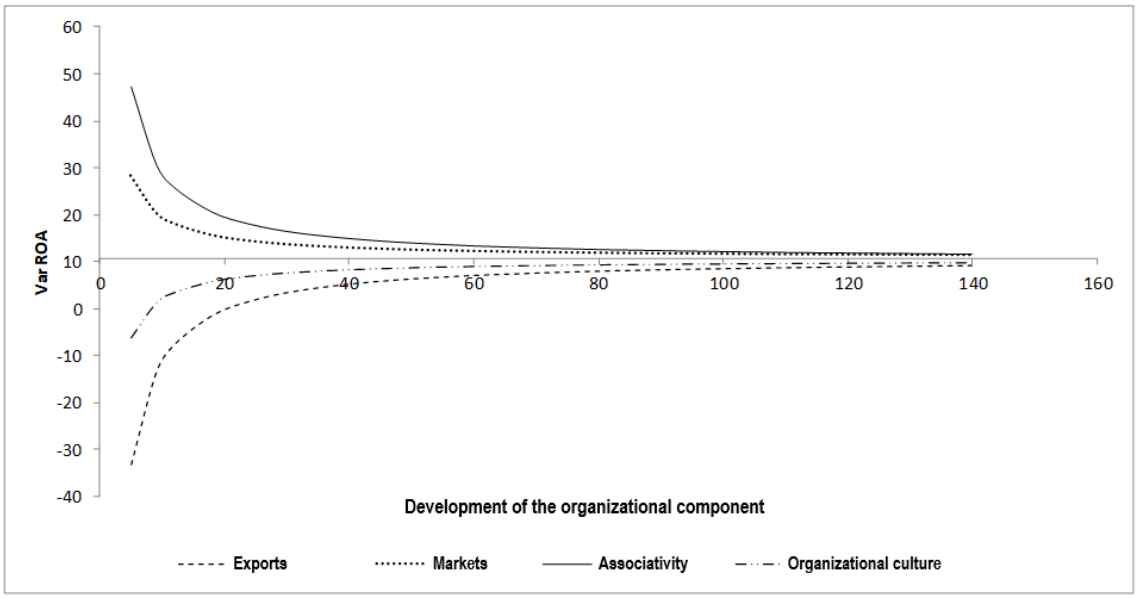

Fig. 4: Behavior of organizational management factors in the complementary model.
Source: Calculation with software SPSS.

The abscissa axis crosses the ordinate axis at the value 10.734%, which corresponds to the value of βo of Equation 7. A horizontal asymptote is constructed at this value, which corresponds to the limiting variation that can be obtained in ROA when the levels of sophistication of the organizational management factors incorporated in the model are increased [33], [17], i.e. a company in the sample can improve ROA by 10.734 percentage points or 83.3% more with respect to the industry average (12.89% at the time the sample was taken) by combining improvements in all its organizational management factors or improving one factor as much as possible and keeping the others constant.

The curves for the factors Associativity and Marketing Management are above the asymptote because the values of their coefficients βi are positive; while the curves for the factors Exports and Organizational Culture have negative coefficients and therefore appear below the asymptote.

Although Ahinful et al. [18] explain that the negative coefficient indicates that the factor is a process inherent to the company even when lower than average or even negative returns are being obtained, the fact that the factors Exports and Organizational Culture obtained a negative coefficient in the complementary model of Equation 7, and in addition: (a) have the highest coefficients in absolute value in this model, and (b) coincide with the key factors in the model of Equation 6, prompts to intuit through this empirical evidence that the sign of the coefficient indicates the importance or priority of the management factor if obtaining positive variations in ROA with respect to the average of the sample of companies is concerned.

The model in Equation 6 indicated that the factors Exports and Organizational Culture are key to explaining the ROA of the companies in the sample; Now, the model of Equation 7 again indicates with the absolute value of its coefficients that these are the factors that have the best impact on the variation of ROA with respect to the average, and that at low levels of management sophistication, the variation of ROA with respect to the average of the sample of companies is forced to be negative, but when the level of sophistication improves, the tendency is for the factor to change direction and force the variation of ROA to be positive. In metaphorical words it can be said that if a climber wants to climb a mountain using his own strength and wants to increase the speed to reach the top sooner, he would have two options, to make more strength to push himself faster (increase the organizational management factors with positive coefficients) or start to get rid of the load he is carrying to improve his momentum with the same strength he currently uses (improve the organizational management factors with negative coefficients). Which is the most efficient and reliable option, although not the most economical for the climber?

