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OPERATIONS MANAGEMENT IN ORGANIZATIONS ARTICULE

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Abstract: Operations Management (OM) is the systematic direction and control of the processes that transform resources into finished goods and services that create value for, and provide benefits to customers. Otherwise, Operations Management - a specialized area of management that converts or transforms resources (including Human Resource skills) into finished goods and services that add value and provide benefits to customers.
Operations Management focuses on carefully managing the processes to produce and distribute products and services. Major, overall activities often include product creation, development, production and distribution which are also, associated with Product and Service management. Related activities include managing purchases, inventory control, quality control, storage, logistics and evaluations of processes. Therefore, operations management often includes substantial measurement and analysis of internal processes and the nature of how it is carried out in an organization depends very much on the nature of products and services in the organization, for example, on retail, universities, manufacturing, banks or wholesale.
It involves the responsibility of ensuring that business operations are efficient in terms of using as few resources as needed and effective in terms of meeting customer requirements.
It is concerned with managing an entire production system which is the process that converts inputs (in the forms of raw materials, labor, and energy) into outputs (in the form of goods and/or services), as an asset or delivers a product or services.
Operations produce products, manage quality and creates service. Operation management covers sectors like banking systems, hospitals, companies, working with suppliers, customers, and using technology.
Operations is one of the major functions of an organization along with supply chains, marketing, finance and human resources. The operations function requires management of both the strategic and day - to -day production of goods and services. Operations Management (OM) a management function involves planning, organizing, coordinating, and controlling all the resources (people, equipment, technology, information (and all others) needed to produce a company's goods and services. It is the central core function of every company, and this is true regardless of the size of the company, the industry it is in, whether it is manufacturing or service, or is for-profit or not-for-profit
Operational Planning – The process of setting work standards and schedules necessary to implement the company's tactical objectives.
Organizational or Corporate Culture – Widely shared values within an organization that provide unity, and cooperation to achieve common goals.

HISTORY OF PRODUCTION AND OPERATIONS MANAGEMENT

The history of production and operations systems began around 5000 B.C. when Sumerian priests developed the ancient system of recording inventories, loans, taxes, and business transactions.
The next historical application of operation systems occurred in 4000 B.C. It was during this time that the Egyptians started using Planning, Organization, and Control in large projects such as the construction of the Pyramids. By 1100 B.C., Labor was being specialized in China; by about 370 B.C., Exnophon described the advantages of dividing the various operations necessary for the production of shoes among different individuals in ancient Greece.

In the Middle Ages, kings and queens ruled over large areas of land. Loyal noblemen maintained large sections of the monarch's territory. This hierarchical organization in which people were divided into classes based on social position and wealth became known as the **feudal system.** In the feudal system, **vassals** and **serfs** produced for themselves and people of higher classes by using the ruler's land and resources. Although a large part of labor was employed in agriculture, **artisans** contributed to economic output and formed **guilds.** The guild system, operating mainly between 1100 and 1500, consisted of two types: merchant guild, who bought and sold goods, and craft guilds, which made goods. Although guilds were regulated as to the quality of work performed, the resulting system was rather rigid, shoemakers, for example, were prohibited from tanning hides.
Services were also performed in the Middle Ages by servants. They provided service to the nobility for cooking, cleaning and entertainment. Court jesters were service providers. The medieval army could also be considered a service since the defended the nobility.

The **industrial revolution** was facilitated by two elements: **interchangeability of parts** and **division of labor.** Division of labor has always been a feature from the beginning of civilization, the extent to which the division is carried out varied considerably depending on period and location. Compared to the Middle Ages, the Renaissance and the Age of Discovery were characterized by a greater specialization in labor, one of the characteristics of growing European cities and trade. It was in the in the history of manufacturing, each product (example, each gun) was considered a special order, meaning that parts of a given gun were fitted for that particular gun and could not be used in other guns. Interchangeability of parts allowed the mass production of parts independent of the final products in which they would be used.

In 1883, Frederick Winslow Taylor introduced the stop watch method for accurately measuring the time to perform each single task of a complicated job. He developed the scientific study of productivity and identifying how to coordinate different task **predetermined motion time systems (PMTS)**. Work sampling is used to measure the random variable associated with the time of each task. PMTS allows the use of standard predetermined tables of the smallest body movements (e.g. turning the left wrist by 90 degree), and integrating them to predict the time needed to perform a simple task. PMTS has gained substantial importance due to the fact that it can predict work measurements without observing the actual work.

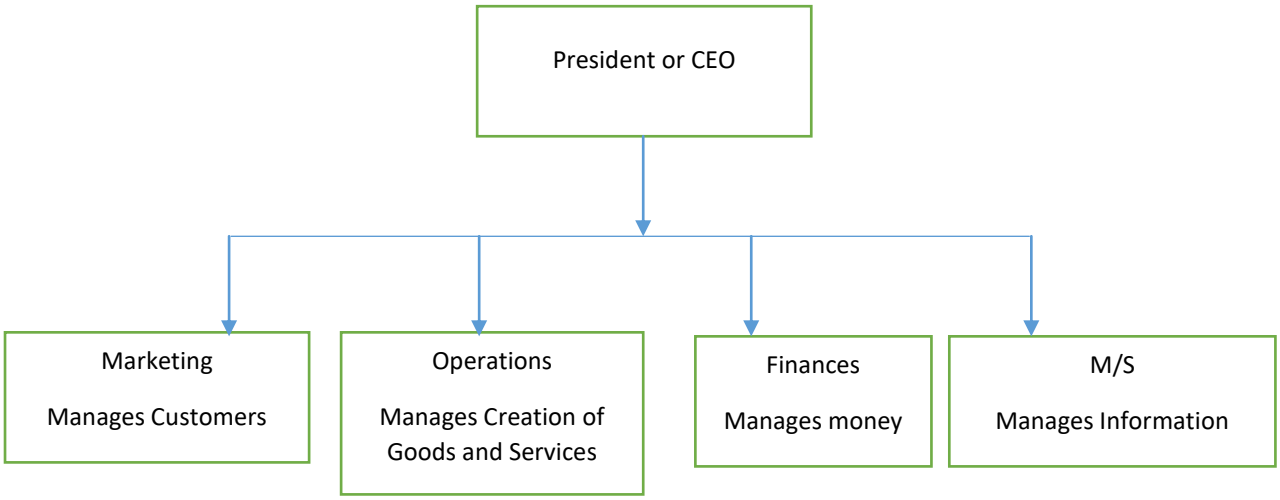
The foundation of PMTS was laid out by the research and development of Frank B. and Lillian M. Gilbreth around 1912. The Gilbreths took advantage of taking motion pictures at known time intervals while operators were performing the given task.

