International Journal of Advanced Technology in Engineering and Science
Volume No.05, Issue No. 10, October 2017
www.ijates.com
IJATES
ISSN: 2348-7550

Operational research: A Study of Decision making for analysing the complex Business Problem

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Abstract

Multi-criteria decision-making or multi-criteria optimization challenges arise when there are many criteria that are completely or partially incompatible with one another. In the complex environment we live in, a choice must be made. When dealing with a complicated organisational context, making decisions based exclusively on one factor seems insufficient. There is no way to condense the variety of beliefs, motives, and objectives inherent in organisations into a single purpose. Decisions may therefore involve many goals that are in conflict with one another. An individual or a group of people can make decisions.

As a result, decision making is a multi-criteria optimization process. Some decisions are analytical in nature and need the collection of facts. Operational research is simply a decision-making tool that provides managers with the information they need to make sound decisions. Managers utilize quantitative data to make choices and determine which option is best. As a result, it is employed to tackle difficult issues. In operations research, issues are broken down into simple components and then solved mathematically in predetermined phases.

Key words: *Operational Research, Decision-Making Model, Complex problem*

INTRODUCTION

Operations research (OR) is an analytical, logical and systematic method of problem-solving and decision-making that is helpful in the management of organizations. In operations research, problems are broken down into basic components and then solved in defined steps by mathematical analysis.Analytical methods used in OR include mathematical logic, simulation, network analysis, queuing theory and game theory etc.

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 study 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.

Operations research, or operational research in British usage, is a discipline that deals with the application of advanced analytical methods to help make better decisions. It is often considered to be a sub-field of mathematics. The terms management science and decision science are sometimes used as synonyms.

Employing techniques from other mathematical sciences, such as mathematical modeling, statistical analysis, and mathematical optimization, operations research arrives at optimal or near-optimal solutions to complex decision-making problems. Because of its emphasis on human-technology interaction and because of its focus on practical applications, operations research has overlap with other disciplines, notably industrial engineering and operations management, and draws on psychology and organization science. Operations research is often concerned with determining the maximum (of profit, performance, or yield) or minimum (of loss, risk, or cost) of some real-world objective. Originating in military efforts before World War II, its techniques have grown to concern problems in a variety of industries.

LITERATURE &REVIEW

Operational research (OR) in business decision and decision making encompasses a wide range of problem-solving techniques and methods applied in the pursuit of improved decision-making and efficiency, such as simulation, mathematical optimization, queueing theory and other stochastic-process models, Markov decision processes, econometric methods, data envelopment analysis, neural networks, expert systems, decision analysis, and the analytic hierarchy process. Nearly all of these techniques involve the construction of mathematical models that attempt to describe the system. Because of the computational and statistical nature of most of these fields, OR also has strong ties to computer science and analytics. Operational researchers faced with a new problem must determine which of these techniques are most appropriate given the nature of the system, the goals for improvement, and constraints on time and computing power.

The decision making (DM) problem is of great practical value in many areas of human activities. Most widely used DM methods are based on probabilistic approaches. The well-known Bayesian theorem for a conditional probability density function (PDF) is a background for such techniques. It is needed due to some uncertainty in

many parameters entered in any model which describes the functioning of many real systems or objects. Uncertainty in our knowledge might be expressed in an alternative form.

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.

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 of 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 cannot 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.

Importance of Operations Research in Decision-Making

Operations research applies sophisticated statistical analysis and mathematical modeling to solve an array of business and organizational problems, as well as improve decision-making. As the business environment grows more complex, companies and government agencies rely on analysis to inform decisions that were once based largely on management intuition. Originally developed by the U.S. Department of Defense during World War II, operations research has helped many large companies and government agencies make better decisions, boost performance and reduce risk.

Simplifying Complexity

Modern challenges associated with a global economy and the growths of technology have increased the complexity of the business environment. Modern corporations often strive to serve a global, rather than a regional or national, customer base and face worldwide competition. By relying on sophisticated mathematical models and advanced software tools, operations research can assess all available options facing a firm, project possible outcomes and analyze risks associated with particular decisions. The result is more complete information on which management can make decisions and set policy, according to the Institute for Operations Research and the Management Sciences, INFORMS for short, a national organization of operations research professionals.

Maximizing Data

Companies collect large amounts of data but may feel overwhelmed by the volume and lack the time or expertise to fully analyze these data, transforming them into useful information on which to base decisions. Operations research uses advanced mathematical and statistical techniques, such as linear programming and regression analysis, to help organizations make the most of their data, according to INFORMS' Science of Better website. Through detailed analysis of the data, operations research analysts can help uncover options that lead to higher profits, more-efficient operations and less risk.

Adding Value

In its executive guide to operations research, "Seat-of-the-Pants-Less," INFORMS reports that operations research has added value to organizations in the public and private sector. For example, INFORMS reported that UPS used operations research to redesign its overnight delivery network in such a way that saved more than $80 million between 2000 and 2002. Meanwhile, New Haven, Connecticut, used operations research to determine the extent to which the city's needle exchange program reduced HIV infection rates.

CONCLUSION

The decision making (DM) problem is of great practical value in many areas of human activities. Most widely used DM methods are based on probabilistic approaches. The well-known Bayesian theorem for a conditional probability density function (PDF) is a background for such techniques. It is needed due to some uncertainty in many parameters entered in any model which describes the functioning of many real systems or objects. 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.

Lastly, the goal of operations research is to provide a framework for constructing models of decision-making problems, finding the best solutions with respect to a given measure of merit, and implementing the solutions in an attempt to solve the problems. On this page we review the steps of the OR Process that leads from a problem to a solution. The problem is a situation arising in an organization that requires some solution. The decision maker is the individual or group responsible for making decisions regarding the solution. The individual or group called upon to aid the decision maker in the problem solving process is the analyst.

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