* **Name:**
* **Department:**
* **Matric No:**
* **Level:**
* **School:**

**OPERATION RESEARCH**

**MAT417**

**Essay Contents:**

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2. **Definition of Operation Research**
3. **Characteristics of Operation Research**
4. **Scope of Operation Research**
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**Introduction to Operation Research:**

Now-a- days life is becoming more and more complex. One has to take certain decision for himself and for others. A student has to decide which course he should take for study. A person seeking employment has to decide which job he should choose for service.

Therefore, one has to develop his talent in such a way that he is in a position to take a correct decision at a proper time. An effective decision depends on many factors which may be economic, social & political.

Therefore, understanding of the possible use of scientific approach in decision-making is of great importance to the business students. Operation research provides a quantitative technique or a scientific approach to the executives for making better decisions for operation under their control.

**Some of the factors which are responsible for this development are:**

(1) Decision problems of modern management are so complex that only a systematic and scientifically based analysis can yield realistic solutions.

(2) Availability of different types of quantitative models for solving these complex managerial problems.

(3) Availability of high-speed computers has made it possible both in terms of time and cost to apply quantitative models to all real-life problems in all types of organisations such as business and industry.

**Definition of Operation Research:**

Operations research, rather simply defined, is the research of operations. An operation may be called a set of acts required for the achievement of a desired outcome.

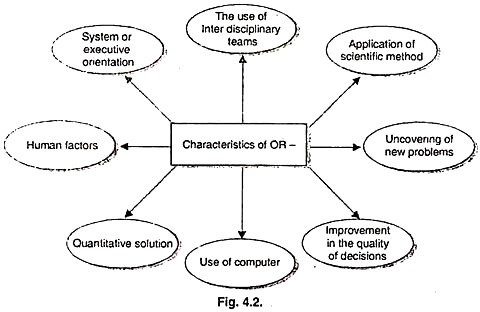
According to Morse and Kimball, “OR is a scientific method of providing executive department with a quantitative basis for decisions regarding the operations under their control.”

**According to churchman, Ackoff and Arnoff:**

“OR in the most general sense, can be characterised as the application of scientific methods, tools and techniques to problems involving the operations of systems so as to provide those in control of the operations with optimum solutions to the problems.”

**Characteristics of Operation Research:**

**The essential characteristics of operation research are:**

**[](https://www.engineeringenotes.com/wp-content/uploads/2017/03/clip_image004-49.jpg)**

**Scope of Operations Research:**

By the definition of OR, it is clearly understood the scope of Operation Research whenever there is a problem for optimization, there is scope for the application of OR.

**Some of the areas of Management where techniques of OR are applied are listed below:**

#### i. Finance, Budgeting and Investments:

(a) Cash flow analysis, investment portfolios.

(b) Credit policies, credit risks.

(c) Claim and complaint procedures.

#### ii. Purchasing, Procurement and Explorations:

(a) Determining the quantity and timing of purchase of raw material.

(b) Bidding policies.

(c) Equipment replacement policies.

#### iii. Production Management:

(a) Project planning.

(b) Manufacturing and facility planning.

#### iv. Marketing Management:

(a) Product selection, timing & competitive action.

(b) Advertising strategy.

(c) Effectiveness of market research.

#### v. Personnel Management:

(a) Recruitment policies and assignment of jobs.

(b) Selection of suitable personnel.

(c) Establishing equitable bonus systems.

#### vi. Research and Development:

(a) Determination areas of concentration of research and development.

(b) Reliability and evaluation of attractive design.

(c) Control of development Project.

**Models in Operation Research:**

A model, as used in operation research, is defined as an idealized representation of the real life situation it represents one or a few aspects of reality. Diverse items such as a map, a multiple activity chart, an autobiography, PERT network, break even equation, balance sheet etc. are all models because each one of them represents a few aspects of the real-life situation. The objective of the model is to provide a means for analyzing the behaviour of the system for the purpose of improving its performance.

#### Classification of Operation Research Models:

**The various schemes by which models can be classified are given below:**

**i. By degree of Abstraction:**

Mathematical models are the most abstract type since it requires not only mathematical knowledge but also great concentration to get the idea of the real-life situation they represent. Language models are also abstract type like cricket or hockey match commentary and concrete models (model of earth, dam) are the least abstract since they instantaneously suggest the shape.

