

MRP IV: MATERIAL REQUIREMENTS PLANNING FOURTH GENERATION

Production and procurement transport planning integration

DOCTORAL DISSERTATION

AUTHOR:

F. Manuel Díaz-Madroñero Boluda

SUPERVISORS:

Dr. Josefa Mula Bru

Dr. David Peidro Payá

ABSTRACT

The Material Requirement Planning system or MRP developed by Orlicky in 1975 keeps on being in our days and, in spite of its identified deficiencies, the most used production planning system by industrial companies. The evolutions of the MRP were reflected in the MRPII system (Manufacturing Resource Planning), which considers productive capacity constraints, MRPIII (Money Resource Planning), which introduces the financial function; and the MRP commercial evolution into the ERP (Enterprise Resource Planning) which incorporates all the company functions into a unique decision system through modules whose central nucleus is the MRP. Later developments of the ERP systems have incorporated the new information and communications technologies. Moreover, these have been adapted to the current economic context characterized by business globalization and the offshoring of suppliers by developing other functions such as supply chain management or transport, among others. On the other hand, many works exist in the academic literature that have attempted to overcome some of the deficiencies of traditional MRP such as results optimization, considering uncertainty in certain parameters, inflated lead times, etc. However in both the commercial and academic environments, the MRP and its variants focus on material requirements and on production capacity planning, which are the main disadvantages in supply chains where there is considerable offshoring of raw materials and parts suppliers. In these contexts, transport planning plays a leading role since high costs and logistical constraints usually make the proposed production plans suboptimal, and even infeasible, and manual replanning is a common practice in companies. This doctoral dissertation proposes a model called MRPIV, which considers the material, production resource capacities and transport planning decisions, with the typical constraints of the latter, such as different modes of collection (milk-run, full, routes) in the supply chain to avoid the suboptimization of these plans which, nowadays, are usually generated sequentially and independently. The proposed model has been validated in a supply chain in the automotive sector confirming the total cost reduction and more efficient transport of needed trucks to carry out the procurement planning.