**BIYANI INSTITUTE OF SCIENCE AND MANAGEMENT**

**MBA II Sem**

**MODEL ANSWER PAPER-2018**

OPERATIONS AND SUPPLY MANAGEMENT

**“SECTION A”**

**Q1. Elaborate strategic decision in operation and supply management.**

**Ans.** Strategic decisions in operations and supply chain management deal with the top-level, risky and complex issues. Here we'll discuss five areas of strategic decision making, including product development, customers, manufacturing, vendors, and logistics.

**Strategic Decisions**

Have you ever been responsible for making complex, all-encompassing high risk decisions? Perhaps it was how to invest your first paycheck or should you buy or rent a place to live? If these types of decisions sound familiar, then you can relate to making strategic decisions. In the business world, these are types of decisions that deal with a large range of corporate activities. They tend to be complex, risky and are used by top-level executives to propose major changes in corporate directions. When managers have to make strategic decisions based on operations, they have to examine specific areas of influence on the company's production.

In this lesson, we will focus exclusively on the five areas that influence strategic decisions in operations and supply chain management through the eyes of CEO Peter Tires who runs the Tread Car Company. Peter, along with his executive vice presidents, makes top-level strategic supply chain decisions that affect his entire organization. Let's take a look at the five areas of business in which strategic decision making is used.

**Product Development**

Peter and his executives must provide the strategic direction for product development, or the creation of new or improved products and benefits, for the company's car product line so that the vehicles are built for sale. An example of a product development strategic decision facing Tread Car company is whether to eliminate slow-selling vehicles, such as the NoGo, or whether to add new larger ten passenger SUVs. This type of strategic decision making will vastly alter the operations and supply chain production, inventory, buyer and supplier factors. In the past, Peter has even acquired new businesses in order to reach his operations goals.

Customers

Another key area of strategic decision making that affects operations and supply chain is based on the analysis of customers who are the final purchasers and users of the product. Tread Car Company spends time researching their customer segments and deciding on the most profitable target markets. Once the strategic decision is made to target certain groups of customers, then operations will focus on how best to make those cars efficiently in order to satisfy the customer and make a profit.

**Manufacturing**

Peter's team also focuses on delivering the best strategic manufacturing decision regarding what products the operations team should produce and with what type of technology. Based on the team's strategic decision to launch three new cars this year, the company has decided to use American workers and build new factories in North Carolina, Seattle and Texas.

**Q2. What do you mean by work measurement? Explain techniques of work measurement?**

**Ans.** Work measurement is the application of techniques designed to establish the time for an average worker to carry out a specified manufacturing task at a defined level of performance. It is concerned with the duration of time it takes to complete a work task assigned to a specific job .

Work measurement helps to uncover non-standardization that exist in the workplace and non-value adding activities and waste. A work has to be measured for the following reasons:

* To discover and eliminate lost or ineffective time.
* To establish standard times for performance measurement.
* To measure performance against realistic expectations.
* To set operating goals and objectives.
* Techniques of work measurement

**The following are the principal techniques by which work measurement is carried out:**

1. Time study

2. Activity sampling

3. Predetermined motion time systems

4. Synthesis from standard data

5. Estimating

6. Analytical estimating

7. Comparative estimating

Of these techniques we shall concern ourselves primarily with time study, since it is the basic technique of work measurement. Some of the other techniques either derive from it or are variants of it.

**1. Time study**

Time Study consists of recording times and rates of work for elements of a specified job carried out under specified conditions to obtain the time necessary to carry out a job at a defined level of performance.

In this technique the job to be studied is timed with a stopwatch, rated, and the Basic Time calculated.

**1.1 Requirements for effective time study**

The requirements for effective time study are:

a. Co-operation and goodwill b. Defined job c. Defined method d. Correct normal equipment e. Quality standard and checks f. Experienced qualified motivated worker g. Method of timing h. Method of assessing relative performance i. Elemental breakdown j. Definition of break points k. Recording media

One of the most critical requirements for time study is that of elemental breakdown. There are some general rules concerning the way in which a job should be broken down into elements. They include the following. Elements should be easily identifiable, with definite beginnings and endings so that, once established, they can be repeatedly recognised. These points are known as the break points and should be clearly described on the study sheet. Elements should be as short as can be conveniently timed by the observer. As far as possible, elements – particularly manual ones – should be chosen so that they represent naturally unified and distinct segments of the operation.

**1.2 Performance rating**

Time Study is based on a record of observed times for doing a job together with an assessment by the observer of the speed and effectiveness of the worker in relation to the observer's concept of Standard Rating.

This assessment is known as rating, the definition being given in BS 3138 (1979):

The numerical value or symbol used to denote a rate of working.