Service Industries: At the turn of the twentieth century, the services industries were already developed, but largely fragmented. In 1900 the U.S. service industry consisted of banks, professional services, schools, general stores, railroads and telegraph. Services were largely local in nature (except for railroads and telegraph) and owned by entrepreneurs and families. The U.S. in 1900 had 31% employment in services, 31% in manufacturing and 38% in agriculture.

The idea of production line has been used multiple times in history prior to Henry Ford: the Venetian Arsenal (1104); Smith's pin manufacturing, in the Wealth of Nations (1776) or Brunel's Portsmouth Block Mills (1802). Ransom Olds was the first to manufacture cars using the assemble line system, but **Henry Ford** developed the first auto assembly system where a car chassis was moved through the assembly line by a **conveyor belt** while workers added components to it until the car was completed. During World War 11, the growth of computing power led to further development of efficient manufacturing methods and the use of advanced mathematical and statistical tools. This was supported by the development of academic programs in industrial and systems engineering disciplines, as well as fields of operations research and management science (as multi - disciplinary fields of problem solving). While systems engineering concentrated on the broad characteristics of the relationships between inputs and outputs of generic systems, operations researchers concentrated on solving specific and focused problems. The synergy of operations research and systems engineering allowed for the realization of solving large scale and complex problems in the modern era.

Recently, the development of faster and smaller computers, intelligent systems, and the World Wide Web has opened new opportunities for operations, manufacturing, production, and service systems.

Organizational Chart



Source: Professor Akalegbere's Research 2020

Organization Chart – A visual device that shows relationship among people and divides the organization's work; it shows who is accountable for the completion of specific work, and who reports to whom in an organization.

Every business is managed through multiple business functions each responsible for managing certain aspects of the business, and the vice president of each of these functions reports directly to the president or CEO of the company.
Marketing is responsible for sales, generating customer demand, and understanding customer wants and needs.
Finance is responsible for managing cash flow, current assets, and capital investments.
MIS is responsible for managing flows of information.

Operation Management (OM) is the business function responsible for managing the process of creation of goods and services. It involves planning, organizing, coordinating, and controlling all the resources needed to produce a company's goods and services. Because operations management is a management function, it involves managing people, equipment, technology, information, and all the other resources needed in the production of goods and services. Operations Management is the central core function of every company. This is true regardless of the size of the company, the industry it is in, whether it is manufacturing of service, or is for-profit or not-for-profit.

Consider a pharmaceutical company such as Merck. The marketing function of Merck is responsible for promoting new pharmaceuticals to target customers and bringing customer feedback to the organization. Marketing is essentially the window to customers. The finance function of Merck makes sure that they have needed capital for different processes including Research and Development (R&D). However, it is the operations function that plans and coordinates all the resources needed to design, produce, and deliver the various pharmaceuticals to hospitals, pharmacies, and other locations where needed. Without operations, there would be no products to sell to customers.

KEY WORDS
Operations, Management, Customers, System, Process, Resources, production, Transformation, output, service, manufacturing, service, strategy, Product, design.

I. INTRODUCTION

The Growth of Global Operations

Global competition has made production a faster-paced, more complex activity. Although the factory remains the centerpiece in manufacturing, it bears little resemblance to its counterpart of a decade ago. Smoke and grease and the clang of steel-on-steel have been replaced by high-tech equipment in contaminant-free, climate-controlled "clean rooms."

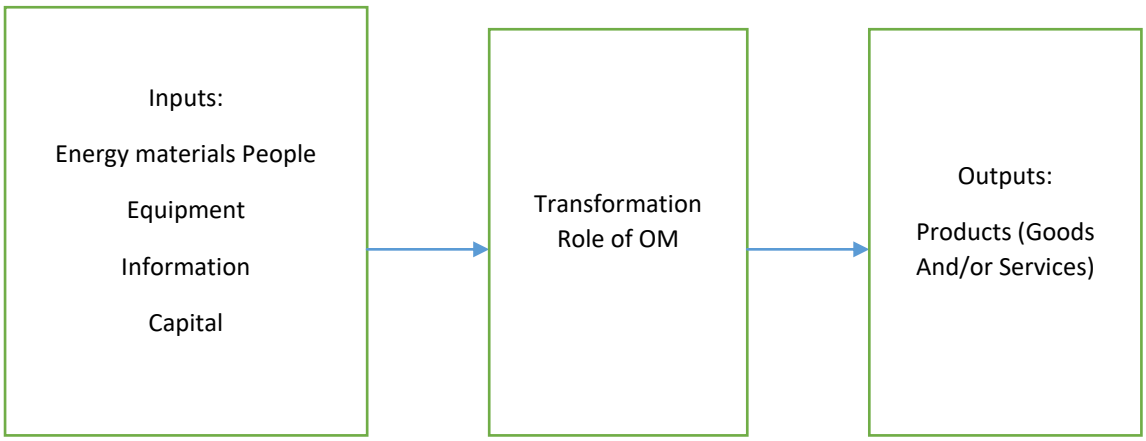
Today's firm may no longer face the pressure of continuous mass production, but it does face constant change. New technologies make machines that run cleaner, faster, and safer and that respond to global demand. For online manufacturing, machines can be connected to the Internet and can adjust their own settings, and make minor decisions without human help. They can communicate with other machines in the company (via the Internet). Communication technologies enable producers of both Services and goods to integrate their production activities with those of faraway suppliers and customers.

