

# Administrative and operational strategies of the coffee processing industry department of Caldas (Colombia)



Revista  
Facultad Nacional  
de Agronomía

Estrategias administrativas y operativas de la industria procesadora de café del departamento de caldas (Colombia)

doi: 10.15446/rfna.v69n2.59134

Félix Octavio Díaz Arango<sup>1\*</sup>

## ABSTRACT

### Key words:

Coffee  
Management  
strategies  
Productivity  
Quality management

Industries, especially coffee industries in countries like Colombia, must focus on management models geared towards customer satisfaction, improved processes and a culture of leadership in organizations. This research focused on the study of how the senior management of companies that process coffee, especially in the Department of Caldas (Colombia), can create, design and implement administrative and operational strategies in order to improve the productivity and quality of the industrial sector. In order to solve this problem, a management guide for quality and operations has been proposed. To develop such a model, the operating performance (OP), productivity (P), quality management (QM), environmental performance (EP), and social management (SM) of the sector were analyzed. This was achieved with a mixed research design involving quantitative and qualitative methodologies. As a result, a model based on quality and operations management, aimed at the coffee processing industry in the Department of Caldas, was obtained. This model improved the positioning of this industry in the domestic and international markets. Furthermore, it was concluded that quality management depends on operating performance and productivity when it comes to increasing the competitiveness of the coffee processing industries in the Department of Caldas (Colombia).

## RESUMEN

### Palabras claves:

Café  
Estrategias  
administrativas  
Productividad  
Administración de la  
calidad

Las industrias, especialmente la del café en países como Colombia, deben enfocarse en el alcance de modelos de administración que busquen la satisfacción de sus clientes, la mejora de sus procesos y una cultura de liderazgo en las organizaciones. La investigación se centró en el estudio de cómo la alta gerencia de las empresas procesadoras de café, especialmente del Departamento de Caldas (Colombia), puede establecer, diseñar e implementar estrategias administrativas y operativas con el fin de mejorar la productividad y calidad del sector industrial. Con el fin de intervenir esta problemática se ha propuesto el diseño de una guía de administración de la calidad y operaciones. Para elaborar dicho modelo se analizó el desempeño operativo (DO), la productividad (P), la administración de la calidad (AC), el desempeño medioambiental (DM), y la gestión social (DRSE) de dicho sector. Lo anterior se logró con un diseño de investigación mixta que involucró la metodología cuantitativa y cualitativa. Se obtuvo como resultado un modelo basado en la administración de la calidad y operaciones, dirigido a la industria procesadora de café del departamento de Caldas. Dicho modelo permite mejorar la posición que tiene la industria caldense en los mercados nacionales e internacionales. Se concluye que la administración de la calidad depende del desempeño operativo y la productividad, con el fin de incrementar la competitividad de las industrias procesadoras de café del Departamento de Caldas (Colombia).

<sup>1</sup> Facultad de Ingenierías. Universidad de Caldas. A.A. 275, Manizales, Colombia.

\* Corresponding author <[felix.diaz@ucaldas.edu.co](mailto:felix.diaz@ucaldas.edu.co)>



**M**anufacturing is one of the most important activities for the Colombian economy. Specifically, the Colombian industrial sector, during the first quarter of 2013, contributed 12.6% to the national GDP. Coffee products were among the activities that had a positive performance in that quarter, at 20.2% (DANE, 2013). The Department of Caldas (Colombia) ranks seventh for the competitiveness indicator among the 29 departments of Colombia. Its capital, Manizales, ranks first among the cities for ease of doing business in Colombia. The manufacturing industry contributes 16.7% to this department's GDP, with coffee products at 22.9% (MINCIT, 2013).

The strategic priorities of the competitiveness agenda of the Caldas Department include strengthening the industrial base of the global and regional sectors in order to increase productivity across the board, with coffee being one of them (DNP, 2016). The topics for improving the competitiveness of the Department of Caldas are: coffee plantation renewal, coffee quality and productivity, and specialty coffees (DNP, 2013).