Standard rating is also defined (in this British Standard BS3138) as:

"The rating corresponding to the average rate at which qualified workers will naturally work, provided that they adhere to the specified method and that they are motivated to apply themselves to their work. If the standard rating is consistently maintained and the appropriate relaxation is taken, a qualified worker will achieve standard performance over the working day or shift."

Industrial engineers use a variety of rating scales, and one which has achieved wide use is the British Standards Rating Scale which is a scale where 0 corresponds to no activity and 100 corresponds to standard rating. Rating should be expressed as 'X' BS.

Below is an illustration of the Standard Scale:

Rating walking pace

0 no activity 50 very slow 75 steady 100 brisk (standard rating) 125 very fast 150 exceptionally fast The basic time for a task, or element, is the time for carrying out an element of work or an operation at standard rating.

Basic time = observed time x observed rating

The result is expressed in basic minutes – BMs.

The work content of a job or operation is defined as: basic time + relaxation allowance + any allowance for additional work – e.g. that part of contingency allowance which represents work.

**1.3 Standard time**

Standard time is the total time in which a job should be completed at standard performance i.e. work content, contingency allowance for delay, unoccupied time and interference allowance, where applicable.

Allowance for unoccupied time and for interference may be important for the measurement of machine-controlled operations, but they do not always appear in every computation of standard time. Relaxation allowance, on the other hand, has to be taken into account in every computation, whether the job is a simple manual one or a very complex operation requiring the simultaneous control of several machines. A contingency allowance will probably figure quite frequently in the compilation of standard times; it is therefore convenient to consider the contingency allowance and relaxation allowance, so that the sequence of calculation which started with the completion of observations at the workplace may be taken right through to the compilation of standard time.

**Contingency allowance**

A contingency allowance is a small allowance of time which may be included in a standard time to meet legitimate and expected items of work or delays, the precise measurement of which is uneconomical because of their infrequent or irregular occurrence.

**Relaxation allowance**

A relaxation allowance is an addition to the basic time to provide the worker with the opportunity to recover from physiological and psychological effects of carrying out specified work under specified conditions and to allow attention to personal needs. The amount of the allowance will depend on the nature of the job. Examples are:

Personal 5–7% Energy output 0–10% Noisy 0–5% Conditions 0–100% e.g. Electronics 5%

**Other allowances**

Other allowances include process allowance which is to cover when an operator is prevented from continuing with their work, although ready and waiting, by the process or machine requiring further time to complete its part of the job. A final allowance is that of Interference which is included whenever an operator has charge of more than one machine and the machines are subject to random stoppage. In normal circumstances the operator can only attend to one machine, and the others must wait for attention. This machine is then subject to interference which increased the machine cycle time.

It is now possible to obtain a complete picture of the standard time for a straightforward manual operation.

**2. Activity Sampling**

Activity sampling is a technique in which a large number of instantaneous observations are made over a period of time of a group of machines, processes or workers. Each observation records what is happening at that instant and the percentage of observations recorded for a particular activity or delay is a measure of the percentage of time during which the activity or delay occurs.

The advantages of this method are that

It is capable of measuring many activities that are impractical or too costly to be measured by time study. One observer can collect data concerning the simultaneous activities of a group. Activity sampling can be interrupted at any time without effect. The disadvantages are that

It is quicker and cheaper to use time study on jobs of short duration. It does not provide elemental detail. The type of information provided by an activity sampling study is:

a. The proportion of the working day during which workers or machines are producing.

b. The proportion of the working day used up by delays. The reason for each delay must be recorded.

c. The relative activity of different workers and machines.

To determine the number of observations in a full study the following equation is used:

Where:

**3. Predetermined motion time system**

A predetermined motion time system is a work measurement technique whereby times established for basic human motions (classified according to the nature of the motion and the conditions under which it is made) are used to build up the time for a job at a defined level of performance.

The systems are based on the assumption that all manual tasks can be analysed into basic motions of the body or body members. They were compiled as a result of a very large number of studies of each movement, generally by a frame-by-frame analysis of films of a wide range of subjects, men and women, performing a wide variety of tasks.

The first generation of PMT systems, MTM1, were very finely detailed, involving much analysis and producing extremely accurate results. This attention to detail was both a strength and a weakness, and for many potential applications the quantity of detailed analysis was not necessary, and prohibitively time -consuming. In these cases "second generation" techniques, such as Simplified PMTS, Master Standard Data, Primary Standard Data and MTM2, could be used with advantage, and no great loss of accuracy. For even speedier application, where some detail could be sacrificed then a "third generation" technique such as Basic Work Data or MTM3 could be used.