Creating Value Through Operations

To understand a firm's production process, we must know what kinds of benefits its production provides, both for itself and for its customers. Production, of course, provides businesses with economic results: profits, wages, and goods purchased from other companies. At the same time, it provides consumers with **utility-**the ability of a product to satisfy a want or need of a human. Although production can contribute to **all four kinds of utility – time, place, possession, and form** – its role in two areas is most obvious. It provides time utility by making products available when consumers want them and form utility by converting raw materials and human skills into finished goods and services.

Operation Process – Set of methods and Technologies used in the production of a good or service.
Analytic Process – Production Process in which resources are broken down into components to create finished products.
Synthetic Process – Production Process in which resources are combined to create finished products.
High-Contact System – Level of customer contact in which the customer is part of the system during service delivery.
Low-Contact System – Level of Customer contact in which the customer need not be part of the system to receive the service.

The Transformation Role of Operations Management



Source: Van Mieghem J. A. (2013)

Operations Management is said to perform a transformation role in the process of converting inputs such as raw materials into finished goods and services. These inputs include human resources, such as workers, staff, and managers; facilities and processes, such as buildings and equipment; they also include materials, technology, and information. In the traditional transformation model outputs are the goods and services a company produces.

At a manufacturing plant the transformation is the physical change of raw materials into products, such as transforming steel into automobiles, cloth into jackets, or plastic into toys. This is equally true of service organizations. At a university, Operations Management is involved in organizing resources, such as faculty, curriculum, and facilities, to transform high school students into university graduates. At an airline it involves transporting passengers and their luggage from one location to another.

The transformation role of OM makes this function the "engine room" of the organization. As a result it is directly responsible for many decisions and activities that give rise to product design and delivery problems. The design and management of operations strongly influence how much material resources are consumed to manufacture goods or deliver a service, making sure that there is enough inventory to produce the quantities that need to be delivered to the customer, and ensuring that what is made is in fact what the customer wants. Many of these decisions can be costly. It is for this reason the **OM** is **a function companies go** to in order to **improve performance** and **financial bottom line**.

Service Operations: Activities producing intangible and tangible products, such as entertainment, Banking, transportation, and education.

Goods Production/Manufacturing: Activities producing tangible products, such as radios, newspapers. Buses, and Textbooks.

Differences in Manufacturing Versus Service Operations

All Organizations can be broadly divided into two categories: Manufacturing Organizations and Service Organizations. Although both categories have an OM function, these differences pose unique challenges for for the operation as the nature of what is being produced is different.

There are two primary distinctions between these categories of organizations. First, manufacturing organizations produce a physical or tangible product that can be stored in inventory before it is needed by the customer. Service organizations, on the other hand, produce intangible products that cannot be produced ahead of time. Second, in manufacturing organizations customers typically have no direct contact with the process of production.

Customer contact occurs through distributors or retailers. For example, a customer buying a computer never comes in contact with the factory where the computer is produced. However, in service organizations the customers are typically present during the creation of the service. Customers here usually come in contact with some aspect of the operation. Consider a restaurant, a Banking floor or a barber shop, where the customer is present during the creation of the service.

The differences between manufacturing organizations and service organizations are typically not as clear-cut as they might appear in the preceding example. Usually there is much overlap between them, and their distinctions are increasingly becoming murky. Most manufacturers provide services as part of their business, and many service firms manufacture physical goods they use during service delivery. For example, a manufacturer of jet engines, such as Rolls Royce, not only produces engines but services them. A barber shop may sell its own line of hair care products.

A Service Operation can further be divided into high contact and low contact segments. High contact segments are those parts of the operation where the customer is present, such as the service area of the post office or the dining area of a restaurant. However, these services also have a low contact segment. These can be thought of as "back room" or "behind the scenes" segments. Examples would include the kitchen segment at a fast-food restaurant or the laboratory for specimen analysis at a hospital.

In addition to pure manufacturing and pure service, there are companies that have some characteristics of each type of organization. It is difficult to tell whether these companies are actually manufacturing or service organizations. An excellent example is an automated warehouse or a mail-order catalog business. These businesses have low customer contact and are capital intensive. They are most like manufacturing organizations yet they provide a service. We call these companies quasi-manufacturing organizations.

The operational requirements of these two types of organizations are different, from labor to inventory issues. As a result, it is important to understand how to manage both service and manufacturing operations.

Comparing Manufacturing and Service Operations

Manufacturers	**Services**
Tangible product.	Intangible product.
Product can be inventoried.	Product cannot be inventoried.
Low customer contact.	High customer contact,
Longer response time.	Short response time.
Capital intensive.	Labor intensive.

The Role of Manufacturing and Service Operations in Organization and Supply Chain

Operations Management (OM) plays a critical role in the organization and Supply Chain. Without OM there would be no products to sell. However, operations cannot work in isolation from other business functions. As each business function manages unique aspects of the business, and they all must work together. For example, operations must work with marketing to understand the exact wants of a particular group of customers. It can then design the exact products customers want and create the production processes efficiently produce these products. Marketing, on the other hand, must understand operations' capabilities, including the types of products it can produce and the limitations of the production process. Without communication between marketing and operations, the company may find itself in a situation where it is producing products the customers don't want.

Operations must also work closely with purchasing to understand availability of materials, cost and quality issues, availability of sources of supply, and lead times. Operations links marketing - with its ties to customers - to sourcing - with links to sources of supply. Operations must understand exactly what customers want and be able to ensure that sourcing can get the materials needed at the right price and at the right time to support product designs, or offer alternative material options.

