TOPIC NAME:

Meaning and Definition of Operations Research:

It is the method of analysis by which management receives aid for their decisions. Though the name of this method, Operations Research (O.R.) is relatively new, but the method used for this is not a new one. Operation Research is concerned with the application of the principles and the methods of science to the problems of strategy.

The subject of operations research was born during Second World War in United Kingdom and was used for military strategy. During World War II, a group of scientists, having representatives from mathematics, statistics, physical and social sciences were entrusted to the study of various military operations. This team was very successful and greatly contributed to the meticulous handling of entire operation and related problems of the operation.

After the World War II, it was started applying in the fields of industry, trade, agriculture, planning and various other fields of economy.

Definition:

Though there are various definitions of Operations Research which maybe differ as per the perspective of each researcher, I would like to define as an application of modern methods of mathematical science to complex problems involving management of large systems of men, machines, materials, and money in industry, business, government and defense. The distinctive approach is to develop a scientific model of the system incorporating measurement of factors such as chance and risk, to predict and compare the outcome of alternative decisions, strategies or controls.

It can also be defined as the application of the scientific methods by scientists and subject specialists to the study of the given operation. Its

purpose is to give administration, a basis for predicting quantitatively the most effective results of an operation under given set of variable conditions and thereby to provide a sound basis for decision-making.

In fact, in Operations Research, research techniques and scientific methods are employed for the analysis and for studying the current or future problems. Thus, Operation Research offers alternative plans for a problem to the management for decisions.

Some of the problems which can be analysed by operations research are given hereunder:

1. Finance, Budgeting and Investment:

i. Cash flow analysis, long range capital requirement, investment portfolios, dividend policies,

ii. Claim procedure, and

iii. Credit policies.

2. Marketing:

i. Product selection, competitive actions,

ii. Number of salesmen, frequencies of calling on, and

iii. Advertising strategies with respect to cost and time.

3. Purchasing:

i. Buying policies, varying prices,

ii. Determination of quantities and timing of purchases,

iii. Bidding policies,

iv. Replacement policies, and

v. Exploitation of new material resources.

4. Production Management:

i. Physical distribution: Location and size of warehouses, distribution centres and retail outlets, distribution policies.

ii. Facilities Planning: Number and location of factories, warehouses etc. Loading and unloading facilities.

iii. Manufacturing: Production scheduling and sequencing stabilisation of production, employment, layoffs, and optimum product mix.

iv. Maintenance policies, crew size.

v. Project scheduling and allocation of resources.

5. Personnel Management:

i. Mixes of age and skills,

ii. Recruiting policies, and

iii. Job assignments.

6. Research and Development:

i. Areas of concentration for R&D.

ii. Reliability and alternate decisions.

iii. Determination of time-cost trade off and control of development projects.

7. Environment Management

i. Water Management.

ii. Controlling Air Pollution.

8. OR in Healthcare.

OR has vast implications in healthcare sector and slowly gaining traction. Listing down a few

i. Cancer cells screening.

ii. Hospitals managing ambulance and many more

9. Transportation and Logistics

i. Vehicle Routing.

ii. Fleet Management.

Methodology of Operations Research:

Operation Research, is a scientific approach for decision-making, and therefore must follow following steps:

1. Formulating the Problem:

The problem must be first clearly defined. It is common to start the O.R. study with tentative formulation of the problem, which is reformulated over and again during the study. The study must also consider economical aspects.

While formulating the O.R. study, analysts must analyse following major components:

(i) The environment:

Environment involves physical, social and economic factors which are likely to affect the problem under consideration. O.R. team or analysts must study the organisation contents including men, materials, machines, suppliers, consumers, competitors, the government and the public.

(ii) Decision-makers:

Operation analyst must study the decision-maker and his relationship to the problem at hand.

(iii) Objectives:

Considering the problem as whole, objectives should be defined. Objectives means the overall outcome of the formulation that is being expected.

2. Deriving Solution:

Models are used to determine the solution either by simulation or by mathematical analysis. Mathematical analysis for deriving optimum solution includes analytical or numerical procedure and uses various branches of mathematics.

3. Testing the Model and Solution:

A properly formulated and correctly manipulated model is useful in predicting the effect of changes in control variables on the overall system effectiveness. The validity of the solution is checked by comparing the results with those obtained without using the model.

4. Establishing Controls over the Solution:

The solution derived from a model remains effective so long as the uncontrolled variables retain their values and the relationship. The solution goes out of control, if the values of one or more variables vary or relationship between them undergoes a change. In such circumstances the models need to be modified to take the changes into account.

5. Implementing the Solution:

Solution so obtained should be translated into operating procedure to make it easily understandable and applied by the concerned persons. After applying the solution to the system, O.R. group must study the response of the system to the changes made.

Characteristics of a Good Model:

i. Assumptions should be simple and few.

ii. Variables should be as less as possible.

iii. It should be able to assimilate the system environmental changes without change in its framework.

iv. It should be easy to construct.