**ii. By function:**

Descriptive models explain the various operations in non-mathematical language and try to define the functional relationships and interactions between various operations. The organizational chart, pie diagram and layout plan describes the features of their respective system. Predictive models explains or predict the behaviour of the system. Normative models develop decision rules or criteria for optimal solutions.

**iii. By structure:**

**(a) Iconic or Physical Models:**

In iconic or physical models, properties of the real system are represented by the properties themselves frequently with a change of scale. Thus, iconic, models resemble the system they represent but differ in-size; they are images.

**(b) Analogue or Schematic Models:**

Analogue models can represent dynamic situations and are used more often than iconic models since they are analogous to the characteristics of the system under study. They use one set of properties to represent some other set of properties which the system under study possesses.

**(c) Symbolic or Mathematical Models:**

Symbolic models employ a set of mathematical symbols to represent the decision variables of the system under study. These variables are related together by mathematical equation/ in equation, which describe the properties of the system. In many research projects, all the three types of models are used in sequence; iconic and analogue models are used as initial approximations, which are, then refined into symbolic model.

**iv. By Nature of the Environment:**

**Deterministic Models:**

In deterministic models variables are completely defined and the outcomes are certain. Certainty is the state of nature assumed in these models. They represent completely closed systems and the results are single valued.

**Probabilistic Models:**

They are the product of an environment of risk and uncertainty. The input and/or output variables take the form of probability distributions. They are semi-closed models and represent the likelihood of occurrence of an event.

**v. By the Extent of Generality:**

**(a) General Models:**

Linear programming model is known as a general model since it can be used for all the functions of an organisation.

**(b) Specific Models:**

Sales response curve or equation as a function of advertising is applicable in the marketing function alone.

**vi. By the time Horizon:**

**(a) Static Models:**

They are one-time decision models. In these models cause and effect occur almost simultaneously and time lag between the two is zero. They are easier to formulate, manipulate and solve.

**(b) Dynamic Models:**

They are the models for situations in which time often play an important role. They are used for optimization of multistage decision problems which require a series of decisions with the outcome of each depending upon the results of the previous decisions in the series.

#### Characteristics of a Good Model:

(1) The number of simplifying assumptions should be as few as possible.

(2) The number of relevant variables should be as few as possible. This means model should be simple yet close to reality.

(3) It should assimilate the system environmental changes without change in its framework.

(4) It should be adaptable to parametric type of treatment.

(5) It should be easy and economical to construct.

#### Advantages of a Model:

(1) It provides a logical and systematic approach to the problem.

(2) It indicates the scope as well as limitations of a problem.

(3) It helps in finding avenues for new research and improvements in a system.

(4) It makes the overall structure of the problem more comprehensive and helps in dealing with the problem in its entirely.

#### Limitations of a Model:

(1) Models are only idealized representation of reality and not be regarded as absolute in any case.

(2) The validity of a model for a particular situation can be ascertained only by conducting experiments on it.

**Role of Computer in Operation Research:**

Recent developments in the field of computer technology have enabled Operations Research to integrate their models into information systems and thus make O.R. a part of decision – making procedures of many organisations.

Use of a digital computer has become an integral part of the O.R approach in decision making. The computer may be required due to the complexity of the model, volume of data required or the computations to be made. In other words, computer in today’s scenarios has become an indispensable tool for solving Operations Research problems. Many O.R. techniques are available today in the form of ‘canned’-programmes.

**The Role of computers in solving current as well as future problems can be explained with the help of following examples:**

(1) Most of linear programming models involve 200 to 300 decision variable with 10 to 200 constraints. It is believed that most of the business problems particularly the blending problems of oil refineries will result on LP model with 4000 to 5000 variables and 3000 to 3500 constraints.

(2) It is difficult to solve manually PERT/CPM models for scheduling problems when hundreds of activities are involved. The software package CPM can handle hundreds of activities with several types of resources. It determines a schedule indicating the earliest start and finish times, the latest start and finish time and the critical activities in a project network.

**The programme capabilities include the following:**

(a) Computation of calendar dates,

(b) Handling multiple start and event,

(c) Accepting user schedule dates for some events of the project,

(d) Summarizing and controlling project costs by resource type, and

(e) Generating outputs in tabular and graphical form.