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Applications of Operations Research in Human Resource Management

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Abstract: Operational HR encompasses the highly visible, day-to-day tactical operations required to keep a workforce running. This made us look for strategic approaches essential for most organisations. Be it defining the future path, determining the future plan, mission, vision, planning, objectives and goals of a particular organization. In a nutshell, we wanted to bring out the intricate relationship between HR and operational research especially considering the current dynamics of the external world. The unprecedented changes in HRM made us dig deeper on the importance of the role and applications of operations research to cope with these changes.

Finally, we believed our research was complete when we presented real-world examples, and it was demonstrated to us that Operations Research approaches may assist firms in making good HR policy decisions at a low cost.

I. INTRODUCTION

"The *Great Resignation* - Post pandemic burnout spurs roughly 3.4 million workers to quit their jobs", according to data released by the Labor Department. (CNBC, 2021). The ever-changing dynamics of the world result in continuous evolution of organizational culture and HRM. With markets becoming more competitive as they expand globally, the focus of HRM falls on how to stay in the game while adapting to unprecedented changes. Be it now or in the past, from productivity's point of view; a need for systematic mathematical models to manage the human resource is essential.

This prompted us to link the concept of organizational research to human resource management. With this goal in mind, we can analyze investments in Human resource management in terms of necessary developments and strategic programs. And minimize any manual errors that might occur unintentionally/intentionally and obstruct the organization's progress, such as ego clashes, favoritism, and gender bias.

Operations Research is a logical strategy that aides in critical and dynamic thinking, expands usefulness in the administration and overall decision making. By using OR tools such as

1) Assignment Problem
2) Linear Programming
3) Goal Programming
4) Game theory

We can bring forth positive effect on work force without compromising productivity at an optimum cost.

The numerical models of tasks research assist associations with breaking down a more prominent number of options than would typically be used, if they somehow happened to utilize just a different methodology. Using operations research, it is easier to analyse multiple alternatives, manage talent and workforce which leads to greater confidence in the final choice. Thus, Operational research helps save time and money thereby increasing managerial efficiency.

II. LITERATURE REVIEW

With the changing dynamics of the external world, every organization's internal structures are bound to shift. Increased importance of the role of Human resource management in organizations enable the use of Operations research to produce strategic organizations decisions.

The objective of this study is to elucidate the tools of Operations Research used in different aspects of human resource management. In this paper, we will elaborate on the different tools and techniques of Operations research used to solve the different complexities of human resource management to produce an optimal solution in each.

To connect these two concepts, published papers and articles were studied to analyse the problems. We will be explaining the use of Operations Research in Human Resource Management through secondary research.

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(Marcikic, Radovanov, Birovljev, 2016) - OR involves converting life situations into mathematical models to gain optimal solutions. In this paper studied, the main focus was on the allocation of human resource to different departments in the healthcare industry. As the resources and budget are limited, their effective utilization and allocation is extremely important.

The great value of this schedule is that it links demand (through determinate staffing levels) and supply (available staff) which ensures better organization of work and balance.

(M. Gupta, 2014) - In this study, Vadodara institute's staff was used to understand the use of Linear programming to minimize the cost of training. During the time spent preparing,

The result showed that the expense of the training program was significantly more than what was required, and that the number of persons sent from each department for the same can be lowered. This help the organization by introducing models that helps to achieve optimum results without exhausting time and money.

(Richardson, 2017) - Businesses rely on people making the right decisions at the right time and bad decisions cost money. The paper elaborates the need for a formal modelling approach for decision-makers to explore a variety of interactions among agents, and their potential outcomes and make the right decisions strategically after analysing each option.

Since, game theory helps provide quick decision making it can be implemented in the human resource management field. If implemented this can be extremely effective for management and staff to analyse problems and make the best decisions.

(D.N. Jayashree, G.A. Harish Babu, 2016) - The paper elaborates that issues in assigning offices to staff members especially in a large institution can be time and energy consuming. The authors talks on the gap needed to be filled between allocating resources for the staff to meet targets for organizations to function effectively. In order to tackle this, they makes use of goal programming.

This technique allows the decision maker to specify targets and then attempts to find a solution that comes as close as possible to meeting these targets. A lot of companies find it difficult to allocate resources to their staff on time.

III. ANALYSIS

Human resource management is an essential part of every field. The decisions made by managers and the working of the organization culture eventually decides the fate of the organization. A variety of business decisions are made based on a variety of considerations. It is observed that the factors based on which the decisions are to be made unknown and partially ignored by the decision makers, and as a result, decisions are made based on intuition and experience, which may or may not prove to be correct. Operations research is a tool that assists business owners in better managing their organizations by taking into account a variety of factors.

The greater part of organizations have understood the need for connecting scientific models with Human resource. However very little acknowledgment has been made as far as adding numbers to it. For example measuring their expenses, delegating them work are still decided with a pre-determined criteria. We have chosen a few tools and techniques of Operations Research methodologies which can be applied in the field of Human Resource Management in order to understand and analyse the role they play to produce optimum results for the given objectives.