Accordingly, the proposed research project is academic in nature. It seeks to achieve an impact on the industrial sector of the processing chain in the coffee region of the Caldas Department, Colombia, considering administration and economics and applying concepts of operational and quality management in the industry.

When analyzing the problems of the coffee industry (DNP, 2013), solutions must be based on management areas that are interrelated with operations management, in concert with the quality management. To respond to these problems, this study sought to answer the question: Is it possible to improve the productivity of the coffee processing industry in the Caldas Department by designing strategies that help generate competitive advantages in the XXI century?

The overall objective of this dissertation was to generate an administrative guide for quality and operations in order to help increase the productivity of the coffee processing industry of the Caldas Department. This model should raise the level and improve the position of the companies in the industrial sector, along with the socio-economic environment to which they belong.

The specific objectives, to design a quality and operations management model in order to improve the productivity of companies in the coffee industrial sector of the Department of Caldas. To analyze whether quality management would improve the productivity of the coffee processing industry in the Department of Caldas, Colombia. To analyze strategies for the development of industrial chains in the coffee processing industry of the Caldas Department. To establish correlations between the internal and external administrative variables and the performance of different functional areas of the businesses.

## **MATERIALS AND METHODS**

This research used the coffee processing industry of the Department of Caldas (Colombia) as the study unit.

This project involved two methods of scientific thought: analysis and synthesis. In the analytical method, the whole is taken apart, breaking it down into its parts or elements to observe the causes, nature and effects of the phenomena. The synthetic method is a reasoning process that tends to reconstruct the whole from the elements as distinguished by analysis, trying for a succinct and methodical extrication.

Each of the components of the studied variables were ordered by class in order to understand their behavior and explain and illustrate the phenomenon being studied. The final research had a mixed approach, integrating the collection and analysis of the quantitative and qualitative data, along with an articulated discussion.

The two approaches in the joint research produced a guide that aims to gain a more complete view of reality, not through two approaches or different views, but by using both in the study of the same reality through interdisciplinary efforts that bring disciplines and areas of knowledge together.

Taking into account the two methodologies, this project used a mixed methodology. Therefore, quantitative and qualitative processes were integrated systematically for inferences from the collected data and a greater understanding of the project.

This was followed by, in response to some elements, such as time, priority of the methodology, type of mixture and theorizing, and a specific mixed design: Sequential

explanatory design (Dexplis), characterized by a primary step that results in the collection of quantitative data, followed by another that organizes and evaluates qualitative data. This inquiry aimed to show a useful proposal for an administration guide to determine the degree of validity of the studied variables. Triangulation as a methodological strategy can prove invaluable for the validity of the research (Rodríguez *et al.*, 2006).

For this study, dominant data will be used (CUAN), along with a search for other data of the natural variety (CUAL), which will be in a companion paper.

The principal independent variables were productivity (P) and Operations Management (operational performance) (OM). However, because productivity is a process executed by senior management, it was considered as the primary independent variable. Either way, the partial results recommended the use of another independent variable, such as operating performance. The independent variable productivity, which has three constructs or predictor variables, is related to external and internal factors that enable organizations to manipulate human resources, capital and management.

The principal dependent variables were the philosophy of total quality is based on three fundamental principles: 1. focus on customers 2. focus on the workforce. 3. focus on the process (Evans and William, 2014).

The dependent variable quality management, which has three constructs or predictor variables, is related to external and internal factors that allow organizations to manipulate customer focus (CF), focus on workforce (FW) and focus on the process (FP).

Other variables were Human Resources (HR), capital (CO), Management (M), Economic Dimension (DE), Competitive Dimension (DC), Operational Dimension (DO), social performance (SP), environmental performance (environmental performance, vitality of the ecosystems (VE)), internal social dimension (IS), external social dimension (IE), economic dimension (corporate governance) (G).

The most appropriate sampling was non-probability sampling because of this study's exploratory inquiry, qualitative studies and marginalized populations.

The second factor applied to the coffee processing industry reviewed the number of companies with the same profile and showed that the population of the coffee sector was small (22 companies) in this region of Caldas. Quantitative and qualitative methodologies were used on quantitative and qualitative samplings carried out on a small population of coffee processing industries in the Caldas region of Colombia during six months (2014 and 2015) to measure the studied variables on a single occasion. From among the data collection instruments in the scientific field, the questionnaire was selected. This tool uses a highly structured interview and a document that allows for the collection of information in an organized manner using indicators for the variables involved in the research.

