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The Problem Areas and its Impact in Production System

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Abstract

The main objective of this paper was to look at the problem areas in production system. The discussion was based on content analysis of existing literature. In doing this, the meaning of the production system, its elements, types of production system (the continuous, intermittent and repetitive) its scope, criteria for evaluating the effectiveness of production system, and the problem areas were looked into. The study came into conclusion by explaining the close interdependence among the three principal problems of capacity management, scheduling and inventory management by explaining how decisions made in one will have a direct impact on performance in the others. Such interdependence is less evident in the other problem areas, a fact which tends to 'underline' the central importance of these three problem areas in the management of operations. In many respects, the problems of inventory management and scheduling are subsidiary to the problem of capacity management while capacity management decisions will determine how the operating system accommodates customer demand level fluctuations. When these problems are properly addressed, it will end Africa's dependency on developed countries for problems associated with their production areas and lessen its impact in production system.

Keywords: *Production System, Capacity Management, Scheduling, Inventory Management, Operating system.*

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Background to the Study

Production system is mainly associated with factory management crept with the development of factory system. Before the evolution of factory system, manufacturing activities were carried on by single person that posed no or very insignificant problem of production and therefore question of production management did not arise. But with the inception of factory system, the situation changed and so many problems of production were begun to creep up and necessity arose to tackle with problems of quality control, layout facilities, meeting the schedules and organization of production activities. Thus, the scope of production management began to develop. In the early stage, the stress was on controlling the labour costs because labour cost was major element of the total cost of production. With the continuing development of factory system, the trend towards mechanization and automation developed and it resulted in the increased costs of indirect labour higher than direct labour costs. So, concerns found it difficult to run the business in these circumstances and evolved many controlling devices like designing and packing of products, indirect labour cost control, production and inventory control and quality control.

Since the level of production has increased tremendously, so many other production problems have been added to its scope. In the present era of intense competition, the scope of production is very wide. The production department in an enterprise is not only concerned with the full exploitation of production facilities but also the human factor that indirectly affects the production, utilization of latest techniques of production and the production of quality goods to the satisfaction of customers of the product.

The Production and Operations Systems

A system is a purposeful collection of interrelated and interacting set of elements or components which, in aggregate, perform some specific and meaningful functions. A production and operations system is therefore, a collection of interdependent units which when pooled together help in achieving the purpose for which the system is set up. For example, the production and operations system is made up of physical and human components e.g. machines, materials, men and many interrelating units which when brought together would result in the production of goods and services. Within the production and operations system, there are series of interacting units or subsystems with each contributing as a unit to the efficiency of the production system and without which the cardinal objective of the production and operations management cannot be achieved. Such key functions or interrelating activities include production planning and control, inventory control and quality control. The major input resources i.e. men, materials and machines are coordinated to ensure effective results in the production planning and control subsystem, inventory control subsystem as well as the quality control subsystem.

When the perspectives of production and operations management functions are viewed from a system's view point, the managers in each of the specific sub-units are able to view their roles and responsibilities as relevant and critical to the attainment of the basic production and operations management objectives. A typical production system describes the process by which the various input resources get transformed or converted to finished goods and services. This process of transformation is the most critical stage of the manufacturing process as the bulk of the firm's resources are engaged.

