

Tactical planning of the production of the manufacturer sector in a region southern of Colombia

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ABSTRACT

Micro, Small and Medium-Sized Enterprises (MSMEs) are a fundamental pillar for the economic and competitive development of the regions. Its operations must be efficient, aligned with its goal and aimed at achieving the best results, in the present and in the future. The present study characterizes the tools, methods and techniques of Planning and Production Control implemented by the companies of the manufacturing sector of the department of Huila (Colombia). Through a retrospective cross-sectional quantitative study of an observational descriptive type, variables corresponding to the operations and short-term planning of the companies with age greater than or equal to 5 years were measured. A previously validated questionnaire was designed and applied as well. The study found that small and micro companies lack planning and control systems and that their historical records are scarce, as well as evidenced low use of skilled labor and little intervention of adequate professionals in operational and business management processes.

KEYWORDS: Planning and production control; business management; competitiveness.

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I. INTRODUCTION

Business development plays a critical role in economic growth. The current business scenario is dynamic and worrisome: the global business desertion indicates that more than 50% of new businesses fail during the first five years of commercial activity [1] [2] [3][4]. In Latin America, more than half of new businesses fail in the first five years of life [5]. In Colombia, only 40% remain open, which points out a business survival below the Latin American average [6] [7]. There are some factors that are directly related to this business survival [8] [9], among which are the strategic and operational planning and the ability to adapt before the dynamics of the market.

The organizations should underlie a business strategy that enables the definition of the long-term objectives as well as create courses of action that allow achieving these objectives through the allocation of the necessary resources. It is important the use of tools that allow the coordination between the different stages of the planning and execution of the processes as well as the existence of integration between the other subsystems of the company. Among the various theories for the management of the company's administration is the Planned Production or Strategic Planning, which offers a comprehensive approach to business management [10]. This perspective is supported by six fundamental principles:

- Develop discipline in an integrated manner.
- Find a balance between the strategic levels and the tactics operational.
- Make clear the interrelationships with other business functions, showing the reciprocal influence.
- Consider the growing relevance of services.
- Find a balance in the content of the topics in a way that takes into account their current and future importance in the company.
- Place the methods and techniques making it clear that they are a means and not an end, establishing their advantages and disadvantages.

Domínguez et al. [11] highlights the "operations function" as the competitive weapon and proposes that acting on this area is possible to achieve results that allow greater competitive advantages in the business world. It is then necessary to give a strategic dimension, indicate the competitive priorities, seek to eliminate the causes of the problems and incorporate new technologies into the management processes and methods. For achieving this purpose, it is important to work with an integrated approach, pay attention and enhance the formation of the human factor and maintain processes of continuous improvement.

Organizations should underlie a business strategy that enables the definition of the long-term objectives and create courses of action as well as allocate the necessary resources to achieve them. In brief, organizations should define their goals and objectives, adopt actions and allocate the necessary resources to achieve the outlined objectives [12].

According to the theory [13] [14], the entire business organization should performance in order to fulfill the long-term objectives established in the financial, production and sales programs. To be executed, these programs become aggregated production plans, in the aggregate planning or in the medium-term, develop then at the intermediate levels of the organization and finish with two aggregate plans: the production and the capacity plans, which continue with the materials plan and the operations programming in the workplaces, where, in case of gaps, the necessary improvements are executed, controlled and established. It is necessary to facilitate coordination between the different levels of the company to achieve the upper levels' objectives. To fulfill the long-term objectives at each stage of the development and adapt them to the different production systems, the theory [15] proposes the use of tools that enable the coordination between the different planning and execution stages of the processes as well as the integration of the company's other subsystems [16] with the operations subsystem.

Through this study, the characterization of the tools, methods and techniques of Planning and Control of Production implemented by the companies of the manufacturing sector of the department of Huila (Colombia) is presented.

