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1. Explain the concept of Systems Life-Cycle.

Solution: Every organization has an objective or objectives (and goals to achieve.) These objectives and goals achieving can be possible only when management organizing the available resources in a suitable structure with a plan. The whole process of achieving objectives like planning, organizing and implementation and correction process by means of feedback bring together by operation management. The physical resources like space, machinery, money and men who organize those physical will take major role in the operation management.

The objectives related to both performance and cost, decision making process related production or operation of the organization, strategic and operational and feedback control system will play important role in deciding life cycle of any organization. The various stages and their life span each stage life cycle of system is discussed in the next section.

The Concept of Systems Life-Cycle.

Life cycle concept is applied in operational management for any production system which takes input and produces some out put by using some process. The production system may be mass production, batch production, Job shop production or unit manufacture or project. The different

production system is applicable to process of production depends on the type of product we produce and the volume of the process we use to produce the goods. The whole process of operation from birth to death of a production system can be viewed as definite Life cycle.

The life cycle concept of any product is similar to any life cycle of a living being. The major stages in the life cycle concept are 1) Development 2) Introduction or Birth 3) Growth 4) Maturity 5) Decline or Death. The similar Life cycle concept we can apply to any product in production system. The Typical product Life- cycle is represented in Figure A1-1. The concept also shows the product life influenced by the external environment and go through the various stages in its life cycle. Through out the cycle the whole process of operation management is applied on the production system to maintain to sustain longer. The inevitable situation due to the environmental influences like people taste, interest there is always new born of other production system. The same concept is shown in the Figure A1-1 Product A and Product B. Product B emerged in the market when the Product enjoying the maturity stage of its life cycle.

Birth

Growth

Maturity

Death

Product A

Product B

Volume

Time

Figure A1-1 Product Life Cycle Concept

The life span of each stage of a product may vary from a few months to years. For an example, within no time some products reach growth stage as soon as they were introduced in the market. Now we will discuss about each stage of the product life cycle.

2.1 Development

The development stage can be a protracted stage and will involve activities such as design, planning, costing, test marketing, etc. The costs are high, with no earned revenue (and thus it does not register as a stage on the diagram at Figure A1-1). Promotion for awareness may commence in advance of introduction of the product to the marketplace.

2.2 Birth (or Introduction stage)

This is the stage where a product will be introduced after initial decisions like selection, technology selection, location and layout design of production facility after study of various aspects of business unit in transpiration and raw material, manpower resources availability etc. This is the stage we call it as Birth stage of the product.

2.3 Growth stage

After introducing the product the next stage for any product is looking for growth. The growth is stage is very critical in the operation management. The key of success is lying in this stage. How we take this product to people or how people will have the feel of necessity of the product depends on the efficient marketing strategies of the management. Sometimes the time taking to reach to growth stage will be faster because of the uniqueness of its usage when compared with its competitor's products. Major efforts are required at this stage to push with all possible strategies in an ethical manner.

2.4 Maturity stage

Once the product is established, the product life cycle enters into the maturity stage. At this stage organization takes feedback from various groups of users and improve the product usability with add on features and introduce different models without changing the basic applications. This is the stage where businesses will be exposed more to the external competitive market which initiates the new comers with similar products where they will take off the market or share the market which causes the original product business organization will go for further improvements or for a new product line. Sustainability of this stage depends on the factors like the management's views, how fast they recognize their product obsolesced and how fast new comers takes over the market.

2.5 Death stage.

As discussed above in maturity stage, in case business management could not predict the impact of the new product growth and lack of taking necessary changes in the product design, the product life cycle enters into the decline or death stage, which leads to the organization merging with new companies or liquidation or sale.

3. Life-cycle costing

The cost of the product throughout the product life cycle is referred to as the Life cycle costing. The new concept of this Life cycle costing is long-term cost. The short-term cost always lead us to inefficient decisions which put us in a wrong track of product selection, design and

production. The initial cost may be higher at growth stage, but if we know that the product sustains longer in the market in future, we should go ahead with considerable investments keeping the future market in mind. The decision policy throughout the life cycle should be maintained in the operational management of such business opportunity.

