

# GCP 1.0: A Tool for Cost Management in Micro and Small Textile Manufacturing Companies in Bucaramanga

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## Keywords

Management software, textile manufacturing industry, production planning, cost management

## Clasificación JEL

M19, L67, M21

## Abstract

This article presents the results of a diagnostic study in which 52 textile manufacturing companies were observed in Bucaramanga to characterize the needs of these productive units. Based on the results, three strategic options were formulated to improve performance: a) To consolidate the productive system by tools that facilitate production processes, b) to strengthen cost structure by designing systems and tools; and c) to share technological initiatives, knowledge and experience to improve resource management. From this perspective, the second phase of the research was oriented to develop the software GCP 1.0 for micro and small companies of children's confection in Bucaramanga, a production cost information system that would facilitate cost management and the fixation of sale prices.

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## GCP 1.0: una herramienta para la gestión de costos en las micro y pequeñas empresas de manufactura textil en Bucaramanga

### Resumen

El artículo presenta los resultados de un estudio diagnóstico en el que se observaron 52 empresas de confección textil en Bucaramanga, que permitió caracterizar las necesidades de estas unidades productivas. Con base en los resultados, se formularon tres opciones estratégicas para mejorar su desempeño: a) consolidar el sistema productivo mediante herramientas que faciliten los procesos de producción, b) fortalecer la estructura de costos mediante el diseño de sistemas y herramientas y c) compartir iniciativas tecnológicas, de conocimiento y experiencia para mejorar la gestión y administración de recursos. Desde esta perspectiva, la segunda fase de investigación se orientó a desarrollar el *software* GCP 1.0 para micro y pequeñas empresas de confección infantil de Bucaramanga, un sistema de información de costos de producción que facilita esta gestión y la fijación de precios de venta.

### Palabras clave

*Software* de administración, industria de confección textil, planeación de la producción, gestión de costos

## GCP 1.0: Uma ferramenta para a gestão de custos nas micro e pequenas empresas de manufatura têxtil em Bucaramanga

### Resumo

O artigo apresenta os resultados de um estudo diagnóstico onde foram observaram 52 empresas de confecção têxtil em Bucaramanga, que permitiu caracterizar as necessidades destas unidades produtivas. Com base nos resultados, foram formuladas três opções estratégicas para melhorar seu desempenho: a) consolidar o sistema produtivo mediante ferramentas que facilitem os processos de produção, b) fortalecer a estrutura de custos mediante o desenho de sistemas e ferramentas e c) compartilhar iniciativas tecnológicas, de conhecimento e experiência para melhorar a gestão e administração de recursos. A partir desta perspectiva, a segunda fase de pesquisa se orientou a desenvolver o *software* GCP 1.0 para micro e pequenas empresas de confecção infantil de Bucaramanga, um sistema de informação de custos de produção que facilite esta gestão e a fixação de preços de venda.

### Palavras chave

*Software* de administração, indústria de confecção têxtil, planejamento da produção, gestão de custos

## Introduction

The dynamics of economic globalization has allowed significant changes in the management of organizations, with the purpose of reaching competitive and comparative advantages in business development. The textile manufacturing industry in Bucaramanga consists of informal productive units due to their size and form of organization; 88% of the 52 companies studied here are micro and small industries, and 75% are constituted as natural persons. This indicates that there exists little culture of associativity, as businesses are administered by their owners. They are relatively new companies that have been operating for 16 to 20 years, and they specialize in manufacturing clothing for kids and babies (Gómez, 2011). The characterization of the sector showed that cost and production management in these productive units is handled in an empirical manner and with few technological tools. For this reason it has been considered relevant to develop a simple, functional and low-cost management tool that would help these companies with planning in order to optimize resources and control.

Thus, a second phase of the research was initiated with the aim of designing a production cost information system through a technological tool that would facilitate cost management and the fixation of sale prices. In this way, with the help of the software GCP 1.0, micro and small companies for children's confection in Bucaramanga can improve the administration process they currently use, promote their businesses in order to grow and strengthen competitive and comparative advantages. Likewise, this tool contributes to production programming based on customer requests, defines demands according to production orders, and establishes the cash flows and sources for financing, so that the company is able to fulfill standard and specific demands requested in each order.

In this context, the application was developed in an environment of system dynamics, based on the companies' characterization, identified needs, and production and cost demands, in which serious problems were observed due to the lack of information systems for management or, conversely, due to the high costs of the same. Aiming to offer a solution, the tool design process was initiated, involving the construction of a simulation model with system dynamics; the design of user interfaces, the database and the implementation were carried out by using a database agent, a free language and a programming environment of free distribution.

In this way, the dynamics of the first prototype were oriented toward production planning, which was later validated in a pilot company and optimized. Based

on this, a cost system by production orders was developed, which currently is in the stage of validation; this stage involves the execution of the flow of production materials and supplies, in order to measure and recognize them, and to assign reasonable costs to them. Likewise, to keep a register and control of supplies, as well as to continue adjusting the tool based on usage experience at the pilot company and to optimize it. The purpose of this system consists in supporting these productive units in the operations of production and fixation of the costs of manufactured products, in order to thus increase productivity and competitiveness so that participation in the market could grow under criteria of competitive advantage.

