Analysis the application of logistics processes in the bakery sector of MSMEs in Valledupar

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Abstract

The adult population, who searches for foods that are beneficial to health, is the predominant consumer of the growing Colombian bakery sector, thus posing a challenge for it in order to generate a high-quality product. The purpose of this research was to analyze the application of logistics processes in the bakery sector of MSMEs in Valledupar, reviewing aspects such as the diagnosis of the current situation regarding logistics in the company, followed by an analysis of production costs, and the management of demand and purchase forecasts in the different MSMEs in the city. Ballou (2004), Castellanos (2015), Guerrero (2017), Mora & Martinez (2010), Saldarriaga (2014), Eslava (2019), among others, were used as references. It was conducted as an applied, non-experimental, field, descriptive and cross-sectional research. The population consisted of 30 MSMEs from the bakery sector. The reliability of the instrument was determined with Cronbach's alpha, resulting in 0.919; while the significance was calculated using the Anova analysis, resulting in 0.000. This indicates that there are differences between the means of the macroprocesses and microprocesses dimensions. Furthermore, with the post-hoc Tukey test, the first major differences in the logistics of inventories showed that in the case of the indicator of logistics cost management and the second dimension, the use of raw materials has greater differences with the performance of the machines, demonstrating the great weaknesses that the bakery sector presents in the application of logistics processes.

Keywords: Logistics processes, bakery sector, Valledupar MSMEs

Introduction

The following research was inspired by several discussions in a classroom between the Logistics Management students and the teacher. After reviewing an MSME in the bakery sector, they realized a large amount of current problems of this business sector. 100% of the population studied in this research are informal workers, generating non-standardized products that by far reflect a lack of quality production processes linked to logistics planning.

For more than three years, students have reviewed MSMEs in the Municipality of Valledupar, but this is the first time that a single sector has been used to analyze the logistics processes applied in the companies of the bakery sector of the Municipality of Valledupar, who are generating jobs but without the minimum safety and health conditions at work required by the national government of any company operating in the country.

Logistics is understood by Castellanos (2015) as the part of the supply chain that plans, implements and controls the effective and efficient flow; the storage of articles and services, and related information from the point of origin to the point of destination, with the aim of satisfying customers. In accordance with the above, Logistics and its processes are one of the most important factors for a company to be competitive, since the success or failure of the commercialization of its product or service depend on it.

The Colombian bakery sector is currently growing, and the adult population is its main consumer, who looks for foods that are beneficial to health, free of chemical components or dyes harmful to the human body. This trend represents a challenge to the bakery sector in search to generate a high-quality product with natural products that help improve eating habits, considering this product is part of any family food baskets of all Colombian households.

The purpose of the research was to analyze the application of logistics processes in the bakery sector of MSMEs in Valledupar, reviewing aspects such as the diagnosis of the current situation regarding logistics in the company, followed by an analysis of the production costs and the management of demand and purchase forecasts in the different MSMEs in the city.

In the development of this scientific paper, the sector is briefly analyzed, dealing with figures for the management of bakery products in Colombia, and then a bibliometric analysis of the population under study is carried out through Vosviewer, while the Atlas ti v8 software is used to make a graph based on these analyses with the keywords that were most related in each one applied through the Scopus database and using the most consulted and updated papers internationally, on the issue of logistics processes and their application in MSM bakeries in the Municipality of Valledupar.

The logistical diagnosis applied to this business sector is described below, followed by an analysis of the processes applied in the forecasts of demand, purchases and categorization of ABC inventories. The paper ends with the interpretation of the results from the application of an instrument to 30 of these bakeries, which were developed through the statistical technique of Anova and the post-hoc

Tukey test, using the SPSS computer tool, in order to interpret the results and be able to generate the conclusions about the research.

Current situation of the bakery sector

According to studies carried out by Revista la Barra (2019), in Colombia there are more than 25,000 bakeries and pastry shops, which record sales of more than three trillion pesos and generate close to 400,000 direct jobs. This shows the importance of the sector, and the potential of an obviously profitable business, which also facilitates entrepreneurship. The bakery sector continues to grow in Colombia, as it is the fifth country in Latin America in per capita consumption of bread (22 kilos per year), a product that is essential for 70% of the Colombian population on a daily basis, according to a study carried out by Taste Tomorrow.

