

# **Model of logistics costs in an SME production system. Case of Footwear Company**

**Yira Janneth Avila Ortiz**

Faculty of Engineering – Operations and Systems department  
Universidad Autónoma de Occidente  
Calle 25 N. 115-85 Km. 2 vía Cali – Jamundí, 760030, Cali-COLOMBIA  
[yira.avila@uao.edu.co](mailto:yira.avila@uao.edu.co); [yira.avila@hotmail.com](mailto:yira.avila@hotmail.com)

**Gloria M. López Orozco, Margot Cajigas Romero**

Faculty of Engineering – Operations and Systems department  
Universidad Autónoma de Occidente  
Calle 25 N. 115-85 Km. 2 vía Cali – Jamundí, 760030, Cali-COLOMBIA  
[gmlopez@uao.edu.co](mailto:gmlopez@uao.edu.co), [mcajigas@uao.edu.co](mailto:mcajigas@uao.edu.co)

## **Abstract**

Production costs and logistical costs are determinant factors in the company's results, therefore, the appropriate management of these allows companies to generate value, stabilizing the cash flow, influencing the growth of the economy at sectoral, regional and national level.

Micro, small and medium enterprises - MSMEs are the focus of the proposal specifically in the footwear and leather sector in Cali; The common characteristic is the lack of information for the decision making regarding costs that allow to define competitive prices, this affects the international relations of commercialization of products. This problem made sense for the proposal of generation of a model and its business logistics methodology to identify production costs and logistic costs generally hidden, validated in this sector; the result of this proposal serves as a reference tool, it provides replicable elements and structures to any productive platform and sector.

The descriptive methodology was used, the analysis of the state of the sector under study allowed to establish the general problems to work towards the increase of sectorial competitiveness; In the company under study, the cost model was redesigned, reducing the lack of understanding of operations not included, improving the visibility of operations and their flow to 100%, thus demonstrating the advantage of the proposal for entrepreneurs and their companies

## **Keywords**

Logistics Costs, Hidden Costs, Production Costs, *MiPyme* Companies, Model and Methodology.

## **1. Introduction**

The national leather industry and its manufactures have suffered at the international level various threats depending on the competitive tendency imposed by each producing country, such as: design, quality, brand; high technology in European countries, Brazil's cluster work, the integration of industry by districts in Italy, government policies to take advantage of low production costs through the exploitation of cheap labor aimed at competition by low prices, as in the case of China, are an example of the competitiveness challenges faced by the Colombian industry [1].

The common feature of MSMEs in the footwear sector in the city of Santiago de Cali is the lack of information to make decisions regarding costs that allows the definition of competitive prices, which affects the international

relations of product marketing. This problem made sense for the proposal of generation of a model and its business logistics methodology to identify the costs of production and the logistics costs generally hidden. Validated in this sector, the result of this proposal serves as a reference tool and contributes elements and structures replicable to any productive platform and sector.

### **1.1 Problematic**

In recent years, companies at the national level have seen as their greatest competitive threat the imports at fairly low prices mainly from China or India. In the first quarter of 2012, 12.3 million pairs were imported, while in the first quarter of 2013 the figure reached 19.8 million pairs, according to Euro-monitor. Of that figure, 26% of imports were worth less than one dollar [2]. Factors such as smuggling, informality and insecurity constitute another threat that openly affects the competitiveness of the footwear sector [3] and make a substantial difference compared to employers who comply with the regulation applicable to the sector [4]. In addition, the fact that the leather chain, in general, has few access barriers, does not have high infrastructure costs, or a high level of human capital, increases sector competition. This sector is characterized by small companies, mostly family, with a pyramidal organizational structure where the existence of other management models is practically unknown [1].

Lack of leadership and technical knowledge prevents companies from identifying key processes that reduce inefficiencies, increase productivity, and reduce production costs in aspects such as lot sizes, layout, inventories, appropriate processes to determine the consumption and management of production, materials technology and others. Likewise, conditions of health and industrial safety are inadequate, salaries and working conditions are not the best, especially in smaller scale enterprises, hence the lack of interest of the economically active population to link with these companies [4].

Colombia is characterized by the low incorporation of technological innovations [1], much of its supply is imitation of other articles and this happens because there are no areas of research and development that allow the creation of new products and original designs [5]. An example of this is evident in most companies in the region of Cundinamarca and Santander, where weaknesses are transversal in terms of process and product engineering, without dimensioning the impact on optimization of production and reduction of costs, since 74% of the companies that are the object of the study have a methodological application of empirical costing, based on the price, previous estimates or costs. At the financial level, the footwear industry in general has difficulty accessing banking loans and although there are governmental and private organizations that have that objective, the fact is that the requirements are based on cash flow conditions that few companies can meet [4].