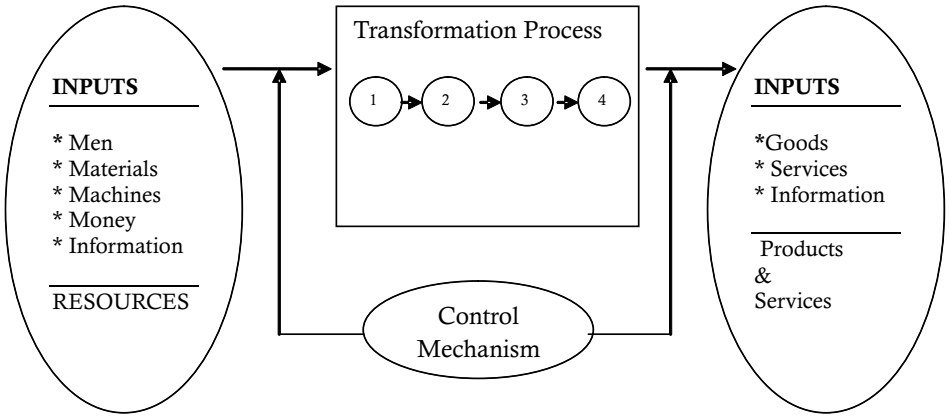

Figure 1: Typical Production System

The four basic elements of the production system are input resources consisting of men, materials, machines, money, energy and information which are needed for any meaningful production to take place. Next is the transformation process where the input resources are actually processed, converted or transformed, as they move from one stage of the manufacturing process to the other, till the process is completed. After the transformation process comes the end products in form of the desired goods and services. Lastly, we have the control loop which regulates the production system and hence performs a useful function at the three critical stages. At the first stage, all the incoming inputs are checked to ensure that they are of the required quality before they are fed into the transformation stage. This implies that, the materials must be of the right quality, the men must be of the right caliber and the machines must be faultless.

During the process of transformation, each stage of the process is checked and monitored, where possible, for conformity with established control procedures. A times, conformance with established quality control procedures are done immediately after the transformation process particularly in instances where it is not feasible to monitor the product or service quality from stage to stage. This 'check point' process is crucial in ensuring that defective goods and services are not passed to the final consumers.

Types of Production Systems

The nature and peculiarities of the company's product or services often determine the type of production system that can be feasibly operated by the organization. Basically, there are three types of production systems that are in use. They are: the continuous production system, the intermittent production system and the repetitive production system.

The Continuous Production System: this is a system in which production runs uninterrupted for 24 hours a day, 7 days a week and 52 weeks in a year without stopping except for periodic shut-down meant for routine maintenance. It has the following principal characteristics:

i. large volume production
ii. Standardized product
iii. Low product variety
iv. Special purpose machines
v. Fixed path production line

vi. Fixed or straight material flow path
vii. Single production line for each product produced.

The Intermittent Production System: unlike the continuous production system which has a single production sequence per product, this production system is characterized by the following:

i. Production of non-standardized products i.e. there are greater varieties of products being handled by the system.
ii. Jobs are usually short-run and are undertaking upon receipt of customer's order.
iii. Production volume is usually small.
iv. There is no mass production rather production is in small lots.
v. Because of limited volume, multi-purpose rather than general purpose machines are often used.
vi. There is no single sequence pattern or process that is appropriate due to variety in customer's demand.

Repetitive Production System: As the name suggests, this production system is characterized with the production of same parts, component or service over and over again. Whenever the demand f a product is erratic, unpredictable, sporadic and irregular, and when volume or market is not large enough to warrant large scale production, the way out is through this production system.

Scope of Production Function

The various activities that form scope of production function can be studied in the following broad areas:

i. Product Selection and Design: The product mix makes the production system either efficient or inefficient. Choosing the right products, keeping the mission and overall objectives of the organization in mind is the key to success. Design of the product, which gives it enough functional and aesthetic value, is of paramount importance. It is the design of the product which makes the organization competitive or noncompetitive. Value engineering does help to retain enough features, while eliminating the unnecessary ones.

ii. Activities Relating to Production System Designing: Decision related to the production system design is one of the most important activities of the production management. This activity is related to production engineering and includes problems regarding design of tools and jigs, the design, development and installation of equipment and the selection of the optimum size of the firm. All these areas require the technical expertise on the part of the production manager and his staff.

iii. Facilities Location: The selection of an optimum plant location very much depends upon the decision taken regarding production engineering. A wrong decision may prove disastrous. Location should as far as possible cut down the production and distribution cost. There are diverse factors to be considered for selecting the location of a plant.

iv. Method Study: The next decision regarding production system design concerns the use of those techniques which are concerned with work environment and work measurement. Standard methods should be devised for performing the repetitive functions efficiently. Unnecessary movements should be eliminated and suitable

positioning of the workers for different processes should be developed. Such methods should be devised with the help of time study and motion study. The workers should be trained accordingly.

