

## **Scope, Opportunity and Challenges in Operations Research**

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**Abstract:** *The scope of Operations Research (OR) has changed essentially over the most recent quite a few years. Beginning from Re-order Point (ROP) to Enterprise Resources Planning (ERP) and Supply Chain Management (SCM), OR has experienced far in wording of scope and techniques being utilized. JIT reasoning, lean generation, and coordinated assembling have essentially changed the ways how we plan and investigate the operations. As of late, OR and coordination's fields get nearer, since there is no real way to isolate those capacities any more drawn out from the operational Research process point of view. Conventional OR's focus is going to move from a component of the association to the supply chain, beginning from providers of providers to clients of clients. Along the supply chain, not just goods and services but likewise all sources of cash, credit, and data should be overseen. Mechanical developments are another aspect of the dialog and the genuine power behind this joining. It may not be wrong to express those patterns in OR with a citation as "Join together (incorporate) and conquer". The profile of the operations managers has additionally changed a great deal through those improvements in OR. Joining, cross-practical training, leadership, worker contribution, responsibility, and framing are only a couple of abilities to name here to stay sought after in future. The measures for consumer loyalty on cost, response time, variability, quality, adaptability and service in future's operations are certain to be high and strict. To coordinate the desires, very much incorporated technological solutions would be just guide of OR specialists. In this paper, the issues specified above will be investigated methodically and the challenges of the new time and also the new abilities required to adapt to those will be talked about in Operations Research.*

**Keywords:** *Scope, Opportunity, Challenges, Operations Research, Supply Chain Management, techniques, function, organization, customers, information, developments, training, leadership, satisfaction, service, technological solutions.*

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### **I. Introduction**

Operational Research, or basically OR, originated with regards to military operations, but today it is generally acknowledged as an effective instrument for planning and basic leadership, particularly in business and industry. The OR approach has given a new tool to overseeing customary management problems. Truth be told, operational research techniques do constitute a logical strategy for investigating the problems of the business world. They give an improved premise to taking administration choices [1]. The act of OR helps in handling mind boggling and complex problems, for example, that of resource allocation, product mix, stock administration, sequencing and booking, substitution, and a large group of comparable issues of modern business and industry. With IT facilities winding up noticeably broadly accessible, the hugeness and scope of OR has developed, is as yet developing. Hence, OR is presently an essential piece of courses of computer science, economics, business management, public administration and a few different orders.

Present day innovative progress is joined by a growth of scientific techniques. While existing strategies have been enhanced to meet the challenge of problems arising from the improvement of trade and industry, a substantial number of new techniques or purported modern tools of examination have been and are being conceived to amplify the degree of logical information to boundless limits of its applications [2]. Such techniques have realized a virtual unrest and can be figured as controlling powers in various strolls of life. Operations Research, prominently known as OR, is a current expansion to an extensive rundown of logical apparatuses which give another standpoint to numerous regular administration issues.

### **II. Review of Literature**

OR adds more noteworthy modernity in solving administration issues. It looks for the assurance of the best (ideal) game-plan of a choice issue, given the restricted assets [3]. Consequently, OR has turn into an adaptable instrument in the field of administration and its potential for future use is for sure generous. With the approach of computerization the centralization of organizational administration has been deteriorated. In a solitary unit of industry, diverse branches of production, sales and inventory are represented by particular

offices. Their objectives and objectives regularly differ trying to fill the normal need of the organization [4]. The strategy choices to arrange these clashing mandates might be taken successfully, if an ideal arrangement can be resolved from all accessible option bargain formulae. OR provides a viable scientific technique to solve such basic leadership issues of modern business and industry.

**Operations Research Uses:** Operations research assumes an important part in nearly all areas of business decisions. A few issues where operational research (OR) approach can be utilized: Operations research plays an important role in nearly all areas of business decisions. Some problems where operational research (OR) methods can be used:

**1. Finance, Investments and Budgeting**

- Credit policy analysis.
- Cash flow analysis.
- Dividend policies.
- Investment portfolios.

**2. Marketing**

- Product selection, timing, etc.
- Advertising media, budget allocation.
- Number of salesman required.
- Selection of product mix.

