

## SOME CONSIDERATIONS ON THE DEVELOPMENT OF THE INFORMATION SUBSYSTEM FOR PRODUCTION PLANNING

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**The information subsystem for production planning is an integral part of enterprise information system. This paper highlighted some of segments for production planning. The paper presents various aspects of development of the considered information system, such as the flow of information, necessary for analysis of planning, database and application of multicriteria analysis. The accent is based on the specifics of production planning for implementation of information technology to support this issue.**

**Keywords:** information systems, production planning

### INTRODUCTION

Production planning is an essential element of each production businesses. The basic feature of planning is based on the optimal choice of the best alternatives for the projection of the future state of production. A large number of influential factors must be taken into account when forming the plan. They are of diverse nature: economic indicators, human resources, unstructured problems that appear every day in practice (Nesic et al., 2006).

Support of computer technology in the implementation of integrated information systems, at the same time is of great importance. Although, the function of production planning process in collecting and processing information for this purpose, can be considered as an information subsystem. It is necessary to use data of a large number of other organizational units of the company. Many authors define a concept of integrated value chain, which defines the integration of organizational units and therefore their information.

Starting at mid-century computerized systems for interrelated business activities have been developed. Some of them are: MRP – Material Requirements Planning, MRPII – Manufacturing resource planning, ERP – Enterprise resource planning, SCM

– Supply Chain Management. The integrated solution called Material Requirements Planning MRP allows integration of the information of all company resources. It promises benefits ranging from increased efficiency to improved quality, productivity and profitability (Appleton 1997). Palaniswamy and Frank (2000) cited examples of significant achievements of manufacturing organizations as a result of the implementation of ERP.

Today, there are a number of concepts used in the production planning. They are of a large extent based on the criteria optimization, to determine the best production plan (Pochet 2001). Among the most widely used is Hierarchical Production Planning - HPP (Hong et al., 2004; Aghezzaf et al., 2011; Venkateswaran et al., 2004). Torabi et al. (2010) proposed the inclusion of fuzzy theory in the HPP structure and combine the two levels of multiple criteria. Fuzzy hybrid approach now becoming more accepted by many authors (Liang 2008; Jamalnia and Soukhakian, 2009; Baykasoglu and Gocken 2010; Aliev et al., 2007; Qin et al., 2011). In addition, a common approach to forming the optimal production plan is a creation of simulation algorithms (Irdem et al., 2008; Orcun et al., 2006), and hybrid approach (Vasant and Barsoum 2010). Some of the other approaches in the planning of

production meet Discrete models (Radulescu and Radulescu 2008), goal programming (Leung and Chan 2009) and others.

In this paper, the primary accent is placed on some major aspects of the formation of information system for production planning, flow and use of integrated information.

### **CHARACTERISTICS OF DEVELOPMENT OF INFORMATION SUBSYSTEM FOR PRODUCTION PLANNING**

The main reason for this is a complex relationship of the service for production planning with other organizational units of companies. Interconnection of these units is not only a function of achieving plan. Production planning implies or is under the influence of development strategy of a company, introduction of new technologies, establishment of personnel policies and employee training, long-term policy of company, influencing factors of external environment.

Indisputably it can be concluded that the function of production planning achieves its direct or indirect connections with almost all aspects of business operations. However, at the exercising of the functions of planning, the most direct information flow is between (Nesic et al., 2006):

- logistics sector that gives the information needed for production planning,
- sectors in which are updated component structures,
- marketing service based on market analysis and customer requirements provides an assessment of the possible sale of products,
- sector plan, based on obtained information, forms the specific production plans.

Information of the *logistics* primarily relate to current problems of direct production and warehouse operations. State of parts inventory in warehouses and features of Just In Time supply are of significant importance for the formation of short-term production plans. Logistics sector actually provides complex information about the current functioning of the entire production. State of machinery and equipment, the possibility of using production capacity and material resources, energy and materials are just some of the operational information, of the logistics that must be taken into account in production planning.

*Sector in which are component assembly updated* is a member of basic technological services in which

are lead evidence of parts and assemblies required for installation. The importance of this organizational unit is particularly evident in the production of complex products with many parts. Based on the structural components, information are obtained related to necessary parts to produce, their quantity, their potential replacements, quality. Starting from a complete product, by structural component are obtained data required for the installation to the most elementary level. Such information are of great importance for the ordering from suppliers, analysis of financial investment and the overall production capabilities.

*Service of marketing* is certainly one of the key functions required for production planning, primarily because of market analysis and possible product placement. The most important information for market research function are related to the movement of sale, market demand for new or existing models, the analysis of prices, consumers, competition. It is undeniable that such a complex system of marketing information services represents a key basis for creation of production plans.