It is important to clarify that we speak of a factor forcing a negative or positive ROA variation result because the true variation of ROA is the aggregate of the different forces exerted by the factors on it. The possibility of finding an asymptotic behavior of the curves showing the incidence of each organizational management factor on the maximum positive variation that can be achieved with respect to ROA corroborates the hypothesis that "the more sophisticated the organizational management of an SMEs, the better financial results it is expected to reflect in terms of profitability", in this case an ROA above the average ROA of the group of companies in the sample [34].

V. CONCLUSIONS

It was shown that organizational management influences the financial results of SMEs, but if this management is analyzed by specialized factors within the different aspects of the organization, it can be found that some have an interdependent impact with others on the financial results measured for example with ROA, while in other factors their impact on this performance indicator is negligible, and finally, key factors can be found that explain more strongly these results.

The analysis of the key factors identified within the model to explain the financial results of the companies in the sample concludes that the Export factor is the most influential on ROA and that this may be due to the untapped potential so far in this specialized aspect of the companies in the sample. In this sense it can be said that there is reciprocal evidence with respect to the statement of Hindasah and Nuryakin [35] and Ali et al. [36] on the individual satiation or exhaustion that is reached in the factors of organizational management on its impact on financial results when new levels of sophistication are sought after a point reached. In this case reciprocal empirical evidence is presented that a specialized factor such as Exports, in this case, when it is at low levels of sophistication or development presents the best levels of ROA improvement.

The incorporation in the model of the organizational management factor Organizational Culture is a finding that reflects its importance in building conditions for an efficient coordination of people towards the achievement of the expected results in the organization; for example, positive relationships have been found with organizational performance results: In companies with market-oriented organizational cultures [37], entrepreneurial organizational cultures [38], [39], [40] with an emphasis on learning or knowledge [41], [42], [43], just to name a few.

In the case of the Export factor, the increase in its level of sophistication explains the improvement in ROA to the extent that learning from the internationalization process strengthens the company competitively and therefore allows it to have better conditions than those competitors without the same level [44], [45], [46]; this is achieved because internationalization processes require innovation in the company, which brings with it improvements in the profitability of the prices offered via added value of the product or service in the local and foreign markets [47], [48], [49].

It was corroborated that as the level of sophistication of organizational management improves, the company's ROA improves to a value higher than the average for the business sector. This variation can be explained by the effects of the level of sophistication achieved in the organizational management factors.

Up to this point, the hypotheses were corroborated and empirical evidence on the impact of organizational management on financial results was presented. However, this empirical evidence also allows us to suggest the statement that: the decision on which management factors management should concentrate on in order to obtain considerable financial results can be determined by taking the sign of the coefficients that accompany the reciprocal terms in a complementary model estimated as in Equation 6.

VI. ACKNOWLEDGEMENTS AND FUNDING

The authors would like to thanks the Office of the Vice-Chancellor for Research of the University of Cartagena for financial support provided during the execution of the project that led to this research article.

VII. REFERENCES

[1] «Global Entrepeneurship Monitor Colombia (GEM). Universidad de los Andes, ICESI, Pontificia Universidad Javeriana, Universidad del Norte», [En línea]. Disponible en: https://www.gemconsortium.org/report/actividad-emprendedora-colombia-un-pais-en-reactivacion.

[2] «GEM 2025/2026 Global Report: From Uncertainty to Opportunity», [En línea]. Disponible en: https://www.gemconsortium.org/reports/latest-global-report.

[3] «¿Es posible medir la perdurabilidad empersarial?», [En línea]. Disponible en: https://repository.urosario.edu.co/handle/10336/27719.

[4] «Profitability and liquidity on firm value and capital structure as intervening variable», doi: https://doi.org/10.21744/irjmis.v7n1.828.