A questionnaire consists of a set of questions, which can be various types, on different variables to be measured, facts and aspects that are of interest in the research and can be applied in various forms to groups of people or individuals, face to face or at a distance. A session was held with 22 participants of the surveyed companies at directors and departmental heads selected because knowledge the processes of the coffee processing companies. The survey included the topics: What differences do capital, management, and human resources make in the development of a company? How is the company doing economically, socially, and competitively? What components focus on the clientele, workforce, and process? What is the company's position towards the environment and the vitality of the ecosystems? What is the company's position towards the internal social dimension, the external social dimension, and the economic dimension of the organization?

Once the themes and categories were detected, we proceeded to quantitatively analyze the data (product of interviews) of all the companies and a hierarchy of topics and categories was established, building a table of responses. Canonical correlation analysis was selected (Hair *et al.*, 2001). Canonical correlation analyses are applied to situations where a regression technique is appropriate, but for more than one dependent variable. A multiple regression analysis is used to find the linear combination of  $p$  variables,  $X_1, X_2, \dots, X_p$ , that best predict the dependent variable,  $Y$ . The multiple correlation coefficient is the simple correlation between  $Y$  and

its prediction through the regression equation. In the canonical correlation analysis, the linear relationship between a group of variables, X, and a group, or a group of variables, Y is examined.

After finding two other linear combinations for each group of variables that have maximum correlation and so on are a set of linear combinations for each group of variables that have high correlation. These linear combinations are called canonical variables and the correlations between the corresponding pairs of canonical variables are called canonical correlations.

According to Saéz and Alfredo (2013), the canonical correlation analysis involves the construction of successive pairs of variables, which are linear combinations of the original, so that each pair represents the best explanation of each set relative to each other that has not been obtained by the previous pairs. In short, the first stage of the canonical

correlation analysis is to build a CCI1 variable and another CCO1, with the following expression:

$$CCI1 = \alpha_{11}X_1 + \alpha_{12}X_2\Delta + \alpha_{1q}X_q$$

$$CCO1 = \beta_{11}Y_1 + \beta_{12}Y_2 + \Delta + \beta_1$$

The correlation between these two variables is the largest among all of the possible linear combinations of the two groups of variables. Therefore, the problem consists of obtaining the weighted vectors a and b, which ensure that the covariance between CCI1 and CCO1 is the maximum possible and make the variance of these new variables equal to the unity, to ensure homogeneity in their distribution with respect to the successive pairs of the variables (Saéz and Alfredo, 2013). The  $r$  pairs of the artificial variables can be determined in a recursive manner, called canonical variables ( $r < p$ ). All analyses were performed by using the statistical package StatGraphics Centurion XVI, version 16.1.15, with a contingency analysis.

