Highlights

How demand pattern identification and multicriteria ABC classification can guide management decisions

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- literature review about multicriteria classification;

- literature review about demand pattern classification;

- generative method to force consistency of pairwise comparisons matrix;

- importance of the correct balance of product criteria weights assigning;

- importance of ABC multicriteria and demand pattern classifications for forecasting;

- brief description of COPSolver: library for solving the multicriteria classification problem;

- brief description of COPSolver: library for solving the demand pattern classification problem.

How demand pattern identification and multicriteria ABC classification can guide management decisions

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Abstract

Multicriteria classification is usualy very important to the decision-making in manufacturing management process. For such classification, the attribution of weights to the criteria strongly influences the coherence of the results found. Saaty's Analytic Hierarchy Process (AHP) is an important method for assigning weights to multiple criteria. AHP's logic is not complicated at all but, since matrices of pairwise comparisons of criteria are usually generated manually and based only on some employee know-how, there is a huge complexity on generating a consistent pairwise matrix. Especially when many criteria are used. This paper presents a constructive algorithm that can be used to adjust inconsistent matrices, forcing such matrices to have a better consistency rate. We tested this algorithm by applying the AHP method, for

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multicriteria ABC classification, to companies in two sectors. As a result we observed that the algorithm can adjust the pairwise matrices in just a few seconds, avoiding the manual work that would be done in weeks, therefore showing that it is an important resource for applying the AHP method. We also present in this paper an analysis of the importance of the attribution of the weights to the criteria and show how the multicriteria and demand pattern classifications may influence the decision on the choice of the appropriate forecasting method.

1. Introduction

2. Algorithm for forcing pairwise matrix consistency

3. Tests and results

To test the two developed COPSolver libraries (COPSolver: library for solving the multicriteria classification problem and COPSolver: library for solving the demand pattern classification problem), we used data from three companies in three different sectors (plastic packaging manufacturering, furniture trades and car mechanics). In the case of the company in the car mechanics sector, only the data relating to truck repairs was used; in the case of the other two companies, all the data obtained from all the products sold over the last 5 years was used. One year's data (last 12 months prior to

the data collection date) was used for the ABC multicriteria classification. The files containing the formatted data used for all the tests and the results can be found at tbfraga.github.io/COPSolver/benchmarks.

plastic packaging manufacturing company

multc. ABC clssf.			demand pattern classification				
				total	A	B	C
A	26	10.24 %	smooth	31.98 %	73.08 %	30.38 %	25.35 %
B	80	31.50 %	slow-moving	18.22 %	19.23 %	34.18 %	9.15 %
C	148	58.27 %	sporadic	49.80 %	7.69 %	35.44 %	65.49 %

furniture trades company

multc. ABC clssf.			demand pattern classification				
				total	A	B	C
A	26	10.24 %	smooth	31.98 %	73.08 %	30.38 %	25.35 %
B	80	31.50 %	slow-moving	18.22 %	19.23 %	34.18 %	9.15 %
C	148	58.27 %	sporadic	49.80 %	7.69 %	35.44 %	65.49 %

car mechanics company

multc. ABC clssf.			demand pattern classification				
				total	A	B	C
A	26	10.24 %	smooth	31.98 %	73.08 %	30.38 %	25.35 %
B	80	31.50 %	slow-moving	18.22 %	19.23 %	34.18 %	9.15 %
C	148	58.27 %	sporadic	49.80 %	7.69 %	35.44 %	65.49 %

Table 1: Multicriteria ABC and demand pattern classifications for three companies (results found by COPSolver)

4. Conclusions and suggestions for future works

In this paper we presented ...

5. CRediT authorship contribution statement

T.B. Fraga: Conceptualization, Project administration, Supervision, Software, Methodology, Validation, Formal analysis, Writing – original draft, Writing – review & editing.

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