[5] «Efectos de la gestión organizacional en la rentabilidad en pymes: evidencias empíricas y algunas consideraciones teóricas», [En línea]. Disponible en: http://www.scielo.org.co/pdf/ean/n69/n69a06.pdf.

[6] «La matriz del mmgo, una, vol. herramienta que estimula el desarrollo de competencias tecnológicas en el contexto empresarial», [En línea]. Disponible en: https://journal.universidadean.edu.co/index.php/vir/article/view/1423/1376.

[7] «Understanding the impact of business analytics on innovation», [En línea]. Disponible en: https://www.sciencedirect.com/science/article/abs/pii/S0377221718305447.

[8] «Knowledge audit as a key tool for business research in the information society», [En línea]. Disponible en: https://ideas.repec.org/a/ssi/jouesi/v7y2020i3p2299-2319.html.

[9] «Does the 'persistence of profits' persist? a study of company profits in Japan, 1964–97», [En línea]. Disponible en: https://doi.org/10.1016/S0167-7187(01)00093-5.

[10] «Efectos tamaño y sector sobre la rentabilidad, endeudamiento y coste de la deuda de las empresas familiares rioajanas», [En línea]. Disponible en: http://hdl.handle.net/10810/7084.

[11] «Persistence of profits for UK manufacturing and service sector firms», doi: https://doi.org/10.1080/02642069600000017.

[12] «Efectos de las fusiones sobre la concentración y la eficiencia bancaria: el caso de las Cajas Rurales y los retos de la crisis financiera», [En línea]. Disponible en: https://doi.org/10.1080/02102412.2010.10779683.

[13] «Firm size and productivity differential: theory and evidence from a panel of US firms», doi: https://doi.org/10.1016/S0167-2681(00)00139-6.

[14] «Factores explicativos del desempeño financiero de las empresas del sector de la piedra natural en España e Italia», [En línea]. Disponible en: http://repositorio.ual.es/handle/10835/14028.

[15] «The nexus between firm size, growth and profitability: new panel data evidence from Asia–Pacific markets», [En línea]. Disponible en: https://doi.org/10.1108/EJMBE-03-2021-0077.

[16] «Factores determinantes de la rentabilidad financiera de las pymes», [En línea]. Disponible en: https://doi.org/10.1080/02102412.2002.10779452.

[17] «The determinants of profitability in non-financial UK SMEs», [En línea]. Disponible en: https://doi.org/10.1108/EBR-09-2022-0173.

[18] «Determinants of SMEs' financial performance: evidence from an emerging economy», [En línea]. Disponible en: https://doi.org/10.1080/08276331.2021.1885247.

[19] «Tamaño y rentabilidad de la gran empresa española: un análisis empírico de su relación basado en un método multicriterio», [En línea]. Disponible en: https://dialnet.unirioja.es/servlet/articulo?codigo=1215420.

[20] «Factors affecting profitability of small medium enterprises (SMEs) firm listed in Indonesia Stock Exchange», [En línea]. Disponible en: http://www.joebm.com/vol4/379-ET10002.pdf.

[21] «Determinants of SMEs' performance: evidence from European countries», [En línea]. Disponible en: https://doi.org/10.1080/1331677X.2019.1636699.

[22] «La Rentabilidad económica y financiera de la gran empresa española: Análisis de los factores determinantes», [En línea]. Disponible en: https://www.jstor.org/stable/42781061.

[23] «Improving the development technology of an oil and gas company using the minimax optimality criterion», [En línea]. Disponible en: https://doi.org/10.3390/en14113177.

[24] «Oil price uncertainty and corporate debt maturity structure», [En línea]. Disponible en: https://doi.org/10.1016/j.frl.2021.102278.

[25] «Lean manufacturing performance in China: assessment of 65 manufacturing plants», [En línea]. Disponible en: https://doi.org/10.1108/17410380810847927.

[26] «The unique chinese innovation pathways: Lessons from chinese small and mediuem sized manufacturing firms», [En línea]. Disponible en: https://doi.org/10.1016/j.ijpe.2016.09.004.

[27] «Institutionalization of the fourth industrial revolution in national economics and on global market: Different paths to success», [En línea]. Disponible en: https://link.springer.com/chapter/10.1007/978-3-030-58267-8_4.

