

Chapter 13

Use of Mathematical Models in a Mechanical Metal Industry to Improve Production Planning and Control

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ABSTRACT

This chapter aims to propose an improvement in decision making in the planning sector and production control (PPC) with application of a mathematical model. In the methodology, the qualitative approach was used because the linguistic codifications are interpreted and characterized by a case study applying a questionnaire to the managers of the company of the metal mechanic sector. In this context,

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six constructs were structured as a proposal for performance improvement, being composed of costs, management, inspection, processes, and capacity. The chapter reports the main results achieved during fuzzy sets application, obtaining a better result compared to FAHP in which there were certain oscillations between the percentage of constructs. The construct prioritized by managers and specialists was the cost construct, reaching 38.60%, being advantageous for the industry when the cost is placed in order of manufacture (subconstruct), followed by the prioritized management construct with 28.50%.

1. INTRODUCTION

Due to the competitive market within the manufacturing sector, organizations need to have efficient and effective planning and process management so that decisions made in the business environment are able to obtain as much information as possible (PRAJOGO et al., 2018). So, the entire productive operational network is integrated, enabling the study of the organization concept by associating the characteristics of the competitive market of the metalworking industries (LONGENECKER, et al., 2013, MUSETTI; ESCRIVÃO FILHO, 2016). Organizations are made up of open systems and are therefore affected directly and indirectly by competition in their operating environment (factory floor). In this sense, it is necessary to guide, monitor and evaluate the decision-making processes in the management of planning and production control (PPC) lays the organization's survival in close competition markets, production control (MUSETTI ESCRIVÃO FILHO, 2016).

Any environment where resources can be found, mainly financial, it will be transformed into a tangible good of service for the consumers, will carry with it the challenge and the necessity to reduce the risks in the decision-making process (BRANDÃO et al., 2017). According to Skolud; Krenczyk; Davidrajuh, (2016), the poor performance of PPC has been one of the main causes that have led companies around the world to terminate the business, or file for bankruptcy.

The improvement process, focuses on business identification and analysis, including quality improvement, waste removal and maintenance of the achieved improvements (AQLAN, AL-FANDI, 2018). However, there is a need for a methodology to identify the sectors of the PCP with the best opportunities, as well as to prioritize and select projects for improvement and allocate resources to the selected projects (SOLIMAN; SAURIN; ANZANELLO, 2018). In order to prioritize and propose an improvement in the decision making in the sector (PPC), methodologies were used to help managers in decision making presenting more accuracy in data analysis.

For Rodriguez, Coast e Do Carmo (2013), the modeling of decision problems, from the multiple criteria perspective, has received important diffusion in the environment of Production Engineering. Salomon, Marins e Duduch, (2009) made use of the AHP method to model the supplier selection process in situations that have multiple decisions. They showed the AHP method applied to the selection of suppliers of new equipment for two assembly lines of an auto parts factory. The model considered the same set of criteria for the two lines and allowed to incorporate aspects of multi-decision modeling to the problem, initially presented as two independent models.

Therefore, one of the used methods was the Fuzzy-Analytic Hierarchy Process (FAHP). Chang (1996) developed the method, which was seeking to rank the factors considered most important, in a certain

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