IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Some mathematical Applications of OR/MS in Green marketing

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Abstract

The analysis of the demand for such items seems well removed from the reliance on mathematical models that characterizes much of the work in operations research and management science (OR/MS). In marketing, human factors play a large role, marketing expenditures affect demand and cost simultaneously and information to support truly symmetric decision is rarely available. Further the effects of most Green marketing actions are typically delayed, nonlinear, stochastic and difficult to measure. Yet, the OR/MS developments in green marketing have been profound and substantial. Through this paper our aim here to discuss a significant literature, and sketching a broad range of applications of OR/MS in Green marketing.

Keywords:- *Mathematical model, Green marketing, Operation Research & Management science (OR/MS).*

Introduction

Transportation industry, as the carrier of goods and passengers, is undeniably one of the fundamental infrastructures, necessary for economic and industrial growth and development. Road transportation, in this amidst, has still kept its popularity, and in spite of air, sea and rail transportation developments, companies rely greatly on road transportation as the most dependable choice yet. At the same time it is one of the hugest consumers of petroleum products, and thus a big contributor to greenhouse gases and CO2 emissions in the air. Being a threatening issue, environmental impacts of different industries as a whole, and transportation pollution as specific, ought not to be neglected anymore and immediate and proper studies as well as actions need to be thought of in dealing with this predicament. “Green Transportation” is a highly interdisciplinary area and researchers and scholars of different realms of knowledge, including automotive engineers, policy makers, management intellectuals, urban planners, chemical engineers, and others, are trying to reduce CO2 emissions from the sector. Them amongst the lagging behind, but pivotal and accommodating role of operation research / management science (OR/MS), with its becoming tool of optimization, has not been fully regarded and needs to be more deeply reviewed. This paper tries to bridge this gap by providing an insight into what OR may contribute to the problem, by reviewing how it has already done it and how it is going to LESS. A hybrid genetic algorithm-based decision support system for enhancing transportation efficiency in reverse logistics Canhong Lin2014.

Model

A model is a representation of reality from the modeller's perspective. Therefore, we must have to develop a multi-perspective model of the problem on hand to understand the problem. Friedrich Nietzsche's theory of knowledge comes to mind: There is only a perspective seeing, only a perspective knowing, and the more affects we allow to think about one thing, the more complete will our concept of this thing, our objectivity, be." You must look at the problem from many angles and consider how the pieces fit together, to see the "whole" of the decision problem. Immanuel Kant and Arthur Schopenhauer, among others, called this model "the World as a representation" of our understanding through Time, Space, and Causality.

Modelling

Modelling is the science of making an optimal judgment that requires a combination of many disciplines. Decision-making is a central human activity. Thus, we are all decision makers, and a "good" decision-making process encompasses many disciplines of study. Appreciation of decision making is wonderful: it makes what is excellent in this strategic thinking belongs to you as well. OR/MS/DS/SS modelling approach to decision-making is aimed at understanding the decision problem (or opportunity) and assisting the decision-maker in his/her decision-making process. Models explain the problems and provide solutions. As Ludwig Wittgenstein said, "the riddle does not exist. If a question can be put at all, then it can also be answered".

Green Marketing

Green marketing is the marketing of environmentally friendly products and services. It is becoming more popular as more people become concerned with environmental issues and decide that they want to spend their money in a way that is kinder to the planet. Green marketing can involve a number of different things, such as creating an eco-friendly product, using eco-friendly packaging, adopting sustainable business practices, or focusing marketing efforts on messages that communicate a product's green benefits.

This type of marketing can be more expensive, but it can also be profitable due to the increasing demand. For example, products made locally in North America tend to be more expensive than those made overseas using cheap labour, but they have a much smaller carbon footprint because they don't have to fly across the globe to get here. For some consumers and business owners, the environmental benefit outweighs the price difference.