A. Assignment Problem

The assignment method is a way of allocating organizational resources in which each resource is assigned to a particular task. The resource could be monetary, personnel or technological.(Investopedia)

The objective is to assign resources in such a way to balance of workload, enhance production

In the paper (Marcikic, Radovanov, Birovljev, 2016) we can analyse the necessity of sufficient workforce and balance for efficient organizational operations in healthcare management, but its practical implementation is still at a relatively low level. This gap can be narrowed through continual and systematic assignment based on the possibilities and managerial techniques and skills, which can contribute to the quality improvement of healthcare services and achievement of better financial results.

For example, Let us take the human resource in the healthcare industry. With the objective to balance the nurses' workload where we assign nurses to different departments with a time constraint

Assignment problem can be used here to solve the issue by finding the most optimal solution.

This way workload can be balanced and sufficient number of nurses can always be present for the patients and in each department.

The use of assignment problems in human resource management has vital managerial strength. In such scenarios, assignment problems is help minimize the total task time and increase efficiency.

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B. Linear Programming

Linear programming is a process that takes into consideration certain linear relationships to obtain the best possible solution to a mathematical model. It is also denoted as LPP. It includes problems handling maximizing profits, minimizing costs, minimal usage of resources, etc. These problems are often solved through the simplex method or graphical method.

One of the most important aim of LPP is the utilization of resources; thus, it is often utilized in human resource management to assist increase productivity and profitability through improved manpower .

This technique optimizes a linear target function, which could be profit or cost, subject to different constraints namely labour, material, time, money, etc. to give an accurate mix of a solution.

Let's consider an example. Take a company XYZ where the HR must choose the optimal number of employees in two departments to maximize the productivity of each department. But they have constraints like salary budget, work hours, training budget, and system availability.

Linear programming are going to be suitable in situations such as to minimize cost along with optimal recruitment of staff and training them according to their needs which can be fulfilled through linear programming.

This ultimately leads to less capital being invested into the Training programs and maximizing productivity. Linear Programming can be considered efficient if used with proper constraints and functions.

C. Game Theory

Game theory depicts how individuals settle on choices when they know that their activities influence one another and when every individual has a similar acknowledgment.

It allows us to understand why certain issues begin, how they may work out (with a 20% of where to focus and 80 % on benefits) what choices we should make and the assurance that the response we get from our work is positive or not.

Game theory helps HRM in the following ways :

1) Growing functionally determined HR and hierarchical advancement systems such that achievement can be estimated.
2) Increasing labour- management relationships
3) Expanding the adequacy of administration, group coordinated effort etc.

Let's suppose that a firm invests Rs.5 on an initiative that has the potential of providing Rs.15 in enhanced productivity of the employee. In a cooperation management , both the employee and the firm may decide to share the excess productivity of Rs.15 evenly

But if the employee were decided to shift their jobs due to the potential of acquiring the entire Rs.15 of rent for themselves, resulting in the employer with an expenditure of Rs.5 with no returns. When analysing this prospect, the organizations may decide to not invest in the HRD initiative and save the Rs.5. Therefore comes game theory application.

D. Goal Programming

Goal programming (GP) is an extension of Linear Programming (LP) which is a mathematical tool to handle multiple, normally conflicting objectives (Ahmed K. Rifai,1996). The strengths of Goal Programming are its simplicity and ease of use.

This method utilizes linear optimization for situations where multiple goals are involved. The primary goal is to reduce the opportunity cost of not achieving a non-prioritized goal over an important goal.

The goal programming technique is an analytical framework which a decision maker can use to provide optimal solutions to multiple and conflicting objectives. Since, this technique is used to provide better decisions and optimal results it can be easily used in human resource management and maximize the productivity of the organization.

(Richardson, 2017) explains the need to fill the gap between allocating resources for the staff to meet targets for organizations to function effectively. Taking a situation where we have shortage of beds in special wards and a need for additional beds in emergency rooms and general surgery wards. We can use goal programming for designing nursing shifts. This will result in improved quality of work, employees' satisfaction, and organizational justice. Another example where we can use goal programming is to allocate optimal resources in educational and university settings. This research will result in optimizing resources including the number of students, number of academics, and the amount of physical space.

From this it is understood that goal–programming formulation has excellent flexibility to consider alternative goal levels, priorities, and budgets in managing human resource efficiently.

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IV. CONCLUSION

Several practical OR applications have been described in this project. Human resource management has a huge amount of information to sort out and need to execute a few administrative choices so as to boost up profitability and limit costs.

These procedures include instruments of Operational Research to a great extent. Activities research utilizes various logical techniques joined with sensible intending to understand genuine management techniques with the help of tools such as goal programming, game theory etc.

Human Resource Management has become an essential component of any organisation. The list goes on and on, whether it's recruiting, training, career development, or succession planning etc. Human resource management is critical to the mutual relationship between employees and employers.