## Methodology

The research was descriptive during its first phase, because it was oriented toward a characterization process in which 52 companies were studied; some peculiarities were described regarding the administrative structure, legal constitution and affiliated personnel, means of production, product lines, supplies linked to these processes, payment systems, cost structure, tools for register and control, fixation of costs and product prices, among others. Based on the findings, strategic options were generated to initiate the second phase of the research.

In the second phase, the research is applied and it focuses on application development, which originates from the contextualization of the sector and the specific needs of these small-size productive units. It is oriented toward the function of production and costs, components with a greater degree of limitation, which evidences that the lack of information systems for cost management or, conversely, a high cost of them limits the optimization of resources and minimization of costs.

After specifying the requirements and the scope of the research, the development phase was initiated, involving the construction of a simulation model with system dynamics, the design of user interfaces, the database and the implementation, which was carried out by using a database agent, a free language and a programming environment of free distribution. The first prototype was oriented toward production planning, and it was validated and optimized in a pilot company; based on this, a cost system by production orders was developed, which currently is in the stage of validation. This involves the execution of the flow of production materials and supplies, in order to measure and recognize them, and to assign reasonable costs to them. Likewise, to keep a register and control of sup-

plies in order to continue adjusting the tool based on usage experience at the pilot company and to optimize it.

Furthermore, a manual of costs by production orders is under construction, which contains information on methods, techniques and procedures for the measurement, recognition, register and control of costs at a reasonable value. This manual comprises all the cost structure, both the conceptual and procedural parts. This is a guide that starts from the design of technical sheets for the product to be manufactured, the process for customer requests, the production order, as well as the order for requesting materials, payrolls for human resources, a summary sheet of costs and the method to apply indirect costs. Additionally, the prototype integrates the user manual for the tool GCP 1.0.

Finally, it has been established that once the tool for production and cost management is validated, there will follow its implementation in a segment of micro and small textile companies in Bucaramanga. The purpose is to demonstrate the functionality and efficiency in solving the problem that gave origin to this research. It should be clear that this is an unfinished product, since it can be further improved based on usage experience, so that it can become a mean that facilitates production and cost management for this type of productive units.

## Theoretical Framework

In world economy, companies are the engine for development and for the propagation of wealth; they contribute to a large extent to the solution of social problems such as unemployment. Likewise, they are generators of goods and services that supply people's needs from primary necessities to others in different levels of satisfaction, which depend on the economic capacity of each individual. The truth is that companies take on the production of goods and services for the society.

With this in mind, the micro, small and medium-sized enterprises (SMEs) of Latin America are a fundamental component of the continent's business network. A high contribution to employment combined with a low contribution to total production are their main characteristics, reflecting a heterogeneous productive structure and specialization in products with low aggregated value that has a low presence in the value of exports (less than 5% in most countries). As a consequence, these companies show wide gaps in sufficiency, incorporation of technical

progress, power for negotiation, access to social networks, and options for upward labor mobility during their working life.

Under equal conditions, there exists SMEs whose origins respond to individual needs for self-employment and which often operate in a situation of high economic informality (low levels of human capital, low wages, lack of technical and countable registers, no access to formal financial resources, scarce internationalization of their products, and work in activities with reduced requirements and technical standards). On the other end, we find SMEs that move in a rapidly growing formal economy, with dynamics in billing and generation of workplaces, as well as adequate financial performance that answers to market opportunities and to an efficient and innovative management. For this reason, the concept of company size conceals a very diverse reality on this type of productive units (CEPAL, 2012).<sup>1</sup>

Similarly, textile manufacturing industry has marked a tradition of more than 100 years in Colombia. This activity has excelled in generating qualified employment, economic growth and absorption of technology, accumulation of know-how, aggregated value, and the presence of diverse products on the international markets. In this context, Colombian textile industry is constituted by more than 450 textile manufacturers and 10.000 confection companies. The majority are small factories, 50% of them have 20 to 60 sewing machines; these production units are located in cities like Bogotá, Medellín, Bucaramanga, Cali, Pereira, Ibagué, and Barranquilla, among others. This industry has become an important growth factor for the country; it possesses a long tradition that allows it to stand out on national and international markets due to its high quality and flexibility to follow the development of new products. Although conditions have not always been favorable, the companies of this sector have been committed to new investments and new processes, which are always assimilated with high professional competence (ANDI, 2010).<sup>2</sup>

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1 Economic Commission for Latin America and the Caribbean (CEPAL) is one of the five regional commissions of the United Nations, with headquarters in Santiago de Chile. It was founded with the goal of contributing to the economic development of Latin America, coordinating actions directed toward this end, reinforcing economic relations among Latin American countries and with other nations of the world, as well as promoting social development.

2 National Association of Entrepreneurs of Colombia (ANDI) is a non-profit organization, aiming to disseminate and propitiate political, economic and social principles inside a healthy free enterprise system. It consists of a significant number of companies from the industrial, financial, agro-industrial, foods, commercial and service sectors, among others.