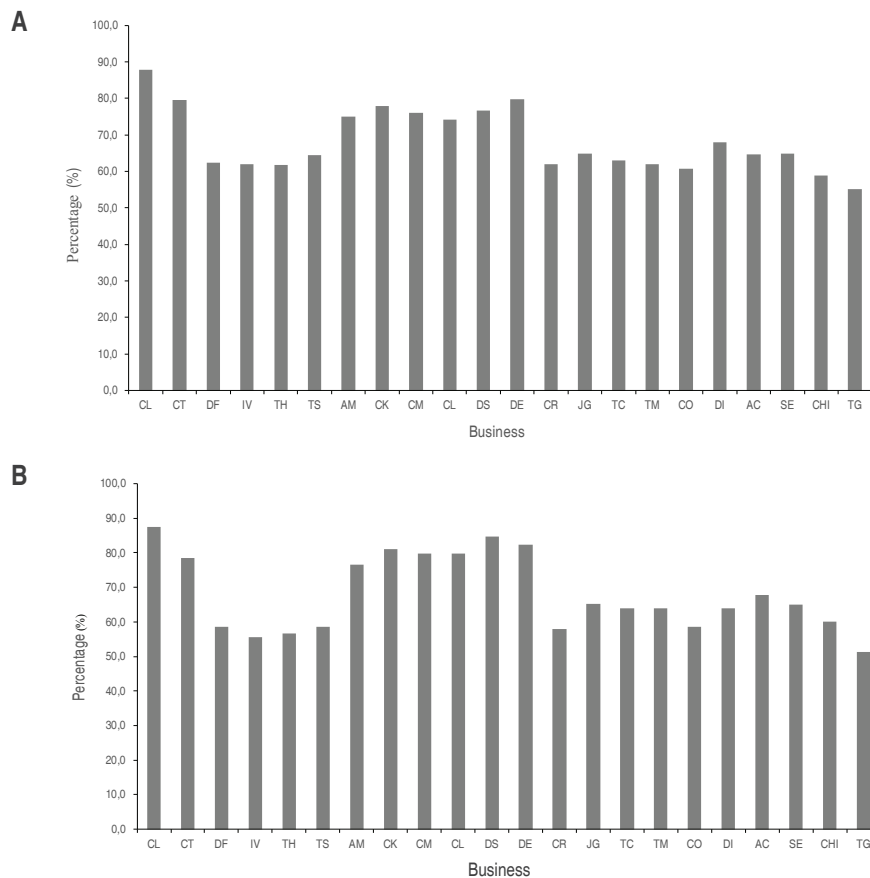


Figure 1. Independent variable for (A) Productivity and (B) Operational Performance

The model for the coffee processing industry in Caldas was created following the cycle of the administrative process, with its four elements: plan, organize, direct and control (Thompson and Antezana, 2015).

### RESULTS AND DISCUSSION

Figure 1 shows the independent variable results for Productivity and Operational Performance. Dependent variable results for Quality Management and Environmental Management are showed in figure 2. Results of the independent variable by Social Performance are in figure 3. Table 1 shows the contingency analysis of the qualitative analysis. Table 2 shows the relationships between the independent variables (productivity and operational performance) and the dependent variables (quality management, environmental performance, and social management) and their correlation, a product of the canonical.

Once the correspondence between the canonical components is obtained as a linear combination of the

group of independent and dependent variables, the possible uses of these variables should be established.

The results showed a strong correlation between the variables of operational performance vs. quality management and productivity vs. quality management (Table 2). The models describing the behavior of the coffee processing industry Caldas department are:

$$C1 = 19508*2.1 \text{ Economic dimension (DE)} + 0.49173*2.2 \text{ Competitive dimension (DC)} + 0.381975*2.3 \text{ Operational dimension (DO)} + 0.0598142*3.1 \text{ Customer focus (CF)} + 0.824674*3.2 \text{ Focus on workforce (FW)} + 0.132194*3.3 \text{ Focus on the process (EP)}.$$

$$C2 = 0.466096*1.1 \text{ Human Resources (HR)} + 0.198841*1.2 \text{ Capital (CO)} + 0.386351*1.3 \text{ Management (M)} + 0.0565554*3.1 \text{ Customer Focus (CF)} + 0.710331*3.2 \text{ Focus on workforce (FW)} + 0.257934*3.3 \text{ Focus on the process (EP)}.$$