It is necessary to add the next most important information for production planning from other functionally related entities:

- *Supply service* - Information of this service are important for production planning in terms of the possibility of obtaining components, materials and energy from current and potential suppliers.
- *Service Quality Management* - Quality Function is an essential element for planning and product placement. This information are primarily related to maintaining the quality of the final product with different aspects. It is important that the quality of of the final product depends not only on the many factors that influence the production companies, but also on the quality of components for installation from a supplier. Information of the quality implementation are derived from internal (manufacturing organization) and external sources (markets, customers, customer service).
- *Human Resources* - General information service for human resource management related to the analysis of current and required staffing resources in order to form a potential production plans. Short-term production plans require information on the required engagement of existing staff resources. Long-term plans influence the formation of complex products analysis of personnel policies, training and economic indicators associated with it.

Information of this *service for the development and advancement of technology* also have significant influence on formation of both short-term, and long-term plans. Permanent improvement of the production process, reducing the time of some technological operations due to the introduction of automated equipment, Just In Time method and a large number of organizational processes, allows changes in the procedure of planning.

Output information from the *service for economy* are financial analysis of business operations, assessment of financial resources for investment production and acquisition of materials and energy, budget efficiency and profitability, as well as many other economic indicators of planned and actual production planning.

*Top management* undoubtedly forms the basic information that can be taken on production planning. This information are primarily related to business policy and unstructured problems that occur every day in practice.

*Sector for production planning*, on the basis of obtained information, forms the specific production plans . It is common for plans that the time dimension can be Daily, Weekly, Monthly, Quarterly, Semi-annual, Annual and Long term.

Figure 1 shows the basic flow of information between organizational units . From the figure can be seen the central place on obtaining large quantities of information of various types. Among the most immediate information of integrated information systems can be enumerated: Estimation of market analysis, Financial resources for investment in manufacturing, Information of supply opportunities to suppliers and components, Stock status in warehouses, Information of structure of assembly for installation, Information of the production, Information of human resource, Information of technological capabilities, Assessment of production quality, Information of managers with unstructured nature. The output informations of plans shall be transmitted to the management , in adopting and issuing the request for production.

The database represents the basis of any information system, and thereby to the information system for production planning. Since this system forms a part of an integrated information system of business organizational unit, it is necessary to use a relational

model of shared databases. It is characterized by the use of the data established within the overall information system. Primary databases, necessary for implementing this information system, are (Nešić et al., 2006): Database Positions (a list of all positions from which the product is made), Database Replacement (a list of positions that are a substitute for the preferred position), Database Suppliers (list of suppliers for all items with dual display suppliers) Database Warehouses (inventory in warehouses), Database Payment (a list of suppliers with payment method), Database Incomplete (still incomplete list of each phase of work, for a specified date, with exact location).

More complete analysis of influential factors, in forming plans of production, includes the following bases: Database Market (information of product sales, prices, market demands), Database Personnel (information available from required staff engagement), Database Quality ( information of achievement product quality), Database Technologies (information of the technological characteristics of production, Database Management (information from other important aspects of current production). Figure 2 shows a general schematic model of interdependence between these entities. From Figure 2 can be seen the use of a large number of databases, with heterogeneous character, formed by the entire enterprise information system. Presented general scheme of the database model showing the interdependence information for formation of plan. The presented model indicates possibility of the formation of relational links between tables of some databases in order to obtain the necessary information. The picture shows just some of the most important groups of data. Application of the database of structural components for processing the most important information for production planning, has the greatest significance in the case of complex products, with many components and subassemblies. Automatically obtaining information of the interdependent assemblies, using the database, could be made by multiple relational tables with a recursive relationship. This provides us with information from installation of some components "in depth", starting from the final product , to the last level of installation. This provides many information needed to form a production plan. The most important are possibilities of producing a certain amount and series of some products and specifications of the required investments for the production and quantity of series.