**4. Synthesis**

Synthesis is a work measurement technique for building up the time for a job at a defined level of performance by totaling element times obtained previously from time studies on other jobs containing the elements concerned, or from synthetic data.

Synthetic data is the name given to tables and formulae derived from the analysis of accumulated work measurement data, arranged in a form suitable for building up standard times, machine process times, etc. by synthesis.

Synthetic times are increasingly being used as a substitute for individual time studies in the case of jobs made up of elements which have recurred a sufficient number of times in jobs previously studied to make it possible to compile accurate representative times for them.

**5. Estimating**

The technique of estimating is the least refined of all those available to the work measurement practitioner. It consists of an estimate of total job duration (or in common practice, the job price or cost). This estimate is made by a craftsman or person familiar with the craft. It normally embraces the total components of the job, including work content, preparation and disposal time, any contingencies etc., all estimated in one gross amount.

**6. Analytical estimating**

This technique introduces work measurement concepts into estimating. In analytical estimating the estimator is trained in elemental breakdown, and in the concept of standard performance. The estimate is prepared by first breaking the work content of the job into elements, and then utilising the experience of the estimator (normally a craftsman) the time for each element of work is estimated – at standard performance. These estimated basic minutes are totalled to give a total job time, in basic minutes. An allowance for relaxation and any necessary contingency is then made, as in conventional time study, to give the standard time.

**7. Comparative estimating**

This technique has been developed to permit speedy and reliable assessment of the duration of variable and infrequent jobs, by estimating them within chosen time bands. Limits are set within which the job under consideration will fall, rather than in terms of precise capital standard or capital allowed minute values. It is applied by comparing the job to be estimated with jobs of similar work content, and using these similar jobs as "bench marks" to locate the new job in its relevant time.

**Q3. What is importance of facility location and factors affecting the same?**

Facility Location is the right location for the manufacturing facility, it will have sufficient access to the customers, workers, transportation, etc. For commercial success, and competitive advantage following are the critical factors:

Overall objective of an organization is to satisfy and delight customers with its product and services. Therefore, for an organization it becomes important to have strategy formulated around its manufacturing unit. A manufacturing unit is the place where all inputs such as raw material, equipment, skilled labors, etc. come together and manufacture products for customers. One of the most critical factors determining the success of the manufacturing unit is the location.

Facility location determination is a business critical strategic decision. There are several factors, which determine the location of facility among them competition, cost and corresponding associated effects. Facility location is a scientific process utilizing various techniques.

**Location Selection Factors**

For a company which operates in a global environment; cost, available infrastructure, labor skill, government policies and environment are very important factors. A right location provides adequate access to customers, skilled labors, transportation, etc. A right location ensures success of the organization in current global competitive environment.

**Industrialization**

A geographic area becomes a focal point for various facility locations based on many factors, parameters and issues. These factors are can be divided into primary factors and secondary factors. A primary factor which leads to industrialization of a particular area for particular manufacturing of products is material, labor and presence of similar manufacturing facilities. Secondary factors are available of credit finance, communication infrastructure and insurance.

**Errors in Location Selection**

Facility location is critical for business continuity and success of the organization. So it is important to avoid mistakes while making selection for a location. Errors in selection can be divided into two broad categories behavioral and non-behavioral. Behavioral errors are decision made by executives of the company where personal factors are considered before success of location, for example, movement of personal establishment from hometown to new location facility. Non-behavioral errors include lack of proper investigative practice and analysis, ignoring critical factors and characteristics of the industry.

**Location Strategy**

The goal of an organization is customer delight for that it needs access to the customers at minimum possible cost. This is achieved by developing location strategy. Location strategy helps the company in determining product offering, market, demand forecast in different markets, best location to access customers and best manufacturing and service location.

**Factors Influencing Facility Location**

If the organization can configure the right location for the manufacturing facility, it will have sufficient access to the customers, workers, transportation, etc. For commercial success, and competitive advantage following are the critical factors:

Customer Proximity: Facility locations are selected closer to the customer as to reduce transportation cost and decrease time in reaching the customer.

Business Area: Presence of other similar manufacturing units around makes business area conducive for facility establishment.

Availability of Skill Labor: Education, experience and skill of available labor are another important, which determines facility location.

Free Trade Zone/Agreement: Free-trade zones promote the establishment of manufacturing facility by providing incentives in custom duties and levies. On another hand free trade agreement is among countries providing an incentive to establish business, in particular, country.

Suppliers: Continuous and quality supply of the raw materials is another critical factor in determining the location of manufacturing facility.

Environmental Policy: In current globalized world pollution, control is very important, therefore understanding of environmental policy for the facility location is another critical factor.