4. Conclusion

As we discussed in the above section, any business organization will have their product life cycles. The operation management of the organization should always keep watching the new trends of people's taste or requirements, the available latest technology and competitor's new proposals so that necessary actions can be taken in advance to decrease the growth stage and increase the span of the maturity stage. The type of operational decisions and selection procedures all depends on the product of any organization plans to develop or introduce into the market.

2. How should an organization balance the different design characteristics in a new product? Elaborate.

Solution: Product design is cross-functional, knowledge-intensive work that has become increasingly important in today's fast-paced, globally competitive environment. It is a key strategic activity in many firms because new products contribute significantly to sales revenue. When firms are able to develop distinctive products, they have opportunities to command premium pricing. Product design is a critical factor in organizational success because it sets the characteristics, features, and performance of the service or good that consumers demand. The objective of product design is to create a good or service with excellent functional utility and sales appeal at an acceptable cost and within a reasonable time. The product should be produced using high-quality, low-cost materials and methods. It should be produced on equipment that is or will be available when production begins. The resulting product should be competitive with or better than similar products on the market in terms of quality, appearance, performance, service life, and price.

New Products may be described in terms of their features and benefits. Features are product characteristics that deliver benefits; we buy products for their benefits. Stated another way:

- ↪ *Features* are product characteristics such size, color, horsepower, functionality, design, hours of business, fabric content, etc.
- ↪ *Benefits* answer the customer's question: What's in it for me?

This distinction is further illustrated in the following examples:

<i>A feature is. . .</i>	<i>A benefit is. . .</i>
↪ Physical size	↪ It's small enough to fit in your raincoat pocket.
↪ A 75 horsepower motor	↪ A mower that takes the work out of yard work.
↪ Patented box spring design	↪ A restful night's sleep.

While New Product features are usually easy to detect and describe, product benefits can be trickier because they're often intangible. The most compelling product benefits are those that provide *emotional* or *financial* rewards. It's not the brighter smile that the toothpaste offers that is its benefit; it's *what the smile might bring you*. (A good-looking mate, a better job, etc.)

Emotional rewards run the gamut of human emotions but basically allow the buyer to feel better in some way. For example, sending flowers to a friend or family member allows the buyer to express love. Buying products made from recycled materials offers the buyer the chance to be environmentally responsible.



Products that deliver financial rewards allow the buyer to :

- ↪ Save money (a discount long-distance phone plan)
- ↪ Make money (computer software for managing a home-based business)
- ↪ Gain convenience and time (microwaveable meals).

Discovering Your Product's Benefits

To identify your product's benefits, you **must** consider the customer's viewpoint.

Besides putting yourself in your customers' shoes mentally, talk to or survey them asking them to identify your product's benefits. They might provide you with information you never thought about!

Look at who has purchased your product in the past. What does that customer profile tell you about your product's benefits?

Going forward, you might set up a few systems to develop and track product benefits:

- ⇒ Ask customers for suggestions for improvement.
- ⇒ Pay attention to customer complaints and prospect inquiries. Be open to what your customers say. Go so far as to train and reward employees for questioning customers and prospects to learn what they want and what they don't like about your product. Analyze and learn from this input.
- ⇒ Watch your competitors. Do the changes in their product offerings suggest desired product benefits?

[Top of Page](#)

Why is it important to understand what my product's features and benefits are?

Understanding product features and benefits allows you to do such things as:

- ⇒ Describe your products in marketing collateral, publications or in a personal selling situation in a way that is most relevant to customers.
- ⇒ Differentiate—explain how your product is different ("better") than the competition's.
- ⇒ Use a variety of pricing and positioning strategies effectively (see several strategy ideas below in "Strategies that are based upon features").

Differentiation

Products may be highly unique (specialty products) or virtually indistinguishable from competitors' products (commodity products)—and anything in between. Specialty products are not necessarily better than commodity products, but they do require different marketing strategies. A potentially important strategy for specialty products is **differentiation**. A company differentiates its products when it sets them apart from the competitors' products in the minds of customers. Having a thorough understanding of how your product's benefits compare to your competitors' allows you to compete with them through differentiation.



Strategies that are based upon features

- ⇒ **Introducing** - Being "the first" to offer a new product feature is a proven competitive strategy. For example, being known as "the first" organic body lotion to have Vitamin E will position your company as a leader, at least for a while.
- ⇒ **Improving/Modifying** - Instead of being at the head of the pack with a totally new

feature, you might simply modify and/or improve your product's features. "Improving" your product creates the impression that your company cares about satisfying its customers.