In this way, changes in the form of doing business in a global platform have resulted in a turn due to free trade agreements (FTAs); this turn demands that companies reevaluate their models of management, production and costs, so that they do not remain in disadvantage against competitors, and to participate with strategies that contribute to positioning and improvement of performance. While it is true that FTAs create opportunities, they also generate threats when companies do not have the means to improve efficiency and to be more productive. Some of the factors that have influenced the growth of these productive units are: the fall of world-wide demand due to the 2008 financial crisis, the revaluation of currency, the drop in the international prices of some raw materials, smuggling as promoter of the sector's internal crisis and of unemployment, and the closing of key markets such as Venezuela and Ecuador.

Even though these companies have a good reputation due to the diversity of their designs, the quality of their products, and their high artisanal component, there are other factors that negatively influence expectations. These are the following (Mafre, 2010):

- Increasing informal labor and smuggling that leave formal companies in disadvantage.
- Importation of raw materials and finished products from Asian countries (for example, China) at a very low cost.
- Arrival of international brands with experience and market intelligence.
- Vulnerability of the international market that lowers exportations in these companies.
- Low participation in the international markets with models of low value, concentrated in maquila industries and not in complete collections.
- High internal costs of production that do not allow the sector to be competitive in market prices with low-cost countries.
- Lack of negotiation politics in Colombian free trade agreements, regarding the consolidation of opportunities to form strategic business alliances for production and investment between producer-exporter countries and textile importers.
- Variable efficiency of cutting, due to the form in which they can situate cutting patterns on fabric, causing waste of material.
- High costs of manufacturing and cutting softwares.
- Little investment in technology, especially in the sewing process.

- Lack of appropriate technology to make productive processes more efficient (cutting, sewing, printing).
- Low levels of automation in storage and packaging processes for finalized products.

As it can be observed, there are a number of factors that put performance at a disadvantage. It is important to mention that in order to make the resources of these productive units efficient, it is necessary to develop tools that contribute to the optimization of means and resources. Thus, management through technological means is a good option to have timely and reliable information in order to make decisions with a greater degree of certainty. It is also worth mentioning that one of the factors of special care in these companies is cost administration which is in charge of generating information for internal users. Therefore, it identifies, collects, classifies, measures, and reports useful information for administrators when determining product costs, customers and providers. They allow planning, control, continuous improvement, and effective decision-making (Hansen, 2009).

To be more specific, cost is defined as a sacrifice of resources assigned to obtain a specific goal; cost involves materials, workforce, and other supplies required for the production, commercialization, administration, and financing of the organization's social object. A real cost is what already incurred (historical), unlike budgeted cost which is estimated to be consumed in the future. The cost objective is everything that requires a cost measurement (Horngren, 2012). Simultaneously, cost is the sum of expenditures in which a natural or a juridical person incurs to obtain a good or a service, or to fabricate a product (manufacturing industry), with the intention of receiving incomes in the future. These costs can be for production (raw material, workforce, and indirect costs), distribution or sale (advertising, commissions, freightage), administration (wages, lease, devaluation of equipment in the area of administration), funding (interests, financial discounts, difference in currency exchange). These costs can also be understood as product costs and period costs (Ramírez, 2005).

But there are other definitions if we look to a stricter economic sense; cost refers to certain economically valuable elements applied to achieve an also economic objective. Thanks to this, it is possible to say that every components of the sale price of an operation or product integrate both costs (acquisition or efforts consumption) and an expected contribution in monetary terms, which indicates that the price received allows the recovery of costs in addition to an economic profit



or gain, as a result of the operation (Faga, 2006). Furthermore, cost is understood as a resource which is sacrificed or renounced in order to reach a specific goal; this involves economic efforts or sacrifice that generate conditions for a good or a service to be sold to an intermediary of the distribution chain or to the final consumer (Carratalá, 2012).

To summarize, there are other considerations to be taken into account regarding management. Regarding production cost, this comprises three elements: materials, workforce, and other general costs. Attributable values can be capitalized in the inventories of manufactured goods, therefore production costs are said to be capitalizable. That is to say, they become assets for the company, while period costs (administration, sales, financial) deal with the income derived from these cost expenditures or expenses (Zapata, 2007). Likewise, cost is the value of resources that are ceded in return of some article or service, which are usually expressed in monetary terms. This is why costs as an instrument of financial execution allow the administration to prepare economic information, to plan and control, to make decisions, and to carry out management development in search for a good use of the supplies associated to manufacture processes in order to obtain the best practices in production and costs (Sinisterra, 2011). Regarding the preparation of financial statements, costs are understood as the value of resources that are delivered or promised to be delivered in return of a good or a service purchased by an entity. Aiming to generate income, it refers to the amount of cash or equivalent of cash paid for the reasonable value of the remuneration given to purchase or produce the asset on the date of the acquisition or manufacture of the good or service (Estupiñán, 2012).