Ensuring that OM fits in with the other organizational functions is necessary but not sufficient. The reason is that each company depends on other members of its supply chain to be able to deliver the right products to its customers in a timely and cost-effective manner. In the upstream part of a company's supply chain, a company depends on its suppliers for the delivery of raw materials and components in time to meet production needs. If deliveries of these materials are late, or are of poor quality, production will be delayed, regardless of how efficient a company's operations process is.

On the downstream side, a company depends on its distributors and retailers for the delivery of the product to the final customer. If these are not delivered on time, are damaged in the transportation process, or are poorly displayed at the retail location, sales will suffer. Also, if the operations function of other members of the supply chain is not managed properly, excess costs will result, which will be passed down to other members of the supply chain in the form of higher prices.

The bottom line is that companies that comprise a supply chain need to coordinate and link their operations functions so that the entire chain is operating in a seamless and efficient manner.

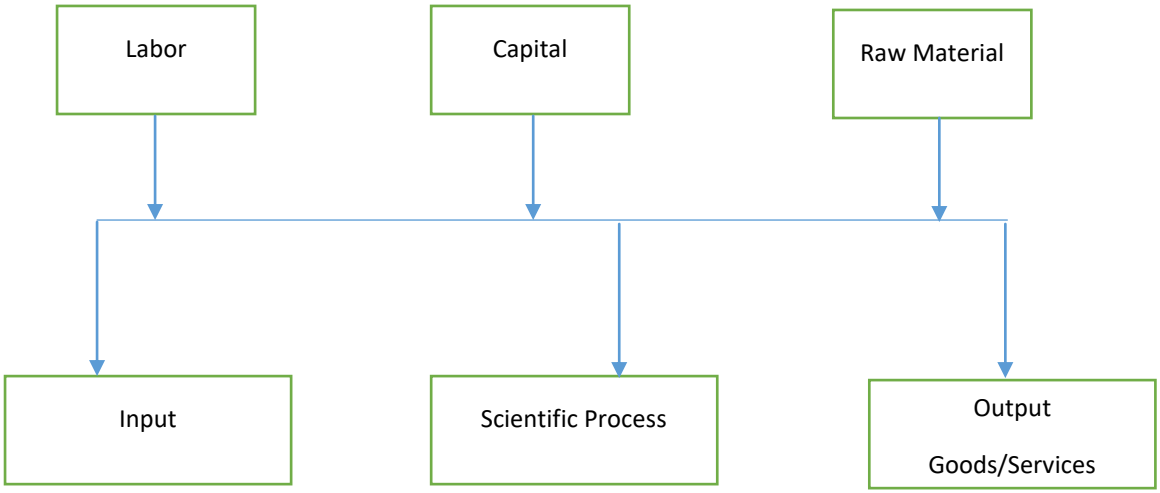
Understanding Production and Operations Management

The very essence of any business is to cater for the needs of customer by providing services and goods, and in that process create value for customers and solve their problems. Production and operations management is about applying business organization and management concepts in the creation of goods and services.

Production is a scientific process which involves transformation of raw material (input) into desired product or service (output) by adding economic value. Production can broadly categorize into the following based on technique:

Production through separation - It involves desired output that is achieved through separation or extraction from raw materials. A classic example of separation or extraction is crude oil into various fuel products.

Production by modification or improvement - It involves the change in chemical and mechanical parameters of the raw material without altering the physical attributes of the raw material. Annealing process (heating at high temperatures and then cooling), is an example of production by modification or improvement.
Production by Assembly - Car and computer productions are example of production by assembly.
Production by Assembly (Car and Computer productions)



Source: Professor Akalegbere's Research 2021

Importance of Production Function and Production Management
Successful organizations have well defined and efficient line function and support function. Production comes under the category of line function which directly affects customer experience and there by future of itself.
The aim of production function is to add value to product or service which will create a strong and long lasting customer relationship or association. And this can be achieved by healthy and productive association between Marketing and Production people. Marketing function people's function are front line representative of the company and provide insights to real product needs of customers. An effective planning and control on production parameters to achieve or create value for customers is called production management.
Operations Management
As to deliver value for customers in products and services, it is essential for the company to do the following:
1. Identify the customer needs and convert that into a specific product or service (numbers of products required for specific period of time)
2. Based on product requirement do back-ward working to identify raw material requirements.
3. Engage internal and external vendors to create supply chain for raw material and finished goods between vendor - production facility - customers.

Production Management v/s Operations Management
Production Management and Operations Management both are very essential in meeting the objective of an organization.
A high level comparison which distinct production and operations management can be done on the following characteristics:
- **Output:** Production management deals with manufacturing of products like (cars and computers) while operations management cover both products and services.
- **Usage of Output:** Products like computer/car are utilized over a period of time whereas service need to be consumed immediately.
- **Classification of work:** To produce products like computer/car more of capital equipment and less labor are required while services require more labor and lesser capital equipment.
- **Customer Contact:** There is no participation of customer during production whereas for services a constant contact with customer is required.

