Chapter 6.3
Functionalities and Position of Manufacturing Execution Systems

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INTRODUCTION

Efforts to separate unequivocally substantial signs of versatile tools of manufacturing management are usually marked by a narrowed view of the field of their use. Similarly, it is so also in the case of specifying the functionality and position of MES (Manufacturing Execution Systems) in the hierarchy of information systems. Presentations generalising MES in this field do not always correspond with models that have a generic character. For that reason it appears useful to investigate the mentioned MES characteristics from a number of angles, and particularly in relation with the basic types of manufacturing systems.

BACKGROUND OF MES EVOLUTION

From a historical point of view, the infiltration of information technology into manufacturing technology was conditioned by the development and advancement of host mainframe computing in the 1950s and ’60s. It gave manufacturers the ability to capture, manipulate, and share information and automate calculation and analysis in order to support design of increasingly complex and capable products. Simultaneously in the framework of manufacturing management, an inventory control took on great importance and most of the software in the 1960s was developed for this purpose. Typically, tools called BOM (bill of materials) processors, which were used as a means to represent process plans, handled inventory control. The focus shifted in the 1970s to Material Requirement Planning (MRP) as the complexity of manufacturing operations increased. This managerial instrument enabled financial managers to both view and control their business processes much more closely. The tools to automate business processes were enhanced by adding further functionalities to meet the increased requirements. Subsequently

in the 1980s, the term Manufacturing Resources Planning (MRP II) became popular. An MRP II presented extension of MRP functions to integrate all aspects of the planning and control of the personnel, materials and machines (Kimble & McLoughlin, 1995). Following, solutions that are marked by the acronym ERP (Enterprise Resource planning) were performed in the early 1990s. An ERP system can be defined as an integrated information processing system supporting various business processes such as finance, distribution, human resources and manufacturing (Choi & Kim, 2002). The newest version of ERP II has been much publicized by the Gartner Group. Fundamentally, ERP II signals a shift in traditional ERP applications from focusing on internal data gathering and management process information to partners, vendors and customers externally via the Web (Farver, 2002). The overall view on evolution of ERP systems is shown in Figure 1. Initially this concept attained a huge popularity among manufacturers, but as the scope of managed systems increased, the ERP system was not suitable for controlling activities on the shop floor level. For this purpose, new tool of manufacturing management called "Manufacturing Execution Systems" was evolved and utilized during the 1990s. There are more interpretations of MES depending on different manufacturing conditions, but the common characteristic to all is that an MES aims to provide an interface between an ERP system and shop floor controllers by supporting various "execution" activities such as scheduling, order release, quality control, and data acquisition (MESA 6, 1997).

Figure 1. Functionality evolutions of ERP systems