On the other hand, within cost management, it is recommended to clarify that costs have to be focused toward the future; history can be taken as a referent but actions have to contemplate what would happen in a concrete scenario, therefore cost estimation or predetermination are very important. In that regard, estimated cost indicates what something can cost, but without any scientific basis, which means that it is based on empirical or historical data; however, in order to lower risks and to increase the degree of certainty, costs are determined in advance, under the concept of standard cost. The difference is that in these costs Taylorist techniques are contemplated, with the aim of gaining better control over production and productivity, therefore it is an advanced technique for cost valuation and efficiency measurement. Thus, the importance of this method is that estimation uses mathematical models and scientific and engineering studies, especially those

related to time and movements to calculate the cost of human resource, production line running time, or the value assumed for the provision of a service (Río, 2001).

At this point, it is necessary to emphasize the function of cost management and production planning as an information system designed exclusively for the administration, since it consists of accounting without external users, entirely at the service of management (Cuervo, 2008). Another fundamental aspect in cost structure is the fixation of prices, which has to take into account low cost strategies. This new dynamics forces a change in the concept of business. The aim is to reduce costs in all areas of the organization: staff, processes, technology and production time, reduction of the commercialization chain, components and raw material. In other words, it is about producing at substantially lower prices. This new way to understand a company abandons the classical model of fixation of prices based on costs, but it allows a modulation on the basis of demand and competitors (Valls, 2008).

It is important to highlight that in order to obtain economic results a company has to exert leadership in something really valuable for the customer or the market. It can be a limited but important aspect of the production line. It can be its services or distribution, or its capacity to transform ideas in sellable products, with promptness and at a low cost (Drucker, 2012). In such situation, the management allows to define strategies to compete with, as it is presented by Porter (2007). When facing the five strengths or factors of the competition, three generic strategies of great efficiency are available to obtain a better performance than that of the opponents in an industry: (a) global leadership in costs, (b) differentiation; and (c) approach or concentration. However, knowledge and experience allow to re-create the imagination of the person directing the company in order to focus on the strategy that he or she considers suitable for the conditions and expectations of the company.

In this context, the task of management does not consist in supervising, but in leadership. Management has to work on the sources of improvement, the idea of product and service quality, and how to convert an idea into design and into a real product, with the purpose of orienting the management toward the productivity and competitiveness of the organizations they direct (Deming, 1989). Hence, commercial success is the result of reevaluating businesses, projecting them, managing them, making good use of resources and defining good practices, so that these productive units capitalize the ideas, creativity, inventiveness and persistence of managers who seek to generate wealth through solid and profitable businesses. This is only accomplished when they focus on administering means and resources

with management models in line with the specific needs of each organization. Thanks to this, there are companies that obtain growth, position, and financial preservation and consolidation, while others fail in the initial phase or in the medium term, because of the lack of efficiency in the way they do management.

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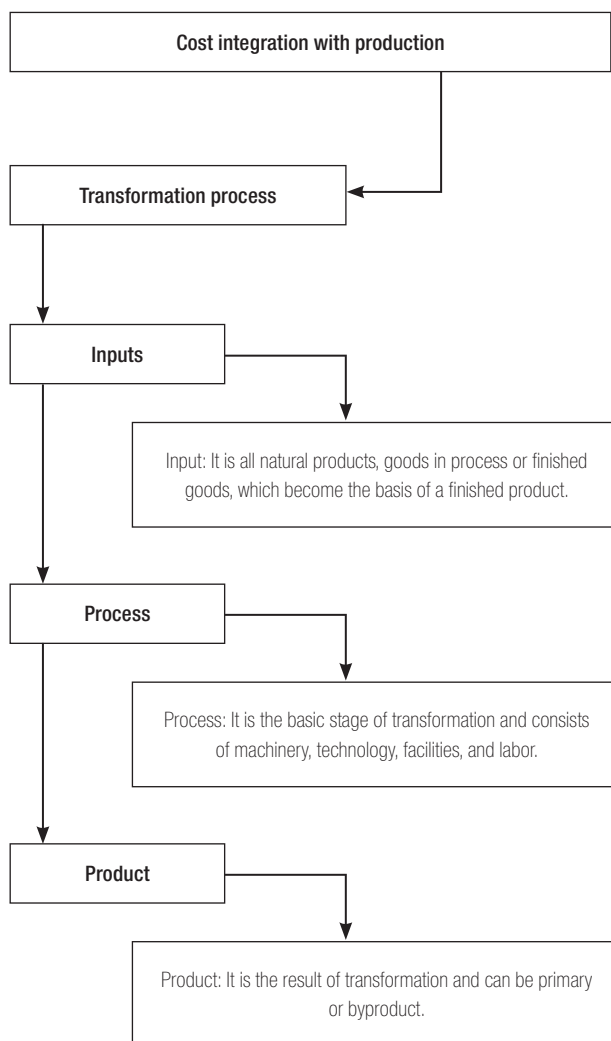
## Results and Discussion

Approximately 98% of the textile industry companies in Bucaramanga are micro and small productive units (Cámara de Comercio de Bucaramanga, 2014). These companies show a high degree of informality, since they lack well defined administrative structures and management models; however, tradition, along the curve of experience, accredits them as organizations that are revitalizing economy due to their participation in generating jobs and income for family units in the region. In this context, it is of vital importance to orient management toward production and costs, which are two directly related variables, in order to provide a solution to problems associated with this industry's productivity and competitiveness (Figure 1).