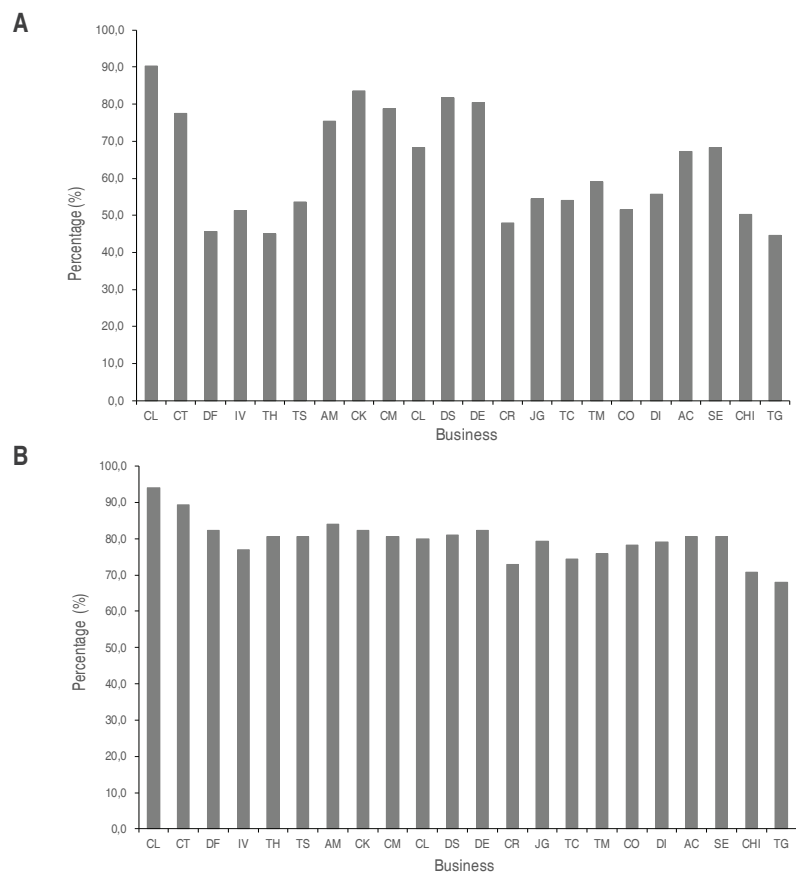


Figure 2. Dependent variable for (A) Quality Management and (B) Environmental Management.

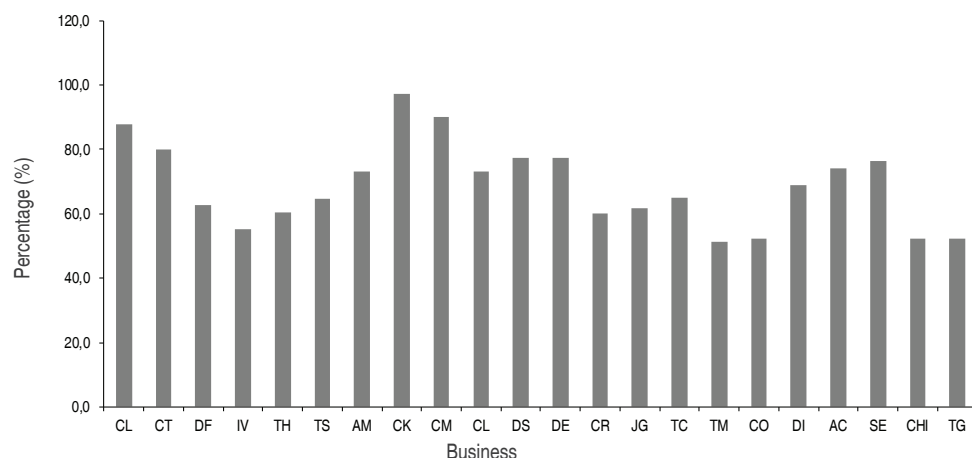


Figure 3. Independent variable by Social Performance.

Table 1. Qualitative contingency analysis.

	HR	CO	M	DE	DC	DO	CF	FW	FP	SP	VE	IS	IE	G
Media	63.7	62.3	58.8	62.3	58.9	58.9	57.7	59.9	56.3	56.2	56.3	57.5	56.3	55.2
DE	17.4	19.3	18.6	16.7	18.3	17.3	17.8	18.3	18.4	18.4	18.4	18.0	18.4	19.8

Table 2. Relationship between dependent and independent variables.

Dependent component	Independent component	R canonical	$\Lambda$ Wilks	Chi <sup>2</sup>	p-value	Correlation
Productivity	Quality Management	0.94	0.09	41.8	0.0000	Strong
	Environmental Performance	0.84	0.21	28.0	0.0001	Weak
	Social Management	0.89	0.17	30.7	0.0003	Medium
Operational Management	Quality Management	0.97	0.04	55.4	0.0000	Very Strong
	Environmental Performance	0.74	0.42	15.3	0.0181	Weak
	Social Management	0.85	0.21	27.0	0.0014	Medium

Statistical summaries of qualitative variables are presented in table 2, using the contingency data (Table 1).