**3. Purchasing, Procurement and Exploration**

- Optimal buying and reordering.
- Replacement policies

**4. Production Management**

- Location and size of warehouses, factories, retail outlets, etc.
- Distribution policy
- Loading and unloading facilities for trucks, etc
- Production scheduling
- Optimum product mix
- Project scheduling and allocation of resources

**5. Personnel Management**

- Selection of suitable personnel
- Recruitment of employees
- Assignment of jobs
- Skills balancing

**6. Research and Development**

- Project selection
- Control of R&D projects
- Reliability and alternative design

### **III. Growth of Operations Research**

The subject of Operations Research (OR) was created in military setting amid World War II, spearheaded by the British researchers. Around then, the military administration in England designated a study gathering of researchers to manage kick the bucket key and strategic issues identified with air and land guard of the nation. The principle explanation behind leading the study was that they were having very limited military resources. It was, in this manner, important to settle on the most effective method for using these resources. As the name infers, operations research was clearly developed in light of the fact that the group was managing research on (military operations) [5]. The researchers examined the various problems and on the premise of quantitative investigation of operations recommended certain approaches which indicated noteworthy success. The empowering comes about acquired by the British operations research groups comprising of faculty drawn from different fields like mathematics, physics, biology, psychology and other physical sciences, immediately roused the United States military administration to begin comparable exercises. Fruitful advancements of the US groups incorporated the improvement of new flight designs, arranging ocean mining and compelling use of electronic hardware. Comparative OR teams likewise began working in Canada and France. These OR teams were normally relegated to the official incharge of operations and thusly their work came to be known as "Operational Research" in the UK and by an assortment of names in the United States: 'operational analysis, operations evaluation, operations research, frameworks investigation, frameworks assessment and systems research [6]. The name "operational research" or "operations research" or simply OR is most broadly utilized these days everywhere throughout the world, for the new approach to deliberate and logical investigation of the

operations of the system. Till the 1950s, utilization of operations research was mostly restricted to military purposes.

**Advantages of a Model:** There are certain significant advantages in using a model. These are:

- (i) Problems under consideration become controllable.
- (ii) It provides a logical and systematic approach to the problem.
- (iii) It provides the limitations and scope of an activity.
- (iv) It helps in finding useful tools that eliminate duplication of methods applied to solve problems.
- (v) It helps in finding solutions for research and improvements in a system.
- (vi) It provides an economic description and explanation of either the operation, or the systems it represents.

**Operations Research and Decision-Making:** Mathematical models have been built for OR problems and methods for explaining the models are accessible by and large. Such methods are normally named as OR techniques. A portion of the essential OR techniques regularly utilized by decision-makers in current circumstances in business and industry are as per the following:

**(i) Linear programming:** This technique is utilized as a part of discovering a solution for streamlining a given target, for example, profit maximization or cost minimization under specific imperatives. This technique is principally worried about the ideal assignment of restricted assets for enhancing a given capacity. The name linear programming is a direct result of the way that the model in such cases comprises of linear equations indicating linear connection between the diverse factors of the system. Linear programming technique solves item blend and dissemination problems of business and industry [7]. It is a technique used to apportion rare assets in an ideal way in problems of booking, item blend, et cetera. Key factors under this technique incorporate a goal work, decision among a few options, points of confinement or imperatives expressed in images and factors accepted to be linear.

**(ii) Waiting line or queuing theory:** Waiting line or queuing theory manages mathematical study of queues. Queues are shaped at whatever point the present interest for benefit surpasses the present ability to give that administration. Waiting line technique concerns itself with the irregular landing of clients at an administration station where the office is constrained. Providing excessively of limit will mean sit out of gear time for servers and will lead to waste of money. Then again, if the line turns out to be long, there will be a cost because of holding up of units in the line. Waiting line theory, subsequently, goes for limiting the expenses of both adjusting and waiting. At the end of the day, this technique is utilized to break down the plausibility of adding offices and to evaluate the sum and cost of waiting time. With its assistance we can observe the ideal ability to be introduced which will prompt a kind of an economic balance between cost of administration and cost of waiting.

**(iii) Game theory:** Game theory is utilized to decide the ideal system in an aggressive circumstance. The most straightforward conceivable focused circumstance is that of two persons playing zero-sum game, i.e., a circumstance in which two persons are included and one-person wins precisely what the other loses. More intricate focused circumstances of the genuine can likewise be envisioned where game theory can be utilized to decide the ideal method.

**(iv) Decision theory:** Decision theory worries with making sound decisions under states of sureness, hazard and instability. In actuality, there are three distinct sorts of states under which decisions are made, viz., deterministic, stochastic and instability and the decision theory.