It can be stated that these companies work by collections that start from a design according to tendencies in fashion and the needs of the market in which they participate. Hence, based on customer requests, production is programmed, taking for granted that the cost system which better fits them is production order. Therefore, when the collection is prepared, they generate technical sheets for each product in which requirements are defined, costs are estimated, and prices are fixed based on demand and competition. In this way, the production order integrates the consumptions of resources originated in diverse activities associated to production, so they finally obtain a total value of consumptions that allows to establish the manufactured product's real unitary cost, which is compared to the estimated cost to evaluate the efficiency of resource management (Figure 2).

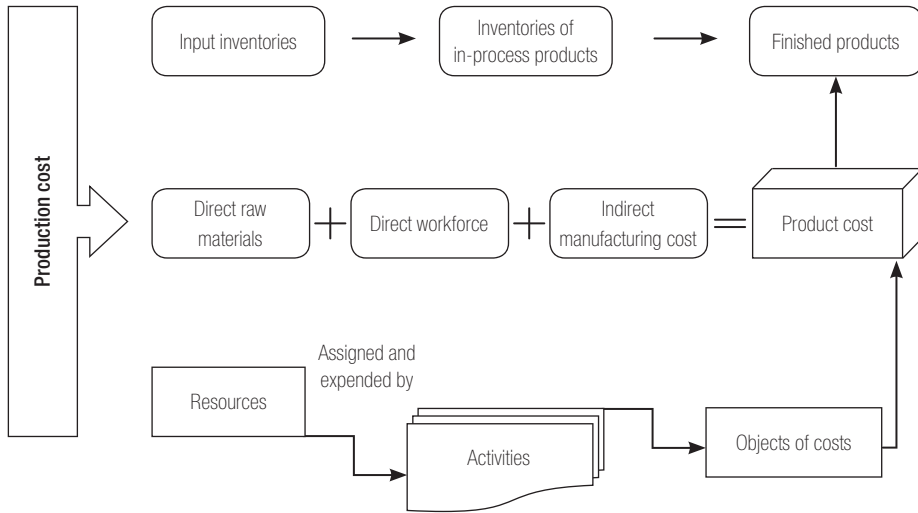
Figure 1. Function of costs and production

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Source: Adaptation from Meléndez (2004, p. 15).

Figure 2. Resources expended in a production order



Source: Authors.

Regarding this point, we can emphasize that cost and production management is the basis of the information system and the software tool proposed for micro and small companies of clothing in Bucaramanga, taking into account that these small productive units require tools but the availability of resources to operate with does not allow them to acquire them. Although it is possible that these means exist on the market, their costs are relatively high for these employers. This is why the software took the function of costs and production to initiate the design, which was developed in a free software environment under the dynamics of layers, taking into account: (a) rules: the logic of business, (b) sight: user interface, (c) data: storage or database; with the architecture of the customer model in the cloud server.

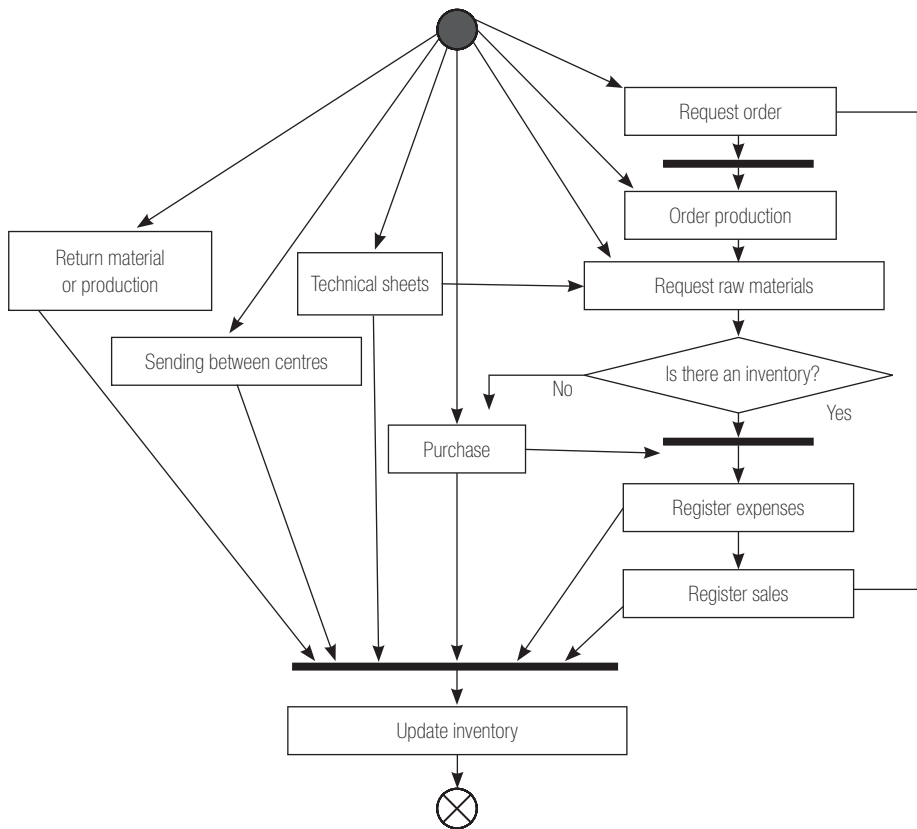
On the other hand, it can be said that using the tool allows: to control movements and flows of materials, to elaborate technical data sheets of each product, to generate raw material purchases, to elaborate shipments between cost centers, to process customer requests, to create production orders, to send supplies requisitions, to register raw material consumptions, to generate return between customers, providers, sellers or cost centers, to register sales and to manage inventory through the Kardex. It is important to mention that during the first phase of validation at a