At the regional level, it has been identified that the main producers of the leather, footwear and leather goods chain are: Bogotá, Santander, Antioquia and Valle del Cauca. The latter, is one of the regions in the country, associated with the production and preparation of leather because it has leather tanning and finishing companies [4], in these processes lies the importance of the sector, taking into account that a high percentage of the production of hides and skins is directed to the manufacture of footwear [6]. In spite of the above, regional entrepreneurs identify a deterioration of the tannery sector, formerly leader in the national context, and that deficiencies in the field of supply in the country require an increasing use of input imports. At present there are more factories than suppliers, generating a bottleneck that requires structuring the demand-oriented supply chain to minimize the risks faced by companies.

According to the results of operational technical diagnoses [4], the areas that deserve more attention in the department are: (i) Information technology. (ii) Process and product engineering. (iii) Protection and care of the environment. And (iv) Quality management. On the other hand, the high informality of the sector, the absence of specialized laboratories for the development of research and development activities, obsolete production processes, weak commercial management, labor instability, the low implementation of indicator systems and maintenance, smuggling, under-invoicing and unfair price competition, among others, help to increase the problem [7]. These antecedents show that Valle del Cauca presents significant difficulties for the economic growth of the region [4], an action that underlies the need for a logistic model and methodology that identifies the production costs and logistics costs of a SME footwear in the city of Santiago de Cali and that it will also become a replicable application model in the sector, which will help improve competitiveness and create opportunities in the national and international market, through the proper administration of the costs.

## 1.2 Methodology

The typology of applied research is practical, qualitative and descriptive. It is (i) practical because the results are used in solving everyday business problems. This type of research normally identifies the problem situation and seeks, within the possible solutions, that which may be the most appropriate for the specific context [8]. (ii) qualitative [9] because it produces findings that are not reached by means of statistical procedures or other means of quantification. And (iii) descriptive because it aims to analyze and inventory characteristics of objects phenomena and study problems to define their nature [10], therefore, first, the situation of the sector is analyzed in a general way and production processes are systematized to identify production costs and logistical costs of production.

The company under study is a shoe factory in the city of Cali that was linked to the macro project of business models in the context of supply chain management, SELOIN research group of the productivity and competitiveness group GICPE from Universidad Autónoma de Occidente de Cali.

The base project was originated in five stages: (i) Defining the current operating structure, beginning with a review of existing processes, operations and procedures, and identifying the functional activities that are carried out; (ii) Elaboration of the measurement and collection instruments of information related to the manufacturing activities; (iii) Analysis of results, determining the cost model, the costing system to implement and establishing the cost structure. (iv) Diagnosis, emphasizing the production function of the company object of this study. (v) Definition of the cost model and methodology, to identify logistics costs. The research was tackled from two fronts (i) the "traditional" costs of production and (ii) the costs from the logistic perspective.

## 1.3 Concepts

Costs within organizations, as an important part of administrative accounting, have evolved and have become a valuable tool for entrepreneurs. Cost accounting is defined as the process of measuring, analyzing, calculating and reporting cost, profitability and execution of operations; classification is necessary to determine the most appropriate method for accumulation and allocation [11]. An extension of this definition [12] clarifies that cost accounting concepts and techniques can be used almost throughout the enterprise and is mainly related to cost planning and control functions. An integral view defines cost accounting as an information system [13] that classifies, accumulates, controls, assigns and determines the costs of activities, processes and products in order to facilitate decision making, planning and administrative control. In table 1, a list of authors and concepts is presented to approximate the reader to a theoretical taxonomy.

Table 1. Taxonomic approximation to the concept of "cost"

<b>Taxonomic criteria</b>	<b>Author</b>
Definition costs	Cuevas [14]; Horngren, Datar and Rajan [15]
Cost elements	Garrison, Noreen y Brewer [16], Aldo Torres Salinas [17]
Indirect Manufacturing costs (IMC) and united costs	Polimeri et, al [12], Horngren [18], Datar and Rajan, Arredondo [19]
Costing system	Cashin y Polimeri [11], Cuevas [14], Horngren, Datar and Rajan [20]
Process costing system	Polimeri et, al [12], Cuevas [14], Calleja [21]
Production order costing system	Cuevas [14], Calleja [21] and Arredondo [19]
Standard costs	Polimeri et, al [12], Garrison, Noreen and Brewer [16], Cuevas [14]
Costing based on ABC activities	Garrison, Noreen y Brewer [16], Mejía Alfaro [22]
Changes in cost structure and administrative trends	Garrison, Noreen y Brewer [16], Mejía Alfaro [22],
Logistics costs	Pau i Cos y Navascués [23]
Logistics costs determination	Estrada, Restrepo and Ballesteros [24], Cueto y Meireles [25]
Principios básicos en el desarrollo de los costos Logísticos	Mauleón [26]
Logistics in the production area	Coyle et al [27], Servera-Francés [28], Ballou [29]

#### **1.4 Cost models and systems - Discussion**

The state-of-the-art research highlights that in the Valle del Cauca, most of the companies are family-based, and that more than 300 million dollars are invested per year in the preparation of accounting and cost information, however, 58% of companies do not have a formalized cost system [30]. With this principle in mind, a cost system can be defined as "a set of structured procedures, techniques, records and reports that have the objective of determining the unit costs of production and the control of manufacturing operations" [31]. Likewise, "cost models can be considered as reference points or archetypes that represent the way information is obtained within the system of costs established to produce results aimed at decision making, whether administrative or financial" [32].

