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Role Of Operations Research in Business Decision Making

Management

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ABSTRACT

This paper reviews the application of Operations Research to the business organizations to take the effective decisions. To find the reasons for the attractiveness of general business problems to OR researchers, the main type of business decision making problems amenable to OR are identified, and some of the many problems solved by using OR are techniques. While mathematical programming is the most widely applied technique, linear programming, transportation, assignment and simulation methods are increasingly widely used. OR now plays an important role in the operation of business problem solving and this importance is likely to increase, creating the opportunity for OR to play an even greater role. This paper indicates that OR techniques play an important role in business organizations and, with the recent dramatic improvements in the real time availability of data and in computer speed, this role will increase.

Introduction

Since the advent of the industrial revolution, the world has seen a remarkable growth in the size and complexity of business organizations. The artisan's small shops of an earlier era have evolved into the billion-dollar corporations of today. An integral part of this revolutionary change has been a tremendous increase in the division of labor and segmentation of management responsibilities in these organizations. The results have been spectacular.

However, along with its blessings, this increasing specialization has created new problems, problems that are still occurring in many organizations. One problem is a tendency for the many components of an organization to grow into relatively autonomous empires with their own goals and value systems, thereby losing sight of how their activities and objectives mesh with those of the overall organization. What is best for one component frequently is detrimental to another, so the components may end up working at cross purposes. A related problem is that as the complexity and specialization in an organization increase, it becomes more and more difficult to allocate the available resources to the various activities in a way that is most effective for the organization as a whole. These kinds of problems and the need to find a better way to solve them provided the environment for the emergence of operations research.

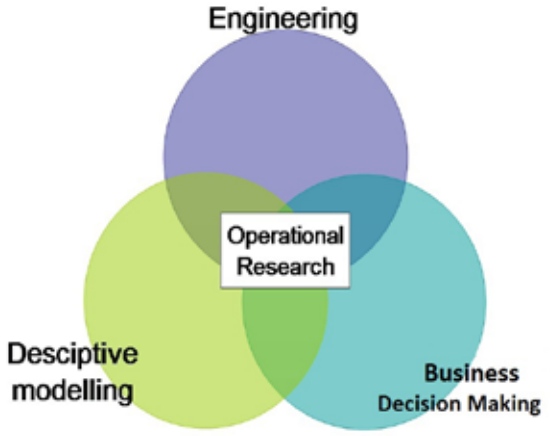

Fig.1: Operations Research Model

The roots of OR can be traced back many decades, when early attempts were made to use a scientific approach in the management of organizations. However, the beginning of the activity called operations research has generally been attributed to the military services early in World War II. Because of the war effort, there was an urgent need to allocate scarce resources to the various military operations and to the activities within each operation in an effective manner. Therefore, the British and then the U.S. military management called upon a large number of scientists to apply a scientific approach to dealing with this and other strategic and tactical problems. In effect, they were asked to do research on (military) operations. These teams of scientists were the first OR teams. By developing effective methods of using the new tool of radar, these teams were instrumental in winning the Air Battle of Britain. Through their research on how to better manage convoy and antisubmarine operations, they also played a major role in winning the Battle of the North Atlantic. Similar efforts assisted the Island Campaign in the Pacific.

OR Applications in Business

Many of the scientists who had participated on OR teams or who had heard about this work were 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.

- **Linear Programming**. Linear Programming (LP) is a mathematical technique of assigning a fixed amount of resources to satisfy a number of demands in such a way that some objective is optimized and other defined conditions are also satisfied.
- **Transportation Problem.** The transportation problem is a special type of linear programming problem, where the objective is to minimize the cost of distributing a product from a number of sources to a number of destinations.
- **Assignment Problem.** Succinctly, when the problem involves the allocation of n different facilities to n different tasks, it is often termed as an assignment problem.
- **Queuing Theory.** The queuing problem is identified by the presence of a group of customers who arrive randomly to receive some service.
- **Game Theory.** 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.
- **Goal Programming.** It is a powerful tool to tackle multiple and incompatible goals of an enterprise.
- **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.
- **Nonlinear Programming.** These methods may be used

when either the objective function or some of the constraints are not linear in nature.

- **Integer Programming.** These methods may be used when one or more of the variables can take only integral values. Examples are the number of trucks in a fleet, the number of generators in a power house, etc.
- **Dynamic Programming.** Dynamic programming is a methodology useful for solving problems that involve taking decisions over several stages in a sequence.
- **Network Scheduling-** PERT and CPM. Network scheduling is a technique used for planning, scheduling and monitoring large projects. Such large projects are very common in the field of construction, maintenance, computer system installation, research and development design, etc.

OR as a Decision Making Approach

Management games and simulations are now a commonly accepted pedagogy in most business schools. Despite their widespread use and acceptance, questions remain as to their effectiveness as teaching instruments. Two particular concerns frequently raised are: 1) the lack of adequate time to make reasonable business decisions between decision-making periods and, 2) the failure of games to draw upon and integrate various concepts and techniques--particularly quantitative techniques--students have learned in business courses. Because games are said to have these two shortcomings, critics charge that students often resort to 'seat-of-the-pants' decision making, thus washing out or abrogating the game's rationale--to help students in using and understanding the interrelatedness of business variables.

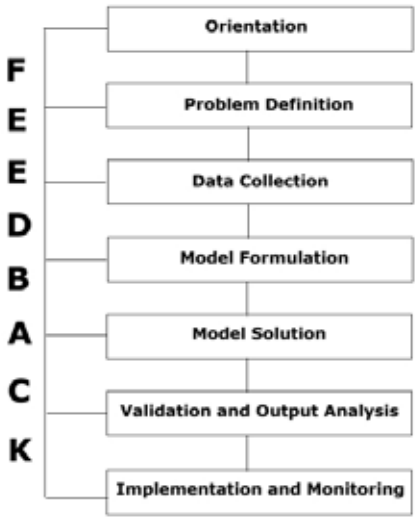

Fig. 2: The Operations Research Approach

This paper addresses some of the major concerns and complaints raised by critics regarding the usefulness and value of management simulations. In particular, this paper describes how appreciation for and integration of business concepts can be enhanced using a variety of Decision Support Systems (DSS) and Operations Research/Management Science (OR/Mg) techniques. Further, it shows how such techniques can also be used to mitigate the time constraints characteristic of most games, and to lessen the degree to which 'seat-of-the-pants' decisions are made.

Before continuing, however, it is necessary to define DSS and OR/MS. DSS refers as much to a point-of-view relative to the role of computers as aids to decision making, as it does to a body of knowledge. DSS tools are particularly appropriate for business games since it is their explicit intention to serve as a set of supportive tools assisting managers in assessing the ramifications of parts or pieces of more complex or semi structured problems. while not totally different, OR/MS techniques focus: 1) on structured problems rather than tasks where the objective, data, and constraints can be pre-specified; and 2) where the payoff is in generating better solutions for given types of problems.

Conclusion

Operations research is the discipline of applying advanced analytical methods to help make better decisions. OR is the use of advanced analytical techniques to improve decision making. Mathematical programming is the OR technique that has been most widely applied in 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 techniques at all.

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