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pilot company, it was possible to evidence that this system facilitates the handling of resources associated to production operations through planning, organization and control. Besides, it is a friendly tool which is accompanied by a manual of costs and a user manual for the software, so that companies would use it for management and this would contribute to improve their productivity and competitiveness.

Similarly, it is necessary to highlight that these employers do not have sufficient training nor experience in handling technological means. Therefore, the cost management system is designed for people with these characteristics. Furthermore, the tool aims to facilitate processes, optimize resources, and supply information to make decisions in a timely manner; as mentioned before, the application contemplates fundamental operations for the functionality of these businesses (Figure 3).

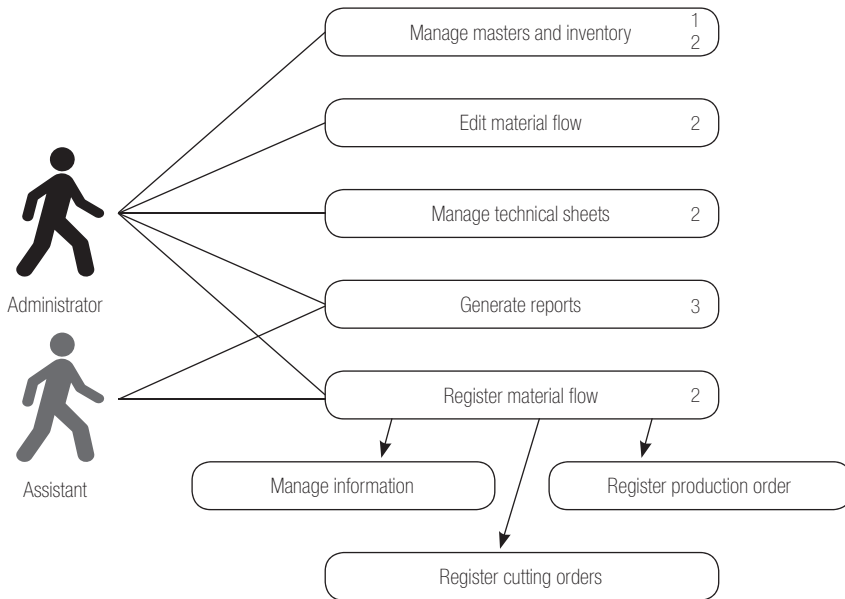
Figure 3. Diagram of activities



Source: Authors.

In this sense, usability tests allow to affirm that the tool is intuitive, user-friendly, and balancing autonomy and limitations for the user, with the aim of elevating confidence in data and information administration generated from it. For example, the administrator has access to all of the functions, while the assistant has some restrictions in order to avoid conflict of interests that affects the validity and control of management, as well as to prevent traceability in the reconstruction of processes. Figure 4 presents a general diagram of the access options.

Figure 4. Diagram of usage cases



Source: Authors.

Taking all of this into account, it is important to consider that process management is measured by results; this is the product of a series of strategies applied for an efficient use of resources through the tool. Hence, means of production are optimized to reach reasonable costs, which compared to market prices reflect positive results that have an impact on the margin of contribution. Confronted with period costs and tax payments, they show an attractive residual value for employers whose purpose is to increase wealth. Under these conditions, the system

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contemplated production order as a means for control, because it allows to sum up costs by product and product lines, with the goal of confronting what was budgeted with real results and to establish variations which, once analyzed, serve as referents for a continuous improvement of the management model. Figure 5 presents an example of the form, which allows to know request orders and their description, as well as production orders generated from the first.

Figure 5. Production order generated by the software GCP 1.0

**Orden de Producción**

Movimientos:

Grupo:

Parte del Nombre:

Fecha Inicial:  Fecha

Fecha Final:  Fecha

Observación:  Exportar

**Órdenes de Pedido**

Id	#	Fecha	C...	C...	T...	Obser...	Fecha...
71	234	2012-09-26 14:...	1	1	2	EJEMPLO	2012-09...
66	1456	2012-09-26 12:...	1	1	6	NA	2012-09...
38	1	2012-09-03 10:...	1	1	2	Ejemplo	2012-09...
39	12	2012-09-03 09:...	1	1	2	Ejemplo	2012-09...
17	120	2012-08-16 13:...	1	1	2	NA	2012-08...

