

OPERATIONAL PLANNING AND SCHEDULING IN MANUFACTURING ORGANIZATIONS

Dragana Vukovic¹; Ph.D. Zoran Nestic²; Ph.D. Stojance Nusev³

¹The College of Applied Technical Science Arandjelovac, SERBIA, dragana.vukovic@vsar.edu.rs

²University of Kragujevac, Faculty of Technical Sciences Cacak, SERBIA, zoran.nestic@ftn.kg.ac.rs

³ University "St. Kliment Ohridski", Faculty of Technical Sciences, Bitola, MACEDONIA,
stojance.nusev@tfb.uklo.edu.mk

***Abstract:** Planning plays an important role in success of manufacturing organizations. It should improve efficiency and effectiveness of manufacturing operations. Main objective of this paper is to explain the importance of balanced capacity and resource production planning, the calculation of material needs for production, and scheduling. This paper will point out the importance of the operational planning and scheduling.*

***Keywords:** Planning, operational planning, scheduling, manufacturing, production.*

1. INTRODUCTION

Planning function is an initial stage of managerial process. It reflects tasks, objectives and actions choosing, in order to achieve chosen goals. It requires decision making by choosing between concurrent alternative paths of action of the future. By planning, organization can determine means and ways of how and what they will achieve specific goals [1]. Plans must be set to fulfil objectives and purposes of (any) organization, and the same stands for manufacturing organizations. This comes naturally, because organizations exist to serve interests of their owners, management and employees. It means that planning comes before any other managerial function, because manager must plan intra-organizational relations, qualifications, how employees will be directed, and what kinds of control should be put in practice. Efficiency of the plan reflects the level of accomplishment of purpose and objectives of business. Simultaneously, efficiency of the plan implies cost-effectiveness regarding purpose and objective achievements, versus expenditures and other factors necessary for its accomplishment. Limitations of resources and environmental uncertainty also affect planning efficiency. Managers need to plan use of resources, in order to avoid their exhaustion and subsequent consequences. As a result of planning, production relations, economic relations, and transportation relations, are coordinated and directed. One of the most essential features of planning is clear sense of direction, which helps anticipate use of resources in the future. This paper introduces operational planning through capacity planning, material planning, management of manufacturing process, and scheduling. Listed operations are among most challenging for manufacturing organizations. The paper will focus on aggregate production and aggregate capacity, which will be broken to the level of scheduling and rough-cut capacity planning. All of the system will be taken into account.

2. OPERATIONAL PLANNING AND SCHEDULING SYSTEM

Operational planning and scheduling systems depend on the utilisation of operations capacity, the volume and timing of outputs, and on balancing of outputs with capacity at desired levels for competitive effectiveness. Setting compatibility between these systems must take place on various levels of management, so that various activities support each other (see Figure 1). We can observe that, as process progresses from top to bottom, intervals of time shrink, and specs of planning go from broad at the top, to very detailed at the bottom.