v. **Facilities Layout and Materials Handling:** Plant layout deals with the arrangements of machines and plant facilities. The machines should not be overlapping, duplication or interruption in production flow. Product layouts, where machines are arranged in a sequence required for the processing of a particular product, and process layout, where machines performing the similar processes are grouped together, is two popular methods of layout. The departments are laid out in such a way that the cost of material handling equipment is reduced. There should be proper choice of materials handling equipment. These days, computer software is available for planning the process layout (e.g. CRAFT, CORELAP etc.). Group Technology (G.T.), Cellular Manufacturing Systems (CMS) and Flexible Manufacturing Systems (FMS) have made our concepts of layout planning undergo a tremendous change.

vi. **Capacity Planning:** This deals with the procurement of productive resources. Capacity refers to a level of output of the conversion process over a period of time. Full capacity indicates maximum level of output. Capacity is planned for short-term as well as for long term. Process industries pose challenging problems in capacity planning, requiring in the long run, expansion and contraction of major facilities in the conversion process. Some tools that help us in capacity planning are marginal costing (Break Even Analysis), learning curves, linear programming, and decision trees.

vii. **Production Planning:** The decisions in production planning include preparation of short-term production schedules, plan for maintaining the records of raw materials, finished and semi-finished stock, specifying how the production resources of the concern are to be employed over some future time in response to the predicted demand for products and services. Production planning takes a given product or line of products and organizes in advance the manpower, materials, machines and money required for a predetermined output in a given period of time.

Thus, production planning is a management technique which attempts to gain the best utilization of a firm's manufacturing facilities. It is gained by the integration and coordination of the manpower, machines, materials and plant services employed in the manufacturing cycle.

viii. **Production Control:** After planning, the next managerial production function is to control the production according to the production plans because production plans cannot be activated unless they are properly guided and controlled. For this purpose, production manager has to regulate work assignment, review work process, check and remove discrepancies, if any, in the actual and planned performances.

Production control involves the following stages:

a. Planning- setting targets of production
b. Routing – decide the route or flow of production activity.
c. Dispatching- Issue materials and authorizations for the use of machines and plant services.
d. Follow-up- Compare the actual production with targeted production. Deviations are found out and corrected and reasons are investigated.

ix. **Inventory Control:** Inventory control deals with the control over raw-materials, work-in-progress, finished products, stores, supplies, tools, and so is included in production management. The raw materials, supplies etc. should be purchased at the right time, of right quality, in right quantity, from right source and right price. This five 'Rs'

consideration enables the scientific purchases. Store-keeping is also an important aspect of inventory control. The raw materials, work-in-progress, finished goods, supplies, tools etc. should be stored efficiently. The different levels of inventory should be managed properly and the issue of materials to departments should be ma promptly and effectively. Proper records should also be kept for various items of inventory control. The production manager has to look after the inventory control activities at three levels-

a. Control of inventories such as raw materials, purchased parts, finished goods and supplies through the inventory technique.
b. Control of flow of raw materials into the plants through the technique of judicious purchasing.
c. Control of work-in-progress through production control.

x. Quality Control: The other important decision taken by the production manager concerns quality control. Product quality refers to the composite product characteristics of engineering and manufacturing that determines the degree to which the product in use will meet the expectations of the customers. Quality control can be ensured through the techniques of inspection and statistical quality control.

xi. Maintenance and Replacement: In this we cover preventive methods to avoid machine break-downs, maintenance, policies regarding repair and replacement decisions. Maintenance manpower is to be scheduled and repair jobs are to be sequenced. There are some preventive replacements also. Machine condition is to be constantly monitored. Effective maintenance is a crucial problem for India which can help better capacity utilization and make operations systems productive enough.

xii. Cost Reduction and Control: Cost reduction ultimately improves productivity. The industry becomes competitive. Essentially, cost reduction and cost elimination are productivity techniques. Value engineering, budgetary control, standard costing, cost control of labour and materials etc. help to keep costs optimal.

