

Factors Determinants of Innovation in the Metal-Mechanical Pymes of Cartagena de Indias (Colombia)

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Abstract

It was identified the different factors of innovation that influence the competitiveness of SMEs in the metalworking sector of the city of Cartagena de Indias. This article is designed to show the tools used in the analysis of the processes, products and human resources implemented in medium-sized companies. The results obtained from the evaluation of the techniques used are: the use of creativity to develop innovation, to strengthen the motivation and implication of the main resource of every organization, the human. The processes are developed with better methods and technologies that help to improve the activities that are being carried out in the same, and the product shows good manufacturing practices and some errors that can be mitigated to always be a step ahead of its competitors. In relation to the stages of the innovation process, the innovation factors in the products obtained the highest evaluation, positively influencing the satisfaction of the interested parties when confronting the new development with the requirements of the market.

Keywords: Business competitiveness, Innovation management, Metallurgy, Organizational innovation, Small enterprises.

INTRODUCTION

In the last decades, innovation and the different systems taught internally in metal-mechanical SMEs at a global level, have experienced a significant advance of the factors of technological innovation, seeking the increase in economic level and, thus, to allow it to stay in the market at which its activities are directed [1]. In this way, SMEs are looking to be at the forefront of competitiveness and with the development of opportunities for technological, scientific, organizational, financial and commercial implementation. Achieving an increase in the competitiveness of companies, products, processes, marketing and innovation [2].

Most companies in the sector do not apply innovation within their processes and organizations in general, either because of lack of information or lack of interest, because they do not adapt to new work techniques or simply because of fear of change [3]. Innovation within organizations is a process that is carried out in a persuasive way, taking into account the agents with which they interact, such as norms, laws, cultural, scientific-technological, industrial, etc. policies [4].

Organizational innovation refers to the realization of changes in procedures and practices carried out within companies,

through the use of advanced techniques, modifications and differentiations, without neglecting the strategic decisions that lead to the reduction of costs and improvement of productivity, and the benefit that this entails both to suppliers and to customers [5].

Within SMEs, the search for productive transformation can bring with it the generation of new unique products with high added value, as new technologies are introduced for their different production lines [6]. The culture of innovation that has been unfounded over the last 15 years helps to mitigate the phenomenon of a lack of R & D implementation, as well as neglect of high technical requirements to make these changes adaptable to customer specifications, both for the offering of new products with creative impact promoting organizational and technological development [7].

That is why it is considered that small and medium enterprises must adjust the innovation factors necessary for the company with each of the objectives of their business and include technological tools as fundamental options within their activity or their productivity plan [8]. It is in this sense that this research aims to search and characterize the needs of the metal-mechanical sector of SMEs in the city of Cartagena, based on the information acquired in the research process, in order to propose the most appropriate strategy, that allows to strengthen the capacities of innovation, obtaining of this form, right decisions to reach the sustainability in the market.

METHODS

As a starting point, a survey is conducted with questions aimed at the use of technologies, related to processes carried out in companies, local, national and international sales, major difficulties they have faced in relation to production, sale, capital, and others; techniques used to strengthen knowledge, innovation activities, activities that ensure the quality of products and services offered, knowledge of programs offered by the state, location of the company, policies that could contribute to competitive development, production capacity, level of precision achieved with the machines, budget for the improvement of the companies, ways of acquiring new technologies, level of training of the personnel of the area of manufacture, percentage of the number of workers, norms applied in the companies, relations and associativity, investment and financing, innovation related to the improvement in processes, development of new products [6]. This survey is analyzed through statistical charts in Excel and taken as a reference for the development of the different research objectives.

In addition, we identify the research approach, the level of research and the design of the research with their respective tools applied for the present study and the models taken as basis for the analysis of factors such as the analysis model of innovation factors of Ovallos (2011), Dogson's (2000) innovation management model and the Roberts and Berry (1985) familiarity matrix model [9].

For the present type of research the central instrument is the matrix of analysis and responds to the synergies of the criterion, there are matrices of analysis created by some authors in this case applicable to situations or to documents. The approach is caologic, we do not work with an analysis matrix with previously defined categories, but we work with open categorization in such a way that the categories arise from the information obtained, this means that the analysis matrix is discovered after processing [10].

