Introduction to Operation Management

030 Deliver

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1 Planning and control

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Planning and control

The way an operation is set up decides what resources it uses to make its services and products. After that, the operation needs to keep providing those services and products regularly. A key part of doing this well is how the operation plans and manages its tasks to meet customer needs. This chapter will give an introduction and overview of some basic ideas and methods for planning and control.

This section will also cover important topics for delivering services and products. These topics include managing capacity, handling inventory, understanding supply chain management, and using planning and control systems like enterprise resource planning (ERP) to manage information for effective delivery.

What is planning and control?

Planning and control involve balancing market demands with the operation's ability to deliver. It includes systems, procedures, and decisions to align supply and demand.

Let's consider an example from a restaurant. The example shows how planning and control in a restaurant setting ensure that all necessary steps are taken to provide effective and timely service to customers, similar to how a factory manages its resources to meet production demands.

- *Pre-Planning:* Before the restaurant opens for the day, the kitchen staff plans the menu based on the ingredients available and the expected number of customers. They ensure that all necessary ingredients are stocked and that any special items are prepared in advance.
- *Coordination:* The head chef communicates with the kitchen staff, waitstaff, and management to ensure everyone knows the day's menu and any special instructions. This ensures that all team members are aligned and ready to serve customers efficiently.
- *Customer Arrival:* When customers arrive and place their orders, the waitstaff relays the orders to the kitchen. The kitchen staff checks the orders to ensure they have all the necessary ingredients, similar to inspecting materials in a factory.
- *Preparation:* The kitchen staff prepares the dishes according to the orders. They gather all the ingredients and follow the recipes, just like assembling materials for a job in a factory.
- *Last-Minute Changes:* If a customer has a special request or dietary restriction, the kitchen may need to adjust the preparation. This might require re-planning the cooking process, similar to rescheduling machines in a factory if a job is delayed.
- *Execution:* Once the dishes are prepared, the waitstaff serves them to the customers. The coordination and planning ensure that the food is delivered promptly and meets the customers' expectations.

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The difference between planning and control

Key differences between planning and control include their nature, sequence, and objectives. Planning is proactive, focusing on setting the direction for future actions, while control is reactive, ensuring that current actions align with the plans. In terms of sequence, planning comes before control; you need a plan in place before you can control activities to ensure they meet the plan. The objective of planning is to set goals and determine the best way to achieve them, whereas the objective of control is to ensure that these goals are being met and to make adjustments if they are not.

Long-, Medium-, and Short-Term Planning and Control in Operations Management

Operations management involves the planning, organizing, and supervising of processes to ensure efficient production and delivery of goods and services. Effective operations management requires a multi-tiered approach to planning and control, typically categorized into long-term, medium-term, and short-term horizons. Each of these planning levels addresses different aspects of the operations and requires distinct strategies and tools.

- Long-term planning, often referred to as strategic planning, focuses on decisions that affect the organization over several years. This includes capacity planning, facility location, technology adoption, and long-term workforce development. The primary objective is to align the operations strategy with the overall business strategy to ensure sustainable growth and competitive advantage.
- Medium-term planning, also known as tactical planning, typically covers a period of several months to a few years. It focuses on resource allocation, production planning, and scheduling to meet the strategic goals set in the long-term plan. The objective is to ensure that resources are used efficiently and that production processes are aligned with market demand.
- Short-term planning, often referred to as operational planning, focuses on day-to-day activities and decisions that affect the immediate future, typically ranging from a few days to a few months. The primary objective is to ensure that operations run smoothly and efficiently, meeting customer demand while minimizing costs and disruptions.

