A COMPARISON STUDY OF ABC INVENTORY CLASSIFICATION USING MCDM METHODS

ABSTRACT

Current production systems that depend on system complexity, uncertainty in product demand and competitive conditions feel the necessity to carry inventory for the continuity of their operations. Although inventory classification is a very important decision making process for manufacturing companies, the diversity of the product families makes the inventory classification process a complex and difficult task. The appropriate classification of the items under ABC classification increases both manufacturing efficiency and productivity. Yet the companies need an ABC classification system to take into consideration of multi-criteria and to take control of their inventories. In this study, a comparison study is developed to help the decision makers in their inventory classification decisions with real case problem.

Keywords: inventory management, ABC inventory classification, multi-criteria decision making.

1. Introduction

Extensive production systems, ever expanding product family, and the uncertainty and complexity of the relationship between demand and product usually obligate the companies to maintain a large inventory level in their balance sheets. Application of appropriate inventory management policies is a crucial issue in increasing productivity and profitability under competitive market conditions. An active inventory control system is highly required for an efficient management of the inventory. The ABC analysis provides this type of classification according to the values and volume of items. However, the classical ABC analysis is unsatisfied the classification for the companies any more. Companies need to consider many criteria in classification that is needed MCDM methods. In real life, most criteria have interactions among themselves that need to be considered in decision-making. ANP method also models the problems by a network involving both relationships and internal dependency of criteria to make the decision-making both efficient and realistic.

2. Literature Review

There exist various algorithms for ABC classification in the literature. A few are exemplified here: Zhou and Fan (2007) studied on weighted linear optimization for multi-criteria ABC classification. They stated that this classification was logical and extensive. Ramanathan (2006), using Analytic Hierarchy Process (AHP), Annual Dollar Usage (ADU), and Scoring (SCR) methods and weighted linear optimization, developed a multi-criteria inventory classification approach. Ng (2007) applied a conversion technique on a mathematical model of the multi-criteria for ABC analysis. Çakır and Canbolat (2008) proposed a multi-criteria classification with DSS which used fuzzy AHP

method. This approach combined with all the criteria and directed the different classification analysis.

3. Research Methodology

In addition to the ABC classification methods defined in the literature (ADU, AHP, and SCR), some new algorithms (FCM and ANP) are performed in application. The items are classified under the criteria of price, demand, criticality, and volume. The first three criteria have a quantitative scale where the criticality has a qualitative scale. The different ranking results are then compared with together using Spearman's rank correlation test to select consistent methods. The correlation coefficients of the differences in the rankings are provided.

4. Data/Model Analysis

In the application, 25 inventory items produced in a soft drinks and beverages products facility are classified under the selection criteria. Then 5 alternative ABC classification methods are employed independently to determine the most appropriate classification result. The items are classified using AHP method under the criteria of price, demand, criticality, and volume. The main purpose of the company is to determine the best and most sensitive classification. Therefore, it is demanded by the managers that they evaluate these criteria using the Saaty's scale. The matrix is evaluated using Expert Choice software and weights of criteria are obtained. When the inconsistency ratio is lower than 0.10 than that will mean the evaluation judgments are significant. In the ANP method, the relationships are determined amongst the criteria first. The internal dependencies of all criteria are demonstrated by the relationship matrix.

5. Conclusions

It is seen in the results that the ranking results of ADU, AHP and ANP methods are consistent, and AHP and ANP methods are absolutely consistent. The remaining comparisons do not indicate any consistency. Either the easy and faster methods such as ADU or the detailed methods such as AHP and ANP regarding the related criteria are presented and compared. The significant improvement is ensured using these methods and sensitive results are achieved regarding the companies' own features. The quantitative or qualitative criteria can be evaluated in the MCDM methods to efficient inventory control.

6. Key References

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