[28] «Análisis empírico de la aplicación del modelo de modernización de la gestión para organizaciones en Pymes colombianas», [En línea]. Disponible en: https://www.redalyc.org/pdf/206/20612980005.pdf.

[29] «Application of data envelopment analysis to evaluate investments in the modernization of collective management irrigation systems in Valencia (Spain)», [En línea]. Disponible en: https://doi.org/10.1007/s11269-021-02986-1.

[30] «Analisis Perkembangan Return On Assets (ROA) dan Return On Equity (ROE) untuk Mengukur Kinerja Keuangan», [En línea]. Disponible en: https://jurnal.um-palembang.ac.id/ilmu_manajemen/article/view/2115/0.

[31] «Analysis of the effect of return on asset, debt to equity ratio, and total asset turnover on share return», [En línea]. Disponible en: https://www.jiemar.org/index.php/jiemar.

[32] «Pengaruh Return On Asset (ROA) Terhadap Nilai Perusahaan», [En línea]. Disponible en: https://jurnal.ceredindonesia.or.id/index.php/akmami/article/view/457.

[33] «The financial factors that influence the profitability of SMEs. International», [En línea]. Disponible en: http://dx.doi.org/10.6007/IJAREMS/v3-i4/1117.

[34] «Is corporate governance a good predictor of SMEs financial performance? Evidence from developing countries (the case of Lebanon)», [En línea]. Disponible en: https://doi.org/10.1080/20430795.2021.1874213.

[35] «The relationship between organizational capability, organizational learning and financial performance», [En línea]. Disponible en: https://doi.org/10.13106/jafeb.2020.vol7.no8.625.

[36] «The impact of organizational culture on corporate financial performance: A review», [En línea]. Disponible en: https://ijecm.co.uk/.

[37] «A multiple-layer model of market-oriented organizational culture: Measurement issues and performance outcomes», [En línea]. Disponible en: https://doi.org/10.1509/jmkr.37.4.449.18786.

[38] «Entrepreneurship in family vs. non–family firms: A resource–based analysis of the effect of organizational culture», [En línea]. Disponible en: https://doi.org/10.1111/j.1540-6520.2004.00051.x.
[39] «The effect of organizational culture on entrepreneurial orientation: A comparison between Germany and Thailand», [En línea]. Disponible en: https://www.tandfonline.com/doi/abs/10.1111/jsbm.12052.
[40] «The impact of organizational culture on entrepreneurial orientation: A meta-analysis», [En línea]. Disponible en: https://doi.org/10.1016/j.jbvi.2021.e00234.
[41] «Linking knowledge processes with firm performance: organizational culture», [En línea]. Disponible en: https://doi.org/10.1108/14691931211196196.
[42] «Unpacking knowledge management practices in China: do institution, national and organizational culture matter?», [En línea]. Disponible en: https://doi.org/10.1108/JKM-07-2017-0260.
[43] «Organizational culture and knowledge management processes: case study in a public university», [En línea]. Disponible en: https://doi.org/10.1108/VJIKMS-05-2018-0041.
[44] «Modelización del comportamiento de la empresa exportadora española. Información Comercial Española», [En línea]. Disponible en: https://www.researchgate.net/profile/Jose-Alonso-32/publication/28050959.
[45] «The impact of SME access to finance and performance on exporting behaviour at firm level: A case of furniture manufacturing SMEs in Zimbabwe», [En línea]. Disponible en: https://hdl.handle.net/10520/EJC-f99d11e56.
[46] «El desempeño de empresas exportadoras según su tamaño: una guía de indicadores y resultados», [En línea]. Disponible en: https://doi.org/10.1257/jep.26.2.91.
[47] «Gains from trade when firms matter», [En línea]. Disponible en: https://doi.org/10.1257/jep.26.2.91.
[48] «Reassessing the productivity gains from trade liberalization», [En línea]. Disponible en: https://doi.org/10.1111/roie.12364.
[49] «Helping SMEs internationalise through trade facilitation», [En línea]. Disponible en: https://www.oecd-ilibrary.org/content/paper/2050e6b0-en.