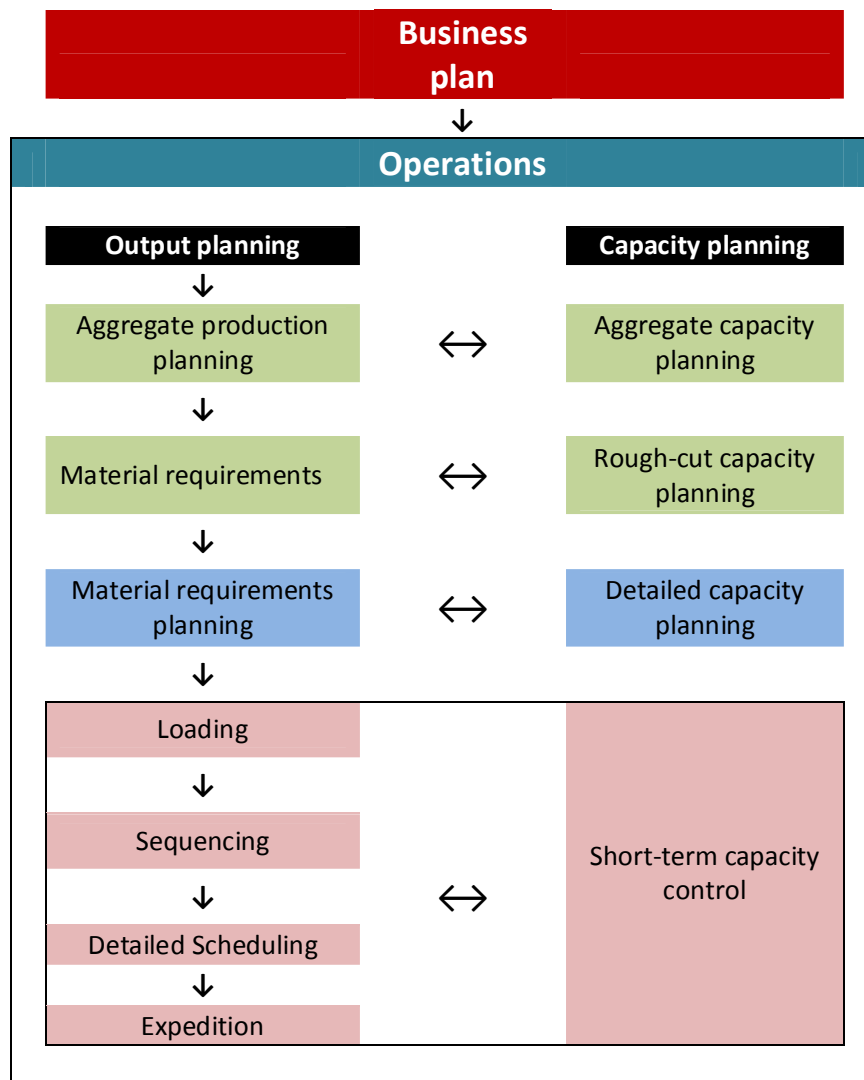


Figure 1. Operational planning and scheduling system [2]

Business plan represents a stated intention of activities in organization, for the specified period of time. It is being developed at the highest executive level of organization, based on overall economic forecast, state of industry forecast, and on the analysis of competitiveness. Business plan reflects competitiveness strategy for the forthcoming years. Figures are usually expressed in terms of the quarterly, or even monthly, output levels. It also can state the overall levels of inventory, which will be maintained during the specified period of time. Business plan is a kind of internal contract between various sectors in organization, such as finance, production, engineering, development, etc. Business

plan typically does not contain all the details, or strict timeline of accomplishment. On contrary, it postulates realistic guidelines, in order to achieve wanted results. Business plan gives guidance for formulation of more detailed plans and decisions on lower levels of management.

3. AGGREGATE PRODUCTION OUTPUT PLANNING

Production process is the transformation of organizational resources into products [3]. The resources are interpreted as assets with which the manager has the ability to create the product itself. Inputs of the manufacturing organization are raw materials, purchased parts, production workers, and work plan. They can be classified in the production process as:

- Transformed resources: resources transformed into semi-products or finished products
- Transforming resources: resources, on which transformed resources are created [4].

The purpose of the transformation process in production is to use transformed resources in order to obtain the finished product. Therefore, there is:

- Material processing - includes operations for transforming the physical properties of the material,
- Information processing - operations of processing production process pieces of information
- Procurement of consumer needs - includes operations that convert consumers' needs into finished products [3].

In the production process, inputs are converted into outputs. Inputs of each production process include work items and means of work. The objects of work include: fabrication material, auxiliary material, directional material [3].

Aggregate Production Planning refers to the production and to the activities of the organization concerning demand, showing the quantity of production expressed in pieces and units of production, by groups or types of products. Since product groups can be manufactured in different factories, institutions or sectors, each of them requires a separate plan. The sectoral production plan covers a predetermined period of time, on a weekly or monthly basis. Planning at this level does not consider minor details such as, for example, how much product will be produced in a particular color, style, model, etc. This plan recognizes only the existing production capacity and existing rules for inventory and inventory maintenance, job stability and the stability of subcontractors [5].