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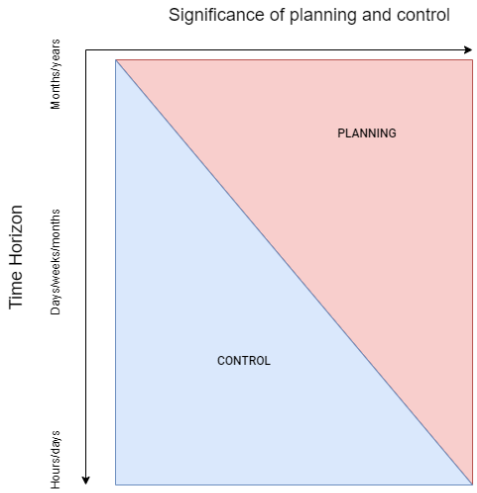

Long-term planning and control

- Uses aggregated demand forecasts
- Determines resources in aggregated form
- Objectives set in largely financial terms

Medium-term planning and control

- Uses partially disaggregated demand forecasts
- Determines resources and contingencies
- Objectives set in both financial and operations terms

Short-term planning and control

- Uses totally disaggregated forecasts or actual demand
- Makes interventions to resources to correct deviations from plans
- Ad hoc consideration of operations objectives

Effective operations management requires a comprehensive approach to planning and control across long-term, medium-term, and short-term horizons. Each level of planning addresses different aspects of the operations and requires distinct strategies and tools to ensure that the organization can meet its strategic goals, optimize resource utilization, and respond to immediate operational challenges. By integrating advanced analytics, digital technologies, and lean principles, organizations can enhance their planning processes and achieve operational excellence in a dynamic business environment.

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The volume–variety effect on planning and control

As previously discussed, the characteristics of volume and variety in an operation significantly influence its planning and control activities. Operations that produce a wide range of services or products in relatively low volumes will cater to customers with diverse needs and employ different processes compared to operations that generate standardized services or products in high volumes.

Volume	Variety	Customer responsiveness	Planning horizon	Major planning decision	Control decisions	Robustness
Low	High	Slow	Short	Timing	Detailed	High
↓	↓	↓	↓	↓	↓	↓
High	Low	Fast	Long	Volume	Aggregated	Low

Consider two contrasting operations: a custom furniture workshop and a water utility company. The custom furniture workshop, which offers a high variety of bespoke pieces, cannot produce items in advance of customer orders. Consequently, the time required to deliver their products is relatively slow. Customers understand this delay but expect extensive consultation to meet their specific needs. The details and requirements of each project emerge only as the individual piece is designed according to the client's specifications, leading to short-term planning. Planning decisions typically involve the timing of activities and events, such as when a design should be finalized, when production should commence, and when each craftsman is needed for the project. Control decisions are also detailed, as a small delay in one part of the design can significantly impact on other aspects of the project. For the custom furniture workshop, planning and control cannot be entirely routine; each project requires individual management. However, the operation's robustness (its ability to withstand disruptions) is relatively high, as there are usually other tasks to address if progress on one part of the job is hindered.

In contrast, the water utility company operates very differently. It has high volume, continuous production, and no variety. Customers expect immediate delivery whenever they turn on a tap. The planning horizon for water supply is very long, with major decisions about infrastructure capacity made years in advance. Even daily demand fluctuations can be forecasted. Seasonal changes, which can affect water usage, are anticipated well in advance. Planning decisions at the water utility focus on the volume of output rather than timing. Control decisions involve aggregated measures of output, such as the total liters of water supplied, since the product is largely homogeneous. However, the operation's robustness is very low because if a major pipeline fails, the ability to supply water from that part of the operation also fails.

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How do supply and demand affect planning and control?

If planning and control involve aligning supply with demand, then the decisions made in this process will be influenced by the characteristics of both demand and supply within an operation. In this section, we explore various aspects of demand and supply that can impact how operations managers plan and control their activities.

Uncertainty in Supply and Demand

If the future were entirely predictable, planning would be simple, and control would be unnecessary. However, the future is inherently uncertain, which complicates planning and control efforts. Sometimes, the availability of inputs for an operation can be unpredictable, causing planned activities to take longer than anticipated. Similarly, demand can be erratic. For instance, a fast-food outlet in a shopping mall cannot precisely forecast how many customers will come, when they will arrive, or what they will order. While certain patterns, like increased demand during lunch hours, can be anticipated, unexpected events such as a sudden rainstorm driving shoppers indoors can cause a significant and unpredictable spike in short-term demand. Both supply and demand uncertainties make planning and control more challenging, but the combination of both types of uncertainty is particularly difficult to manage.