Parte del Nombre:  Tipo: Con Valores

**Órdenes de Producción**

Id	Fecha	Usuario	Estado	Observación
72	2012-09-26...	1	1	FRIGIDA
68	2012-09-26...	1	1	NA
65	2012-09-25...	1	1	
42	2012-09-03...	1	1	Ejemplo
41	2012-09-03...	1	1	Ejemplo
40	2012-09-03...	1	1	Ejemplo
39	2012-09-03...	1	1	Ejemplo

Parte del Nombre:  Tipo: Con Valores

**Detalle**

Id	Det. Id.	Prod. Id.	Produ...	Grupo	Talla	Cant...	Valor
71	1118	25	Améric...	1	M	150	0

**Detalle de la orden de producción**

Id	DetId	Talla Id	Prod...	Prod...	Cant...	Id	Orden
72	1123	NA	25	Améric...	2	2	71
72	1124	M	25	Améric...	150	3	66

Tipo: Con Valores Componentes

Source: Authors.

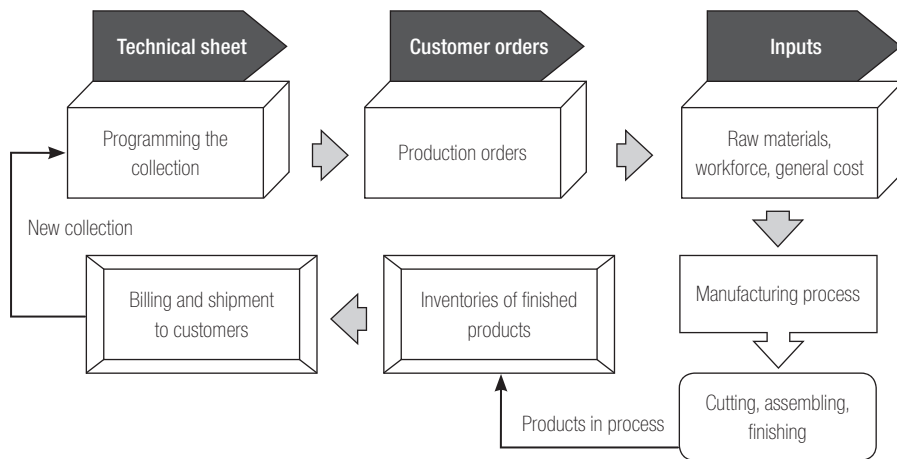
In any case, it is important to explain here that production order is the unit that sums up the consumption of resources for every element of the cost, raw materials, workforce, and other general costs of production. It becomes the unit of pay, given that it is generated for the production of a specific request, for a reference and a certain number of units; thus, the total cost accumulated in each order divided by the numbers of registered units in the same allows to determine the unitary cost of the manufactured product. For this reason, it does not only establish cost, but controls it at the same time.

As mentioned before, cost management is a fundamental basis to generate competitive advantages that would allow to project and strengthen companies in the long term. It is because of this that during periods of big changes management



plays a role of big importance, as it turns into the light that leads the organization to the correct direction. It is essential to point out that the clothing industry has to assume requirements derived from free trade agreements, where those companies that are productive lead a structure of low global costs and possess competitive advantages, as well as cultivate opportunities to obtain better performances in the economic activity. Nonetheless, it is evident from research results that the conditions in which these productive units operate present limitations, among which we can mention: qualified human resource, use of technological tools, financial information systems and costing methods. Under this perspective and based on the very needs of this business sector, it is crucial to consider that production orders are a system that adjusts to requirements, as production is programmed based on customer requests, and fulfilled by collections (Figure 6).

Figure 6. Accumulation of costs in production processes



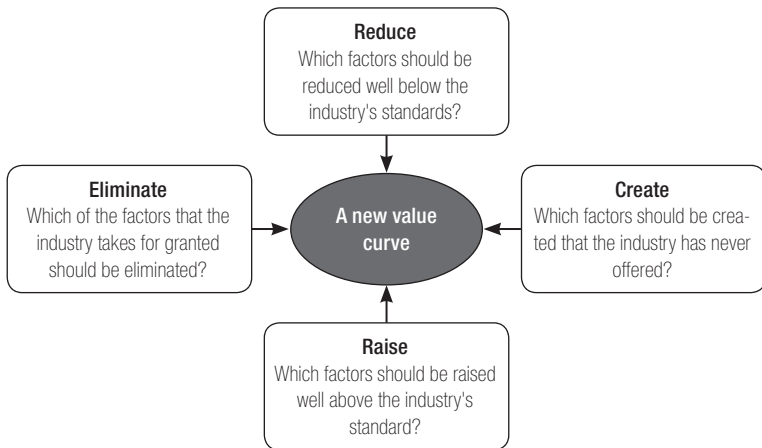
Source: Authors.

