* Methodology of O.R

The systematic methodology developed for an O.R. study deals with problems involving conflicting multiple objectives, policies & alternatives.

O.R. in the final analysis is a scientific methodology which is applied to the study of the operations of large complex organisations or activities with a view to assessing the overall implications of various alternative courses of action, thus providing an improved basis for managerial decisions.

→ The O.R. approach to problem solving consists of the following 7 steps.

1. Formulation of the problem
2. construction of a mathematical model
3. obtaining the Input-data
4. Deriving the solution from the model
5. validity of the model
6. Establishing control over the solution
7. Implementation of the final results.

1 Formulate the problem.

The first step in O.R. is to develop a clear and simple statement of the problem that is to identify the problem correctly.

It is very essential that the problem at hand be clearly defined.

It is almost impossible to get the 'right' answer from a 'wrong' problem.

once the problem is rightly define we can say that 50% of the problem is solve

After identification, formulation of the problem is to be carried out

→ Formulating a problem for OR study, analysis must be made of the 4 major components:

a) the environments

b) the decision maker

c) the objectives,

d) alternative courses of action & constraints

After identifying the components of the problem the relationship that exist among the components of problem should be analyse

→ out of 4 components,

1 environment is most comprehensive since it embraces & provides a setting for the other three (3)

* → In general environment, is the framework within which a system or organised activity is directed to attain the prescribed objectives or goals.

2. Decision - maker
Is the second component of the problem

Decision - maker or research consumer or system operator is the person who is in actual control of the operations (system) under study

3. Objectives :-
Is the third component of the problem to which analysis must be made

objectives should be defined by taking into account the system (problem) as a whole

4. Alternative course of action and constraints Are the final components of the problem.

The research problem is to determine which alternative course of action is most effective to achieve a certain set of objectives

2. Construction of Mathematical Model

After formulating the problem, the next step is to construct a model for the system under study

In O.R. study, it is usually a mathematical model.

OR

The next step is to build suitable mathematical model.

→ A mathematical model consists of a set of equations which describe the system or problem.

→ These equations represent:

(i) The effectiveness function or objective function

(ii) constraints.

(iii) Decision variable

(i) The effectiveness fun or objective fun is a mathematical expression of the objectives

i.e. mathematical expression of the cost or profit of the operation.

(ii) Constraints :- or restrictions are mathematical expressions of the limitations on the fullfillment of the objectives.

⇒ The objective function & constraints are functions of 2 types of variables.

(a) controllable (also called decision) variables

(b) uncontrollable variables.

(a) controllable

→ The variable i.e. directly under the control of the operations analyst is called controllable variable.

→ The values of these variables are to be determined from the solution of the problem

exi- Inventory control problem

(b) uncontrollable variables

A variable i.e. a function of the external environment and over which the operations analyst has no control, is called uncontrollable variable or state of nature

For exi:- in transportation problems, the per unit transportation cost is an uncontrollable variable.

3. Obtaining the Input data.

Once the mathematical model of the problem has been formulated,

the next step is to obtain the data to be use in the model as input.

since the quality of data determines the quality of output, the importance of obtaining accurate and complete data cannot be over emphasized.

4. Deriving the solution from the model:-

Having collected the input data, the next step is to determine the values of decision variables that optimize the given objective function

This deals with mathematical calculations from obtaining the solution to the model

It may be noted that the solution can be categorized as,

(a) feasible or infeasible

A solution that satisfy all the constraint of the problem including the condition of non-negativity is klas feasible solution

while infeasible solution is one that does not satisfy the condition of non-negativity of variable

(b) optimum solution:-

An optimum solution to the problem is one of the feasible solution which also optimizes the objective function.

The feasible solution other than the optimum solution are called non-optimal solution.

(c) Unique solution:-

If there exist only one optimum solution to the problem, it is said to be unique optimum solution.

5. ~~Validity of the model.~~

on the other hand two or more optimum solutions to the problem exist.

Then such problem are called multiple optimum solution.

5. Validity of the model:

Validating a model requires to determine as if the model can reliably predict the actual systems performance.

It also includes testing the structural assumptions of the model for their validity.

A common approach for testing the validity of the model is to compare its performance with past data available for the actual system

6. Establishing control over the solution.

After testing the model and its solution the next step of the study is to establish control over the solution by proper feedback of the information on variables which deviated significantly.

(7) Implementation of the final Result

Finally the tested results of the model are implemented to work. this would basically involved a careful explanation of the solution to be adopted and its relationship with the operating realities.