An organisation expands to the extent that its employees expand. However, it is a well-known fact that humans are prone to making mistakes when performing any task without the assistance of logical or scientific methodologies.

Operations research is a decision-making analytical method that solves management problems by breaking them down into elementary components and solving them in well-defined steps using mathematical analysis.

Operations research and human resource management are two fields that run parallel to each other, but their combination can produce significant results in terms of decision making for organisational leaders in terms of efficiently managing their workforce. Optimization provides them with the right sense of direction for allocating resources in the right area, based on a mathematically determined criterion rather than any random, manual method.

V. LIMITATIONS

A. Lack of primary data. Primary data gives current news and personal opinion which based this paper on secondary research.

B. Since many people don't have proper knowledge and understanding of this subject, it's proper and accurate implementation is a tough job to do. We have shown the scope of HRM in OR using different techniques and tools but a proper mathematical model is difficult to prepare

C. As our focus and emphasis was entirely on the findings of past research papers, the essence of originality would not be complete.

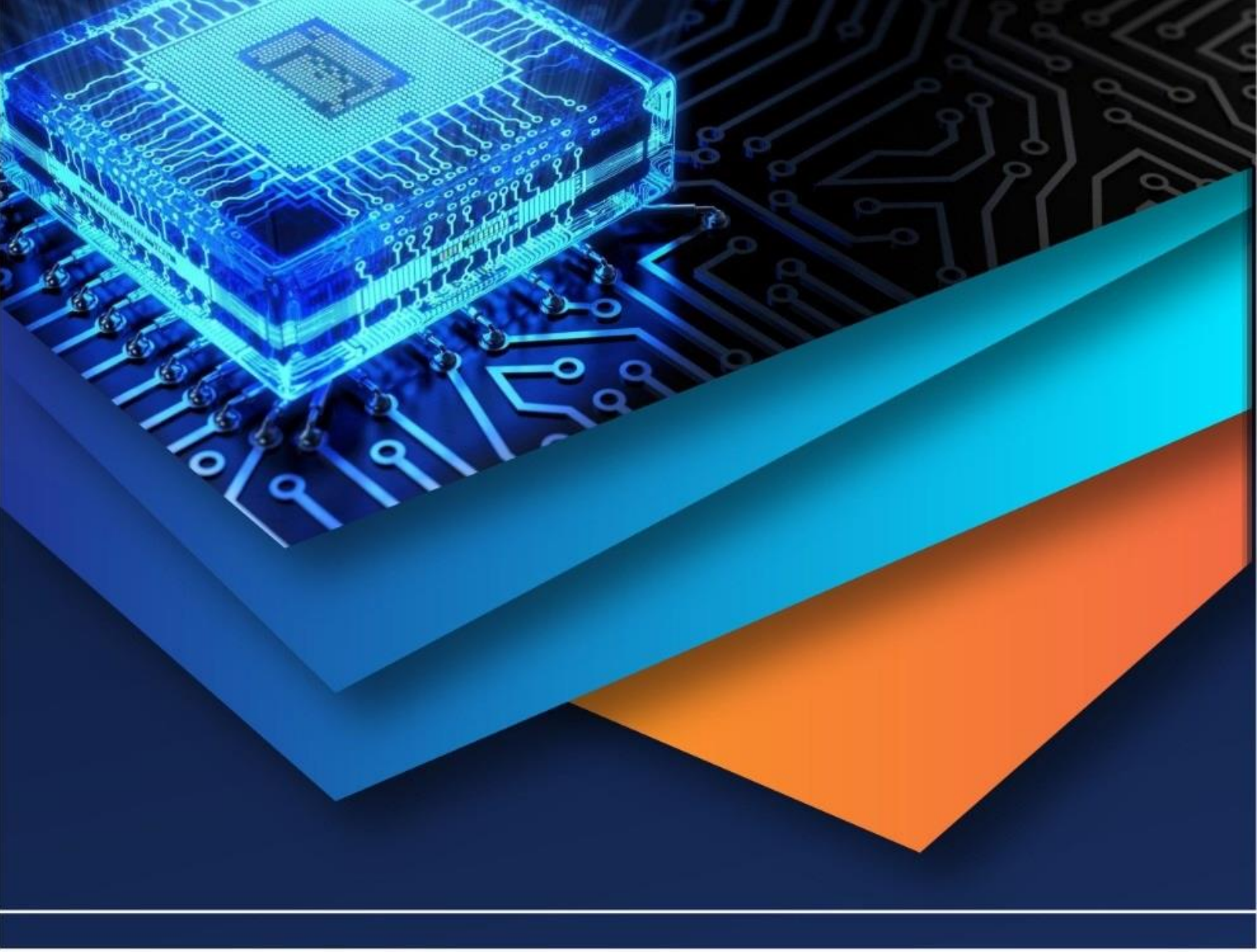
D. There can be the question of authenticity of the Internet, which cannot be checked completely.

E. Though we have done a detailed analysis of operations research in HRM, we could not explore its full potential but its application in real life scenarios has a high scope.

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