Operations: Policy and Strategy
It is very important for an organization to have well defined objective. A well-defined objective facilitates development of strategies and policy thereby creating value for customers.
Operation Strategy

Operational Strategy is essential to achieve operational goals set by organization in alignment with overall objective of the company. Operational strategy is design to achieve business effectiveness or competitive advantage.
Operational Strategy is the planning process which aligns the following:

Source: Van Mieghem J.A. (2013)
In this global competitive age organization goal tend to change from time to time therefore operations strategy as a consequence has also be dynamic in nature.
A regular Strength, Weakness, Opportunities and Treat (SWOT) Analysis ensures that the organization is able to maintain competitive advantage and business leadership.
Strategic Management Process for Production and Operation
For success of organizational strategic objective, strategic planning has to trickle down to various function areas of the business. In order to build strategy management process a sequential process as is followed:
Competition Analysis: In this step company evaluates and studies current competition in the market and practices that are followed in the industry for operations and production vise-?-visa company policies.
Goal Setting: Next step involves narrowing down the objective towards which one(s) the organization wants to move towards.
Strategy Formulation: The next step is breaking down of organizational goats into operations and production strategies.
Implementation: The final step is to convert operations and production strategies into day to day activities like production schedule, product design, and quality management.
As organizations are always customer - centric, production and operation strategy for organization are built around them.
Productivity
Measurement of formulated operations and production strategy is important to maintain alignment with the organization objectives. In simple terms productivity is defined as sum of total output per employee or per day. Productivity of company is dependent on industry and environmental conditions in which it is operating.
Two essential part of productivity are labor and capital. In scenario of limited resources, optimum and efficient utilization of labor and capital will generate favorable productivity. Productivity measurement also enables company to identify areas which require improvement or special focus. Also productivity provides ready report card to measure status against company's production objective.
Productivity measurement can be classified in three categories based on the inputs used for calculation. Partial productivity ration of output is compared to one of the resource used for example, labor productivity where output is compared to the labor wages.

Total productivity measure takes into consideration sum of all input factors which are for the output. In the modern age technology plays an important part in productivity.
Wastivity
Another important factor in the case of productivity is wastivity. Not 100% of input would be converted to output, there is going to be waste during production. Wastivity is reciprocal of productivity. Classic examples of wastivity are defective products and services which either have to be re-cycled or disposed of completely. Other example is idle capacity of material, man-power and equipment.
International Production and Operations Management (IPOM)
International production and operations management deals with production of goods and services in the international locations and markets. It involves management process has to take into consideration local production and market (labor and capital), and International customer requirements.
Nature of IPOM
The foundation for International production production and operations is not different to domestic production and operations management. But there are certain aspects which makes International exposure a challenge for an organization. The very 1st difference is International business environment where not just economics but also language, cultural differences and International quality standards have to be respected and maintained. The 2nd aspect is the International stint that makes the company more aware of its surroundings, foreign markets thus making it more competitive.
As IPOM is dynamic in nature, organization has to design its strategic objectives to cover the following areas:

- Meeting International quality standards

- Forecasting demand and production design
- Profitability
- Minimum production cost
- Adaptation to modern available technology
- Adaptation to foreign languages and culture

Domestic POM and IPOM

Organization has to clearly identify challenges it is likely to face in an International environment. Those challenges can be categorized as follows:

Culture: Domestic POM has to content with homogeneous culture where as IPOM has to content with multi-culture , multi-language, and multi-ethnicity scenario.

Business Environment: Domestic POM has to consider local economical and social factors where as IPOM has to deal with economical and social factors across countries and continents.

Quality Standards: Domestic POM has to look at a single local market therefore not much variation in quality standards where as IPOM has to consider different International markets with different quality standard requirements.

Pricing: Pricing for Domestic POM may not be a challenge as competitors would also operate in the same environment. IPOM has to consider the customer paying capacity which may vary from developed country to developing country.

Technology: In domestic environment innovation and usage of technology is much more comparable among competitors. For IPOM owing to different quality quality and pricing requirements investment in technology becomes imperative.

Economies of Scale: Domestic POM has to deal with limited local market, hence limiting the scope of its economies of scale where as IPOM has to access to larger market thus providing for the chances of achieving larger economies of scale.

Market Segmentation: Domestic POM is around local market where as IPOM has to deal with developed and diversified market.

Usage of Resources: Domestic POM has to deal with in-flexibility of moving around resources within one location while IPOM has the advantage of moving around resources from high cost market to low cost market.

IPOM Strategies

Organizations need to consider the following factors while developing IPOM strategies:

Production/Factory Location: The choice of location for the production facility depends on its proximity to the market and cost of production (labor) in that particular environment.

Factory Design, Layout, and Quality Standards: Organization need to standardize design and layout across their production as to minimize production planning process, provide flexibility in sharing technical knowledge and manpower.

External Vendor and Procurement: Organization needs to finalize the vendors to provide raw material as well as important components required to complete the final product. Also, procurement schedule has to be finalized as not to hurt production.

II. OPERATIONS PLANNING AND CONTROL

Forecast - Facet of a production plan that predicts future demand. The business plan and forecasts developed by top managers guide operations planning.

The business plan outlines goals and objectives, including the specific goods and services that the firm will offer . Managers also develop production production plans through forecasts of future demand for both new and and existing products. Covering a two-to-five-year period, the production plan anticipates the number of plants or service facilities and the amount of labor, equipment, transportation and storage needed to meet demand. It also, specifies how resources will be obtained.

Capacity Planning

The amount of a product that a company can produce under normal condition is its **capacity.** A firm's capacity depends on how many people it employs and the number and size of its facilities. Long - range planning considers both current and future capacity.

Capacity Planning for Producing Goods

Capacity planning for goods means ensuring that a firm's capacity slightly exceeds normal demand for its products. To see why this is the best policy, consider the alternatives. If the capacity is too small for demand, the company must turn away customers - a situation that cuts into profits and alienates both customers and sales people. If capacity greatly exceeds demand, the firm is wasting money by maintaining a plant that's too large, by keeping excess machinery online, or by employing too many workers (**Idle Capacities**).

The stakes are high in capacity decisions: While expanding fast enough to meet future demand and to protect market share from competitors, firms must also weigh the costs of expanding. "It is always better to constantly evaluate ones business to make certain capacities are added in advance of demand to serve the markets, meet customers' needs, and grow with them" - Cachon, G. Terwiesch, C (2006).

Capacity Planning for Producing Services

In low-contact processes, maintaining inventory lets managers set capacity at the level of average demand. When orders exceed the set average, some are placed in inventory - set aside in a "to be done" file -and then processed on a day when fewer than the set average orders come in.