II. MATERIALS AND METHODS

The study followed a retrospective cross-sectional quantitative approach of an observational descriptive type. The object of study were the companies of the manufacturing sector with commercial registration in the department of Huila (Colombia). Companies with economic activity registered in section C (CIU Code) "Manufacturing Industries", with commercial registration in force in 2017 and seniority equal to or greater than 5 years old were included as well. Companies that did not present complete information and whose commercial register was not renewed were excluded. The calculated sample was 382 companies which were selected by proportional stratified random sampling according to their size, being the selected strata micro, small, medium and large company. The primary information sources were the database of the Single Business and Social Registry (RUES) of Neiva Chamber of Commerce and a questionnaire designed by the researchers and previously validated by experts along with the application of Cronbach's Alpha coefficient. The main measured variables were company information, standardization of processes, production capacity, forecasts, production master plan, MRP and inventories. A univariate statistical analysis was performed; a distribution of frequency and proportions was used for the qualitative variables and measures of central tendency and dispersion for the quantitative variables.

III. RESULTS

The sample consisted of 88.7% (n = 339) micro companies, 9.9% (n = 38) small companies and 1.3% (n = 5) medium companies, whose main commercial activities are related to food products processing (22.3%), installation, maintenance and specialized repair of machinery and equipment (18.8%) and manufacture of metal products (10.7%). Table 1 distinguishes the distribution of companies by activity and size. Large companies were not included.

Table 1: Companies registered by economic activity and size.

Economic activity	Micro	Small	Medium	Total
Printing and copy production activities	1.6%	0.0%	0.3%	1.8%
Clothing making	6.0%	0.5%	0.0%	6.5%
Coking, manufacturing, production, refining oil and mixing fuels	0.5%	0.0%	0.0%	0.5%
Leather tanning and retanning; footwear and leather articles manufacturing	1.3%	0.0%	0.0%	1.3%
Production of beverages	0.8%	0.0%	0.3%	1.0%
Production of food items	19.6%	2.4%	0.3%	22.3%
Manufacture of electrical appliances and equipment	0.5%	0.0%	0.0%	0.5%
Manufacture of n.c.p. machinery and equipment	0.8%	0.5%	0.0%	1.3%
Manufacture of furniture, mattresses and bedsteads	7.3%	0.3%	0.0%	7.6%
Manufacture of other non-metallic mineral products	5.2%	1.0%	0.3%	6.5%

Manufacture of rubber and plastic products	1.0%	0.8%	0.0%	1.8%
Manufacture of metal products, except machinery and equipment	9.7%	1.0%	0.0%	10.7%
Manufacture of basic metallurgical products	3.1%	0.0%	0.0%	3.1%
Manufacture of textile products	2.9%	0.0%	0.0%	2.9%
Manufacture of chemical substances and products	4.7%	0.5%	0.3%	5.5%
Manufacture of motor vehicles, trailers and semi-trailers	0.5%	0.0%	0.0%	0.5%
Installation, maintenance and specialized repair of machinery and equipment	17.3%	1.6%	0.0%	18.8%
Other manufacturing industries	1.8%	0.3%	0.0%	2.1%
Supply of electricity, gas, steam and air conditioning	2.4%	0.5%	0.0%	2.9%
Transformation and manufacture of wood and cork products	1.6%	0.5%	0.0%	2.1%
Total	88.7%	9.9%	1.3%	100%

According to the results obtained, about 27% of the companies surveyed adopt elements of the tactical planning of production for the development of their operations, being the use of operational resources the largest share (36%). It was evidenced that the use of planning elements for both medium and short term is the same, with 25% of the companies adopting some of these elements. Regarding the operative resources, it was found that the implementation of a management system is the element most adopted by the companies (49%). In terms of medium-term planning, the sales record (68%), the use of forecasts (29%) and the determination of production capacity (25%) are mostly used. Knowledge of the materials list (43%) and process routes (25%) are relevant in short-term planning. Table 2 distinguishes each element adopted by the companies surveyed.

Table 2. Elements of Production Planning and Control adopted by the companies.

	Yes n(%)	No n(%)
Operational resources		
Operational softwares	84(0.22)	298(0.78)
Personal qualification	148(0.39)	234(0.61)
Management system	186(0.49)	196(0.51)
Total	137(0.36)	245(0.64)
Medium term planning		
Standardized processes	91(0.24)	291(0.76)
Production capacity	95(0.25)	287(0.75)
Efficiency of the production centers	65(0.17)	317(0.83)
Efficiency of the plant	65(0.17)	317(0.83)
Use of production centers	65(0.17)	317(0.83)
Use of the plant	65(0.17)	317(0.83)
Sales record	261(0.68)	121(0.32)
Sales forecasts	110(0.29)	272(0.71)
Aggregate production plan	50(0.13)	332(0.87)
Total	95(0.25)	287(0.75)
Short term planning		
Production master plan	50(0.13)	332(0.87)
Production capacity evaluation	64(0.17)	318(0.83)
Material requirements	165(0.43)	217(0.57)
Process routes	84(0.22)	298(0.78)
Total	95(0.25)	287(0.75)
Overall total	103(0.27)	280(0.73)

