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DISTRIBUTION METHODOLOGY IN SMALL BREWERY COMPANY TO OBTAIN PROFITS IN SHORT TIME

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Abstract: This paper presents a methodology oriented to obtain profits in the short-term and is applied to the brewery industry for distributing goods. It is composed of two models of Operations Research (OR), the Knapsack Problem (KP), and the Traveling Salesman Problem (TSP). Also, the Greedy Algorithm is used. In the first step, the KP modified model is used in the choice of the product to give priority to products, which maximize the profit of the Company, making the load assignments for each route respecting the constraints of volume and weight of vehicle capacity. The volume of the vehicle considers full boxes, and its weight and profit are calculated in bottles. As a result, the product loaded is prioritized, where the highest profit product is delivered first and then the low-profit product. Subsequently, the TSP model was used to select the best route for the distribution of the products. Finally, with the Greedy Algorithm and results obtained previously, the customers to be visited are determined.

1 Introduction

In Mexico, 2014, the number of Micro, Small, and Medium Enterprises (SMEs) were more than four million, according to [1]. Moreover, according to [2], the SMEs are 99% of the businesses that exist in Mexico. The SMEs generate 80% of current jobs and more than 36% of Gross Domestic Product (GDP), for this reason, it is the economic sector that has one of the most significant social impacts. To accelerate and to improve their competitiveness, any federal programs support the entrepreneur, where they can obtain advice, services, and credits. The support offered focuses on solves economic problems or develops strategies to make the SMEs grow. Nevertheless, there are no programs to analyze the internal process of each one of the SMEs.

There are international studies that report problems to implement development projects and low success rates [3,4]. A good strategy that SMEs can use to obtain the analysis and the improvement of their processes is to interact with universities because, after all, education and research are keys in the formation of worldwide markets [5]. On the other hand, in Mexico, the universities, especially those that are offering postgraduate studies, are developing investigation [6] based on the case study method and using data from SMEs in order to develop the application of knowledge to real-world situations [7]. In this way, the case presented and improved is a result of this relationship.

Within the improvement to the brewing company, the knapsack Problem (KP), the Traveling Salesman Problem (TSP), and the Greedy Algorithm are used to solve the problem of distribution of goods to customers incurring in the lowest possible costs. The problem is tackled because the Company is not complying with the deliveries to customers promptly, and the priority of the Company is to attend the customers that represent more income. The current delivery of the company process consists of supplying the customers as soon as possible, which incurs unnecessary costs because they do not have a delivery plan.

The KP or also known as the Backpack Problem is a Combinatorial Optimization Problem (COP) and is used to define objects to fit into a backpack, so that optimizes the total value, without exceeding the weight and/or volume of the backpack [8] proposed a solution of 0-1 in the KP (non-viable - viable) while several processors run at the same time, it was a way to achieve better time solution of the problem of this nature for the NP-Hard solution. Besides, [9] proposes three levels of the knapsack algorithms that minimize the errors of the best solution for small problems. These algorithms are discarded and made a selection of the best solutions that were defined as Hyper-heuristics.

On the other hand, [10] propose a heuristic be able to