In high-contact processes, Managers must plan capacity to meet demand, a supermarket in the U.S.A., for instance, has more cash registers than it needs on an average day, but on Saturday morning or during the three days before Thanksgiving, they'll all be running at full capacity.

Location Planning

Location affects production costs and flexibility, sound location planning is crucial factories, offices, and stores. Depending on its site, a company may be able to produce low-cost products or it may find itself at a cost disadvantage relative to its competitors..

Location Planning for Producing Goods -In goods-producing operations, location decisions are influenced by proximity to raw materials and markets, availability of labor, energy and transportation costs.

Location Planning for Producing Services -Low-contact services can be located either near to or far from resource supplies, labor,or transportation outlets.

High-contact services must locate near their customers. Thus fast-food restaurants such as Taco Bell and McDonald's in the U.S.A. now locate in nontraditional locations with high traffic such as high way rest stops, military bases, hospitals, and shopping malls.

Layout Planning

Layout of machinery, equipment, and supplies determines whether a company can respond efficiently to demand for more and different products or whether it find itself unable to match competitors' speed and convenience.

Layout Planning for Producing Goods - In facilities that produce goods, layout must be planned for three types of space:

1. **Productive Facilities:** For example, workstations and equipment for transforming raw materials.
2. **Nonproductive Facilities:** Storage and maintenance areas.
3. **Supportive Facilities:** Offices, restrooms, parking lots, cafeterias, and so forth.

Process Layouts- Spatial arrangement of production activities that groups equipment and people according to function. In a process layout, which is well suited to job shops specializing in custom work, equipment and people are grouped according to functions. In a custom bakery, machines blend better in an area devoted to mixing, baking, which occurs in the oven area, and cakes are are decorated on tables in a finishing area.

Cellular Layout: Spatial arrangement of production facilities designed to move families of products through similar flow paths.

Product Layout: Spatial arrangement of production activities designed to make one type of product in a fixed sequence.

Assembly Line: Product layout in which a product moves step by step through a plant on conveyor belts or other equipment until it is completed.

U-Shaped Production Line: Product layout in which machines and workers are placed in a narrow U shape rather than straight line.

Flexible Manufacturing System(FMS): Production system in which a single factory uses automation to produce a wide variety of products.

Quality Planning: Every operations plan must ensure that products meet the firm's quality standards. The American Society for Quality (www.asq.org), defines **quality** as the combination of "characteristics of a product or service that bear on its ability to satisfy stated or implied needs." Such features may include a reasonable price and consistent performance in delivering the benefits it promises. Quality planning prepares employees for continuously improving the firm's products and production methods.

Methods Planning: In designing operations systems, managers must identify each production step and the specific methods for performing performing it. They can then reduce waste and inefficiencies by examining procedures on a step-by-step basis - an approach sometimes called **method improvement.**

Service Flow Analysis: Method for analyzing a service by showing the flow of processes that create it. Service flow analysis helps managers decide whether every process is needed. Moreover; because each process is a potential source of good or bad service, analysis also helps isolate potential problems known as **fail points.**

Operations Scheduling: The time tables developed for acquiring and using of production Resources in operations.

Scheduling Goods Operations: Scheduling of goods production occurs at different produced, when production will take place, and what resources will be used during specific time periods.
Manufacturing personnel must also known the location of all coils on the plant floor and their various stages of production. Start-up and stop times must assigned, and employees need scheduled work assignments.
Scheduling Service Operations: Service scheduling may involve both work and workers. In a low-contact service, work scheduling may be based either on desired completion dates or on the time of order arrivals.
In high-contact services, the customer must be accommodated as part of the system and its processes. Precise scheduling may not be possible.
Tools for Scheduling- Special projects, such as plant renovations or relocation often require close coordination and precise timing. In these cases, scheduling is facilitated by special tools, such as **Gantt** charts and **PERT** chart.
Gantt Chart: Production Schedule diagramming the steps in a project and specifying the time required for each.
PERT Chart: Production Schedule specifying the sequence and critical path for performing the steps in a project.

OPERATIONS CONTROL: The Process of monitoring production performance by comparing results with plans. Operations Control includes **material management and operations process control**. Both activities ensure ensure that schedules are met and production goals fulfilled, both in quantity and in quality.
Follow - up: The production control activity for ensuring that production decisions are being implemented.
Materials Management: The Planning, organizing, and controlling the flow of materials from design through distribution of finished goods. Even before production starts, materials management focuses on product design by emphasizing **Standardization.**
Standardization: The use standard and uniform components in the production process rather than new or different ones for related products.
Inventory Control: In materials management, inventory control includes the receiving, storing, handling, and counting of all raw materials, partly finished goods. It ensures that enough materials are available to meet production schedules (stocking).
Purchasing: The acquisition of the materials and services that a firm needs to produce its products.
Holding Costs: Costs of keeping extra supplies or inventory on hand.
Lead Time: In purchasing control, the elapsed time between the customer's placement of an order and the seller's shipment of merchandise.
Supplier Selection: The process of finding and selecting suppliers from whom to buy. The process of supplier selection typically has four stages:
1. Investigating possible suppliers
2. Evaluating and isolating the best candidates
3. Negotiating terms of service with a final choice
4. Maintaining a positive buyer-seller relationship