Modifying product features is a strategy many businesses use to compete with a competitor who lowers their price. For example, if the maker of one organic body lotion lowers its price, the maker of another may add Vitamin E as a "new improved" feature but keep its price the same.

Don't forget that modifying features usually leads to changes in benefits. Stay on top of knowing the perceived benefits your product offers so you can communicate them in your marketing messages.

↔ **Grouping** - Oftentimes, features are "grouped" into different product models—and prices—starting with a basic model to a "fully loaded" model. Automobiles, many electronic devices, even vacation packages offer a variety of features to add to a basic product model. This can even be true of services. For example, if you're an accountant you might offer a certain fee for preparing annual tax returns, another fee to additionally process payroll, and another to manage all of a client's financial affairs.

3. Define Job Design. Explain the important factors to be considered for Job designing.

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Solution: Job design means to decide the contents of a job. It fixes the duties and responsibilities of the job, the methods of doing the job and the relationships between the job holder (manager) and his superiors, subordinates and colleagues. Job design also gives information about the qualifications required for doing the job and the reward (financial and non-financial benefits) for doing the job. Job design is mostly done for managers' jobs. While designing the job, the needs of the organisation and the needs of the individual manager must be balanced. Needs of the organisation include high productivity, quality of work, etc. Needs of individual managers include job satisfaction. That is, they want the job to be interesting and challenging. Jobs must not be made highly specialised because they lead to boredom.

Important Factors to be Considered for Job Designing

Job design is affected by organizational, environmental and behavioral factors. A properly designed job will make it more productive and satisfying. If a job fails on this count, it must be redesigned based on the feedback. The various factors affecting job design are the following

Organizational factors

Organizational factors include characteristics of task, work flow, ergonomics and work practices.

Characteristics of Task: Job design requires the assembly of a number of tasks into a job or a group of jobs. An individual may carry out one main task which consists of a number of inter-related elements or functions. On the other hand, task functions may be split between a team, working closely together or strung along an assembly line. In more complex jobs, individuals may carry out a variety of connected tasks, each with a number of functions, or these tasks may be allocated to a group of workers or divided between them. Complexity in a job may be a reflection of the number and variety of tasks to be carried out, or the range and scope of the decisions that have to be made, or the difficulty of predicting the outcome of decisions.

The internal structure of each task, consists of three elements Planning, Executing and Controlling. A completely integrated job will include all these elements for each of the tasks involved. The workers or group of workers having been given objectives in terms of output, quality and cost targets, decide on how the work is to be done, assemble the resources, perform the work and monitor output, quality and cost standards. Responsibility in a job is measured by the amount of authority, some one to put to do all these things. The ideal design is to integrate all the three elements.

Work Flow: The flow of work in an organization is strongly influenced by the nature of the product or service. The product or service usually suggests the sequence and balance between jobs, if the work is to be done efficiently. After the sequence of jobs is determined, the balance between the jobs is established.

Ergonomics: Ergonomics is concerned with designing and shaping jobs to fit the physical abilities and characteristics of individuals so that they perform the jobs effectively. Ergonomics helps employees to design jobs in such a way that workers' physical abilities and job demands are balanced. It does not alter the nature of job tasks, but alters the location of tools, switches and other facilities, keeping in view that handling the job is the primary consideration.

Work Practices: Work practices are set ways of performing work. These methods may arise from tradition or the collective wishes of employees.

Work practices were till now, determined by time and motion study which established the standard time needed to complete the given job. The study required repeated observations. The accuracy of the readings depended on competence of the work study engineer. Deviations from the normal work-cycle caused distortions in measurements, was biased towards existing work practices with little effort at method's improvement and could be carried out only when, production was under way.

A new technique has now emerged which, if introduced, could drastically alter the work practices. Called the MOST (Maynard Operating Sequence Technique), the technique uses a standard formula to list the motion sequence ascribed in index values.

Environmental factors

Environmental factors affect the job design. These factors that have a bearing on job design are employees abilities and availability and social and culture expectations. Employee Abilities and Availability: Efficiency consideration must be balanced against the abilities and availability of the people to do the work. When Henry Ford made use of the assembly line, for example, he was aware that most potential workers lacked any automobile making experience. So, jobs were designed to be simple and required little training. Therefore, considerable thought must be given, as to who will actually do the work.

