



## Decision Making with Operations Research in Global Business

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### Abstract

The Operations Research is one of the employing technique used very much for make better decisions in the global business. Research has shown that majority of managers in global business organizations use of operations research techniques. The objective of this paper is to discuss the principles and ideas of Operations Research which are very helpful in a dynamic, complex and competitive business environment. To achieve the aim of the paper, this paper examines the nature of Operations Research, the Operations Research techniques available for managers and the various areas of operation where they can be applied. Therefore, this paper reviews the application of Operations Research to the Global business organizations to take the effective and consistent decision making to achieve business excellence.

**Keywords:** Operations Research; Business Organizations; Managers; Problem solving; Decision making.

### 1. Introduction

Operations research or operational research is a discipline that deals with the application of advanced analytical methods to help make better decisions. Operations Research is one of the popular problem solving and decision-making science. It is a collection of managerial decision making and programmable rules that provide basis for the decision making to managers at all levels of global business. As the global business environment has become very much complex and competitive, Operations Research has gained paramount significance in applications like Lean production, world-class Manufacturing systems(WCM), Six-sigma quality management, Benchmarking, in industry as airlines, service organizations, military branches, and in government, Just-in-time (JIT) inventory techniques. According to (1991) Akingbade et al, it is a problem-solving science-based activity using analysis and modelling as a basis for aiding decision-makers in organizations to improve the performance of the operations under their control. It is dealing with analyzing complex business problems and assisting managers work out the best to solve the problem & achieving objectives. According to Agbadudu, 2006, It can be said to have been in existence since the beginning of mankind. However, the concept actually emerged in 1940 during the time of world war II, when the military management of England and USA called upon the team of scientists to develop the strategies to make the most efficient and consistent use of limited military resources in the war. This paper highlights the significance of operation research, different techniques and its importance in business practices. This paper indicates the importance of OR in finding the optimum solution of critical problems in business organizations. It helps in decision making process in public, private, government and the society. Such a wide usages of operational research models used by the government, industry and academicians would not only contribute to the discipline but also would contribute to enhance the quality of economic production.

## **2. Nature of Operations Research**

Operations Research is a mathematical approach for analyzing business problems and making decisions in organizations. It aims at providing rational bases for decision making by seeking to understand and structure complex situations and to use this understanding to predict system behavior and improve performance. The nature of organization is essentially immaterial. As the name implies, Operations research indicates “research on operation”. Therefore, the nature of Operations Research is to solve the problems by conducting operations (i.e activities) within business organizations. The research part of the name implies that Operations Research use an approach that resembles the way research is carried out in the established business organizations. Thus, the Operations Research involves creative decision making research that is carried out with the operations. In the other words, we can say that the nature of Operations Research to find the best solution (optimal solution) of problem.

## **3. Problem Solving Approach of Operations Research**

There are many different problem solving techniques. Operation research is the one of the innovative problem solving approach Operations research. This step is characterized by research, data analysis, and creative application of the knowledge gained to scope and bound the problem. The major steps of a typical problem solving approach of operations approach are the following:

### **Step I. Identify Problem**

The first step of OR study is to identify the problem and the environment in which the problem exists. The Operations that constitute this step are visits, research, meeting, observations, etc. With the help of such operations, the OR analyst gets sufficient knowledge and support to proceed and is better prepared to formulate the problem.

### **Step II. Define the Problem**

After identifying the problem, the problem is defined with its uses, objectives and limitations of the study that are stressed in the light of the problem. The end results of this step are clear grasp of need for a solution and understanding of its nature.

### **Step III. Model Construction**

The next step in problem approach as to construct the model which is representation the real or abstract situation of the problem. These models are mathematical models based on the operations representing problem, process or environment in form of equations having relationships or formulae. The operations in this step is to defining interrelationships among variables and formulating constraint equations, usely known as OR models or searching suitable alternate models. The hypothetical model must be tested in field and modified in order to need of work under given environmental constraints. A model may also be modified if the organization is not satisfied with the results that it gives.

### **Step IV. Collection of Relevant Data**

It is a well known fact that without authentic and relevant data the results of the formulated models cannot be trusted. Hence, selection of right kind of data is a necessary step in OR problem solving process. The important part off this step is analysis of selected data and facts, collecting opinions from people and using computer data banks. Therefore, the purpose of this step is to have sufficient input data to operate and test the model.

### **Step V. Testing of Solution**

With the help of constructed model and collected data input, the problems is solved and its solution is obtained .This solution can not be implemented immediately and this solution is used to test the model and to find its limitations if any. If the solution is not reasonable or if the model is not behaving properly, updating and modification of the model is considered at this stage. The end result of this step is solution that is desirable and supports current organizational objectives.

