Chapter 6
Multicriteria Decision Support Model for Selection of Tinplate Suppliers:
A Case Study in CAN Company

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ABSTRACT

The evaluation and selection of suppliers has been an issue of great strategic importance over time. In this way, a structured evaluation is crucial, considering several criteria. This work reviews several multi-criteria decision support methodologies explored in the literature to solve the supplier evaluation process based on CAN company specifications, strategies, and requirements. Considering the characteristics of each supplier and a set of criteria with different weights, the AHP method and the PROMETHEE method are applied to establish a ranking according to the performance in the selected criteria. In addition, to help the company make the best decision, an analysis of ranking stability is performed by varying the weights assigned to the criteria. The study and models developed were easy to apply and understand, meeting the specified objectives.

INTRODUCTION

With the constant changes and demands of the market, the competition between supply chains has assumed global importance and an increasingly aggressive stance, requiring companies to make greater efforts to develop new management tools. Regardless of the sector in which companies are inserted,

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the activities related to the process of selection and evaluation of suppliers, are of extreme importance (Alencar, Almeida, & Mota, 2007).

The CAN company is a leading global company in the production of consumer goods packaging, where its main raw material is tinplate, which is acquired from several suppliers around the world. In this way, not being responsible for the production of this raw material, the evaluation and selection of suppliers is one of the critical activities so that the company obtains a competitive advantage.

The delivery of materials with quality problems, long lead times, high acquisition costs, among other things, can cause losses to the company. It is therefore extremely important to have a portfolio of reliable suppliers with positive characteristics.

Usually, suppliers tend to have similar characteristics to their competitors, which does not allow their evaluation and selection to be a simple process. In this way, a thorough evaluation of the criteria in supplier selection becomes crucial. However, this task frequently involves multiple criteria (quantitative and qualitative), which present different forms of measurement, thus being a multicriteria decision problem (Wang, 2010).

According to (de Boer, Labro, & Morlacchi, 2001), in industrial companies, as in the case of the company under study, the weight of purchases represents between 50% and 90% of its total turnover, which makes purchasing operations a determining factor for profit maximization.

In order to assist analysts and decision-makers in situations where there is a conflict of interests, considering a set of criteria, the Multicriteria Decision Analysis (MCDA) arise, which aim to help in choosing the best alternative (Gomes, Pereira, & Lins, 2002).

Applying two methods to support multi-criteria decision making, the **AHP** (Analytic Hierarchy Process) and **PROMETHEE** (Preference Ranking Organization Method for Enrichment Evaluation), the main intention is to obtain a ranking of the best suppliers. The application of both methods will allow to enrich the conclusions obtained, since, according to (Bruno, Esposito, Genovese, & Passaro, 2009), while the AHP approach structures the problem hierarchically, comparing judgments made by the decision makers (between alternatives and criteria) on a par and synthesizes in a simple way the priorities, the PROMETHEE method seeks to order potential alternatives by comparing them by pair, establishing a degree of preference, where the importance of each criterion is determined by the decision maker, by assigning a weight to it (Almeida, 2011).

The chapter is organized in 3 sections. Initially it addresses concepts, problems in supplier selection and multicriteria decision analysis. Subsequently, the methodologies of the criteria and the AHP and PROMETHEE methods will be deepened. Finally, both methods are applied in the evaluation of the suppliers of the CAN company in order to establish a ranking and to conclude which suppliers best fit the company's requirements.

BACKGROUND

1. Selection of Suppliers

The selection of suppliers should consider customer needs and the ability of the company has to meet those needs. Thus, it is considered that the initial point to start the process of production and distribution of a product, begins with the supplier (Sonmez, 2006). As stated by (Azadfallah, 2016; de Santis, Golliat, & de Aguiar, 2017; Rodrigues Lima-Junior & Ribeiro Carpinetti, 2016), supplier selection can

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