In this framework of conceptual clarification, cost models operate by accumulating the necessary costs for each activity, production or service, so that their distribution must be based on the functional relations between the production and the costs necessary to carry it out [31]. It is emphasized that in every cost system the greatest difficulty has always been the allocation or distribution of indirect manufacturing costs, there is really no uniformity in what the existing cost models and systems are in fact often referred to as being the same, in addition, since both models and systems respond to various internal and external variables in organizations, many classifications are identified. However, in relation to cost systems, the most well-known classification refers to the production system that is used by the company [21], the most known are: (i) Process costing system; cost of production orders, (iii) Costing system by classes, (iv) Costing system for operations or activities; being the last two, variations of the costing system by production orders. Similarly, when talking about cost models, the ones that have had the greatest application are (i) the total cost model, (ii) the variable cost model (direct costing), (iii) the cost model based in activities (ABC). (iv) the model of total or absorbing costs, which includes in the cost of the product all costs of the productive function, regardless of its fixed or variable behavior [13]. (v) In variable or direct costing all variable manufacturing costs (direct or indirect) are included as inventory costs.

It could be said that the central problem of the calculation of the cost of the products are the indirect costs, therefore, the existence and treatment for them is the cause of the debate on the cost models. In this regard, there are two important points: (i) The first is that costs are not direct and indirect, but rather are the mechanisms of measurement of their consumption, more or less complex and possible, according to the characteristics of the production process and the cost of the system of information, which convert the measurement of the elements of the cost applied to the production, in direct and indirect. (ii) The second is that although the cost of products is not the only objective of a cost model, if it is a fundamental objective oriented to the study of the profitability of products and, therefore, of pricing, a transcendental question in situations of high competition risk among companies in a sector [33].

It should also be taken into account that the costing systems can be measured in their real, normal or standard amount. Actual costs refer to those spent or distributed daily in real time. Talking about normal costs involves calculating a portion of the indirect costs that will be allocated to each product as it is produced, providing a timely estimate of the cost of production. Standard costs are defined as the objectives that the company should achieve, constituting a basis for controlling costs, evaluating performance and improving processes.

#### **1.5 Logistic Methodologies in Production**

For a company to remain in the market depends on the relationships with its suppliers and customers. Managing these relationships is the topic of logistics. At present, due mainly to globalization, technology and internet, among others, product life cycles have changed, becoming ever shorter. The companies have had to readjust their operations and processes to respond to the changes in the market and the ways of operating, a fact that has led to large and / or small companies the emergence of different methodologies to measure, diagnose, improve and ultimately, achieve the proper management of the supply chain-CS [34], [35], [13], [36]. In this framework, supply chain management is integrating the main business processes from the supplier to the end user through original providers that provide products, services and information that add value to customers and other stakeholders [35].

In the literature, logistic methodologies are classified according to the scope of their application [37] in: (i) Integral methodologies, (ii) partial methodologies for the diagnosis of SC, (iii) methodologies for the improvement of specific processes, and iv) methodologies for performance measurement and improvement of SC. In addition, we

identify the integral models of logistics management oriented to companies designed under the criterion of a stable structure, compared to logistic management models focused on the characteristics of SME companies [38].

Some of the logistic methodologies applied in production are: (i) The SCOR supply chain operations model [39], a tool to represent, analyze and configure CS, provides a unique framework that links business processes, management indicators (KPIs), best practices and technologies in a unified structure to support communication between SC participants and improve the efficiency of chain management. (ii) Logistical management methodology for the improvement of small enterprises, aimed at small enterprises. It is based on a series of tools (indicators), a logistical improvement plan, which contributes to cost reduction, process improvement, that is, to improving competitiveness. (iii) MESIADLog logistic chain performance evaluation methodology [40], which allows the construction of an integrated system for evaluating the performance of the integral logistics chain, called SIADLog, considering different aspects not completely solved by existing methodologies. (iv) The Lean system is a process management approach based on producing the necessary parts in the necessary quantities and at the necessary time. Lean Management has as objectives not only productivity, but also costs, time, quality and flexibility, all of which are basic components of competitiveness as currently understood [41], [42]. (v) Six sigma, is a rigorous improvement methodology whose fundamental principle is customer focus. It uses the process of defining problems and situations to be improved, measuring to obtain information and data, analyzing collected information, implementing process improvements, controlling processes or products with the objective of achieving sustained results; is useful and important in SC because through the intensive use of statistical tools it is possible to identify the key processes of the organization that require improvements and that in one way or another affect the satisfaction of the consumer against the product or service offered [43], [44].