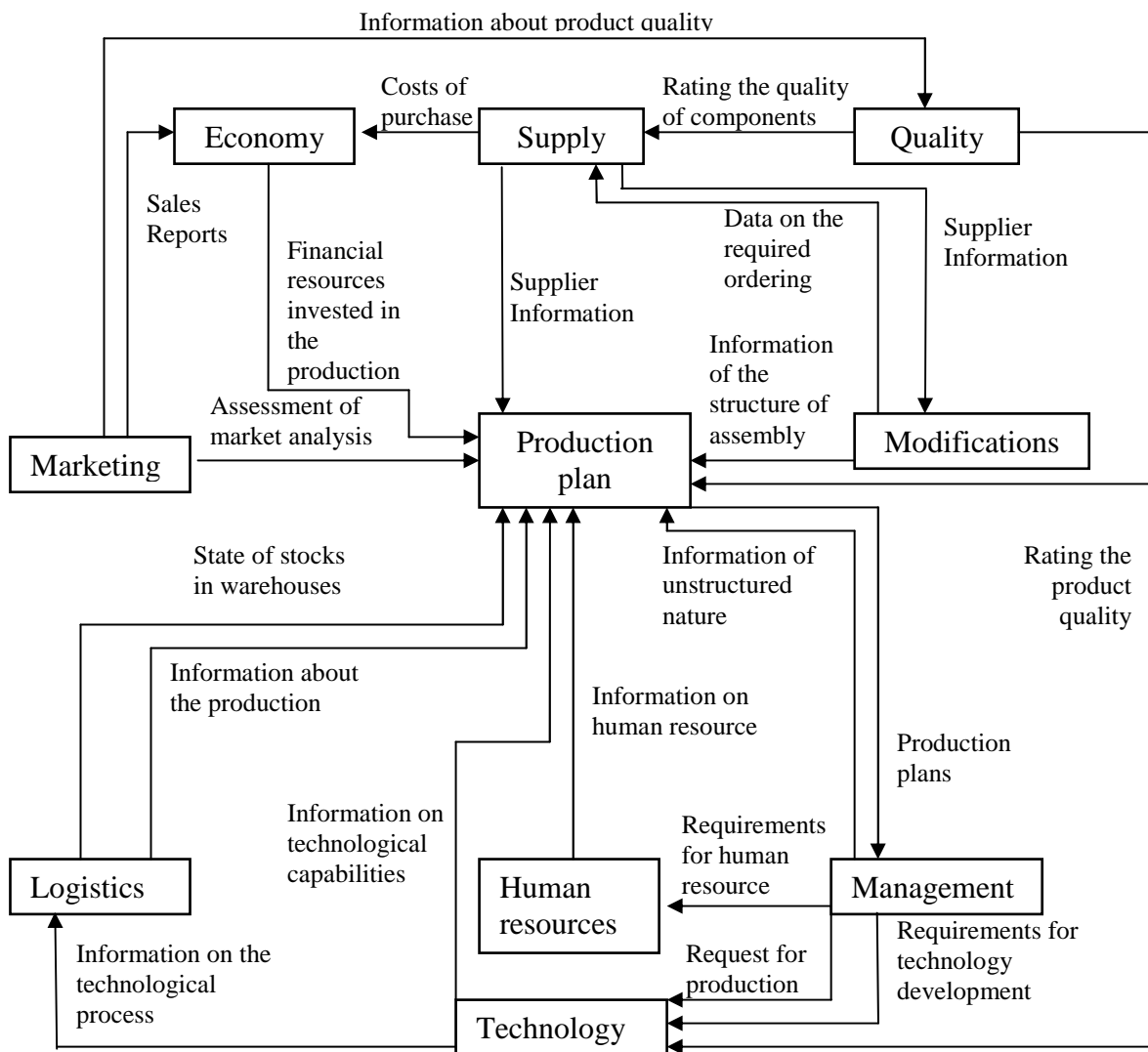


Figure 1: The global flow of information of organizational units.

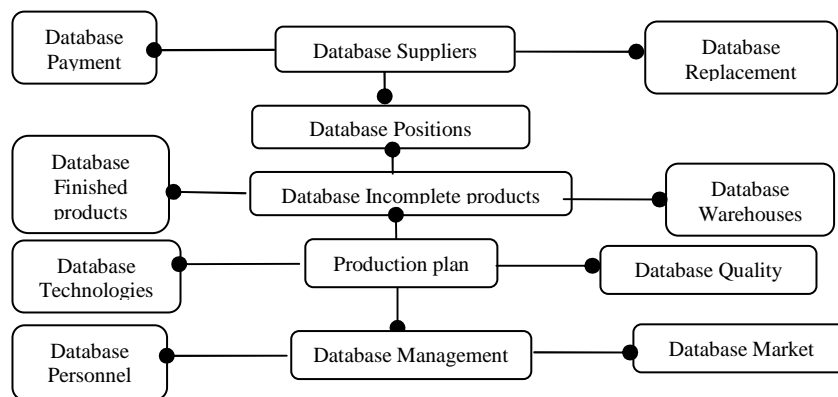


Figure 2: A general schematic model of interdependence between entities.

By placing relationships between table with structural components and other database tables (Suppliers, Payment ...) it is allowed accurately obtaining extended information for the planned volume of production. For each planned volume of production is, in this way, obtained accurate

information of the financial statements, available components and materials and many others.

It should be noted that in this way can be simulated a future state of the entire organizational unit, considering all possible versions of production plans. In this way, are created conditions for

selecting the best production plan and the basis for the application of optimization methods in this subject. Considering the diversity of influential factors, in forming the plan of production, application of criteria optimization can be a next step in improving the selection of the optimal production plan. Radojičić et al., (2010) analyzed in detail possibilities of application of criteria optimization in production planning. The study proposed the following model of criteria, taking into account their preferences: Market needs, Production capacity, Financial resources for production, Labor force, Profitability, Possible supply problems, Stocks of finished products, Stocks of material.

## CONCLUSION

This paper presents a review of the flow of the most important information used in integrated information systems for production planning. According to its characteristics in terms of requests for information, it can be considered as the information subsystem of the entire information system of organization. The paper discusses the general and the most important segments of information for planning of production, their flow, databases and training system using criteria optimization. It can be concluded that there is a large number of complex information related to using this information system. Here is pointed importance of using product structure in implementation of planning. By relational linking to other tables of information system can be obtained many business parameters for simulation of models for some production plans. Displayed consideration can be a contribution to starting point for creating a practical implementation of information subsystems intended for production planning.

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