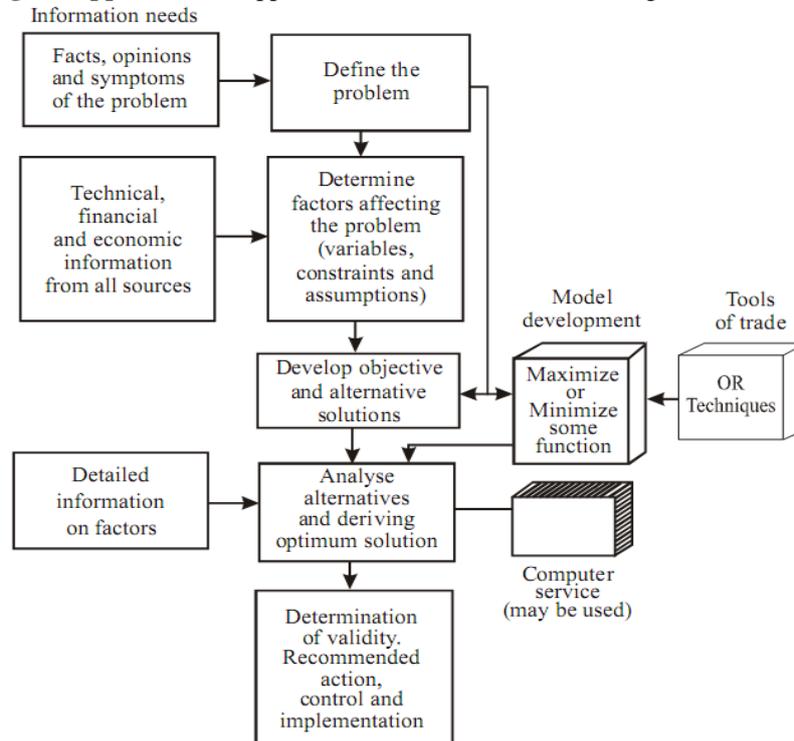
**(v) Simulation:** Simulation is a technique of testing model which takes after a genuine circumstance. This technique is utilized to mimic an operation preceding real execution. Two methods of simulation are there: One is Monte Carlo technique of simulation and the other is System Simulation Method. The previous one utilizing irregular numbers is used to solve problems which include states of instability and where mathematical formulation is inconceivable, however in the event of System Simulation, there is a proliferation of the working condition and the framework takes into consideration breaking down the reaction from the earth to elective administration activities. This method draws tests from a genuine populace as opposed to drawing tests from a table of random numbers.

**(vi) Some other OR techniques:** In addition to these, there are a few other techniques, for example, non-linear programming, dynamic programming, search theory, and the theory of substitution. A concise specify of some of these is as per the following:

**(a) Non-linear programming** is that type of programming in which a few or all the variables are curvilinear. As such, this means that either the objective function or limitations or both are not in the linear form in many practical situations, we experience nonlinear programming problems, but for calculation reason we surmised them as linear programming problems. And still, after all that, there may remain some non-linear programming problems which may not be completely illuminated by and by known methods.

(b) Algorithmic programming is the polar opposite of heuristic programming. It might likewise be named as close mathematical programming. This programming alludes to an intensive and comprehensive mathematical approach to research all parts of the given factors keeping in mind the end goal to acquire optimal solution.

**Flow chart showing OR approach:** OR approach can also be illustrated through the following flow chart:



**Opportunities of Operations Research:** The factors described in the past area introduce a number of challenges to operations researchers. In any case, given the experience and foundation of OR professionals, these challenges can be turned into opportunities. OR has a long history of fruitful application of progressed analytical methods to enable settle on to better choices in numerous industrial sectors (e.g. airline, telecommunication, and manufacturing industries). In spite of the fact that healthcare OR is not another field the number and effect of OR applications linger behind different service industries [8]. Frequently, chiefs guarantee that healthcare systems, and specifically hospitals, pose rather mind boggling and dynamic problems contrasted with those confronted by different service industries, along these lines blocking the fruitful utilization of OR tools.

**Operational Research in India:** The Operational Research Society of India, built up in 1957 is among the oldest societies in the world. It is partnered to the International Federation of Operational Research Societies (IFORS) and the Asia Pacific Operational Research Societies (APORS). The society has roughly 500 members. The members of the society are predominately from the academic departments of mathematics, statistics, industrial engineering, computer science and administration of colleges and organizations of higher learning. Shockingly, operational research in India is portrayed by pockets of magnificence [9]. There is just a single college division in the country which offers a post-graduate programme with an attention on operational research. There are a few college departments in the nation which offer operational research courses as a piece of their engineering educational programs. A portion of the early vital commitments to operational research train originated from Indian Scientists. There are a few extraordinary OR professionals of Indian root working in different parts of the world both in the scholarly world and the industry. Notwithstanding, the improvement and development of operational research in India and its applications in the Indian setting has been to some degree constrained [10]. The accompanying is the fractional rundown of explanations behind the need of progressive utilization of OR tools and techniques in the Indian situation.