Historical Needs for OR/MS

Until the middle of the 19th century, most industrial enterprises only employed a few workers. However, as companies expanded, it became less and less feasible for one person to manage all of the new managerial functions of the business effectively. New scientific methodologies were developed to provide assistance to each new type of managerial function as it appeared. As more specialized forms of management emerged, more specialized sub-functions, such as statistical quality control, equipment maintenance, marketing research, and inventory control emerged. Whenever a managerial function is broken down into a set of different sub-functions, a new task, called the executive function of management, is created to integrate the diverse sub-functions so that they efficiently

serve the interests of the business as a whole. The executive function evolved gradually with organizations themselves. However, increasing demands were made on the manager who, in turn, sought aid outside the organization. This gave rise to management consultants. What we call OR/MS/DS/SS today is, in fact, the use of scientific tools to aid the executive or originated in Great Britain during World War II to bring mathematical or quantitative approaches to bear on military operations. Since then OR/MS/DS/SS has evolved to be applicable to the management of all aspects of a system, product, or service, and hence is often referred to as Systems Science or Management Science. It has now become recognized as an important input to decision-making in a wide variety of applications in business, industry, and government.

The term OR arose in the 1940's when research was carried out on the design and analysis of mathematical models for military operations. Since that time the scope of OR has expanded to include economics (known as econometrics), psychology (psychometrics), sociology (socio-metric), marketing (marketing research and marketing science), astrology (astronomy), and corporate planning problems. The growing complexity of management has necessitated the development of sophisticated mathematical techniques for planning and decision-making, and the OR/MS/DS/SS features prominently in this structured decision-making process cycle by providing a quantitative evaluation of alternative policies, plans, and decisions. The mathematical disciplines most widely used in OR/MS/DS/SS modelling process include mathematical programming, probability and statistics, and computer science. Some areas of OR, such as inventory control, production control, and scheduling theory, have grown into sub-disciplines of their own right and have become largely indispensable in the modern world.

Military organizations had gone through the same type of evolution as other businesses and industries. This organizational evolution took place in the twenty year gap between the end of World War I and the beginning of World War II when the military leadership had to turn to teams of scientists for aid. These teams of scientists were usually assigned to the executive in charge of operations; hence their work came to be known as Operational Research in the United Kingdom and by a variety of names in the United States: Operation Research, Decision Science, Operational Analysis, System analysis, Success Science, and Management Science. The name Operations Research is the most widely used.

The potential of computer and information systems as new tools for management forced the non-technically trained executives to begin to look for help in the utilization of the computer. The emerging search for assistance was accelerated by the outbreak of the Korean War. This vigorous growth of OR in the military continued to provide rapid applicability to other industries and sectors.

The Nature and Meaning of OR/MS/DS/SS

Many definitions of OR/MS/DS/SS have been offered, as well as many arguments as to why it cannot be defined. The following definitions provide a useful basis for an initial understanding of the nature of OR/MS:

A scientific method of providing executive management with a quantitative base for decisions regarding operations under their control (Mores- Kimball 1943). The application of the scientific method by inter-disciplinary teams to problems involving the control of organized (man- machine) systems so as to provide solutions which best serve the purpose of the organization as a whole (Ackoff-Sasieni 1968).

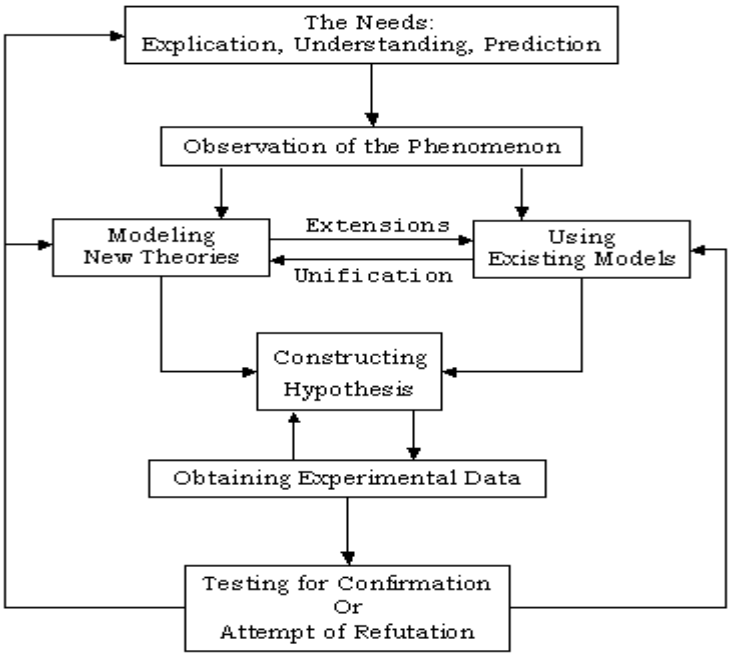
Scientific approach to problem solving for executive management (Wagner 1969), Optimal decision-making in, and modelling of, deterministic and probabilistic systems that originate from real life. These applications, which occur in government, business, engineering, economics, and the natural and social sciences, are largely characterized by the need to allocate limited resources. In these situations, considerable insight can be obtained from scientific analysis, such as that provided by OR/MS/DS/SS (Hiller-Lieberman 1974).