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Consider QuickFit Tires, a company that operates a drive-in tire replacement service. They need to manage a stock of tires, similar to the task faced by the manager of tire stocks in a car manufacturing plant. However, demand is very different for QuickFit Tires. They cannot predict either the volume or the specific needs of customers. They must make decisions on how many and what types of tires to stock, based on demand forecasts and the risks they are willing to take regarding stockouts. This is the nature of independent-demand planning and control. It involves making educated guesses about future demand, putting the necessary resources in place to meet this demand, and responding quickly if actual demand deviates from the forecast.

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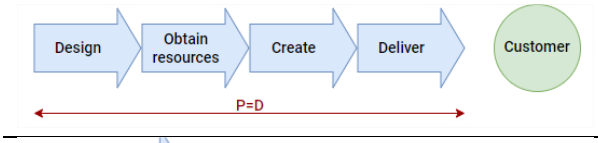
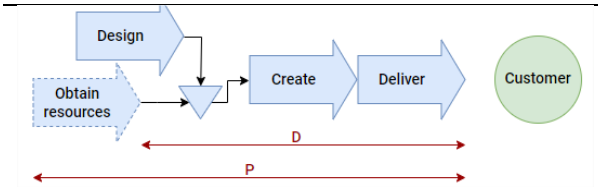
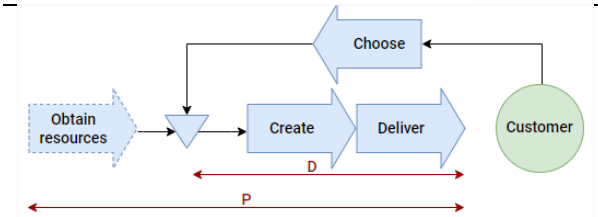
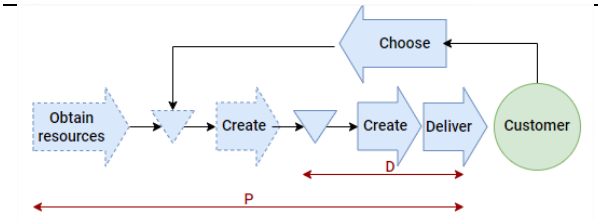
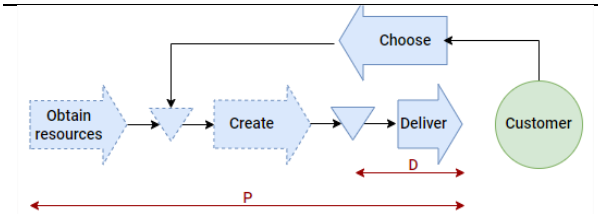
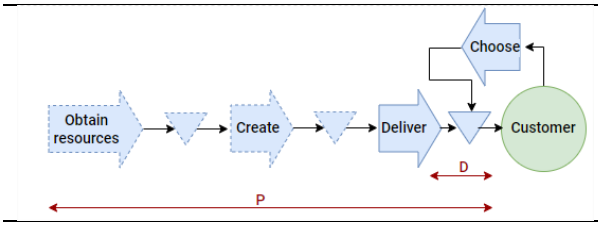
	**Design, resource, create and deliver to order**	*advertising agency, construction project*
	**Design, create and deliver to order**	*website development, custom furniture production*
	**Create and deliver to order**	*hair blow-dry bar, house builder with standard designs*
	**Partially create and deliver to order**	*internet retail fulfilment, assemble to order computers*
	**Create to stock**	*preserved food production, domestic appliance production*
	***Collect/choose from stock***	*collect retailer, vending machines*

The *P:D* ratio of an operation indicates how long the customer has to wait for the service or product as compared with the total time needed to carry out all the activities to make the service or product available to the customer.