### **Step VI. Implementation and Find results**

This is the last step of the problem solving approach of OR study. In OR the decision-making is scientific but implementation of decision involves many behavioral issues. Therefore, organization has to resolve and think upon the behavioral issues related to the workers and supervisors to avoid conflicts in the future. The gap between organization and analyst may offer some resistance but must be eliminated before solution is accepted in totality. Both the parties should play positive role, since the implementation will help the organization as a whole. A

properly implemented solution obtained through OR techniques give the result of the problem in improved working conditions.

#### 4. Operations Research as Innovative Practice

Innovation is paramount element of the any business strategy of survival. Innovation is not managerial, but likewise of societal importance: to fall behind in the international race will result in a long term reduction of national welfare. The international viewpoint of innovation processes is stressed: differences in cultural background or governmental frame work are detrimental to the cost and speed of innovation in organization in comparison to the other business organizations. Remarkably, there is significant role of operations researchers to deal with the problems and make it as innovation. The innovation process will be structured on the basis of competence, commitment and leeway. Many of the researchers had worked many to develop many techniques which can be used as innovative practices in the business environment and motivated to pursue research relevant to the field; important advancements in the state of the art resulted. A prime example is the simplex method for solving linear programming problems. Many of the standard tools of OR, such as linear programming, dynamic programming, queuing theory, and inventory theory, were relatively well developed before the end of the 1950s. The development of electronic digital computers, with their ability to perform arithmetic calculations thousands or even millions of times faster than a human being can, was a tremendous boon to OR. Today, literally millions of individuals have ready access to OR software. Consequently, a whole range of computers from mainframes to laptops now are being routinely used to solve OR problems. The following operations research practices are elaborated which are helpful in the business organizations.

**4.1 Linear Programming.** Linear Programming (LP) is a mathematical technique to achieve the best outcome in a mathematical model whose requirements are represented by linear relationships. In this technique, the problem of assigning a fixed amount of resources to satisfy a number of demands in such a way that some objectives optimized with satisfying defined conditions.

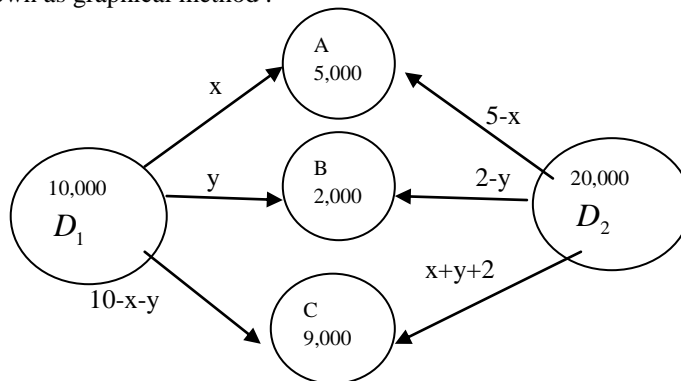
**4.2 Transportation Technique.** The transportation problem is a special type of linear programming problem, such as minimization of cost, maximization of operating efficiency. Therefore, the objective is to minimize the cost of distributing a product from a number of sources to a number of destinations. The physical distribution of product increases the cost. Multi- plant companies with wide range of warehouse are interested in minimizing the transportation cost. The main objective is to minimize the level of distribution of supply point to demand point that is made by organization for every shipment. It is what warehouse should be within exact term of It demand to make clear supply and reduce down the overall cost of physical distribution. The transportation method for solving the physical distribution or transportation problem is an iterative, like the simple method .We can elaborate this by giving a example. Consider the problem of a Brick Manufacturer who has two depots  $D_1, D_2$  having stocks of 10,000 and 20,000 bricks respectively and he has the orders of 5,000 , 2,000 , 9000 bricks from the three builders A,B,C and cost of transporting the 1000 bricks to builders from depots are taken :

From \ To	A	B	C
$D_1$	40	20	30
$D_2$	20	60	40

Problem is how manufacturer fulfill the orders such that his transportation cost is Minimum. Thus this problem is infact a transportation problem whose cost matrix is given as :

From\ To	A	B	C	Availability
$D_1$	40	20	30	10,000
$D_2$	20	60	40	20,000
Required	5,000	2,000	9,000	

It can be solve by Modi U-Vmethod for the transportation problem. But it can also be solve by another method which is known as graphical method .