The methodologies presented have results on efficiency, waste reduction, optimization of resources in production and give potential elements to understand the context of logistics costs, but they do not answer the problem. Therefore, some methodologies that emphasize and fully address the issue of logistics costs related to the production area are presented: (i) Analysis of the size of packaging in the value chain to minimize logistics costs: a case study in Colombia [45]. In this article, two optimization models were formulated: one to determine the 5 secondary packaging sizes that reduce the need for opening to attend the orders received, and another to define which of those packaging sizes are most appropriate to serve each channel. sales, minimizing the associated total logistics cost. The result of this analysis shows useful findings for the attention of several channels, where the optimization in the definition of secondary packaging sizes produced an average reduction of 8.2% of the total logistic cost of the analyzed company. (2) Logistic variable cost analysis for SMEs [46]. This article presents an analysis of the impact of variable logistical costs on the competitiveness of SMEs. It describes the competitiveness needs and evaluates how competitiveness can be potentialized through the analysis of variable logistic costs in these companies. (3) Cost methodology for health service provider institutions: application of Diagnostic Related Groups - DRG [47].

### **1.6 Factors affecting the performance of a footwear company in the city of Cali**

The SMEs in the footwear sector are exposed to the result of controllable and uncontrollable factors that directly affect the calculation of their production costs. Internal factors must be reviewed by companies and take steps that progressively reduce and even eliminate them, but external factors must be constantly monitored to make effective decisions.

Table 2. Factors affecting the performance of companies

Principales factores internos que inciden en el desempeño del proceso productivo	Principales factores externos que inciden en el desempeño del proceso productivo
La informalidad en la contratación de los trabajadores	Dificultad para acceder a préstamos bancarios
Tecnología y procesos productivos obsoletos	La informalidad de los empresarios en el cumplimiento de sus acreencias
Insuficiente capacitación del personal a nivel de ingeniería y costos	Escasez de materia prima de buena calidad
Deficiencias en diseños	Falta de interés en agremiarse y/o desconocimiento de las ventajas a obtener
Deficiencias en tecnologías de información	Ausencia de entidades que promuevan la investigación y el desarrollo
Estructura organizacional piramidal	Competitividad desleal en precios
Administración orientada a alternativas para reducir impuestos antes que a generar valor a través de la gestión de sus procesos productivos	Políticas gubernamentales que permiten el ingreso al país de mercancía a precios bajos sin garantías para los productores nacionales
Débil gestión comercial y ausencia de servicio al cliente	El contrabando
Falta de planeación principalmente a largo plazo	

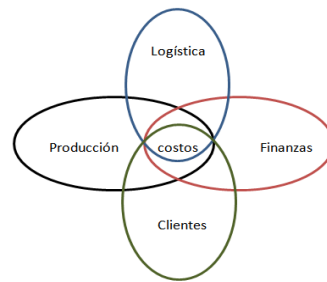
External factors are, in some cases, subject to social culture, which can also gradually change; and in other cases it is up to the regulatory and regulatory institutions to take appropriate action. The main factors identified in enunciate in table 2.

## 2. Proposal

The operation of the company is carried out through production orders that are elaborated from the requirements of the warehouses and the external clients. This makes the costing system chosen for the determination of the unit cost of production to be the system of cost-per-production orders. To choose the cost model to be used, it was considered that, for the management of the organization, it is important to know and secure the costs associated with the production itself; for this reason, its policy of hiring the direct workforce, allows it to know exactly its direct costs, to manage the reduction of indirect costs and to procure surpluses for the absorption of the fixed costs that the company has. The model that best adjusts is the model of variable costs to which have incorporated some semi-expenses directly associated with the performance of its operations and, in which it would not incur if not for it. The allocation of direct materials and direct labor is done based on actual costs. For the allocation of indirect manufacturing costs, it was considered that the company makes multiple references throughout the period, each with different processing characteristics and different times; for this reason, predetermined rates were calculated based on the company's total indirect productive hours of indirect labor.

The model links the production area to inter-acting with clients, emphasizing the fulfillment of expected service levels, with the finance and / or administration area, ensuring timely and appropriate supply for the development of the production process. Finance and / or administration on a par with customers ensure the timely collection of the portfolio generated. On the other hand logistics and production are directly involved in internal operations. With clients, logistics ensures the appropriate customer service, which includes packaging, deadlines, information flow, etc. Finally, logistics and finance and / or administration carry out the strategies that includes from the analysis of the current situation, review of changes, definition of long-term objectives and other actions that can be economically carried out in the company, which added to the achievement of the purpose of reducing costs, contribute to the success of a company, figure 1 presents the proposal.

Figure 1. Proposed cost of production management model



## 2.1 Methodology phases

The methodological proposal adds to the traditional methodology the contribution of logistics in the identification of variable unit cost of production in its traditional and logistic components and is developed through each of the components of the model, indicating at each step that costs can be presented but not managed properly.

**Step 1:** Begins with the establishment of the Mission, Vision and Values of the company. The Mission defines the *raison-d'être* of the company, its purpose or primary objective to which it directs the plans and programs developed. The Vision for its part, is the image of the company that is wanted for the future. Values are the ideals and collective principles that guide the actions of the individual, are the axis of conduct of the company and are closely related to its purposes [48].