The information above shows how the national bakery sector is important in the family food basket of Colombians. Thus, this sector is growing in all the municipalities of the country, either by creating formal or informal companies, but which contribute to the generation of employment in the regions.

For this research, 30 MSMEs that operate in the Municipality of Valledupar were considered, which are bakery, pastry, snacks and cheese donut producers. However, as in most cities in Colombia, the MSMEs in the bakery sector are family-owned or made up of people who, for some reason, worked in a company in this sector, retired and implemented their own business, most of them informally.

Bibliometric analysis that justifies the development of the subject internationally

Using the Voswiever tool, a bibliometric analysis was first performed with respect to the different publications of articles indexed in the Scopus database. It was carried out by the 30 students of the course. The results were then uploaded to the Atlas ti software. v8, which generated a graph with the keywords most related in the reports of bibliometric analysis delivered. The following relationships with this cloud of keywords were presented, as shown in Figure 1, wherefrom the analyzes with Voswiever, related to Supply Chain (50), Logistics (69), Production (39), Bakery (39) and Bakery (Spanish) (48), are keywords that are discussed in Scopus publications internationally, showing that research on logistics processes and the bakery sector is being published in a large number of papers and also presenting a large number of reviews by readers of scientific topics.

Figure 1.Word cloud from Biometric analysis reports

Source: Authors' own research generated with Atlas ti v8, (2020)

Logistic diagnosis

Based on Anaya (2014), the population under study was diagnosed and a checklist involving ten areas that are part of the logistics processes of a company was made, relating them as follows: 1) General data of the company, 2) Hierarchical and functional organization, 3) Product data marketed, 4) Market data and distribution channels, 5) Procurement and inventory management, 6) Warehouse entry process, 7) Order processing of customers, 8) Storage and physical distribution, 9) Analysis of the logistics chain and 10) Existing IT support.

The application of the instrument in the MSM bakeries evidenced the lack of management of the concepts of logistics processes in the workers of the different companies, which generated some type of discomfort on the part of their managers when they saw that their companies work in an industrial way that is empirical, with a great deal of ignorance of processes and strategies that would serve as process improvement tools aided by logistics and that would increase competitiveness in the region.

Among the main weaknesses that the MSMEs presented are that 100% of them do not have a strategic logistics plan for their operation in the demand for the product; the infrastructure is not adequate since they do not have the proper industrial safety signs, much less an occupational health and safety plan. One of the aspects that showed great deficiency in the processes was the use of computer technologies: 83% did not have a computer in their company to manage basic information on costs, sales, purchases and other needs that the company needs to carry out in a computer system.

Demand, purchase and ABC categorization forecasting system

Computer systems (Mora & Martinez, 2010) were applied to the total population under study: the authors designed 16 computer systems for the optimization of logistics processes, from which the following was obtained:

None have any forecasting system to help them make a budget for future purchases and therefore be prepared for what must be produced in order to satisfy the supply of the coming months. They use the 90%, a system which consists of purchasing from suppliers as raw materials are consumed, which in most MSMEs are used in their entirety daily, since they sell their products on-demand without generating stocks of products for the following day.

Due to the informality of the management of these micro-companies, forecast analysis, linear regression and suppliers' analysis of their raw material are not carried out, generating a great weakness in the management of companies, which are shaping up to disappear at the hands of other companies that do plan their production, purchases and sales, taking advantage of the market and positioning themselves more and more with the implementation of optimization strategies for logistics processes, such as the categorization of ABC inventories, where, following Mora & Martinez (2010), a company that has not categorized its inventories, does not know how much it has invested in them, much less what should be the market strategies to optimize their sale.

Currently, in the population under study, none of the MSMEs has carried out a study to categorize their inventories, either of raw materials or products, which is generating losses due to the aging of inventories, the damage due to the expiration of products, packaging in poor conditions, among other problems that place the bakery sector as a critical segment in the application of logistics processes to seek improvement of its products and increase competitiveness in the regional market.