A branch of applied mathematics where in the application is to the decision-making process (Gross 1979).

Comparing definitions given by More-Kimball and Gross, the divergence is notable after almost 40 years: in one case, OR/MS/DS/SS is defined as scientific method, while in the other it is seen as a branch of mathematics. In examining these definitions, it should be noted that neither the old and well-established scientific discipline nor science itself has ever been defined in a way that is acceptable to most practitioners.

The Methodology of OR/MS

OR/MS/DS/SS is the scientific method of decision-making. In most discussions of the general scientific method you would find certain stages and essential processes, as depicted in the following flowchart:



The General Scientific Approach

Although these phases of an OR/MS/DS/SS project are normally initiated in the order listed, they usually do not terminate in this order. In fact, each stage usually continues until the project is completed and continuously interacts with the others.

The Prototype Applications

An important consequence of the application of OR/MS/DS/SS to a wide variety of problems is that a small set of problem types have been identified which account for most problems. Because of the frequent recurrence of these problems, prototype techniques have been developed for modelling them and for deriving solutions from these models. Prototype applications include.

Forecasting: Using time series analysis to answer typical questions such as: How big will demand for products be? What are the sales patterns? How will this affect profits?

Finance and Investment: How much capital do we need? Where can we get this? How much will it cost?

Manpower planning and Assignment: How many employees do we need? What skills should they have? How long will they stay with us?

Sequencing and Scheduling: What job is most important? In what order should we do jobs?

Location, Allocation, Distribution and Transportation: Where is the best location for an operation? How big should facilities be? What resources are needed? Are there shortages? How can we set priorities?

Reliability and Replacement Policy: How well is equipment working? How reliable is it? When should we replace it?

Inventory Control and Stock out: How much stock should we hold? When do we order more? How much should we order?

Project planning and control: How long will a project take? What activities are most important? How should resources be used?

Queuing and Congestion: How long are queues? How many servers should we use? What service level are we giving? This broad range of potential applications and wide variety of OR/MS/DS/SS modelling process techniques, which can be selected and combined for a multi-disciplinary approach, work together to make the profession a dynamic and exciting one. Modelling is the science of making an optimal judgment that requires a combination of many disciplines**.**

Decision-making is a central human activity. Thus, we are all decision makers, and a "good" decision-making process encompasses many disciplines of study. Appreciation of decision making is wonderful: it makes what is excellent in this strategic thinking belongs to you as well. OR/MS/DS/SS modelling approach to decision-making is aimed at understanding the decision problem (or opportunity) and assisting the decision-maker in his/her decision-making process. Models explain the problems and provide solutions. As Ludwig Wittgenstein said, "the riddle does not exist. If a question can be put at all, then it can also be answered.

Conclusion

Models are categorized according to their distinctiveness such as kind, evolution in time, as well as accessibility of records. Models can be static in nature (Iconic), or act like reality but often not appear like reality (Analogous). Mathematical and computer models are known as symbolic models. Here we see algebraic, numerical, and logical modelling. These mathematical models are designed to offer understanding to some aspect of said reality. Simulation models can be classified as computerized duplications of real systems. The computer performs these mathematical functions with precision and speed. Dynamic modelling in organizations is the collective ability to understand the implications of change over time. This skill lies at the heart of successful strategic decision process. The availability of effective visual modelling and simulation enables the analyst and the decision-maker to boost their dynamic decision by rehearsing strategy to avoid hidden pitfalls.

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