**Step 2:** Identify customers and classify them accordingly to the frequency, volume of their purchases and punctuality in their payments. Also categorize your products. This allows you to know which references make the most income for the entity.

**Step 3:** Plan the material requirements to avoid time losses due to delays in the arrival of the product, lost sales for not getting the product the customer needs at the moment, costs to have to buy with other suppliers that do not guarantee the same prices of the usual supplier and, excess inventories that negatively affect cash flow and generate a cost to maintain them.

**Step 4:** Draw a flow chart of the production process identifying number of processes, personnel involved, time used in the work, utensils and tools used and identify the business processes.

**Step 5:** Detail in each process the tasks developed sequentially by all people linked to the production line. This allows you to validate that there are no doubly assigned functions and ensure the process fluidity on the production line and determine the expected average time to process a production order.

**Step 6:** Quantify the money collections for the period and those for the following period (as well as weekly) and draw up a budget for this same period, which will ensure that with the resources that you receive can attend the costs of the production process. If you do not have money available to pay for the purchase of your products you may incur loss of possible commercial discounts or even incur financial expenses. Rotation of personnel for breach of payment also results in additional production costs.

**Step 7:** Once you create the production order of a reference, begin to accumulate in a cost sheet the different elements of cost generated.

**Step 8:** Calculate the total unit variable cost of production.

**Step 9:** Analyze the behavior of the unit variable, variable cost of production. If there is a significant variation, it should analyze in depth which of the elements of the cost has been affected between the costs of materials, labor costs and, indirect manufacturing costs, among others.

**Step 10:** Measure the management performed through the analysis of some logistics indicators of production, supply and inventories whose application will allow you to evaluate the logistic performance of the production area and in the event that unusual behavior occurs, take corrective measures in a timely manner.

Given that the SMEs usually focus their financial review on the analysis of the income statement and the calculation of some basic financial indicators that are calculated with the information that their financial statements show, from this information they can also make a comparative analysis which allows them to visualize the effect of logistics costs on their financial statements; Table 3 presents the step-by-step methodological proposal for the calculation of variable cost.

Table 3. Methodology to find the unit variable cost

Production Traditional methodology		Logistics	Finance and / or administration	Hidden costs
		-Definition of mission, vision, values and objectives		-Absence of effective strategies
		-Identification of customers (A, B, C) and categorization of products (A, B, C)		-Ineffective Sales Force Orientation
			-Plan the material requirements	-Lost sales -Excessive purchases -Scarcity costs
-Draw a flow chart of the production process		-Review plant layout design -Check availability and time using machines		-Time lost -Product lost
-Detail tasks performed in each process		-Check updated weather studies		-Labor surcharges
			-Quantify the collections and draw up a budget for this same period	-Discount not taken -Absenteeism of staff due to default on payments -Financing Costs
Materials	-Determine the cost of MDs	-Review inventory levels -Determine the acceptable percentage of waste of raw material - Check outages in production due to shortage	-Periodically quantify the percentage of waste. Validate your reasonableness.	-Maintenance cost -Cost of financial immobilization of raw material -Cost obsolescence of the raw material -Overcharges
	-Determine the cost of MIs			
Workforce	-Determine T.P. and allocate MOD and / or MOI costs	-Track staff turnover and absenteeism.		-Reduction of the quality of the production -Increase in processing times -Overcharges in training
	-Calcule el costo de MOD y MOI			
Indirect manufacturing costs	-Determine the T.P. and assign CIF semifi	-Verify costs by use in the production of property owned by the owners		-Costs not considered related to owners such as: --Leases --Production salaries --Transport. m.p. -Depreciation of molds -Depreciation of machinery and equipment -Others
	- Quantify semi-fixed CIFs			
Calculate the total unit variable cost of production		- Analyze logistics costs	-Analyze the variable cost of production - Analyze management and financial indicators	-Returns processing -Costs of samples and courtesies -Other logistics costs

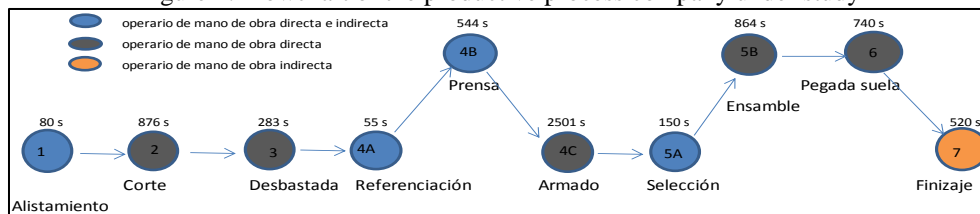
Total unit production variable cost

CLIENTS

### 3. Results

In the development of this methodology, the part corresponding to the obtaining of the traditional costs of production allowed to identify for the company object of study, the process flow chart (see Figure 2), detail of the tasks performed, the determination of the costs of raw materials, labor costs and indirect manufacturing costs, as well as the variable unit cost of production. The company analyzed determines its costs of production in an empirical way, taking the product they consider has the highest consumption of materials and based on that cost they assign the sales prices to all the references. This makes them unable to determine the profitability per product or know which references are the ones that are generating the highest or lowest returns. With the methodology presented and applied to all references, one can find not only the unit production cost but also the break-even point in units sold and generate strategies to absorb fixed costs.

