Overview of Production Planning Risks and Production Life Cycle Modeling

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Abstract

Today's environment mandates the industry to constantly adapt to new and changing patterns to meet the demand produced by the consumer markets. Achieving this requires the companies to adhere to immense and stringent deadlines as well as follow a disciplined and structured approach.

The aim of this research paper is to examine the significance and impact of the production planning risks and production life cycle modeling on businesses in today's highly competitive market.

Planning plays an extremely important role in various industries. Quality of planning and the extent to which the risk identification and assessments have been conducted are the major underlines which affects and differentiates a business from other competitors thereby attaining success.

However, during the course of action, risks such as resource failure, lack of real time information, communication gap between various departments, cross functional training etc. arise, that need to be addressed and mitigated so as to achieve a suitable, sustainable and effective model for the business.

Mitigation of risks, production planning and scheduling is essential for achieving efficient resource allocation over time in meeting demands of finished product's for an entity.
1. Introduction

Production planning is the formulation of what, when, where, how the is the process to be performed and who is to perform the task. It has a direct link to customer’s satisfaction. Risk is involved at every step throughout the production life cycle. On-time delivery not only retains customer satisfaction and loyalty but also saves you from paying heavy penalties. Poor production planning could just be the beginning of disaster whereas a good plan could provide a competitive advantage. In the current competitive market a strong production life cycle model helps businesses generate value added, high quality product, in a highly efficient manner [1].

Sort – Set in order – Shine (and inspect) – Standardize - Sustain (5S) and Total Productive Maintenance (TPM) are two simple yet effective tools for organizing the work place and are keys to achieving production stability. 5S is in place in all world class organizations. TPM targets in achieving zero breakdowns. Providing cross functional training for key operations is equally essential. Small lots mean less average inventory and also shorten manufacturing lead time. Small lots with shorter setup times also increase the flexibility to respond to demand changes [2].

The objective of the production life cycle model is to achieve the desired efficiency while adhering to the standard operating procedures (SOP), so as to achieve the desired product(s) with no compromise in quality. It’s a continuous process, keep refining, keep improving and keep getting better at it.

Retaining present customer’s and bringing in new business, in the present highly competitive market is necessary for the growth of any business. Customer’s are looking for quality, cost, on-time delivery and excellent service support, when selecting a product. This has produced new challenges with production planning and production life cycle as well. Use of fully integrated Enterprise Resource Planning (ERP) software applications in manufacturing is almost necessary to remain competitive [3].

2. Literature Review

Production planning follows a typical hierarchical system. Decision making follow a sequence, with each set of decisions providing constraints, within which more detailed decisions must be made, resulting in the development of models. Production planning which do not recognize the uncertainties can be expected to generate inferior planning decisions as compared to models that explicitly account for the uncertainties [1].

How good a production plan is, cannot be determined when it is generated. It can only be determined after the plan is executed. Only a plan with clearly defined objectives can be easily evaluated afterwards and only then we know what should have been done differently. As shown in figure 1 below, this process usually happens in asynchronous mode where
generation and execution of a plan are separated. This separation of planning and execution is the reason for many common production problems.

**Figure 1: Conventional Planning System**

Advanced planning and scheduling (APS) system overcomes the above mentioned shortcoming, by bridging the gap between planning and execution. However to make an APS system successful it is important to feed production data back on a continuous basis and update our plans and schedules accordingly. It works in a closed loop form as shown in figure 2 below.

Manufacturing companies have recognized the impact with success stories abounding in almost all industries.

Today’s worldwide market is constantly changing, bringing in new competition along with new opportunities. New competition pushes businesses to achieve higher levels of service. New technology compresses product life cycles and demands that companies adopt new technology or risk losing market share. In this ever changing environment, keeping a competitive edge means being able to anticipate and respond quickly to changing business conditions. In order to achieve this, company needs solid means of information systems that supports all areas of business [13].
Enterprise Resource Planning (ERP) is one such means. One of the key features of ERP is, the data is captured at the point of origin and impacts all related sub-systems. This eliminates data entry errors by preventing individuals from replicating information and maintaining their own records, thereby saving lot of time and energy. ERP is the key which integrates information of various departments to achieve transparency, evolve uniformity and create standardization. ERP not only makes decision making process easier but provides information to take intelligent ones, thus enhancing productivity and profitability by taking into consideration various factors [12].

3. Methodology

3.1 Research Question(s)

As indicated in the introduction, the major research question is to examine the significance and impact of the production planning risks and production life cycle modeling on businesses in today’s highly competitive market.

We will study the elements of production planning; the risks involved and commonly used production system models by various businesses.
3.2 Elements of Production Planning

Production planning and control is a predetermined process for allocation of resources and efficient utilization of the same. The main objective of the production plan is maximization of efficiency, appropriate delivery of goods, minimize the labor turnover time as well as the waiting/lead time. Figure 3 below illustrates the elements of production planning.

With regard to successful execution of production control, production planning is actually of great significance. Planning pertains to determining in advance what's to be done in future. The planning department prepares numerous charts, manuals production budgets etc., upon the basis of information obtained through management [4].

Routing is determining the exact path or even route, the product has to adhere to from raw materials until it’s transformation into finished product [5].

Scheduling in easy words means fixation of time as well as day when every procedure is actually to start as well as finish. It is definitely an essential component of production control, as all future process of production is actually based on it.

Dispatch relates to the process of initiating production i.e. releasing job / work orders for production [6].