With regards to the size of the company, it was evidenced that medium companies adopt the elements of production planning and control by 80%, followed by small (57%) and micro (23%). It was also evidenced that the adoption of elements for medium and short term planning is similar in companies regardless their size. In terms of operational resources, small and medium companies adopt them in a similar manner. The information distinguished by element and size of company is shown in table 3.

Table 3. Elements of Production Planning and Control by company size.

	Micro		Small		Medium	
	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)
Operational resources						
Operational softwares	51(0.15)	288(0.85)	29(0.75)	9(0.25)	4(0.80)	1(0.20)
Personal qualification	119(0.35)	220(0.65)	25(0.65)	13(0.35)	4(0.80)	1(0.20)
Management system	153(0.45)	186(0.55)	30(0.81)	8(0.19)	3(0.60)	2(0.40)
Total	107(0.35)	232(0.65)	28(0.74)	10(0.26)	4(0.80)	1(0.20)
Medium term planning						
Standardized processes	68(0.20)	271(0.80)	20(0.52)	18(0.48)	3(0.60)	2(0.40)
Production capacity	71(0.21)	268(0.79)	20(0.52)	18(0.48)	4(0.80)	1(0.20)

Efficiency of the production centers	41(0.12)	298(0.88)	20(0.52)	18(0.48)	4(0.80)	1(0.20)
Efficiency of the plant	41(0.12)	298(0.88)	20(0.52)	18(0.48)	4(0.80)	1(0.20)
Use of production centers	41(0.12)	298(0.88)	20(0.52)	18(0.48)	4(0.80)	1(0.20)
Use of the plant	41(0.12)	298(0.88)	20(0.52)	18(0.48)	4(0.80)	1(0.20)
Sales record	220(0.65)	119(0.35)	36(0.95)	2(0.05)	5(1.00)	0(0.00)
Sales forecasts	85(0.25)	254(0.75)	20(0.52)	18(0.48)	5(1.00)	0(0.00)
Aggregate production plan	27(0.08)	312(0.92)	20(0.52)	18(0.48)	3(0.60)	2(0.40)
Total	70(0.21)	269(0.79)	22(0.57)	16(0.43)	4(0.80)	1(0.20)
Short term planning						
Production master plan	27(0.08)	312(0.92)	20(0.52)	18(0.48)	3(0.60)	2(0.40)
Production capacity evaluation	41(0.12)	298(0.88)	20(0.52)	18(0.48)	3(0.60)	2(0.40)
Material requirements	142(0.42)	197(0.58)	20(0.52)	18(0.48)	3(0.60)	2(0.40)
Process routes	61(0.18)	278(0.82)	20(0.52)	18(0.48)	3(0.60)	2(0.40)
Total	68(0.20)	271(0.80)	20(0.53)	18(0.48)	4(0.80)	1(0.20)
Overall total	77(0.23)	262(0.77)	22(0.57)	16(0.43)	4(0.80)	1(0.20)

IV. CONCLUSIONS

The present study aimed at characterizing the tools, methods and techniques of Planning and Production Control implemented by the companies of the manufacturing sector of the department of Huila (Colombia). In order to attain this objective, 382 companies were surveyed and the use of elements of production planning was measured.

The study evidenced that, according to the size of the company, the productive units adopt different elements that enable an adequate planning of their productive activities, being the small and medium companies more rigorous than the micro.

A notable fact that comes up from the study is the low level of qualified personnel in charge of the productive processes of the companies. It was found that only 40% of companies rely on professionals suitable to their activities for carrying out the appropriate tactical planning of the production. Furthermore, the lack of knowledge about the processes and their production capacity hinders the development of competitive advantages.

This study has thus enabled the drawing of a baseline in the region. The knowledge and productive diagnosis of the companies allow drawing up future research lines that allow the development and improvement of their capacities. Besides, it allows drawing up strategies for the growth of the manufacturing sector aligned with the singular strengths and opportunities of the South-Colombian region.

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