Taking into account all of the above, with the aim of better understanding the dynamics of how costs are handled in these companies, it is worth mentioning that they produce in average two or three collections per year. According to requests made by customers, production is programmed, which means that production orders are generated based on requests, and then requests for supplies are established. At the same time, in each process costs are being integrated and as a result

the inventory of products in process is obtained. When the production cycle is finished, these turn into costs in the inventories of finished products, which later are invoiced to customers; the costs of manufactured and sold products are determined in that way.

Furthermore, it is important to examine some aspects of the clothing industry in Bucaramanga; one of them comprises the tradition that has allowed this industry to achieve some learning curve, to act in an efficient way, and to innovate in designs, processes, technology, resources and supplies, distribution channels and cost management strategies, with the goal of creating value. This is reflected in competitive advantages that elevate their positioning in the market. This means that although it is true that cost management contributes to productivity, competitiveness and positioning in the market of these productive units, it is not the only factor; therefore, visualizing other features such as value generation is feasible to promote business success. It is convenient then to review actions that allow to evaluate everything that could add or subtract value for buyers, in order for the management to focus on a continuous improvement and to avoid efforts that do not generate profit. This new form of actions of value breaks the disjunction between differentiation and low costs, to create a new curve of value based on four key questions. Actions that create value are shown in Figure 7.

Figure 7. Four actions to build elements of value



Source: Kim & Mauborgne (2005, p. 114).

Therefore, while studying the reality of this industry, it is noted that there exists a tradition that has elevated the learning curve, in which the artisanal component becomes a factor for differentiation and generation of value. In this way, the hands of the women of the region are what add value through design, cutting, sewing, embroidery, and finishing, in accordance with fashion tendencies, with customer and consumer demands, to answer with innovative products, particularly in clothing for children population.

On the other hand, although this industry has had to confront big challenges to gain recognition, it is encouraging to know that these companies have contributed to generating job opportunities for the inhabitants of the region. Hence, a diversified economy is evidenced, with low prices, good educational offer, and a vigorous business sector with a lot of tradition that has helped Bucaramanga to become the city with the lowest levels of poverty, destitution and inequality in Colombia. At the same time, DANE<sup>3</sup> revealed poverty rates in Colombia, which changed from 34.1% in 2011 to 32.7% in 2012, which means that there are 15 millions of poor people in the country. In Bucaramanga, a city of half a million of inhabitants, this rate was 10.4%, data that is well below the ones set by the Millennium Development Goals (MDGs) for 2015, which is 28.5%. Besides, it is the only city with an extreme poverty rate of 1.2%, versus 10.4% of the national average. The capital of the Department of Santander has the lowest level of inequality, with a Gini coefficient of 0.432, against a nation total of 0.539.

Finally, it is essential to mention that there are multiple reasons that motivate the generation of strategic options, allowing that these productive units continue strengthening their processes and management; they generate big profits for the regional economy, society and institutions. Likewise, this research focused on this sector because of the importance of the participation of women and family groups of the region, because they have big needs inside the organizations, a result of the limitations in productive and competitive factors derived from the lack of systems and technological means to support operations and resource administration in these business units.

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3 National Administrative Department of Statistics (DANE) is the entity responsible for planning, processing, analyzing and diffusing the official statistics of Colombia. It belongs to the executive branch of the Colombian state with nearly 61 years of experience. The entity fulfils the highest standards of quality and offers to the country and to the world more than 90 investigations from sectors like economy, industry, population, agriculture and quality of life, among others.

## Conclusion

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An important factor to highlight is that clothing companies in Bucaramanga are productive units with high degree of informality, especially regarding the administrative structure, models of management, availability of resources, and technological means implemented. For these reasons, it is of vital importance for these companies to have a cost information system, through the accumulation of supplies by production orders, which are generated from customer requests, so that it allows the planning and control of resources.

The development of the system for Cost and Production Management GCP 1.0 was possible thanks to the cooperation of employers, accountants and software developers, with the purpose of obtaining a friendly, simple and functional tool that is available for these productive units, and which, due to its easy handling, provides them with means to determine costs and fix sale prices.

The complexity of the tool progressively increased, as requests demanded a high level of flexibility; this was partly achieved due to the architectural model used and to the model of design implemented. Initially, it had a simulation model using system dynamics for understanding and explaining the complexity of the phenomenon. Hence, the information system has facilitated:

- Understanding production costs based on system dynamics and production processes.
- Identifying resources linked to these processes and establishing the physical structure of the product through integrating diverse elements.
- Evidencing the economic sacrifice and the aggregated value, necessary factors for the fixation of sale prices.

System Dynamics (SD) allowed to identify requirements, to offer flexibility in the software, to progressively increase the complexity of the architectural model implemented. Similarly, it allowed to demonstrate control over a problem and to formulate the characteristics and design of the software based on requests; for users, to understand needs and conciliate disagreements. This model facilitated construction and operation thanks to an interdisciplinary learning that approached the complexity of the phenomenon to natural language. However, it is a system under construction that initiates its second phase of validation, specifically regarding costs, due to the fact that the production module has already been optimized.

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