Operation Research and Its Scope
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Abstract: Operations Research (O.R.) from the perspective of an industrial engineer. The focus of the chapter is on the basic philosophy behind O.R. and the so-called "O.R. approach" to solving design and operational problems that industrial engineers commonly encounter. In its most basic form, O.R. may be viewed as a scientific approach to solving problems; it abstracts the essential elements of the problem into a model, which is then analyzed to yield an optimal solution for implementation.

Keywords: Phases in Operation Research Study, Scope, Characteristics, Methodology, Models

I. INTRODUCTION
It is the method of analysis by which management receives aid for their decisions. Though the name of this method, Operation 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 operation research was born during Second World War in U.K., 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.

I. PHASES
Formulate the problem: This is the most important process, it is generally lengthy and time consuming. The activities that constitute this step are visits, observations, research, etc.
Solution of the model: After selecting the appropriate data input, the next step is to find a solution. If the model is not behaving properly, then updating and modification is considered at this stage.
(i) Judgment Phase: Determination of operation, Determination of objectives.

II. SCOPE
On the other hand, with the explosion of population and consequent shortage of food, every country is facing the problem of optimum allocation of land for various crops in accordance with climatic conditions and available facilities. In the field of Industrial Engineering, there is a claim of problems, starting from the pro-curement of material to the despatch of finished products. Management is always interested in optimizing profits.

III. CHARACTERISTICS
(i) Inter-Disciplinary Team Approach:
This requires an inter-disciplinary team includ­ing individuals with skills in mathematics, statistics, economics, engineering, mate­rial sciences, computer etc.
(ii) Wholistic Approach to the System:
While evaluating any decision, the important interactions and their impact on the whole organisation against the functions originally involved are reviewed.
(iii) Methodological Approach:
O.R. utilises the scientific method to solve the problem
(iv) Objective Approach:
O.R. attempts to find the best or optimal solution to the problem under consideration, taking into account the goals of the organisation.

IV. METHODOLOGY
The general form of a mathematical model is:
\[ O = f (x_i, y_i) \]
where \( O \) = Objective function
\( x_i \) = Controllable variables
\( y_i \) = Uncontrollable variables
\( f \) = Relationship between \( O \) and \( x_i, y_i \).
Since model is only an approximation of the real situation, hence it may not include all the variables.

V. MODELS
To do operations research, you need to grasp math and computers. These tools create models that describe or show a scenario, such as production output or the flow of customers at a fast-food restaurant. The core of a model is the objective function -- a goal such as reducing customer wait times or optimizing production. Variables, or inputs, feed the models. For example, the optimal output for cough medicine may depend on the amounts of various ingredients, container sizes and temperatures applied to the ingredients. A model for speedy service of customers depends on the time of day -- breakfast and lunch may be peak times for fast-food restaurants, for example -- and the number of registers and workers to run them and the kitchen.

2. RESULT
• Routing, such as determining the routes of buses so that as few buses are needed as possible.
• Supply chain management: managing the flow of raw materials and products based on uncertain demand for the finished products.
• Project production activities: managing the flow of work activities in a capital project in response to system variability through operations research tools for variability reduction and buffer allocation using a combination of allocation of capacity, inventory and time.
• Efficient messaging and customer response tactics.
• Automation: automating or integrating robotic systems in human-driven operations processes.
• Globalization: globalizing operations processes in order to take advantage of cheaper materials, labor, land or other productivity inputs.

3. CONCLUSION AND DISCUSSION

I believe that although there is a core of common concepts and tools between O.R. practice in the First and Third Worlds, O.R. must take a different shape to enable it to make a substantial impact in development management especially in the rural sector.

In this lecture I have tried to suggest key directions of change that will be necessary:
1. Recognition and reduction of dependency relationships with the First World in the case of managers, researchers and teachers,
2. Wide and deep integration with computers and I.T., and
3. Willingness to deploy softer, participative and user-driven methodologies such as “soft” systems, decision support systems and expert systems.

The situation is similar to the Hindu tradition of God where His incarnation comes to earth to restore righteousness whenever the forces of evil become rampant. Each time He is the same in essence but His form is adapted to the need of the hour. For example one of his incarnations was as Narsimha, half-man half-lion, because only in that shape could he destroy an evil king who had been promised the boon that he could not be killed by man nor could he be killed by beast.

4. REFERENCES