Figure 2. Flowchart of the productive process company under study





A check of the proposed methodology, allows to evaluate the existence of logistic costs already incorporated in the cost of production or not considered in the determination of the variable cost of the product (see table 4). Markings in the "sometimes" column and in the "no" column indicate that in the cost of production they may be presenting logistical costs that require their identification in order to be managed, in addition to the recognition of certain logistical costs that have not been considered but which are actually performed and are necessary to carry out the production process. There are hidden costs in the company due to lost sales, excessive purchases, shortage costs, lost time, cost of financial immobilization of raw material, cost of obsolescence of the raw material, hidden costs not considered paid or assumed by the owners of the business, among others.

Table 4. Cost validation check

#	Questionnaire	Yes	Sometimes	No	NA
1	Does the company have clearly and in writing its Mission, Vision and Objectives?			x	
2	Is there identification and classification of customers (A, B, C)?			x	
3	Is there classification and categorization of products (A, B, C)?			x	
4	Is planning and programming of raw materials and materials for a given period?		x		
5	Does it have cash flow to meet production requirements scheduled for the next period?		x		
6	Does the physical layout of the production plant facilitate and streamline production processes?			x	
7	Are production machines available at the time they are required within the production process?	x			
8	Do you really know what time it takes the employees to perform each of the tasks in the production area?		x		
9	Have production stoppages been eliminated due to a shortage of raw materials or materials?			x	
10	Are your raw materials and material inventories being used and rotating in the warehouse in a short time?			x	
11	Are you technically aware of the reasonable percentage of waste in raw materials, especially in leather cutting?		x		
12	Do you periodically analyze the consumption of raw material in production lots to validate the amount of waste generated?		x		
13	Is your staff permanent?	x			
14	Have you considered within the cost of production those related to goods and services rendered by the owners such as: warehouse leases, production labor and transportation in purchase of materials in personal vehicles?			x	
15	Have you considered within the cost of production the cost for depreciation of the molds and molds used?			x	
16	Have you considered within the cost of production the cost of depreciation of machinery and equipment?	x			
17	Do you analyze your production costs?		x		
18	Do you analyze your logistics costs?			x	
19	Do you do some analysis to your financial indicators?		x		
20	Do you do some analysis to your management indicators?			x	

### 3.1 Conclusions

Costing systems respond to the way in which the products or services are elaborated and the costs accumulate. Cost models, on the other hand, indicate which cost elements are going to be allocated to products, specifically indirect manufacturing costs, and administrative and sales costs. Within this context, the costing methods reflect the degree of precision of the possible results to be obtained depending on the type of economic information that feeds the system, whether real, normal or standard costs. For SME footwear operating under the form developed by the company under study, using a cost-of-production order system, the variable cost model allows them to manage their costs as a planning and financial strategy tool at the time of production. determine prices and use of idle capacity, among others.

An important aspect is that when discussing logistical methodologies related to the determination of production costs, the type of company, the technological level for the development of its operations, the operations it performs, the availability of financial resources, requirements of their customers and the information system they manage are determinant to establish in which part or parts of the production process logistic costs or hidden costs could be generating an increase in production costs. There are multiple methodologies. It is necessary to make a general evaluation in the company to identify these aspects and proceed to avail themselves of some of them or to implement a new methodology that allows to identify the existing logistical costs and to be able to establish how they are maintained, reduced or eliminated to improve the results of the organization.

The application of the presented logistic methodology allowed to determine that the cost of production happens to be conformed not only by the traditional costs of raw material, labor and indirect costs of manufacture, but also incorporate logistic costs that must be identified and quantified for their proper management. Some of these costs are included in indirect costs of semi-manufactured manufacturing, which for various reasons originated in the company and others have not been taken into account. Hidden costs of lost sales, excessive purchases, shortage costs, time losses, cost of financial immobilization of raw material, cost of obsolescence of the raw material, hidden costs not considered paid or assumed by the company the owners of the business, among others.

Factors external to companies, such as difficulty in accessing bank loans, unfair price competition, government policies without guarantees for the producer, and contraband, in addition to internal factors such as informality in hiring, lack of training, technology and obsolete production processes, business culture oriented to tax reduction, not to the generation of value through its costs, among others, are added to the variables that must be considered to carry out an adequate management of production costs