Social and Cultural Expectations: During the earlier days, securing a job was the primary consideration. The worker was prepared to work on any job and under any working conditions. Now, it is not the same. Literacy, knowledge and awareness of workers have improved considerably. So also, their expectations from the job. Hence, jobs be designed to meet the expectations of workers.

When designing jobs for international operations, uniform designs are almost certain to neglect national and cultural differences. Hours of work holidays, vacations, rest breaks, religious

beliefs, management styles and worker sophistication and attitudes are just some of the predictable differences that can affect the design of jobs across international borders. Failure to consider these social expectations can create social dissatisfaction, low motivation, hard to fill job openings and a low quality of work life, especially, when foreign nationals are involved in the home country or overseas.

4. Elaborate your understanding about Aggregate Production Planning.

Solution: Aggregate planning is an operational activity that does an aggregate plan for the production process, in advance of 2 to 18 months, to give an idea to management as to what quantity of materials and other resources are to be procured and when, so that the total cost of operations of the organization is kept to the minimum over that period..

The quantity of outsourcing, subcontracting of items, overtime of labour, numbers to be hired and fired in each period and the amount of inventory to be held in stock and to be backlogged for each period are decided. All of these activities are done within the framework of the company ethics, policies, and long term commitment to the society, community and the country of operation.

Aggregate planning has certain prerequired inputs which are inevitable. They include:

Information about the resources and the facilities available.

Demand forecast for the period for which the planning has to be done.

Cost of various alternatives and resources. This includes cost of holding inventory, ordering cost, cost of production through various production alternatives like subcontracting, backordering and overtime.

Organizational policies regarding the usage of above alternatives.

"Aggregate Planning is concerned with matching supply and demand of output over the medium time range, up to approximately 12 months into the future. Term aggregate implies that the planning is done for a single overall measure of output or, at the most, a few aggregated product categories. The aim of aggregate planning is to set overall output levels in the near to medium future in the face of fluctuating or uncertain demands. Aggregate planning might seek to influence demand as well as supply

5. Define Value Engineering and Analysis. What are the various methods for VE and VA? Explain one of these methods with an example.

Solution: Value engineering (VE) is a systematic method to improve the "value" of goods or products and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be increased by either improving the function or reducing the cost. It is a primary tenet of value engineering that basic functions be preserved and not be reduced as a consequence of pursuing value improvements.

In the United States, value engineering is specifically spelled out in Public Law 104-106, which states "Each executive agency shall establish and maintain cost-effective value engineering procedures and processes.

Value engineering is sometimes taught within the project management or industrial engineering body of knowledge as a technique in which the value of a system's outputs is optimized by crafting a mix of performance (function) and costs. In most cases this practice identifies and removes unnecessary expenditures, thereby increasing the value for the manufacturer and/or their customers.

VE follows a structured thought process that is based exclusively on "function", i.e. what something "does" not what it is. For example a screw driver that is being used to stir a can of paint has a "function" of mixing the contents of a paint can and not the original connotation of securing a screw into a screw-hole. In value engineering "functions" are always described in a two word abridgment consisting of an active verb and measurable noun (what is being done - the verb - and what it is being done to - the noun) and to do so in the most non-prescriptive way possible. In the screw driver and can of paint example, the most basic function would be "blend liquid" which is less prescriptive than "stir paint" which can be seen to limit the action (by stirring) and to limit the application (only considers paint.) This is the basis of what value engineering refers to as "function analysis"

Value engineering uses rational logic (a unique "how" - "why" questioning technique) and the analysis of function to identify relationships that increase value. It is considered a quantitative method similar to the scientific method, which focuses on hypothesis-conclusion approaches to

test relationships, and operations research, which uses model building to identify predictive relationships.

Value engineering is also referred to as "value management" or "value methodology" (VM), and "value analysis" (VA). VE is above all a structured problem solving process based on function analysis—understanding something with such clarity that it can be described in two words, the active verb and measurable noun abridgement. For example, the function of a pencil is to "make marks". This then facilitates considering what else can make marks. From a spray can, lipstick, a diamond on glass to a stick in the sand, one can then clearly decide upon which alternative solution is most appropriate.