If  $x, y$  thousand bricks are to be transported from  $D_1$  to A,B then corresponding rest of the bricks will be transported from  $D_2$  to A,B respectively and hence to C . e.g.

$$\begin{aligned} \text{Min } Z &= 40(x) + 20(y) + 30(10 - x - y) + 20(5 - x) + 60(2 - y) + 40(x + y + 2) \\ &= 30x - 30y + 600 \end{aligned}$$

subject to constraints :  $10 - x - y \geq 0$  or  $x + y \leq 10$

$$5 - x \geq 0 \Rightarrow x \leq 5$$

$$2 - y \geq 0 \Rightarrow y \leq 2$$

$$x + y + 2 \geq 0 \Rightarrow x + y \geq -2$$

$$x \geq 0, y \geq 0$$

**4.3 Assignment Problem.** The Hungarian algorithm is one of many algorithms that have been devised that solve the linear assignment problem within time bounded by a polynomial expression of the number of agents. The assignment problem is a special case of the transportation problem which is a special case of the minimum cost flow problem, which in turn is a special case of a linear program. While it is possible to solve any of these problems using the simplex algorithm, each specialization has more efficient algorithms designed to take advantage of its special structure. If the cost function involves quadratic inequalities it is called the quadratic assignment problem

**4.4 Queuing Theory.** This theory is helpful in the situation where queue is formed. There are different types of queue e.g. customer waiting for services, machine waiting for repairmen and aircraft waiting for landing. The objective of a queuing model is to find out the optimum services rate and the number of servers so that the average cost of being in queuing system and the cost of service are minimized. The queuing models are basically relevant to service oriented organizations and suggest ways and means to improve the efficiency of the services. This model can be applied in the field of transportation, daily life (restaurants, doctors clinic), Industries (service of machines) and in the field of business the queuing problem is identified by the presence of a group of customers who arrive randomly to receive some service.

**4.5 Game Theory.** Game theory is the formal study of conflict and cooperation. Game theoretic concepts apply whenever the actions of several agents are interdependent. These agents may be Individuals, groups, firms, or any combination of these. The concepts of game theory provide a language to formulate, structure, analyze, and understand strategic scenarios. It is used for decision making under conflicting situations where there are one or more opponents (i.e., players). In the game theory, we consider two or more persons with different objectives, each of whose actions influence the outcomes of the game.

**4.6 Simulation.** It is a technique that involves setting up a model of real situation and then performing experiments. Simulation is used where it is very risky, cumbersome, or time consuming to conduct real study or experiment to know more about a situation. Therefore, By *simulation* is meant the technique of setting up a stochastic model of a real situation, and then performing sampling experiments upon the model. The feature which distinguishes a simulation from a mere sampling experiment in the classical sense is that of the stochastic model. Whereas a classical sampling experiment in statistics is most often performed directly upon raw data, a simulation entails first of all the construction of an abstract model of the system to be studied.

## 5. Operations Research Model

It is the duty of OR expert to communicate his highly specialized techniques, ideas and concepts into simple operations which can be easily understood by the managers and workers. For better understanding of operation research tools to solve the problem, we have constructed a Operations research model described as:

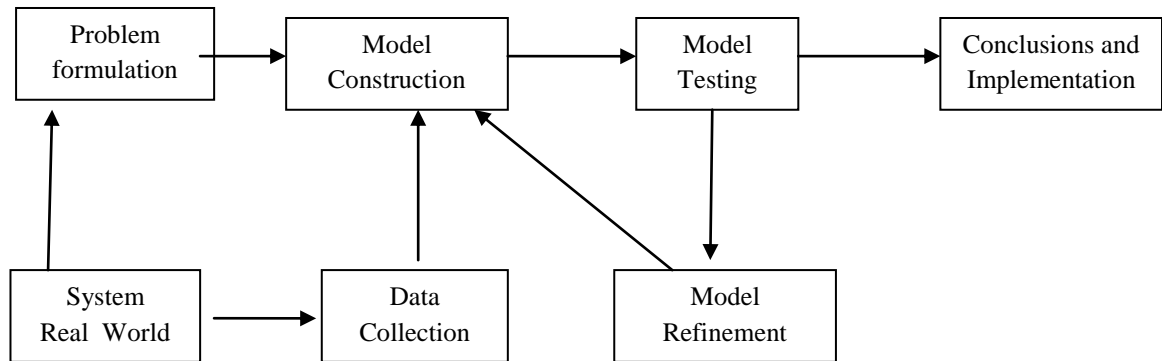


Figure:1 Operations Research Model

## 6. Operation Research applications in business

Using the above practices, the operations research have very importance in different sectors. These are based on the various techniques of the operations researchs.

- Finance, Budgeting and Investment
- Marketing
- Purchasing &Physical Distribution
- Six-sigma quality management
- Anti-money Laundering
- Traffic flow optimization
- Retail planning, Merchandize optimization
- Research and Development
- Supply and chain management
- Inventory planning
- Product mix and blending
- Staff allocation and resource allocation
- Capital Budgeting

## 7. Conclusion

Therefore, Operations research is the mathematical innovative practice of applying advanced analytical methods to help make better decisions in the business organizations. Mathematical programming has been used to solve a considerable range of problems in business organizations - forming portfolios of equities, employee oriented, customer oriented product oriented and production oriented etc. Today's global markets and instant communications mean that customers expect high-quality products and services when they need them, where they need them. Organizations, whether public or private, need to provide these products and services as effectively and efficiently as possible by the OR mathematical tools at all.

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## Authors' Biography



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