Figure 3: Elements of Production Planning

Follow-up is in the form of various daily production reports based on the work performed. An adequately planned follow-up process is actually helpful to find errors as well as flaws in early stages and helps finding remedial measures [7]. This is actually the last but not the least component within the process of production planning and control.
The function of inspection is to make sure whether preferred quality of the product has been accomplished or not. It is actually carried out at various levels of production activity. Corrective action is an important element because it works like feedback loop to re-process production cycle.

3.3 Production System Models

There are three basic types of production system models namely one-off, batch and mass production. Some industries may use a combination of one or more than one system resulting in combinational or hybrid production system.

3.3.1 One-off Production System:

This type of production system is used to assemble product’s that are too large, bulky in nature and have complex assembly systems. To overcome this, resources required for the completion of the project such as personnel, supplies, equipment’s are bought to the product’s assembly area.

The production of aircrafts by Boeing is one such example as depicted in figure 4 below:

**Figure 4: One-off Production System**

![One-off Production System Diagram](image)

**Advantages:**

- Possibility to assign one or more skilled or semi-skilled workers to ensure consistency and continuity of work.
- As the requisite material is readily available at one location, there is minimal movement of materials.
- It is flexible enough to accommodate any changes during production.

**Disadvantages:**

- Results in the lower utilization of labor and equipment.
- Final product may be expensive.
- High equipment handling costs

3.3.2 Batch Production System:

In this system, machines with similar functions and services are located together. For example all drilling machines are located in one area or department A and all milling machines are located in another area or department B. Specifications may vary significantly from one batch to the other, however the machines can be changed easily to produce a batch of a different product. Typical layout is shown in figure 5 below:

![Batch Production System Diagram](image)

**Figure 5: Batch Production System**

**Advantages:**
- Flexibility for allotment of work to equipment and workers.
- Efficient utilization of equipment.
- Allotment of supervisors and instructors to a particular type of machine resulting in a better product quality.
- Workers in one section are not affected by the nature of the operations carried out in another section. For example, a lathe operator is not affected by the rays of the welding, as the two sections are quite separate.

**Disadvantages:**
- Inventory categorized as work in progress will be of substantial amount.
- Production cannot be automated at times as well as the control over the production becomes challenging.
- Increase in material handling costs as well as production lead time.

3.3.3 Mass Production System:

In this type of production various operations on raw material are performed in a sequence and the machines are placed along the product flow line. This type of layout is preferred when identical, standardized items are required to be produced on a continuous assembly line. As
shown in figure 6 below, work units move along a line, not necessarily a geometric line, but a set of interconnected work stations.

**Figure 6: Mass Production System**

Advantages:
- Better co-ordination and simpler production planning and control.
- Smooth and continuous work flow.
- Product’s complete at faster pace.

Disadvantages:
- Changes in the product or process layout are significantly hampered.
- The pace of working depends on the output rate of the slowest machine which may result in excessive idle time.
- It is difficult to increase production beyond the capacities of the production lines [10].

3.4 Production Risk Portfolio

A risk is an uncertain event or condition, therefore a risk management plan is a must in any business. It is very important to foresee risks, estimate impacts and define responses to the issues. Businesses must begin a risk assessment program that best suit their distinctive culture as well as risks. Because change is continuous and may happen all of a sudden, continuing initiatives to improve the sophistication as well as range of risk assessment methods are essential [8]. Figure 7 below illustrates the five step approach involved in risk assessment [5].

**Figure 7: Risk Assessment Steps**

- Identify Risks
- Analyse Risks
- Evaluate or Rank the Risk
- Prepare Corrective Action Plan
- Monitor and Review
In accordance with production risk management framework, risk management offers few unique features in comparison to the traditional risk management process [9]. The steps mentioned above are helpful in the creation of a risk assessment matrix as shown in figure 8 below:

**Figure 8: Risk Rating Matrix [11]**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td>moderate</td>
<td>moderate</td>
<td>high</td>
<td>critical</td>
<td>critical</td>
</tr>
<tr>
<td>Major</td>
<td>low</td>
<td>moderate</td>
<td>moderate</td>
<td>high</td>
<td>critical</td>
</tr>
<tr>
<td>Moderate</td>
<td>low</td>
<td>moderate</td>
<td>moderate</td>
<td>moderate</td>
<td>high</td>
</tr>
<tr>
<td>Minor</td>
<td>very low</td>
<td>low</td>
<td>moderate</td>
<td>moderate</td>
<td>moderate</td>
</tr>
<tr>
<td>Insignificant</td>
<td>very low</td>
<td>very low</td>
<td>low</td>
<td>low</td>
<td>moderate</td>
</tr>
</tbody>
</table>

4. Results

It still remains a challenge to meet stringent deadlines and keep up with promised delivery dates.

Lack of cross functional training.

Being pushed by demand, at times a realistic plan is not in place to begin with.

Various departments continue to work in isolation creating communication gap.

Organizations without fully integrated Enterprise Resource Planning (ERP) in place are the ones that are impacted the most.

Reluctant to making major organizational as well as cultural changes.

Information systems not updated in real time manner at times, resulting in delayed availability of latest information.

5. Conclusions

Based on the results above, it can very well be said that there is significant impact of the production planning risks and production life cycle model on businesses. Careful attention to the fundamental design of the production system is a critical factor in the overall success of the business.

Recognition of risk associated to functional disruptions is actually considerably fragile within the analyzed businesses. They don’t have sufficient information to determine actual
deficits resulting through the functional disruptions. In addition, some businesses don't follow the formal risk management process. Their decisions tend to be biased significantly through the instant business requirements. Gap is located between risk belief as well as strategy formulation and fact based information selection is actually missing.

Use of fully integrated Enterprise Resource Planning (ERP) system is strongly recommended. Investment will be needed for implementation and training of personnel’s however it very well would justify the investment.

References