Methodology

For the data collection, the Likert questionnaire was used, which consists, according to Hernández, Fernandez & Baptista (2014), in an instrument that allows measuring the variable in terms of intensity. The instrument was based on its construction on the theories or postulates of the authors reviewed in the theoretical framework of the study. To answer the instrument, five (5) alternative responses were considered: always, almost always, sometimes, almost never and never (see Table 1).

Table 1. Assignment of scores

Option	Score
Always	5
Almost always	4
Sometimes	3
Almost never	2
Never	1

Source: Hernández, Fernández & Baptista, (2014)

An instrument of 24 questions was designed on a Likert scale, and its validity was carried out by five experts on topics of research methodology and topic management. Cronbach's Alpha was used to measure the reliability of the instrument, obtaining a value of 0.919 from a double-input matrix designed for the analysis of results, placing the instrument in a highly reliable category.

The analysis of results was carried out with the application of the statistical technique of Anova. Hernández, Fernández & Baptista (2014) state that the data is analyzed on the data matrix using a computer program. In this research, for the analysis of the data collected through the questionnaires, the statistical software SPSS, version 21.0, was used through an inferential statistical analysis.

In this sense, the results achieved after applying the appropriate questionnaire to the Logistics Processes variable were examined using the analysis of variance technique (ANOVA). According to Namakforoosh (2014), the analysis of variance of two dimensions consists in identifying the effect of two or more independent variables on a dependent variable. In addition, the same author states that, in an analysis of variance of two factors, there are four sources of variation: 1) Between columns, 2) Between lines, 3) Interaction, and 4) Error. The variation or variance of the error is the intragroup variance, and the other three are of intergroup variance. The variance of the error is the variance of uncontrollable factors and serves as a denominator in all the ratios of F (Table value is distribution).

According to Namakforoosh (2014), in the effects of the two dimensions, the main effect and the effect of the two factors are obtained together, but knowing exactly where the significant relationship is can be obtained through the post-hoc Tukey test, which measures how much the difference between the means of each dimension is, for the study of positioning, and of the subsets established from the significant differences between each of the indicators, demonstrating the high means in contrast to the lower. In this way, different tables were generated with the SPSS software to collect the results in order to highlight the means achieved, thereby allowing the behavior of the

studied population to be observed, in order to make the respective conclusions and recommendations.

In the same way, to carry out the analysis and interpretation of results, measurement parameters were established. As stated by Hernández, Fernández & Baptista (2014), whenever it is intended to conduct statistical analyses, the responses of the participants to the questions of the questionnaire must be coded, which means assigning symbols or numerical values to each of them —in the case of closed questions, it is possible to code a priori or precode the answer options, and include this precoding in the questionnaire.

In this sense, the scale used to interpret the results was established based on the number of alternatives on the scale, taking into account five (5) categories (see Table 2).

Table 2. Scale for interpretation of results

Value scale	Analysis category
1,00 < 1,80	Absent
1,81 < 2,60	Scarcely present
2,61 < 3,40	Generally present
3,41 < 4,20	Present
4,21 < 5,000	Very present

Source: Authors' own research (2020)

Dimensions to evaluate in the MSM bakeries

Dimension 1: Logistics Macroprocesses

In decision-making, measurement is essential, because it allows collecting and analyzing the pertinent data to analyze the different macro and microprocesses, which are applied by companies in the activities that make up Logistics and which are pertinent to forecast the results and eliminate subjective appreciations, promoting participation in decision-making by the entire business team (Silvera, Rodolfo, 2018).

Dimension 2: Logistics microprocesses

For the dimension of logistics microprocesses, a strict knowledge of the structure of said processes is required, that is, the activities associated with each one of them and the resources that these demand, both from personnel, equipment, machinery, materials, office supplies, public services, space, among others. Once the dimension of the processes is clear, it is necessary to quantify these resources in terms of the units of use, whether they be monetary units, hours of labor, hours of use of machinery, square meters used (Silvera, Rodolfo, 2017).

The analysis of the variable, the dimensions to be evaluated and the indicators suggested by Castellanos (2015) and analyzed from the logistical diagnosis made by the students of the Logistics course are presented in Table 3.

