

Introduction to Operations research:

Definition and History:

Operation Research : “The field of science studying man machine systems in order to describe ,understand and predict the systems behavior.”

OR involves the following aspects:

Data gathering , modeling ,Simulation and decision support

Started in 1930's

Has origins in world war 1(convoy theory and Lanchester Laws)

In modern era research began in studying in inventory management in early 20th century(Ford w.Harris)

Stages of developing OR models:

Step1:

Observe the problem environment(Get sufficient information and support to proceed.)

Step2:

Analyzing and defining the problem.(clear grasp of need for and nature of solution requested)

Step3:

Develop the required OR model(model that works under the stated environmental constraints)

Step4:

Select the appropriate input data(Sufficient inputs to operate and test model)

Step 5:

Provide a tested feasible solution (Solutions should support current organizational goals)

Step6:

Implement the final solution(enforce the adoption of solution into daily routine)

Applications of OR:

Examples:

Facilities planning like Transportation loading and unloading

Manufacturing like production scheduling

Marketing like production introduction timing

Finance like portfolio analysis and dividend policy making

Human resources like personnel planning

Challenges in OR:

Lack of synchronization between different teams

Required high end systems

Dynamic industries face difficulty in setting up OR pipelines(dynamic is data is changing freq)

Mathematical formulation is not always possible.

Linear optimization:

Decision variable:

A decision variable is the quantity that the decision maker controls in order to optimize the objective function.

Constraints:

The constraints are the restrictions or limitations on the decision variables. They usually limit the value of the decision variables.

Non negativity restriction:

For all linear programs, the decision variables should always take non negative values for decision variables should be greater than or equal to 0.

Sensitivity analysis:

When a scenario changes, decision variables will change and hence optimal solution changes.