**Q4. Explain six sigma quality process.**

Six Sigma (6σ) is a set of techniques and tools for process improvement. It was introduced by engineer Bill Smith while working at Motorola in 1986.[1][2] Jack Welch made it central to his business strategy at General Electric in 1995.

It seeks to improve the quality of the output of a process by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. It uses a set of quality management methods, mainly empirical, statistical methods, and creates a special infrastructure of people within the organization who are experts in these methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has specific value targets, for example: reduce process cycle time, reduce pollution, reduce costs, increase customer satisfaction, and increase profits.

The term Six Sigma (capitalized because it was written that way when registered as a Motorola trademark on December 28, 1993) originated from terminology associated with statistical modeling of manufacturing processes. The maturity of a manufacturing process can be described by a sigma rating indicating its yield or the percentage of defect-free products it creates. A six sigma process is one in which 99.99966% of all opportunities to produce some feature of a part are statistically expected to be free of defects (3.4 defective features per million opportunities). Motorola set a goal of "six sigma" for all of its manufacturing operations, and this goal became a by-word for the management and engineering practices used to achieve it.

**Six Sigma doctrine asserts:**

Continuous efforts to achieve stable and predictable process results (e.g. by reducing process variation) are of vital importance to business success.

Manufacturing and business processes have characteristics that can be defined, measured, analyzed, improved, and controlled.

Achieving sustained quality improvement requires commitment from the entire organization, particularly from top-level management.

Features that set Six Sigma apart from previous quality-improvement initiatives include:

A clear focus on achieving measurable and quantifiable financial returns from any Six Sigma project.

An increased emphasis on strong and passionate management leadership and support.

A clear commitment to making decisions on the basis of verifiable data and statistical methods, rather than assumptions and guesswork.

The term "six sigma" comes from statistics and is used in statistical quality control, which evaluates process capability. Originally, it referred to the ability of manufacturing processes to produce a very high proportion of output within specification. Processes that operate with "six sigma quality" over the short term are assumed to produce long-term defect levels below 3.4 defects per million opportunities (DPMO). The 3.4 dpmo is based on a "shift" of +/- 1.5 sigma created by the psychologist DrMikel Harry. He created this figure based on the tolerance in the height of a stack of discs.[3][4] Six Sigma's implicit goal is to improve all processes, but not to the 3.4 DPMO level necessarily. Organizations need to determine an appropriate sigma level for each of their most important processes and strive to achieve these. As a result of this goal, it is incumbent on management of the organization to prioritize areas of improvement.

"Six Sigma" was registered June 11, 1991 as U.S. Service Mark 1,647,704. In 2005 Motorola attributed over US$17 billion in savings to Six Sigma.

Other early adopters of Six Sigma include Honeywell and General Electric, where Jack Welch introduced the method.[6] By the late 1990s, about two-thirds of the Fortune 500 organizations had begun Six Sigma initiatives with the aim of reducing costs and improving quality.

In recent years, some practitioners have combined Six Sigma ideas with lean manufacturing to create a methodology named Lean Six Sigma. The Lean Six Sigma methodology views lean manufacturing, which addresses process flow and waste issues, and Six Sigma, with its focus on variation and design, as complementary disciplines aimed at promoting "business and operational excellence".Companies such as GE,[9] Accenture, Verizon, GENPACT, and IBM use Lean Six Sigma to focus transformation efforts not just on efficiency but also on growth. It serves as a foundation for innovation throughout the organization, from manufacturing and software development to sales and service delivery functions.

The International Organization for Standardization (ISO) has published in 2011 the first standard "ISO 13053:2011" defining a Six Sigma process.[10] Other "standards" are created mostly by universities or companies that have so-called first-party certification programs for Six Sigma.

**“SECTION A”**

**Case study**

A person borrows 100 shares of stock AXE which is selling for $50 and sell short thereby receiving $5000. He take $4750 and purchases 125 shares of stock BYF. By investing the remaining $250 in risk free bonds at 4 percent. This transaction will not require us to put up any funds ofour own. The short sale will be sufficient to fund the investment in BYF and leave money to invest in risk free bonds.

Calculate the arbitraging profitability or loss?

**Ans.**

If the top outcome occurs, sell the 125 shares of BYF for 125 x $60 = $7500.

This amount is sufficient to buy back 100 shares of $250 x 1.04 = $260.

If the bottom outcome occurs,sell 125 shares of BYF for 125 x $32= $ 4000 enough money to buy back 100 shares of AXE which is selling for $ 40. Again we will have risk free bonds worth $260. Regardless of the outcome we end up with $260 .

By putting up no money of our own and ended up with a sure $260. It should be apparent that this is an extremely attractive transaction,so everyone would do it.