Master Production Scheduling (MPS): The main objective of the MPS is to harmonize the demand of individual products from a product group. This higher level of planning performs the fragmentation of the product group to individual products, and indicates when it will be produced. MPS is an important link between marketing and production. It shows when the orders will be fulfilled, and when the shipment will be ready for delivery. Arrears are also not neglected, so the timing of planned production and delivery is realistic.

4. AGGREGATE CAPACITY PLANNING

Aggregate Capacity Planning is a statement of desired output and is useful only if feasible. Role of the aggregate capacity planning is to maintain capacity utilization at the desired level, and to test the feasibility of planned production within the existing capacities. The aggregate capacity plan addresses the ability of the organization to deal with supply in order to meet demand. Each factory, institution or sector must have its own aggregate capacity plan in order to plan the total production. Capacity and production must be balanced, as shown by the arrows in Figure 1. The capacity plan "translates" the production plan, expressing it through the input parameters, roughly estimating the utilisation of sectoral capacity. The product group usually employs foreseeable capacities, e.g. working hours of people and / or engagement of certain production machines. Although the basic capacities can be considered fixed, the management has the space to manipulate capacities in the short term, affecting the employment of the workforce, subcontractor, or adding shifts to ensure the desired overall output. As a result, the overall planning process balances the output levels of production with capacity constraints, with temporary adjustments, in order to meet demand and achieve the desired level of capacity utilization. Such plan sets the boundaries of production schedules. Rough-cut

capacity planning is aligned with the provisional master production plan by testing performance in terms of capacity, before the final version of the MPS is established. This step ensures that the proposed MPS does not overload any sector, work unit or machine, which would make the MPS unusable. Detailed capacity planning, also called capacity planning, is the accompanying process with the Material Requirements Planning (MRP) that looks at the details of the required capacity to execute the MRP. At this level, more precise estimates of the available and required capacities for the planned scope of work are possible.

5. MATERIAL REQUIREMENTS PLANNING (MRP)

MPS plays a major role in planning raw materials inputs. Material Requirements Planning (MRP) is the key to the success of production and operational management in the manufacturing industry. The MRP reflects the receiving and processing of raw materials in time phases, to allow the execution of the MPS.

Planning of production resources is related to the time and phases through which the material passes, in order to achieve the target in a given time interval. Each business plan is designed to evaluate the range of the product itself, as well as the extent of its production, and in distribution [3].

An operational plan is drawn up through the business plan, covering the amount of materials and other resources needed for the implementation of the business plan. In terms of material needs, the overall needs and needs for procurement for a certain period of time can be noted. Effective planning of raw and other materials ensures the operations. In order to effectively produce, it must be known how much of the raw and other materials are available. It is necessary to carefully order, to not create higher inventory costs by over-ordering, but also not to order a too little, which would directly negatively affect the production process [6].

The management of the production shop coordinates all weekly and daily activities necessary for the job to be accomplished. Individual jobs are assigned to machines, and work units. Parts of priority production processes are determined. Start time and job tasks for each phase is determined (planned to the detail), and raw materials and work processes are monitored and optimized for each and every individual position. Coordination of all these activities into smoothly going processes, especially when unplanned congestion or new priorities occur, frequent demands for optimization of production and capacity at the last moment, represents short-term capacity control.

6. CONCLUSION

The planning system must enable production operations to fulfil the goals set in the business plan. Modern and effective planning approaches have increased demands for a higher level of knowledge and professionalism. Planning is carried out as a well-established professional feature, supported by properly trained personnel, which is equipped with appropriate software systems. Establishing efficient planning systems is done through several phases: Reviewing all production operations related to the business plan; developing a planning system that effectively supports the type of production system that is adopted; arranging a planning system. Every enterprise should strive to continuous development and progress. It is necessary to plan all functions, and production among the most important. Planning actually links all the functions of the management because it represents its basic function. Operational production planning is the development of strategic plans for immediate tasks by individual segments. We live in a time characterized by huge competition, and in time of rapid market changes occurrences. Changes are more and more frequent and companies need to have plans, both long-term and short-term (operational) to ensure not only their existence, but also the growth and development of their business. In order for the company to operate successfully in such an uncertain environment, it is necessary to plan accurately and carefully. A good plan facilitates production management activities and allows the company to appear on the market with the right product at the right time and thus profit.

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