September 24-28, 2012
Rio de Janeiro, Brazil

Congreso Latino-Iberoamericano
de Investigación Operativa
Simpósio Brasileiro
de Pesquisa Operacional

A MIP MODEL FOR REPLICATING SHELF SPACE ALLOCATION SOLUTIONS IN A SUPERMARKET CHAIN

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ABSTRACT

Shelf space is one of the most valuable resources of a retail company, giving utmost importance to shelf space management. The underlying challenge consists in distributing the scarce shelf space of a retail store among the different products to be displayed. As clients choices can be influenced by in-store factors, enhanced shelf space allocation decisions can boost stores financial performance.

In a typical supermarket, it has been shown that two thirds of all categories require changes on a monthly basis, leading to a continuous need for space management. When considering companies with multiple stores, this effort for space management increases considerably. As a result, most of the times the stores are clustered within groups with similar products assortment and demand pattern but different space available.

The shelf space allocation problem has long been considered by marketing professionals and the OR community, with the first published studies tracing back to the seventies. However, academic work is far from being applied in practice: most of the optimization models have practical limitations, either because of their simplicity and lack of key-practical features or due to the large number of parameters difficult to estimate.

In this work we present a model that aims to close this gap. The model replicates a manually generated, basic shelf space allocation solution, incorporating the key-practical features required by marketing professionals, throughout all the stores of a cluster. The objective is to fit the same assortment of products into different existing spaces, following the allocation pattern received as input. The model keeps product families together and vertically aligned as observed in the basic solution. This is a mixed integer goal programming model with the objective of minimizing the deviation between the number of items allocated to each product and a given target number. To efficiently tackle the problem we developed a mathematical programming based heuristic which solves a series of partially relaxed MIP subproblems to construct the solution.

This is a problem-driven operations research work, inspired by the case of a Portuguese supermarket chain, but at the same time, to the best of our knowledge, this is the first time that the replication problem is tackled in the shelf space literature. We believe

that this is an important approach to encourage the use of optimization in the practice of shelf space management.

KEYWORDS. Retail. Shelf Space Allocation. Mixed Integer Goal Programming.

IND - OR in Industry , PM - Mathematical Programming