JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

"CERTAIN SCIENTIFIC METHODS FOR LIBRARY MANAGEMENT"

Ravindra P. Rewaskar
Department of Mathematics, Shankarlal Khandelwal College, Akola (M.S.), India.

Abstract:
The elements of the system are dependent on their surroundings, related to one another and affect the system overall. A library is therefore a system, with its different divisions and sections acting as its constituent parts. The discipline known as science of library management is concerned with the study of library management practices and regulations. The application of management science to library management gave rise to this significant area of contemporary library science. There are many scientific methods which can be used for management of library. In this paper particularly the use of operation research in the management systems of library is discussed.

Keywords:

Library management, Operation research, queuing theory.

I. Introduction:

Gathering, storing, organizing, retrieving and making information sources available to information consumers is the main goal of every library system. A library is an organization that operates in any field like education, research, social services, etc. and it is a subsystem of a broader structure. It is composed of several subsystems, including the administration, circulation and collection systems. Like every other organization, libraries and information centres need capable executive branch. The topic of whether management is an art or a science is debatable, but one thing is certain: in the context of current technology, management is evolving from an art to a science [1]. Performance, return on investment, profit, expenses, utility, distance, length of time and similar factors are typically used to determine optimality. Research in library and information science has frequently been criticized for being fragmented, narrowly focused and problem-oriented [2]. Effective and efficient material management is what is meant by library management. A successful library is one that is well-managed, as is generally recognized. Libraries nowadays are intricate systems that need for advanced management.

The need for knowledge has grown because of advancements in computer and communication technology and modern library patrons always demand top notch resources available to them and locations. The goal of modern libraries is to maximize their resource utilization due to growing expenses, restricting budgets and the availability of new technologies. The general public and private library organizations alike must deliver these services and goods as effectively and efficiently as they can. To put it another way, this calls for meticulous planning and analysis, the cornerstones of effective operations research (OR). When an issue is significant enough to merit the time and resources needed for a thorough investigation, the model based OR approach to solving issues performs well.

II. Operation Research (OR):

An analytical approach to problem solving and decision making, operation research (OR) is helpful in the management of firms that deal with objects. In operations research, issues are deconstructed into their most fundamental parts and then mathematically analysed into a sequence of actions for solution. Many people have the widespread misperception that OR is just a set of mathematical operations. Indeed, operations research employs a wide range of mathematical methods, but its application is far more extensive. In reality, it is a methodical approach to problem-solving that makes use of one or more analytical tools during the

analysis phase. The phrase "operations research" may be the single biggest issue with OR; to the uninitiated, it does not evoke any form of meaningful image of the notion. In order to give people in charge of operations the best possible answers to issues pertaining to system operations, operations research applies scientific methodologies, techniques and tools to complex operational challenges. The steps in the scientific process include problem identification and observation, hypothesis formulation and testing and test result analysis. Deciding whether or not to accept the hypothesis is subsequently done using the data that was thus acquired. The findings should be put into practice if the hypothesis is confirmed, otherwise, they shouldn't.

If a rational and consistent strategy is taken, a significant amount of time and effort can be saved while constructing and solving OR models. This suggests that while establishing variables, resource availability and functional linkages between variables in the objective function and limitations, the individual making the choices must exercise caution. Additionally, this will lessen the possibility of conceptual and computation related mistakes and flaws can even be readily identified and fixed early on.

III. Operations research in Library Management:

An essential management tool that may help administrators at libraries make efficient use of all available resources is operations research. Alternatively, researchers might gain a better understanding of information services and library resources and operations by using a set of analytical techniques. Early in the 1960s, operations research techniques were introduced into libraries. The first person to take an interest in libraries was Philip M. Morse of the Massachusetts Institute of Technology (MIT), who utilized the school library as a practical laboratory for students working on operations research projects.

In order to determine the ideal value for the efficacy objective measurements, a mathematical model must be developed or constructed. A model like these aids in capturing the essence of a system, which is necessary for decision-analysis. The process of transforming numerical data and verbal descriptions into mathematical expressions is known as formulation. This process depicts the relationship between pertinent decision variables or factors, the goal and restrictions and the limitations on the use of finite resources like labour, material, machinery, duration, storage room, funds, power, etc. to a number of competing activities like jobs, items, services, new equipment, projects, etc. based on a predetermined optimality criterion.

By tackling difficult management choice issues, operations research uses sophisticated analytical approaches and mathematical models to enhance decision-making processes in businesses. The study's methodology makes use of analytical techniques including queuing theory, network analysis, simulation and logical reasoning. Usually, process modelling, options analysis, or mathematical modelling serve as the foundation for this.