6. Write short notes of the following.

a) Learning Curve

A learning curve is a graphical representation of the changing rate of learning (in the average person) for a given activity or tool. Typically, the increase in retention of information is sharpest after the initial attempts, and then gradually evens out, meaning that less and less new information is retained after each repetition.

The learning curve can also represent at a glance the initial difficulty of learning something and, to an extent, how much there is to learn after initial familiarity. For example, the Windows program Notepad is extremely simple to learn, but offers little after this. On the other extreme is the UNIX terminal editor vi, which is difficult to learn, but offers a wide array of features to master after the user has figured out how to work it. It is possible for something to be easy to learn, but difficult to master or hard to learn with little beyond this.

The concept of the Learning Curve basically states that there is less and less learning as more repetitive steps are taken. The Boston Consulting Group conducted some empirical studies and below are the conclusions from that study:

The time required to perform a task decreases as the task is repeated,

The amount of improvement decreases as more units are produced, and

The rate of improvement has sufficient consistency to allow its use as a prediction tool.

b) Acceptance Sampling

Acceptance sampling uses statistical sampling to determine whether to accept or reject a production lot of material. It has been a common quality control technique used in industry and particularly the military for contracts and procurement. It is usually done as products leave the factory, or in some cases even within the factory. Most often a producer supplies a consumer a number of items and decision to accept or reject the lot is made by determining the number of defective items in a sample from the lot. The lot is accepted if the number of defects falls below where the acceptance number or otherwise the lot is rejected.

c) Assembly Line Balancing

An assembly line is a flow-oriented production system where the productive units performing the operations, referred to as stations, are aligned in a serial manner. The workpieces visit stations successively as they are moved along the line usually by some kind of transportation system, e.g. a conveyor belt. Originally, assembly lines were developed for a cost efficient mass production of standardized products, designed to exploit a high specialization of labour and the associated learning effects. Since the times of Henry Ford and the famous model-T however, product requirements and thereby the requirements of production systems have changed dramatically. In order to respond to diversified customer needs, companies have to allow for an individualisation of their products.

d) Material Requirement Planning

Solution: Material requirements planning (MRP) is a production planning and inventory control system used to manage manufacturing processes. Most MRP systems are software-based, while it is possible to conduct MRP by hand as well.

An MRP system is intended to simultaneously meet three objectives:

Ensure materials are available for production and products are available for delivery to customers.

Maintain the lowest possible material and product levels in store

Plan manufacturing activities, delivery schedules and purchasing activities.

e) **Standardization and Variety Reduction**

Solution: Standardization is the process of developing and implementing technical standards.

The goals of standardization can be to help with independence of single suppliers (commoditization), compatibility, interoperability, safety, repeatability, or quality.

In social sciences, including economics, the idea of standardization is close to the solution for a coordination problem, a situation in which all parties can realize mutual gains, but only by making mutually consistent decisions. Standardization is defined as best technical application consensual wisdom inclusive of processes for selection in making appropriate choices for ratification coupled with consistent decisions for maintaining obtained standards Precisely separating the two terms known as standardisation and variety reduction is as difficult as separating research from development and mechanisation from automation. The exercise is barren. Both are concerned with the elimination of unnecessary diversity in any sphere of company operations. Standardisation is most commonly used in the sense of reducing a series of items all serving the same purpose to one item or a very few items, e.g. all inter-office memoranda to be written on A4 paper. Variety reduction is widely interpreted as a reduction in a range of items all serving the same or similar purposes by removing the least profitable and those with least user appeal. There is a wide overlap between this technique and standardisation (q.v.).

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The difference between the two techniques is brought about when one considers the way in which they are applied. Variety reduction, though it can be employed on any aspect of company operations, is usually in practice restricted to three areas; the product range, the raw materials list and stocks of engineering spares. Furthermore, a variety reduction effort is normally organised as a special project for a team, special consultant or committee. A big effort is made and then the team is disbanded, leaving a residue of variety reduction concepts as a permanent legacy for the managers who are permanently concerned with the product range.

Illustration:

A common approach to variety reduction of products is to appoint a full-time team of three or four people to study the problem, report on it and assist with implementation. The team will systematically cover each product group looking for identical products with different code numbers and for those whose sales are very low. The arguments for removal of products must be based on profitability considerations: a profitability analysis of the product range is an important aspect of a variety reduction study.

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