III. TOOLS FOR OPERATIONS PROCESS CONTROL

Worker Training: Customer satisfaction depends largely on the employees who provide the service. In service-product design, employees are often both the providers of the product and the salespeople. Naturally, Good customer relationships don't happen by accident: Service workers can be trained in customer-oriented attitudes. "Without employees trained in customer-relationship skills, businesses such as airlines, banks, restaurants, and hotels can lose customers to better-prepared competitors." Professor Akalegbere.
Lean System: production system designed for smooth production flows that avoid inefficiencies, eliminate unnecessary inventories, and continuously improve production processes.
Just-in-Time (JIT) Production: Production method that brings together all materials and parts needed at each production stage at the precise moment they are required.
Material Requirements Planning (MRP): Production method in which a bill of materials is used to ensure that the right amounts of materials are delivered to the right place at the right time.
Bill of Materials: Production Control Tool that specifies the necessary ingredients of a product, the order in which they should be combined, and how many of each are needed to make one batch.
Bill of Labor: The production tool that specifies the number and category/class of Human Resource Skills needed in the production activity.
Manufacturing Resource Planning (MRP II): Advanced version of Material requirements planning(MRP) that ties together all parts of an organization into its production activities.
Quality Control: Management of the production process designed to manufacture goods or supply services that meet specific quality standards.
VALUE ANALYSIS: An Applied Concept for Manufacturing and Service Industry.
All organizations strive to create value for their customers. This value creates mind space for product and services. Value analysis, therefore, is a scientific method to increase this value.

Value is a perception hence every customer will have their own perception on how they define value. However, overall at the highest level, value is quality, performance, style, and design relative to product cost. Increasing value necessarily does not mean decrease in all-inclusive cost of production but providing something extra for which a premium can be charged.

Objective and Benefits of Value Analysis:

- Value analysis aims to simplify products and process. There by increasing efficiency in managing projects, resolving problems, encourage innovation and improve communication across the organization.
- Value analysis enables people to contribute in the value adding process by continuous focus on product design and services.
- Value analysis provides a structure through cost saving initiatives, risk reduction and continuous improvement.

Activities for Value Analysis: Activities for value analysis are separated into the following activities:
Product/Service - The first step is to identify the product or service which is based on usage/demand, complexity in the development and future potential.
Cost Analysis - The next step is to understand the detail cost structure in developing and manufacturing the product.
Define Product and function - The next step is to define all the primary function of the product and service through satisfying the basic need and then taking step in delighting the customers. The better understanding of the product components and characteristics is required.
Evaluation of Alternatives - Through brainstorming, possible alternatives can be short listed which will provide value to the primary function of the product. Cost evaluation at high level needs to be done for all the alternatives, and the cheapest alternative listed.
Secondary Function Evaluation - Secondary functions of the product and services are studied and evaluated.
Recommendation - Value Analysis done has to be communicated to the various level of the management team as to get their approval/acceptance.
Value Analysis Team - The process of value analysis is carried out by value analysis team. It is paramount that the team selection for the value that team selection for value analysis follows a structured process. Value analysis team consist of trained and qualified team members who have the background and knowledge about the project. Team leader is selected by the project manager. Team size for value analysis is from about five to ten members.
Value Analysis Process - Value analysis process can be divided into three phases of mainly pre-analysis, analysis, and post analysis. Pre-analysis contains activities of project selection and team selection. Analysis phase as the name suggests consists of activities like investigation, speculation, evaluation, implementation of the report and post analysis that include regular project audit - lessons learn t.

Effective Product Design

Organization success is dependent on customer satisfaction and delight. Customer satisfaction is achieved through development of product and service, which have all attributes required by the customer. A successful product or services do not only have attractive package design but should be also able to provide robust performance.
Thus, product design must be practical enough for production and powerful enough to provide a competitive advantage.

Product Design

A good product design has the following common features:

- **Utility**: The product design should make product utility as per the expectation of the customers and provide steady performance through the product life circle.
- **Aesthetics**: Product aesthetics (beauty) is important in the success of the product. The product beauty and appreciation is dependent on the market and the end consumer.
- **Producible:** Product design should enable effective production of product through available production methods.
- **Profitability:** Product design should make economic sense as to deliver needed value the customers and sustainability to the organization.
- **Differentiability:** A good product design should enable a product to be differentiated from its competition. This can be achieved by use of attractive and superior packaging, and also by providing additional service on the product after sales.

The The essence of product design is to satisfy the customers and maximize product value at minimum cost for them. This may not necessarily require the development of new products, but the enhancement of existing products and services.

Stages of Product Design

Product design is a creative process which looks at all the available options and beyond. The process can be divided into three stages:

Stage One: This stage involves brainstorming, bringing ideas and analysis of customer and market survey feedback.
Stage Two: At this stage the idea is being converted into a feasible solution to satisfy the customer expectation and needs, using available resources and technology.
Stage Three: This is the last stage in which the product is introduced into the market.

Factors Affecting Product Design

A success product design has a combination of the following factors:
Correct Team Selection: This is very essential to get the correct team in place which has expert designers who are not only aware and comfortable with technology but also the understanding of the customer expectation.
Customer Involvement: The involvement of the customer in product design and testing can provide insight, feedback into the direction of the project.
Prototyping: Product design is a high risk concept as it involves commitment of capitals and manpower; therefore, it is imperative that extensive samples and testing are done with customers and the market.
Raw Materials: It is essential that raw materials to be used in the production meets the quality standards of the end product. Furthermore, procurement system needs to be in place to ensure continuous, and cost effective supply.
Product Method and Product Layout: The feasibility study of the production method and process layout determines future success of the product.
External Factors: The Environmental and government regulations play important part in product design. And these norms are updated from time to time, so product design should have the flexibility to adapt.

Product Selection

Product Selection process is done through a combination of financial analysis, risk analysis, existing product portfolio, raw material supply and pre-determined product criteria.

Process Design and Analysis

The objective of organization is to provide service and product, which will satisfy the customers and create value for them. Product and service design is based on the customer feedback, and market requirements. Process design is where the product is broken down into parts, which further can be helpful in the actual manufacturing process.