## References

- [1] D. Tobón y J. Barrientos M, «Caracterización de entornos y determinantes de la eficiencia en los sectores del cuero, el calzado y la marroquinería.,» SENA - U.Antioquia, 2009.
- [2] Oficina económica y comercail de la embajada de España en Bogotá, «El mercado de la moda y calzado en Colombia,» ICEX, Bogotá, 2015.
- [3] S. Estrada, A. F. Payan y H. F. Patiño, «El sector calzado del área metropolitana centro occidente. Rumbo a la productividad y competitividad con ingenio e innovación,» *Scientia Et. Technica*, vol. XII, n° 31, pp. 189-194, 2006.
- [4] Coelho - Entregable 1, «Linea base del sector del cuero, calzado y marroquinería en Colombia.,» Programa de Transformación productiva - Universidad del Rosario, Bogotá, 2016.
- [5] A. J. Caicedo R, J. O. Rolon M y E. M. Niño P, «Identificación y caracterización de la cadena productiva del calzado y marroquinería del área metropolitana de Cúcuta,» *Revista de la Facultad de Ciencias Económicas y Empresariales - FACE*, vol. 13, pp. 183-198, 2013.
- [6] Dnp - Departamento Nacional de Planeación, «Cuero, calzado e industria marroquinera. Cadenas productivas estructuras, comercio internacional y protección.,» DNP, Bogotá, 2004.
- [7] Departamento Administrativo de Planeación Municipal de Santiago de Cali, «Programa de fomento y fortalecimiento de clúster- PFFC.,» Alcaldía de Santiago de Cali - Departamento de Planeación, Cali, 2015.
- [8] A. A. Vara H, «Desde la idea hasta la sustentación: 7 pasos para una tesis exitosa. Un método efectivo para las ciencias empresariales.,» Universidad de San Martín de Porres - Instituto de Investigación de la Facultad de Ciencias Administrativas y Recursos Humanos, Lima, 2014.
- [9] A. Strauss y j. Corbin , «Bases de la investigación cualitativa. Técnicas y procedimientos para desarrollar la teoría fundamentada.,» *Sage Publicaciones - Universidad de Antioquia. Facultad de Enfermería.*, vol. 3, p. 19, 2002.
- [10] O. Escorcía O, «Manual para la investigación. Guía para la formulación, desarrollo y divulgación de proyectos.,» Universidad Nacional de Colombia. Facultad de Artes. Escuela de Arquitectura y Urbanismo., Bogotá, 2010.
- [11] J. A. Cashing y R. S. Polimeni, *Contabilidad de Costos*. Traducción de la primera edición en inglés., México: McGraw-Hill, 1987, pp. 10,12.
- [12] R. S. Polimeni, F. J. Fabozzi, A. H. Adelberg y M. A. Kole, *Contabilidad de costos*. Traducido, Bogota: McGraw Hill - Interamericana S.A., 1997, p. 61.
- [13] D. N. Ramirez P, *Contabilidad Administrativa: Un enfoque estratégico para competir.*, México: Mc.Graw Hill/Interamericana, 2013, p. 29.
- [14] C. F. Cuevas, *Contabilidad de Costos. Enfoque gerencial y de gestión*, Bogotá: Person Education, 2010, pp. 4, 13.
- [15] C. T. Horgren, S. M. Datar y M. V. Rajan, *Contabilidad de Costos, un enfoque gerencial*, México: Pearson Education, 2012.