The discipline of information science has effectively utilized OR. The reason behind OR's applicability not only to regular tasks but also to strategic and operational planning, design difficulties in organizations and the ability to build new procedures as and when the circumstance calls for them. Despite being regarded as one of the greatest management decision-making and monitoring approaches, it has a limitation in that it can only be used in scenarios where mathematical models can be created. Operations research use methodical techniques for gathering data and producing evidence and it targets particular issues inside certain projects.
Example of mathematical modelling of a library problem and its solution using OR is discussed below.

Naturally, from practical considerations, the total number of staff members must also be minimized. The question is how to determine the number of staff members needed and the work and rest schedule that will allow each employee to have two consecutive days off each week in addition to meeting the requirements for normal work operations.
As each employee receives two consecutive days off, the total number of employees necessary may be computed as long as the total number of employees receiving two consecutive days off is calculated in [3].

Considering workers required as m_1, m_2,… and number of people who take a rest as x_1, x_2,…with respect to working days of a week. So optimization problem becomes for minimization that is

Min $x_1+x_2+\ldots$

subject to the constraints of $\geq m_i$, where i = 1, 2…, n = number of working days.

In another problem of Circulation desk service quality evaluation how idea of queuing theory is applied can also be observed in [3].

Operational research features include being trustworthy, technically and behaviourally suitable, simple and accurate in decision-making, beneficial in enhancing the quality of the solution, goal-oriented optimal solution and quantitative solutions.

While there are many benefits to operations research, there are also some drawbacks. The issues with model construction, money and time constraints are more closely linked to OR's restrictions. The primary

drawback of operations research is its often disregard for the role that people play in the manufacturing process. Employee absenteeism and emotional variables are not taken into consideration in this technology-driven strategy. Human interactions and behaviours are involved in the implementation of choices. It doesn't take into account the complexity of people and their behaviours. Additionally, there is a significant disconnect between operations researcher and administrators. Being Time- and Money-Intensive Operations research is highly expensive.

For OR to be effective, an organization must devote time and resources to it. Owing to rapid technological advancements, scenarios are always changing, thus staff members need to constantly analyse every scenario that falls under OR's jurisdiction. Only the effects of measurable and numerical factors can be assessed by OR. For instance, OR could calculate the deadline for the final product's readiness. However, as it does not provide for employee absences, a high rate of employee absence could seriously impact the production schedule.

The outcomes of OR are frequently scholarly in nature. Real-world integration and implementation of these might not be possible or useful. Since the researcher is typically a mathematician with little experience with real-world library circumstances, the answers he computes may be unrealistic. Because real-world scenarios differ greatly from OR outcomes, the OR results may become less significant and appealing. The Library System is a rapidly expanding database for information retrieval that aims to preserve the day-to-day operations of libraries via the development of computerized technologies.

IV. Conclusion:

There can be different types of models using the constraints composed from given situations and these can be solved to its best solution using the optimization techniques. Operations research addresses issues that librarians handle on a daily basis. Because it is now so simple to create mathematical models using computers, OR has expanded significantly as a result of the widespread use of computers in firms. Operations research was used by manufacturers to plan equipment maintenance, manage inventories and distribution and produce goods more quickly.

References:

[1] Moran, B.B., Morner, C.J., “Library and information center management,” ABC-CLIO, 2017

[2] Grover R, Glazier J., “A conceptual framework for theory building in library and information science”, Library and Information Science Research, 8(3) pp: 227-242 1986;

[3] Li, Jing-jing and Xi-min Li, “Application of Operation Research in Library Management.”, Advances in Social Science, Education and Humanities Research, volume 290 (2018).

[4] Bommer, Michael R. W., “Operations Research in Libraries: A Critical Assessment.”, Journal of the Association for Information Science and Technology (1975)

[5] Taha, H. A., “Operations Research. New Jersey,” Prentice Hall, 1997.

[6] Mittal, K.V. and Chander, Mohan. Optimization Methods in Operations Research and Systems Analysis. Delhi: New Age International. 2008.

[7] Song, J. W., “Functions and Ways of Computer Information Technology in Optimizing Library Operation and Management Considering Massive Data Mining”, 6th International Conference on Computing Methodologies and Communication (ICCMC) (2022) pp. 717-720 2022.

[8] Bin, Long., “Application of operation research in library management”, Journal of Huanggang Normal University, (2008).