Table 3. Analysis of the logistic processes variable

Variable	Dimension	Indicator
Logistic Processes	Macroprocesses	Supply logistics Inventory logistics Logistic cost management Distribution and customer service
	Microprocesses	Utilization Performance Productivity Reverse logistics

Source: Own research (2020) and Castellanos (2015)

As observed in Table 3, Castellanos (2015) recommends the indicators presented in the tables on the right, corresponding to macroprocesses, supply logistics, inventory logistics, logistics cost management, and distribution and customer service. For the "Micrologistics" dimension, Castellanos (2015) recommends evaluating the following indicators: utilization, performance, productivity, and reverse logistics.

Results

Macroprocesses dimension:

In the results presented in Table 4, the data offered by the software after performing the analysis of variance (ANOVA) and the post-hoc Tukey test are presented for each related dimension (Table 4 and Table 5, respectively).

Anova application results:

Table 4. ANOVA of one factor

average_answers_1

	Sum of squares	gl	Square root	F	Sig.
Inter-groups	83.025	3	27.675	136.222	.000
Intra-groups	23.567	116	.203		
Total	106.592	119			

Source: SPSS results analysis. V21

The previous procedure allowed to specify the significance obtained in the comparison of the averages reached by the indicators of the “Macroprocesses" dimension, locating a significance level of 0.000 —this value being less than 0.05 (0.000 <0.05), level of referential significance. Therefore, there are significant differences between the compared indicators.

Post-hoc Tukey test results:

Table 5. average_answers_1

HSD de Tukey

Macroprocesses	N	Subset for Alpha = 0.05		
		1	2	3
Inventory logistics	30	1.7667		
Procurement logistics	30		3.2667	
Distribution and customer service	30		3.5667	
Logistic cost management	30			3.9667
Sig.		1.000	.054	1.000

Source: SPSS results analysis. V21
The means for the groups in the homogeneous subsets are shown.
a. Use the sample size of the harmonic mean = 30,000.

Table 5 shows the results of comparing the means of the analyzed indicators, finding that the multi-range Tukey test located three subsets, ranking the "inventory logistics" indicator as the first one, which concentrated the lowest rating at 1.7667 pts, listed as absent. It is followed by the indicator “logistics of purchases”, located in the second subset with an average of 3.2667 points, as well as the indicator “distribution and customer service”, which concentrated 3.5667 points, ranking in the second subset, listed as present. Finally, the indicator "logistics cost management”, with an average of 3.9667 points, was located in the third subset, reaching the highest score. However, it shows a behavior classified as present.

The results show a position in each of the aspects involved in the development of logistics macroprocesses, considering the opinions contributed by the managers and staff of the company, generating that the indicator "management of logistics costs" is the one of greatest concern in the bakery companies of Valledupar, Colombia, followed by "distribution and customer service", "purchase logistics" and finally "inventory logistics".
Based on the information in Table 5, the indicator with the highest average stands out according to the opinion of the surveyed subjects: “logistics cost management” is considered the most important macroprocess of the results, evidencing that, in bakeries, this indicator is one of the logistics processes that managers are trying to optimize and apply in order to improve their logistics processes.

On the contrary, the lowest average of the inventory logistics indicator shows that this is the current great weakness of the MSM bakeries. According to the opinion of the surveyed subjects, it is adjusted to the postulate expressed by Guerrero (2017), when affirming that the leaders of MSMEs should focus on: 1) Formulating a mathematical model that describes the behavior of the inventory system; 2) Deriving an optimal inventory policy with respect to specific information to adjust the model, and 3) Keeping a record of inventory levels and indicating when it is convenient to resupply.

Macroprocesses dimension:

In the results presented in Table 6, the data that the software yielded after performing the analysis of variance (ANOVA) and the post-hoc Tukey test are presented for each related dimension (Table 6 and Table 7, respectively).

