Chapter 13
Intelligent Management Information System

INTRODUCTION

Background and Motivation

The Intelligent Management Information System (IMIS) has the potential to transform human decision making by combining research in Artificial Intelligence, Information Technology, and Systems Engineering. The field of Intelligent Decision Making (IDM) is expanding rapidly, due in part to advances in artificial intelligence and network-centric environments that can deliver the technology. Communication and coordination between dispersed systems can deliver just-in-time information, real-time processing, collaborative environments, and globally up-to-date information to the human decision maker. At the same time, artificial intelligence techniques have demonstrated that they have matured sufficiently to provide computational assistance to humans in practical applications. It is the development direction of modern management science and technology. In this chapter, firstly we introduce the introduction and background of IMIS, and briefly, the related design conception. Subsequently, the Intelligent Decision Support System (IDSS) is depicted, which is the most significant technology of IMIS and related activities in the manufacturing process. The applications of IDSS and two cases for industrial manufacturing are then presented, representing the future development direction of manufacturing management. Lastly, a summary of this chapter is given.

IMIS researchers and technologists have built and investigated Decision Support Systems (DSS) for more than 35 years. The developments in DSS began with building model-oriented DSS in the late 1960s which were followed by theory developments in the 1970s, and the implementation of financial planning systems and Group DSS in the early and mid-1980s. During the mid-1980s, Intelligent DSS were implemented through combining knowledge systems with DSS. These developments are discussed below, as well as the origins of Executive Information Systems, On-line Analytical Processing (OLAP), Business Intelligence, and the implementation of Web-based DSS in the mid-1990s, which quickly became a topic for active discussion, and whose influence spread widely.

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The development process of the computer management system can be divided into the following phases.

The first phase (initial stage), 1950s to 1960s: electronic data processing and transaction processing systems, the main tasks being wage management, data statistics, account management, registration statements, and other data-processing services and information services.

The second phase, 1960s to 1970s: the management information system (MIS) and office automation system (OAS). MIS is the development of electronic data processing and is mainly business-oriented management; OAS is the development of business systems, which focuses mainly on office transaction processing and information services.

The third phase, 1980: high-level, strategic and large-scale management decision-making, mainly represented by Decision Support Systems (DSS), using decision analysis methods for solving unstructured and semi-structured information processing problems.

Basic Concepts and Foundations

The Intelligent Management Information System (IMIS) is the next generation of computer management system. It researches ways to improve the intelligence level of computer management systems as well as the design theories, methods and technological achievements of the Intelligent Management System. IMIS is based on the Management Information System and the application of artificial intelligence technology. It is a new computer Management System which has the characteristics of intelligent integration and coordination.

The characteristics of IMIS are as follows:

1. IMIS is able to meet the different requirements of various levels of management staff, such as decision-making support for executive staff, planning and scheduling for middle-level managers, and production control and office transaction processing for general personnel.

2. IMIS provides a multi-level, multi-stage and multi-directional information management service:
   a. Multi-level management: high-level decision support (macro, large-scale and coarse-grained strategic planning and management); middle-level information management (cope and size of the factory, workshop, department planning and scheduling operation management); activities at base level (micro, small, fine-grained workshop, statistical enquiries).
   b. Multi-stage management: short, medium and long-term planning and management; pre-planned management; medium-term management scheduling; post-evaluation of management.
   c. Multi-directional management: production management (business administration), financial management, sales management, labor, personnel management, material management and customer management.

IMIS METHODOLOGIES

The Design of IMIS

IMIS is a new generation of computer management system, developed on the basis of the function and technology integration of MIS, OAS and DSS; it applies artificial intelligence expert systems, knowledge engineering, pattern recognition, artificial neural networks, and other methods and techniques. These basic technology have been mentioned exactly in Chapter 2, 4 and 5 of this book. The design idea of IMIS principally includes man-machine harmony, integrated management functions, three-dimensional models and integrated intelligence systems.