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Evaluation Of the Factors for Successful Reverse Logistic Applications in the Pharmaceutical Industry: A Fuzzy Logic Based Approach

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Extensive Summary

Reverse logistics is one of the important activities in managing logistics proposals and thanks to successful reverse logistics activities, returned products can be safely disposed of. The pharmaceutical sector is one of the leading sectors that continue to grow and grow, supporting economic development. In the pharmaceutical industry, the management of returned products is a critical part of logistics activities. In some cases, ministry inspections can take decisions such as stopping the use of pharmaceuticals, withdrawing from the market, and in this case the products that are decided to be collected are collected at the manufacturer firm and the manufacturer undertakes the disposal procedures. It is clear that the pharmaceutical tracking system contributes to the monitoring of reverse logistics activities. Through the barcodes printed on the pharmaceutical packaging during production, all the information up to the last customer information reached can be observed by the Ministry of Health through the pharmaceutical supply chain. This situation also prevents pharmaceutical forgery.

In the literature, there has been no study evaluating the factors affecting reverse logistics activities in the pharmaceutical sector with fuzzy logic approach.

In this study, Fuzzy DEMATEL (Decision Making Trial and Evaluation Laboratory) Method, which is one of the fuzzy multi criteria decision making techniques, is used to evaluate the relations between the criteria and it is possible to make an order of importance among the criteria.

The factors affecting logistics processes are not deterministic. Therefore, companies should determine appropriate strategies and make relevant predictions. For this purpose; the factors affecting the application of reverse logistics processes in the pharmaceutical industry were examined and the relationship between them was evaluated with the Fuzzy DEMATEL Method and the order of significance between the factors was determined.

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The DEMATEL method has been proposed by Fontela and Gabus (1976), and reveals the causal relationships between the factors, while the factors distinguish the two groups as affected (effect) and influencing (cause). Establishing the affected or affected factors is very important for solving complex decision problems.

The Fuzzy DEMATEL Method's steps in this study are as follows: the triangular fuzzy numbers corresponding to the fuzzy expressions of the interactions between the scale and the factors are determined by the experts. Then direct relation matrix was created by five different experts. Then the arithmetic mean of direct relation matrices is reduced to a single evaluation matrix and the total relation matrix is constructed with the help of equations and the importance of the relationship level and importance of factors calculated by a set of fuzzy operations.

It is aimed to evaluate the factors of reverse logistics activities in the pharmaceutical industry in this study. Factors related to reverse logistics activities in the pharmaceutical sector were determined by referring to literature research and expert information. Then, DEMATEL method was applied with a fuzzy logic based approach in order to reveal the relation between the factors and the degree of importance by taking the opinions of five different experts. According to this, it is determined that factors of reverse logistics are effect or cause factors and the importance level between the factors is determined. The ten factors considered are; regulatory procedures, rational pharmaceutical use practices, transportation costs, barcode applications, disposal costs, warehouse conditions, awareness of environment, shelf life, communication performance, product design

When sorting according to the weight of the factors, transportation costs, disposal costs and communication performance are the most important factors. In addition, in a diagram of the effect / cause factors, the horizontal axis distinguishes two groups that affect and are influenced by factors. Accordingly, the effect group factors are; rational drug use practices, transportation costs, barcode applications, shelf life, and cause group factors are regulatory procedures, disposal costs, warehouse conditions, awareness of environment, communication performance, product design.