All production decisions are subject to control measures, after receiving proper feed-back. Control function is exercised over the quantity to be produced, quality expected, time needed, inventory consumed and carried and costs incurred. Control system is designed after due cost benefit analysis. Controls should be selective. A self-controlling cybernetic system though preferable, is not possible in all complex industries. Environmental changes ultimately affect all the systems of the organization. A dynamic environment makes it compulsory to adapt the production system to the changes in technology and other factors of the environment. Product mix, composition of products, introduction of new products, changing the layout system is some of the representative decisions which respond to environmental feedback. Apart from these factors, the production system designer should pay full attention to two other important problems, viz. (i) human factor, i.e., the impact of production systems on the workers operating it and (ii) research and development activities. These two problems have a vital impact on production system designing.

Criteria for evaluating the effectiveness of the Production System

The effectiveness of the production system is measured by the following criteria:

1. The volume of output produced per period.
2. The operating costs of the system in terms of amount of materials used, man-hour consumed per unit of output, amount of scraps or wastage generated by the production system per production run.

3. Production capacity utilization
4. Product or service quality and reliability.
5. On-time delivery as reflected in the number of customers' due date met or not met.
6. Production system flexibility in terms of the system ability to cope with expansion or contraction in product volume or changes in product features or characteristics.
7. Frequency of production system failure as brought about by machine breakdown, strike, shortage of materials etc.

The Problem areas in Production System

Basically, three areas which have a particular significance for Operations Management can be identified. Although, each of these problem areas is important in the effective planning and operation of the system. These are the principal problem areas of Operations Management; they are the problems of capacity management, scheduling and inventory management.

Capacity Management

Providing the capability to satisfy current and future demand is a fundamental responsibility of Operations Management. Get the balance between capacities and demand right and operation can satisfy its customers cost effectively. Get it wrong and it will fail to satisfy demand and have excessive costs. The determination of capacity is the key system planning problem and the adjustment of capacity is the key problem area in system control. Capacity decisions will have direct influence on system performance in respect of both resource utilization and customer service. It is difficult to see how any organization can operate effectively without good capacity management. Excess capacity inevitably, gives rise to low resource productivity, while inadequate capacity may mean poor customer service. Decisions made in other areas are unlikely to offset errors in this area.

The Objectives of Capacity Planning and Control

The decisions Operations Managers taken in devising their capacity plans affect several different aspects of performance:

1. Costs will be affected by the balance between capacity and demand (or output level if that is different). Capacity levels in excess of demand could mean under-utilization of capacity and therefore high unit cost.
2. Revenues will also be affected by the balance between capacity and demand, but in the opposite way. Capacity levels equal to or higher than demand at any point in time will ensure that all demand is satisfied and no revenue lost.
3. Working capital will be affected if an operation decides to build up finished goods inventory prior to demand. This might allow demand to be satisfied, but the organization will have fund the inventory until it can be sold.
4. Quality of goods or services might be affected by a capacity plan which involved large fluctuations in capacity levels, by hiring temporary staff for example. The new staff and the disruption to the operation's routine working could increase the probability of errors being made.
5. Speed of response to customer demand could be enhanced, either by the build-up of inventories (allowing customers to be satisfied directly from the inventory rather than having to wait for items to be manufactured) or by the deliberate provision of surplus capacity to avoid queuing.

6. Dependability of supply will also be affected by how close demand levels are to capacity. The closer demand gets to the operation's capacity ceiling, the less able it is to cope with any unexpected disruptions and less dependable its deliveries of goods and services could be.
7. Flexibility, especially volume flexibility, will be enhanced by surplus capacity. If demand and capacity are in balance, the operation will not be able to respond to any unexpected increase in demand.

Scheduling

This is concerned with the timing of occurrences. Operations scheduling in its widest sense may be considered to be concerned with the specification in advance of the timing of occurrences within the system, arrivals to and departures from the system including arrivals to and departures from inventories within the system. Thus, we consider the inventory management problem to be part of a wider operations scheduling problem. Conventionally, we take a narrower view of the scheduling problem. We normally focus on activity scheduling, which is concerned only with activities directly related to the function. The timing of such activities may have a significant impact on resource utilization and customer service.