Anova application results:

Table 6. ANOVA of a factor

average_answers_2

	Sum of squares	gl	square root	F	Sig.
Inter-groups	15,000	3	5,000	37,021	,000
Intra-groups	15,667	116	,135		
Total	30,667	119			

Source: SPSS results analysis. V21

By applying the statistical technique analysis of variance (ANOVA), it was possible to specify the significance obtained in the comparison of the indicators of the "Microprocesses" dimension, obtaining a significance level of 0.000, this value being less than 0.05 (0.000 < 0.05; level of referential significance). Therefore, the differences observed between the indicators are significant; that is, the behavior of the indicators marks different degrees of presence in this dimension. This is shown below in the concentrated data in Table 7.

Post-hoc Tukey test results:

Tabla 7. average_answers_2

Tukey's HSD

Microprocesses	N	Subset for Alfa = 0.05		
		1	2	3
Utilization	30	1,7667		
Reverse logistics	30		2,0333	
Productivity	30		2,1333	
performance	30			2,7333
Sig.		1,000	,718	1,000

Source: SPSS results analysis. V21
The means for the groups in the homogeneous subsets are shown.
a. Use the sample size of the harmonic mean = 30,000.

Table 7 contains the results of post-hoc multiple range Tukey test, in which the established comparison reveals little significant differences in the concentrated averages between the different indicators that make up the “Microprocesses” dimension of the Logistics processes variable.

As shown, three subsets were located, generating the following results: the "Utilization" indicator concentrated the lowest rating with an average of 1.7667 points, ranking as Absent, followed by the "Reverse logistics" indicator with an average 2.0333 pts, and the indicator of "Productivity" with 2.1333 pts, both being scarcely present, finally followed by the indicator "Performance" with an average 2.7333 pts, reaching the highest score and category generally present. Despite the behavior of all the indicators, they did not manage to be in the present higher category, demonstrating that there are great weaknesses in the application of logistics processes by MSMEs in the bakery sector under study in this research.

It can be inferred that the processes that involve the performance of the company through logistics are one of the objectives that managers or owners of companies have in mind to keep producing, but they are short in the use of elements of machines, computer systems, packaging, adequate transportation, among others, due to their status as informal companies, which prevents them from requesting loans from banks for the purchase of infrastructure. This keeps these MSMEs in the sector in productions of cost time and immediate consumption and leaving them without financial muscle to expand to other markets in the country.

According to the above, the indicator most favored by the opinion of the surveyed subjects was “Performance” located in the one with the highest average, as also established by Ballou (2004), who considers that the company must be based on the optimization of product standardization processes, high-quality raw materials, implementation of comprehensive quality systems and, lastly, innovation in production and marketing areas so that customers are fully satisfied.

Conclusions

Considering the results obtained in the present research, the conclusions that are deduced are presented as generalizations applicable to the bakery companies of Valledupar. Next, the final reflections by the researcher are exposed based on the findings, which structured the present study.

With regard to the application of logistics Macroprocesses in MSM bakeries in Valledupar, it was evident that the development of inventory logistics processes are quite deficient, leaving MSMEs as companies that operate empirically without any kind of planning and living day to day off of their few sales, hoping that the financial support they need to advance and improve their production falls

from heaven, but their short vision of the future has them facing a reality of a short business life in the Colombian market.

With reference to the analysis of logistics processes through Micrologistics, in bakery companies of Valledupar, where the indicator of the use of the processes presented the lowest value in the average of the means, showing that their logistics processes are carried out empirically and without quality standards, generating problems of little control in losses due to the difference in the production of elements that vary in size, weight, consistency, among others, but which are sold at the same price in the market. It was also evidenced that the managers or owners of the MSMEs are not oblivious to this problem, but they face the problem that in order to generate quality products the investment and modernization of machinery is needed, which appears as one of the great barriers to this type of organization because due to informality, the government excludes them from any financing strategy that helps them evolve and puts them to compete with the different companies in the same sector that if they are formalized, and enjoy privileges, tax relief, long-term loans, so they can improve their production and manage to expand their business nationally and –why not– internationally.

The significant contribution of research to the National and International Bakery sector is according to the results obtained, the formalization of MSMEs is necessary, so they can obtain economic support from the government and optimize their production, improving their infrastructure and therefore all its processes, above all those of quality and distribution of products thus achieving to evolve and be more competitive in this market.

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