A product, for example, has attractive packaging to provide the right aesthetics plus has function and features, which provide value to customers. Process design ensures that there is smooth and continuous relationship between required output and all the intermediate process.
For example, in the manufacturing of Air-Conditioners, the process design has to be such that maximum supply is achieved during the hot months of Summer when demand of the product is at the highest. So people, process and machines need to align to give continuous production throughout the year as to satisfy seasonal demands.

Process Planning

Process development for process design can be summarized through the following steps:
Process Requirement: The 1st step is to collect and gather information to give structure with the end objective. That is to make process requirement document highlighting various stages, risk and stakeholders for production. This will include assessment of available technology, raw material requirement, factory/plant layout and demand forecast.
Team Building: Once the process requirements are finalized, for each objective, a team is selected based on skills and experience on the subject matter. The function of the team is to get familiarize with the whole process and of advisory capacity.
Planning and Implementation: Process planning team team will develop modules, policies and procedures required for production, for internal and external approval before implementation.
Audit: Regular Project Audits are carried out to make sure that process implemented is in line with the plan and products and services to be delivered to the customers add value to them.
End of Product Life Circle: Over a course of time there may be enhancement to the product or the product may be discontinued, and in this circumstance the process developed will also be discontinued.

Product Process

Based on the nature of product and service, production or conversion process can be divided into two broad categories, continuous production (assembly line,oil refinery) and intermittent production (job work, service).
Production process for both manufacturing industry and service industry can be classified into categories based on the standardization of the product or service. It can range from single project assignment like a building or bridge (Manufacturing) to interior design, banking (Service), and Mass production project like car (Manufacturing) to fast food joint (Service).

Process Design

A successful process design has to take into account the appropriateness of the process to overall organization objective. Process Design requires a broad view of the whole organization and should not have a myopic outlook. And the process should deliver customer value with constant involvement of the management at various stages.
In order to achieve a good process design, effective process strategy is required, which deals with a singular line items required to manufacture the end product. Effective process strategy deals with raw material procurement, customer participation, technological investment etc. Over a period of time process design has undergone change and new concepts like flexible Manufacturing Systems have been developed to deliver efficient and effective production design and analysis.

IV. CONCLUSION

WAITING LINE (QUEUE) MANAGEMENT

The waiting line or queue management is a critical part of service industry. It deals with issue of treatment of customers in sense reduce wait time and improvement of service. Queue management deals with cases where the customer arrival is random; therefore, service rendered to them is also random.
A service organization can reduce cost and thus improve profitability by efficient queue management. A cost is associated with customer waiting in line and a cost with adding new counters to reduce service time. Queue management looks to address this trade off and offer solutions to their management.

Waiting on line is a common phenomena in daily life activities, for example, Banks have customers on line waiting to get services from the tellers; cars queue up for re-filling; workers line up to access machine complete their jobs.

MANAGING TECHNOLOGY IN OPERATIONS MANAGEMENT

Since the last decade or so, technology has changed the way organizations conduct their businesses. Advent of technology in operation management has increased productivity of the organizations.
Technology and Operations Management: The scope of Technology and Operations Management has evolved over a period of time and has moved from development of products into design, management and improvement of operating system and processes.
Usage of technology in operation management has ensured that organizations are able to reduce the cost, improve the delivery process, standardize and improve quality and focus on customization, thereby creating value for customers.

Integration of Technology with Production System

Technology drives efficiency in organization and increases productivity of the organization. However, bringing technology in the production system is highly a complex process, and it needs the following steps:
Technology Acquisition: Technology acquired should align with the overall objectives of the organization and should be approved after elaborate cost-benefit analysis.
Technology Integration: Technology affects all aspects of production i.e. capital, labor, and customers. Therefore, a solid technology integration plan is required.
Technology Verification: Once technology is integrated, it is important to check whether it is delivering operationally effective, and is being used to its fullest.

Technology in Manufacturing and Design

Technology is getting extensively used in the customization of products and services designs. The use of computers and supporting electronic systems is now integral part of modern industrial and services industries. Current techniques can be classified into the follow categories:
Computer-Aided Design (CAD): CAD facilitates the linking of two more complex components of design at very high level of accuracy thus delivering higher productivity.
Computer-Aided Manufacturing System (CAM): A Precision that is very essential in operating any machine and therefore, Computerized Numerical Controlled machines are used, thus ensuring the highest level of accuracy.
Standard for the Exchange of Product Data: As the name suggests product design is transmitted among CAM in three dimensions. Standard for the Exchange of Product Data Process sharing of product across all phases of product life cycle and serves as neutral file exchange.

Automation in Production and Operations

Automation reduces manual intervention in the manufacturing process. It increases productivity and reduces margin of error thereby facilitating economies of scale. There is this – advantages of automation also, such as unemployment, high breakdown cost and initial capital investment. Therefore, automation, may not be suitable in all situations, and in the end alignment with an overall organization objective is important.

Challenges

Technology can be a facilitating factor in bringing about change in operations and production Management. But it may not be feasible to use technology in all aspects. There are challenges of high initial cost of investment, high cost of maintenance and mismanagement.

This paper attempts to show case the importance of production function and production Management as successful organizations have well defined efficient line function and support function. Production comes under the category of line function which directly affects customer experience and thereby future of itself.

The aim of production function is to add value to product or service which will create a strong and long lasting customer relationship or association. And this can be achieved by healthy and productive association between Marketing and Production people. Marketing people's function are front representation of the company and provide insights to real product needs of customers.

An effective planning and control on production parameters to achieve or create value for customers is called production management.

This paper high lights that for a company to deliver value for customers in products and services, it has to identify the customer needs and convert that into a specific product or service required for specific period of time, and based on product requirement do back-ward working to identify raw material requirements. Also, the company as part of its operations management has to engage in internal and external vendors to create supply chain for raw material and finished goods between vendor – production facility – customers.

The company should have a regular Strength, Weakness, Opportunities, and Treats (SWOT) Analysis to ensure that the organization is able to maintain competitive advantage and business leadership.

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