Here, operations manager is confronted with task of considerable size which requires substantial investment of time, effort and money. A project consists of tasks with definite starting and ending points. Project scheduling is specifically concerned with determining the many activities required by the project, the precedence relationship of the activities, time requirements and the best sequence for executing the project. There are many techniques for assisting managers in planning, scheduling and controlling projects. The three most popular of them all are the Gantt Charts, the Critical Path Method (CPM) and the Programme/Project Evaluation and Review Technique (PERT). One of the earliest techniques for coping with project planning and scheduling problems was developed by Henry Gantt. His technique, known as Gantt Projects Planning Chart, was useful in planning the time-phased completion time for each activity of the project.

The Objectives of Project Scheduling

Managers use project scheduling network analysis generally for effective planning and control, and specifically for the attainment of the following objectives:

1. The determination of the shortest time for completing the project.
2. The identification of critical or bottleneck activities with a view to giving such activities extra attention.
3. The determination of how much flexibility or slack exists with bottleneck activities.
4. The assessment of the effects of shifting resources from ordinary to bottleneck activities
5. The determination of the probability of completing the project on schedule should there be variations in the time requirements of activities.

Inventory Management

Inventories are the soul and livewire of any production system. Inventories refer to stock of items used in the operation of the business. They include items used within the production system such as basic raw materials, supplies of components or spare parts, work-in-process and finished goods. Without any adequate supply of inventories, manufacturing operations will grind to a halt.

The existence of output stocks may facilitate the provision of high customer service, at least in terms of availability or 'timing'. However, they may be costly. The provision of input resource stocks may benefit customer service, yet resource productivity may adversely affect because more resources are idle. Few organizations can exist entirely without stocks of raw materials, work-in-progress or, where appropriate, output goods. The planning of inventory levels, control of inventories and the maintenance of such stocks are expensive but necessary. Inventories will normally tie up considerable amounts of capital, so there is a balance to be struck between obtaining the benefits of inventories such as flexibility, high customer service and insulation against demand fluctuations, and minimizing the cost of such stocks.

The management of materials involves two closely related functions namely:

i. **Inventory Planning:** This is concerned with such decisions as what to store or produce; where are the best sources for purchase of goods; what the most economical arrangement for transportation is; storage, inspection etc.

ii. **Inventory Control :**This is concerned with decisions such as: when to order or produce, how much to order or produce and what type of material control system should be instituted in order to minimize total inventory cost or maximize profit.

The inventory problem is indeed present in any purposeful organization such as military, government, business firms, schools, banks or even ordinary household.

The concern for better inventory management has stimulated the extensive development of quantitative models. The inventory problem focuses on the selection of two decision variables: the Re-order Level (RL) and Re-order Quantity (RQ). The criterion for selecting this variable is the minimization of total inventory related costs: Ordering cost (C), carrying/holding cost (H), varies with the type of decision environment, the proper decision variables provide an economic balance the cost of keeping too many and keeping too few item in inventory reserve.

Conclusion

One factor adding considerably to the complexity of inventory, capacity and scheduling problems is their close interdependence. Decisions made in one will have a direct impact on performance in the others. Such interdependence is less evident in the other problem areas, a fact which tends to 'underline' the central importance of these three problem areas in the management of operations. In many respects the problems of inventory management and scheduling are subsidiary to the problem of capacity management. Capacity management decisions will determine how the operating system accommodates customer demand level fluctuations. Capacity management decisions will provide a context within which inventories and activities will be both planned and controlled. They will to some extent reflect operating policy decisions, while inventory and scheduling problems might be considered as more tactical. When these problems are properly addressed, it will end Africa's dependency on developed countries for problems associated with their production areas and lessen its impact in production system.

References

Banjoko, S. A. (2005). *Production and operations management.* Lagos: Pumark Nigeria Limited

Nigel, S., Stuart, C., & Robert, J. (2007).*Operations management.(5th ed.)*England: Pearson Education Limited.

Oyende, A. I. (2011). *Introduction to production management.* Lagos: Makinola International Enterprise.

Rajgopal, J.(nd). *Maynard's industrial engineering handbook (5th ed*.).

Telsang, M. T. (2009). *Production management.* New Delphi: S Chand and Company Ltd.

Verma, A. P.(2011). *Operations research.* New Delhi: S.K Kataria & Sons. www.mcgrawhill.ca/olc/stevenson