For data collection, a questionnaire is used with questions focused on the use of technologies, related to the processes carried out in companies, local, national and international sales, the main difficulties they have faced in relation to production, sale, capital, and others; techniques used to strengthen knowledge, innovation activities, activities that ensure the quality of products and services offered, knowledge of programs offered by the state, location of the company, policies that could contribute to competitive development, production capacity, level of precision achieved with the machines, budget for the improvement of the companies, ways of acquiring new technologies, level of training of the personnel of the area of manufacture, percentage of the number of workers, norms applied in the companies, relations and associativity, investment and financing, innovation related to the improvement in processes, development of new products, improvement in obtaining main products challenges; management of suppliers and market, among others that allow the analysis of the current situation of companies in terms of innovation activities to a total of 13 metalworking companies in the city of Cartagena.

RESULTS AND DISCUSSION

The forged as a main activity receives 29% of the population of metal-mechanical SMEs, this activity does not correspond as secondary (0%), although 6% goes to subcontracting to obtain products with this characteristics and lastly, 64% do not perform this process, as shown in Figure 1.

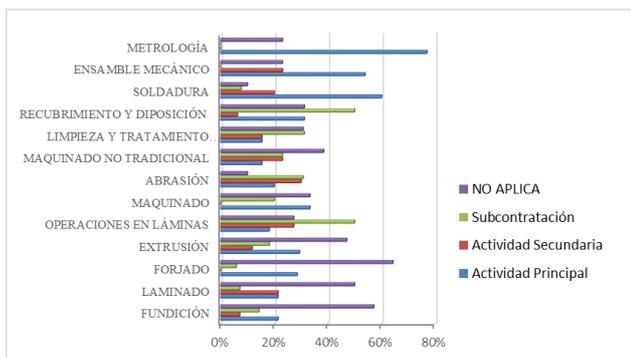


Figure 1: Processes carried out in metal-mechanical SMEs

All of the above, allows to infer that most of them are not taken into account, due to their high cost, which leads us to say that these are the critical processes of the production system of metal-mechanical SMEs.

On the other hand, the subcontracting has a considerable percentage, since the investment is minimal to obtain the products with specific characteristics necessary for the continuation of productive processes, this poses a positive margin for the investment of new methods to realize its products. In this sense, 31% of the metallurgical sector of the city must handle new methodologies, in order to ensure that innovation processes can accommodate positive changes in SMEs in the metallurgical sector.

The latter is in a percentage of 80% of innovation in its processes, which means that the production capacity in reference to the demand of the clients can rise to more than 56%, yes, new technologies are used in the machining area, which has a 38% technological development (taking into account traditional machines and tools), on the other hand, the combination of manual tools, machine tools, equipment with a 15% also, the mixture between equipment and robotized technology with a percentage of 8%.

As shown in Figure 2, the part of the techniques used to strengthen the knowledge of metal-mechanical SMEs is the internal training of the personnel, where 65% of the companies impart as a premise contributing as a support technique to the projects in groups of suppliers, clients or universities, research centers, among others. Therefore, there is a tendency to create a group contribution for different factors of innovation, avoiding problems due to lack of knowledge of productive issues, quality control, etc.

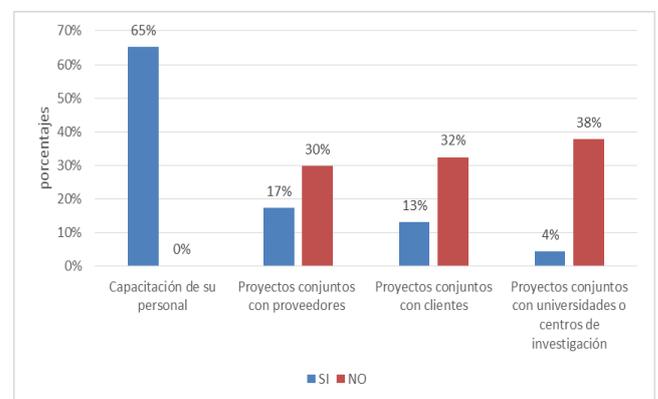


Figure 2: Techniques used to strengthen the knowledge of metal-mechanical SMEs

In the analysis of Figure 3 of the relationship between the innovation criteria and their characteristics, it can be observed that within the human resource of these companies in the metalworking sector, events such as product development and process improvements are a fundamental pillar in this criterion of innovation, because if these companies invest in a trained and specialized personnel capable of innovating subsequently they will have the capacity to use new and improved processes.

