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Heuristic Approaches for Integrated Production and Distribution Planning

Géraldine Strack [a] Bernard Fortz [b], Fouad Riane [c],

[a] *Louvain School of Management and CORE, Université Catholique de Louvain*

[b] *Département d'informatique, Faculté des sciences, Université Libre de Bruxelles and CORE, Université Catholique de Louvain*

[c] *Louvain School of Management, Facultés Universitaires de Mons*

Abstract

In this paper, we propose a mathematical model which integrates tactical-operational production and distribution decisions in an environment of shared resources. More precisely, we integrate lot-sizing production and distribution decisions and vehicle routing decisions. In order to solve this global linear mixed integer model, we develop a heuristic method which takes into account routing considerations in the production problem. Computational tests are performed to evaluate the quality of the solution obtained with our integrated heuristic and to measure the size of problems which can be solved with this heuristic. First of all, we observe that the solutions obtained with our integrated heuristic are on average only 5% worst than the solutions obtained with an optimal solution approach. Secondly, with our integrated heuristic, we are able to solve problems of larger size than with an optimal solution approach.

Key words: Integrated Model, Production, Distribution, Generalized assignment heuristic

1 Introduction

Nowadays, with the increase in competition, managers are faced with the need to provide goods and services at a lower cost (a lower price) but with the same quality. Therefore, businesses are forced to reorganise internally and seek for new decision tools which will enable them to optimize more accurately their material acquisition, production and distribution systems. In addition, the development of more precise information technology enables the elaboration of more precise decision tools.

Decision tools based on modeling, optimization and simulation methods where integration is an important component enable to fulfill the needs of managers. Indeed, eliminating boundaries between decision levels, problems and tools is crucial in order to improve performance in terms of "increase in service level, better management of inventory level, higher forecast accuracy and greater customer and employee satisfaction"[8]. Interdepartmental integration can be defined as a mix of collaboration and interaction characteristics. Collaboration corresponds to the strategic alignment of goals of the different departments whereas interaction consists of information exchange between departments.

⋆ Corresponding author: G. Strack

Email addresses: geraldine.strack@uclouvain.be (Géraldine Strack), bernard.fortz@ulb.ac.be (Bernard Fortz), fouad.riane@fucam.ac.be (Fouad Riane).