- [16] R. H. Garrison, E. W. Noreen y P. C. Brewer, Contabilidad administrativa, México: McGraw Hill Interamericana, 2007.
- [17] A. Torres S, Contabilidad de costos: análisis para la toma de decisiones., México : McGraw Hill Interamericana, 2010.
- [18] C. T. Horngren, S. M. Datar y M. V. Rajan , Contabilidad de costos, un enfoque gerencial., México: Pearson Education, 2012.
- [19] M. M. Arredondo G, Contabilidad y análisis de costos., México: Grupo Colpatria, 2015, p. 36.
- [20] C. T. Horngren, S. M. Datar y M. V. Rajan, Contabilidad de costos, un enfoque gerencial, México: Pearson Education, 2012.
- [21] F. J. Calleja B, Costos, Sonora México: Pearson Educational - U. Sonora, 2013.
- [22] G. E. Mejia A, «Ingresos y costos, una propuesta para su análisis estratégico. Estudio de caso empresas colombianas.» Universidad Nacional de Colombia - Facultad de ciencias económicas. Escuela de administración y contaduría pública., Bogotá, 2011.
- [23] J. Pau I Cos y R. Navascués, Manual de logística integral, Madrid: Edición Diaz de Santos, 2001.
- [24] S. Estrada , L. S. Restrepo y P. P. Ballesteros , «Análisis de los costos logísticos en la administración de la cadena de suministro,» *Scientia Et Technica*, vol. XVI, nº 45, pp. 272-277, 2010.
- [25] E. Cueto Ible y S. Meireles P, Gestión de costos en un operador logístico., Madrid: EUMED, 2012, p. 69.
- [26] M. Mauleón T, Logística y costos., Madrid: Diaz de Santos, 2006, p. 11.
- [27] J. J. Coyle, C. J. Langley, R. A. Novack y B. J. Gibson, Administración de la cadena de suministro. Una perspectiva logística, México: CENGAGE Learning, 2013.
- [28] D. Servera-Francés, «El concepto y evolución de la función logística,» *Innovar*, vol. 20, nº 38, pp. 217-234, 2010.
- [29] R. H. Ballour, Logística. Administración de la cadena de suministro, México: Pearson Education, 2004.
- [30] C. O. López A, J. M. Quintero G y F. Zea L, «La contabilidad de costos en las empresas del Valle del Cauca, Colombia: Realidades, impactos e inferencias.» *Revista del instituto internacional de costos*, nº 10, pp. 86-106, 2012.
- [31] D. Hansen y M. Mowen, Administración de costos, México: Thomson, 1996, p. 502.
- [32] C. Mallo R y M. A. Jiménez M, Contabilidad de costes, Madrid: Larousse - Ediciones Pirámide, 2014, p. 77.
- [33] V. Serra S, «Base conceptual de los nuevos modelos de costes. Perfeccionamiento e innovación,» *Revista española de financiación y contabilidad.*, vol. xxvii, nº 96, pp. 679-708, julio - septiembre 1998.
- [34] D. Kane, «A global view of supply chain management, Douglas Lambert interviewed,» *Auckland Business Review*, vol. 10, nº 2, pp. 30-35, 2008.
- [35] D. M. Lambert y M. C. Cooper , «Issues in supply chain management,» *Industrial Marketing Management*, vol. 29, nº 1, pp. 65-83, 2000.
- [36] E. Monterroso, «El proceso logístico y la gestión de la cadena de abastecimiento,» *Virtual Pro - Procesos Industriales* , nº 125, pp. 1-33, 2012.
- [37] Y. L. Becerra , «Propuesta metodológica para la definición de estrategias de mejoramiento en logística de PYMEs,» *Revista Ingeniería, Investigación y Desarrollo* , vol. 15, nº 1, pp. 48-57, 2015.
- [38] P. Cano O, F. Orue C, J. L. Martínez F, Y. Mayett M y G. López N, «Modelo de estion logística para pequeñas y medianas empresas en México,» *Revista Contaduria y administración - Universidad Nacional Autónoma de México* , vol. 60, nº 1, pp. 161-203, 2015.
- [39] J. L. Lama y F.-C. Lario E, «Análisis del modelo SCOR para la gestión de la cadena de suministro,» *IX congreso de ingeniería de organización - Gijón. Universidad Politécnica de Valencia*, pp. 1-10, 2005.
- [40] J. Campos , C. Taboada y R. Chalmeta, «Metodología para la evaluación del rendimiento de la cadena logística,» *Información Tecnológica*, vol. 15, nº 4, pp. 77-84, 2004.
- [41] A. López y P. Ruiz, «La gestión de costos en lean manufacturing: cómo evaluar las mejoras en costes en un sistema lean,» Universidad Internacional de la Rioja - UNIR, La Rioja, 2013.
- [42] K. B. Mandrodt, R. H. Thompson y K. Vitasek, «Lean practices in the supply chain,» Jones Lang LaSalle, 2008.

- [43] E. Arnheiter y J. Maleyeff, «The integration of lean management and six sigma.,» *The TQM Magazine*, vol. 17, nº 1, pp. 5-18, 2005.
- [44] L. Mantilla C y J. M. Sánchez G, «Modelo tecnológico para el desarrollo de proyectos logísticos usando lean six sigma,» *Estudios Gerenciales*, vol. 28, nº 124, pp. 23-43, 2012.
- [45] C. Mejía A, «Análisis del tamaño de empaque en la cadena de valor para minimizar costos logísticos: un caso de estudio en Colombia,» *Estudios Gerenciales*, vol. 31, nº 134, pp. 111-121, 2015.
- [46] C. E. Córdoba I y J. A. Zapata C, «Análisis de costos variables logísticos para Pymes,» *Escenarios: Empresa y Territorio*, nº 1, 2012.
- [47] A. Torres H y G. M. Lopez O, «Metodología de costos para instituciones prestadoras de servicios de salud: aplicación de los grupos relacionados por el diagnóstico-GRD,» *El hombre y la máquina*, nº 40, pp. 31-43, 2012.
- [48] J. M. Sainz De Vicuña, *La misión hoy más necesaria que nunca*, Madrid: Planeta de Agostini Profesional y Formación S.L., 2004.

## **Biographies**

**Yira Janneth Ávila Ortiz**, Is a public accountant at the University Libre from Cali, candidate for Master's in Logistics Integral of the Universidad Autónoma de Occidente, Businesswoman and researcher, with more than 15 years in accounting work, belongs to the GICPE research group, in her SELOIN, where she contributes her accounting and logistical knowledge in the development of new research proposals.

**Margot Cajigas Romero**, Is a public accountant, Master in organizational sciences, Ph.D. in Economics and Business at the University of Granada. He is a specialist in financial management, financial evaluation of projects, formulation and evaluation of projects, costs and budgets. accounting and finance GICOF, has more than 7 books published.

**Gloria Mercedes López Orozco**, is an Industrial Engineer, associate teacher in the Operations and Systems department, coordinator of the GICPE research group. Master in Integral Logistics, Master in Advanced Models for the Direction of Operations in Supply Chain Management, Ph.D in Engineering. She has business experience of more than 10 years in the logistics and transportation sector.