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P:D Ratios

Another way to characterize the spectrum between "Design, resource, create, and deliver to order" and "Collect/choose from stock" planning and control is by using a P:D ratio. This ratio contrasts the total length of time customers have to wait between requesting a service or product and receiving it, known as the demand time (D), with the total throughput time from start to finish (P). Throughput time refers to how long the operation takes to design the service or product (if it is customized), obtain the necessary resources, create, and deliver it.

P and D Times Depend on the Operation

P and D times are illustrated for various types of operations in previous figure. Generally, the ratio of P to D increases as operations move from "Design, resource, create, and deliver to order" to "Collect/choose from stock." In other words, as one moves down this spectrum towards the "Create to stock" and "Collect/choose from stock" end, the operation has anticipated customer demand and already created the services and products, even though there is no guarantee that the anticipated demand will materialize. This is a particularly important point for planning and control activities. The larger the P:D ratio, the more speculative the operation's planning and control activities will be.

In its extreme form, the "Collect/choose from stock" operation, such as a high-street retailer, has taken a gamble by designing, resourcing, creating, and delivering (or more likely, paying someone else to do so) products to its shops before it has any certainty that customers will want them. Contrast this with a "Design, resource, create, and deliver to order" operation, such as an advertising agency. Here, D is the same as P, and speculation regarding the volume of demand in the short term is eliminated because everything happens in response to a firm order. By reducing their P:D ratio, operations reduce their degree of speculative activity and also reduce their dependence on forecasting (although poor forecasting will lead to other problems).

However, do not assume that when the P:D ratio approaches 1, all uncertainty is eliminated. The volume of demand (in terms of the number of customer orders) may be known, but not the time taken to perform each order. Take the advertising agency again: during each stage of the process, from design to delivery, it is common to seek the customer's approval and/or feedback many times . Moreover, there will almost certainly be some recycling back through stages as modifications are made. And, similar to how simultaneous development works in new service and product design, a stage can be started before the previous one has been completed. For example, the video shoot director may begin work prior to the completion of the artwork design. This is illustrated in next figure. So, in this context, it is the timings that are uncertain.

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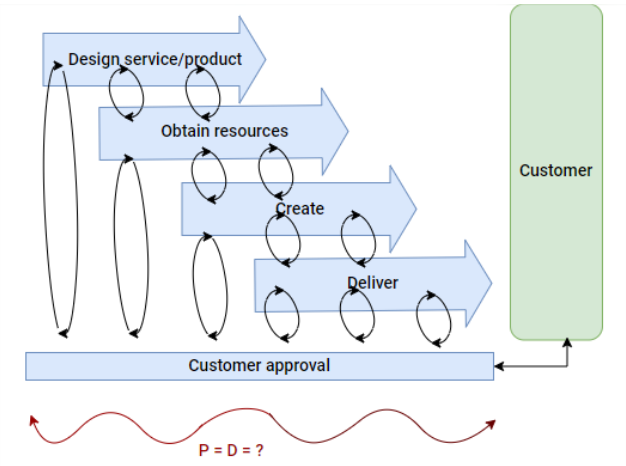

In summary, while a lower P:D ratio can reduce speculative activity and reliance on forecasting, it does not entirely eliminate uncertainty. The nature of the operation and the specific processes involved will always introduce some level of unpredictability, whether in the form of customer demand or the time required to complete each stage of the operation. Understanding and managing these uncertainties is a crucial aspect of effective planning and control.

The activities of planning and control

In planning and control, the reconciliation of supply and demand involves managing **volumes, timing, and quality**. This process ensures that an organization meets customer demand efficiently, without overproducing or underproducing. The key focus is on the activities that govern volume and timing, which are essential to maintaining a smooth flow of operations.

Four primary overlapping activities guide this process:

1. **Loading**: Deciding how much work to allocate to each resource, such as machines or workers.
2. **Sequencing**: Determining the order in which tasks should be completed to optimize efficiency and meet deadlines.
3. **Scheduling**: Establishing specific timelines for when tasks or jobs should be started and finished.
4. **Monitoring and Control**: Tracking the progress of operations to ensure they are on schedule and making adjustments as necessary.

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