In criteria such as new products these companies develop research projects for the introduction and development of new products that can meet customer demand, but since they are small companies and according to data analysis many of these projects have not met expectations prior to the realization of these research projects, many these companies must do a thorough study of the market and the competition in order to have the capacity to develop innovation products in the metalworking sector. In the criterion of process innovation many of the metalworking companies carry out processes of innovation such as the use of new techniques of manufacturing of products and new machinery for the manufacture of high quality products that can satisfy the market demand.

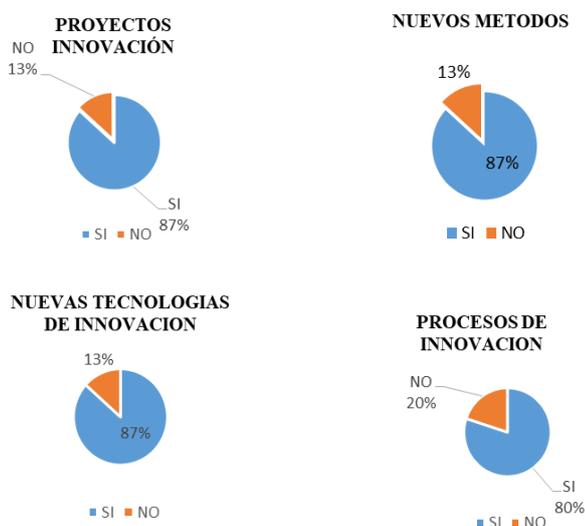


Figure 3: Incognitos related to the innovations in the metal-mechanical SMEs of Cartagena

It can also be observed that the actions implemented in the metal-mechanical SMEs of the city of Cartagena present a significant and changing percentage for this sector, considering that many of the companies comply or fail to comply or implement some innovation factors either for lack of knowledge or for the situation of their economic solvency.

It is important to keep in mind that the aspects that present a low percentage according to the information collected, it is of vital importance that different types of strategies are worked, generated and proposed that allow these small companies not only to improve the processes applied in the same but to handle them correctly, in order to be in a process of better continues and in this way to minimize these shortcomings that have been presented.

SMEs are at an average level in terms of the application or implementation of innovation factors or innovation technologies; on the other hand, they seek in the same way to hoard more customers or expand their participation in the market and the metalworking sector, trying to adapt to the demands of customers and also plan new techniques,

strategies or methods that contribute to the improvement of their processes and induce them to implement innovations and technologies that allow them to fulfill these objectives in an easier and fast.

It is also important to highlight that many of the companies start innovation projects or activities within their organizations and are abandoned over time due to different factors that may be present and of which it is important to be prepared to deal with them efficiently and so that it can reach the fulfillment of the innovative goal that the company had recently proposed.

CONCLUSION

Taking into account the obtained percentages it was evidenced that the majority of SMEs of the metallurgical of the city of Cartagena the one of manufacture of the products with base of metal and other elements have not acquired machinery technified for its processes but they have been maintained in the traditional equipments which do not make it possible to compete with new competitors to the highly technological market, what we can observe is that many of these SMEs make reference to that they handle and raise the innovation in their services, products and personnel, but it is evident that they do not know how the machinery, tools, which is difficult when determining the factors of innovation, because it happens that technically they know new processes, they manage trained personnel but it is very difficult to put them into practice, one of the great difficulties encountered in this sector is the lack of investment in new processes and methods of innovation in resu however, at the end of the process, it is found that they handle the same machinery, methods, technologies and processes established by the custom or because it is very difficult for the operative to do in a new way is a problem for metal-mechanical SMEs lower their level of production. It would hurt you without taking into account that it is very difficult to keep up with the times without handling the concepts of innovation, new technologies, methods of innovation among others.

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