- Planned Indian economy (until 1990) and hence lack of appreciation of competition and a global outlook by industry and society
- Several opportunities to improve the economic performance of India as a nation was ignored by policy planners
- The decision making machinery was predominantly driven by rationing and resource allocation

- Efficiency and effectiveness was not a consideration in decision making and resource allocation
- Political class was driven by often narrow party considerations rather than the society welfare
- Ruling class was never held accountable for its performance and the economic growth in the country
- Bureaucracy was only interested in maintaining status quo related to development
- Under these circumstances policy planning choices were based on effectiveness of the stated programme objectives. Consequently, efficiency took back seat.
- Resource consumption was routinely monitored in all social projects. However, the utility of resources and its productivity was never monitored.

So far in the Indian Economy, Agriculture sector has played a predominant and key part. This is notwithstanding the economic setting where industrialization in the country has been hesitant [11]. While agriculture would keep on play an important role in the years to come, the pace of industrialization has to be fast to make up for lost time with whatever is left of the world India has officially exhibited that it can assume an overwhelming part in global economy in the ranges identified with information technology and different associated services. At the point when the world is moving towards information based economy, to be a developed nation, India needs to be globally aggressive in its policy, planning and its execution [12]. It likewise needs to discover ways and means by which the detained assets (bio-differences, rich minerals, metals, and comprehensively aggressive labor) are viably utilized. The assets required are to be proficiently dispensed without trading off on their viability. This would request a lot of application of logical techniques, processes and approaches [13]. It is in this setting operational research would assume an extremely huge part to help policy planners, directors and executives to transform India as an aggressive nation.

**Challenges of Operational Research:** There is a need to give careful consideration to progress factors and to draw on a more extensive scope of analytical methods, with more trade with more extensive OR work. In any case, the procedure of OR is not finished without a group prepared in OR knowledge and aptitudes [14]. Difficult to perform adequately by a solitary individual, an interdisciplinary group is basic for the fruitful and significant utilization of OR techniques to give prove on the pertinence, viability, adaptability and change of health policies and projects in the most fair and effective way [15]. In this manner there is a need to develop workforce prepared and capable in operations research planning, implementation and assessment. A portion of the other challenges for operational research limit building have been laid out underneath (a) Shortage of financing, (b) Turnover of trained staff, (c) difficulty of actualizing research skills in program settings, (d) hesitance or powerlessness of supervisors to utilize discoveries, (e) need to assess limit building methods, (f) period of time expected to accomplish minimum amount of trained researchers and consumers, (g) requirement for more customer situated training and (h) require to improve linkages between researchers and managers.

#### **IV. Conclusion**

Operations Research Process situated authoritative structures have started such a large number of discourses related with jobs, measurement and compensational systems, and corporate culture. One thing is certain that the thought is substantial and applicable. Late improvements likewise bolster this approach. Activity Based Costing (ABC), Statistical Process Control (IPC) techniques, recent talks on organizational theory, substance of SCM are for the most part ventures towards to this heading. Technological innovations and tools like Internet, OR and ECR with ERP and SCM bundles give the spine to future advancements on OR and

logistics. Normal pattern on each one of those is the incorporation of conventional functional tasks into one under a procedure serving to a particular target, consumer loyalty. This pattern might be completed the scope of OR and Logistics over the time. It may not be right to supplant the citation, "Separation and vanquish", with another one for the new thousand years, "Join together (coordinate) and prevail". It appears to be likely that the accompanying terms will be every now and again articulated in future and help to reshape operations Research management world: Teaming, value-added activities, come up short saving, self-initiative, employee contribution, operator ownership, empowerment, commitment, OR, ECR, supply chain, value chain, globalization, green marketing, mass customization, deferred separation, lean generation, agile manufacturing, power. Those are on the whole endeavors for customer satisfaction. The measures for customer satisfaction on cost, reaction time, variability, quality, flexibility and service in future's operations are certain to be high and strict. To coordinate the desires, all around incorporated technological solutions would be just guide of Operations Research practitioners.

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