Since the p-value (0.19) by Square Chi is greater than 0.05, hypothesis that coffee processing industries and qualitative variables are independent cannot be rejecting. Therefore, industries observed for this research, could be unrelated to its qualitative variable associated.

The quantitative study (CUAN) revealed a strong correlation between the variables of operating

performance (independent) vs. quality management (employee) and productivity (independent) vs (quality management). The focus group participants spoke about the qualitative variables selected for the study, with an emphasis on production costs, productivity and quality of the finished product.

The qualitative study (CUAL) revealed that the coffee processing industries in the Department of Caldas do not experience a degree of independence between each analyzed qualitative variable. With research, each company became more open and responsive. On the



other hand, it was inferred that the coffee processing industry in the Caldas Department presented a strong dependence on the variable of quality management. In addition, there was a strong dependence between the variables quality management, operational performance and productivity.

Correlations between the (internal and external administrative) independent and dependent variables from the point of view of the performance of the different functional areas of the coffee processing companies are emerging, with strong dependence between the operational performance and quality management.

Management strategies that improve the productivity of the coffee processing industry in the Caldas Department include customer focus, focus on workforce, focus on the process, capital and management. Customer focus will be reflected in understanding customer needs, ensuring that the objectives of the organization are linked to these needs and perspectives, communicating those needs and perspectives throughout the organization, measuring customer satisfaction and acting on the basis of the results, systematically managing relationships with customers and ensuring a balanced approach between satisfying customers and other stakeholders.

Focus on workforce inspires opportunities for people, encourages leadership in the organization, evaluates the performance of the workforce, shares knowledge and experience, systematically defines what is necessary to obtain the desired results and activities, and ensures that the data and information are sufficiently accurate and reliable. It is therefore advisable to carry out focus on the process, employing holistic approaches for continuous improvement, set goals and indicators guide continuous improvement, and adopting the GMP, HACCP and ISO 9001: 2008, ISO 9001: 2015 certifications, strategies for improving a non-certifiable system and recognizing and mentioning improvements.

Capital refers to having enough equipment, tools and methods to ensure the proper performance of the product, investing in improving processes, and reviewing production costs and sources of funding. Inflation, costs of raw materials and finished products play an important role in the final product. Organizations must think about improving

technology, ensuring product quality and continuously designing new technologies.

Management focuses on working with low production costs, complying with programs to ensure the quality of products, work behavior of company personnel, rapid distribution of their products, encouraging customers to consume coffee, improving service, covering the regional market, and improving the location, raw material supply, and supply of competent personnel.

The most important aspect to follow in the coffee processing sector in the Department of Caldas is the development of "quality management" as a skill for the advancement of industrial chains, deepening the focus on customers, focusing on workforce strategy and focusing on processes.

The quality management was the variable that had more weight in the results. Evans and William (2014) stated that a competitive advantage denotes the ability of a company to gain market superiority. A strong competitive advantage provides customer value and leads to financial success and business sustainability. This statement is consistent with the results, where it was stated that quality plays an important role in the competitive strategy of the coffee processing industry. Evans and William (2014) asserted considerable evidence that quality initiatives positively impacted the bottom line. When implemented effectively, total quality management approaches dramatically transform financial performance. This is seen in the results obtained in this research, where a model that predicts the behavior of the coffee processing industry in the Caldas Department, comparing an analysis of quantitative and qualitative variables, was found; the variable quality management was the most important for this sector.

The main operational strategies to be followed by the coffee processing industry in the Department of Caldas include the strategy called development of economic dimensions. This is because the studied variables operating performance and quality management, both qualitatively and quantitatively, showed a strong correlation, which included unit production costs, profitability, inventory turnover, return on investment, indirect actual costs and materials, market share, customer service, product variety, timely delivery, customer satisfaction, product development speed, compliance with specifications, change of

equipment, total production time, and acquisition time. The first strategies to be followed by the coffee processing industry consist of reducing the unit production costs and increasing operational profitability of the organization. This requires goals and operational and financial indicators. Inventory turnover should be fast. The return on investment should be short, material costs should be reduced. Subsequently, it should focus on covering a high market share in the coffee region, thinking about the customer, product diversification and timely distributing their products.

