

INTRODUCTION
TO
OPERATIONS RESEARCH

Operations Research??

Operations Research: (OR) is a science which deals with problem, formulation, solutions and finally appropriate decision making. It is a branch of applied mathematics that uses techniques and statistics to arrive at optimal solutions to solve complex problems

- OR is typically concerned with determining the maximum profit, sale, output, crops yield and efficiency. And minimum losses, risks, cost, and time of some objective function
- It uses mathematical models, statistics and algorithm to aid in decision-making
- It is often used to analyze complex real life problems with the goal to optimize performance
- Example: Allocation of limited resources to various activities

History of Operations Research

- OR came into existence as a subject during World War-II to manage scarce military resources in UK
- The name (operations research) derived because of the team working on research in military operations
- After successful application in UK military it was adopted by US military to optimize their resources
- Later on OR application extended to the industrial sector for taking decision on profit maximization and cost minimization
- The first mathematical technique used for profit/cost (max/min) is Linear Programming/simplex method in 1947

Features of Operations Research

- Decision-Making
- Scientific Approach
- Inter-Disciplinary Team Approach
- Objective-oriented Approach

Decision-Making

- Every industrial organisation faces multifacet problems to identify best possible solution to their problems.
- OR aims to help the executives to obtain optimal solution with the use of OR techniques.
- It also helps the decision maker to improve his creative and judicious capabilities, analyse and understand the problem situation leading to better control, better co-ordination, and finally better decisions.

Scientific Approach

- OR applies scientific methods, techniques and tools for the purpose of analysis and solution of the complex problems.
- In this approach there is no place for guesswork and the person bias as decision maker.

Inter-disciplinary team approach

- Basically the industrial problems are of complex nature and therefore require a team effort to handle it.
- This team comprises of scientist, mathematician and technocrats. Who jointly use the OR tools to obtain a optimal solution of the problem.
- They tries to analyse the cause and effect relationship between various parameters of the problem and evaluates the outcome of various alternative strategies.

Objective-oriented Approach

- Operations research always try to find the best and optimal solution to the problem.
- For this purpose objectives of the organisation are defined and analysed.
- These objectives are then used as the basis to compare the alternative courses of action.

Phases of OR study

Steps required for the analysis of a problem under OR are as follows:

- i. Observe the problem environment
- ii. Analyse and define the problem
- iii. Develop a mathematical model
- iv. Selection of data input
- v. Solution and testing
- vi. Implementation of the solution

Scope of Operations Research

Some of the areas where OR techniques are applied :

- Finance-Budgeting and investment
- Purchasing and Procurement
- Production Management
- Marketing
- Personnel Management
- Research and Development

OR Models in practice

- Allocation models
- Inventory models
- Waiting line models
- Competitive (Game theory) models
- Network models
- Sequencing models
- Dynamic programming models
- Markov-chain models
- Simulation models
- Decision analysis models