Ultimately, coffee processing industries must be agile in the design and supply of new products, meet the requirements of product quality, maintain excellent condition of their production equipment and constantly renew them, and maintain adequate production and acquisition of resources for operations.

Another response variable obtained in the research was quality management. Armoletto (2007) stated that, in order to strengthen companies, strategies aimed at optimizing the end result of the value chain should be strengthened. This involves primary activities related to the product or service and secondary activities or support. The results obtained for this variable agree with this statement, as it was one of the most important variables found in the study.

Taking into account the above, the best guide that would help increase production and improve productivity of the coffee processing industry in the Department of Caldas is as follows:

Coffee processing industry in the Caldas Department = Operating Performance + Quality Management.

The results infer that the guide to increasing production and improving productivity is related to handling the economic, competitive, and operational dimensions with customer focus, focus on workforce and focus on the process.

The proposed cycle is shown in figure 4, where it illustrates the combination of the components of the administrative process with the phases of implementation of the proposed model.

The first component is the planning cycle, where the objectives are defined with a customer focus; the

second mechanism is organization, where the economic, competitive and operational components will be defined; the third element addresses how the focus will include the workforce in order to achieve the objectives. Finally, there is control, which follows the approach in the process and defines the plans.

Benefits that the formulation and implementation of strategies can provide the coffee processing industry in Caldas, Colombia for the XXI century, according to the results obtained in this dissertation, the implementation of quality management in coffee processing industries results in an increased positive operating performance for the coffee processing industry in the Caldas Department.

Administrative and operational strategies to develop production and improve productivity of the coffee processing industry in Caldas in the XXI century should focus on a philosophy of customer focus, focus on the process, focus on workforce, and adoption of economic, competitive and operational dimensions.

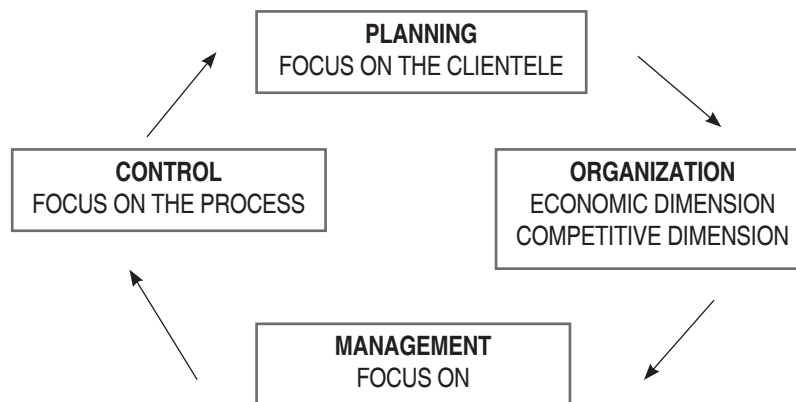
The adoption of these strategies will produce increased productivity and quality of the industrial sector and coffee processing industry.

The senior management of coffee processing companies, especially in the Department of Caldas (Colombia) may establish, design and implement strategies and models following a series of implementation steps.

The results obtained from the use of quantitative and qualitative process coincide with the deductions recorded by Benavidez (2012), who reports that improved productivity increase also allows greater product diversification. However, a high dependence on this variable with quality management was found.

Porter (1999) stated that individual strategies are at the absolute discretion of management, while collective ones require the interaction of several companies. Both individual and collective strategies are included in the generic strategies (leadership in total cost, differentiation and focus). One of the strategies to be followed by individual members of the coffee processing industry Caldas Department is quality management.





**Figure 4.** Administrative and operative model for increasing production and improving productivity of the Coffee Processing Industry in Caldas department.

However, the culture and work goals for each organization must be kept in mind; in other words, work must begin at the personal level and be practiced for all activities of daily life (Evans and William, 2014).

According to the results, the coffee processing industry should focus on a productive competitive strategy that seeks to integrate quality management as well as administrative and economic abilities to achieve operational achievements.

## CONCLUSIONS

Quality management depends on the operating performance (operations management) and productivity in order to increase the competitiveness of the coffee processing industries in Caldas department.

The statistical analyses developed in this research confirmed that the independent variables have more relevance in terms of quality management, which is subject to a number of conditions specific to each organization.

This model shows that the effects on the coffee processing industry depend on the economic dimension, the competitive dimension, and the operational dimension, with heavy reliance on quality management. According to the results, the cost structure of the organizations has a strong dependence on improving the competitiveness of the coffee industry in the region.

Qualitative variable economic dimension showed more frequently in the results. Most of the surveyed companies expressed a dependency on their current and future achievements.

To increase the production and productivity of the coffee processing industry in the Department of Caldas in the XXI century and make the sector more competitive, efforts should be concentrated on implementing operations and management strategies in conjunction with quality management. To do this, organizations must have a customer focus, a focus on workforce and a focus on the process.

## REFERENCES

- Arnoletto E.J. 2007. Administración de la producción como ventaja competitiva. En: [www.eumed.net/libros/2007b/299](http://www.eumed.net/libros/2007b/299). 149 p.; consulta: septiembre 2013.
- Benavidez Ch. 2012. Calidad y productividad en el sector hotelero Andaluz. Tesis Doctoral. Departamento de Economía aplicada. Facultad de Ciencias Económicas y Empresariales. Universidad de Málaga. 294 p.
- Departamento Nacional de Planeación DNP, 2016. Agenda interna para competitividad y la productividad del departamento de Caldas. En: <http://www.almamater.edu.co/sitio/Archivos/Documentos/Documentos/00000079.pdf>. 176 p.; consulta: enero 2016.
- Departamento Administrativo Nacional de Estadística DANE, 2013. Boletín de prensa comercio exterior – importaciones y balanza comercial. Bogotá. En: [http://www.dane.gov.co/files/investigaciones/boletines/importaciones/bol\\_impo\\_dic12.pdf](http://www.dane.gov.co/files/investigaciones/boletines/importaciones/bol_impo_dic12.pdf). 17 p.; consulta: septiembre 2013.
- Departamento Nacional de Planeación DNP, 2013. CONPES 3763. Una estrategia para la caficultura colombiana. En: <https://olaboracion.dnp.gov.co/CDT/Conpes/Economicos/3763.pdf>. 33 p.; consulta: septiembre de 2013.

- Hair R, Anderson R and Tatham W. 2001. *Multivariate Data Analysis*. Fifth edition. Prentice Hall International, Londres. 157 p.
- Hernández S y B. Fernández. 2010. *Metodología de la investigación*. Quinta edición. McGraw Hill Interamericana, Perú, Lima. 607 p.
- Evans J y William L. 2014. *Administración y control de calidad*. Novena edición. Cengage Learning Editores, México. 696 p.
- Ministerio de Industria y Comercio (MINCIT). 2013. Perfil económico del Departamento de Caldas. En: <http://www.mincit.gov.co/publicaciones.php?id=16724> 23 p.; consulta: septiembre 2013.
- Rodríguez S, Pozo LI y Gutiérrez P. 2006. *La triangulación analítica como recurso para la validación de estudios de encuesta recurrentes e investigaciones de réplica en educación superior*. *Relieve* 12(2): 289-305. doi: 10.7203/relieve.20.1.3856
- Saéz, M y Alfredo T. 2013. El análisis de correlación canónica como instrumento para la evaluación de la eficiencia. En: <http://eprints.ucm.es/6743/> 41 p.; consulta: diciembre 2013.
- Thompson M y Antezana J. 2015. El proceso administrativo. En: <http://www.promonegocios.net/administracion/proceso-administrativo.html>. 2 p.; consulta: junio 2015.
- Porter M. 1999. *Ser competitivo: nuevas aportaciones y conclusiones*. Primera edición. Deusto S.A. Ediciones, Barcelona. 478 p.
- 
-