IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Novel Mechanism for Linear Programming: Simplex Method.

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ABSTRACT

This paper focuses on one of the most widely used techniques in operations research which means a straightforward system (linear programming). A parallel system is a mathematical way to provide the right solution to problems where both purpose and need are specific. A systematic planning process took place during World War II. The rapid implementation of the equitable system in various fields began after World War II. This study provides insight into the assumptions and structures of a specific plan. It also defines the process of creating any problem as a problem of a coherent system if all assumptions are satisfied. Limitations and mathematical structures are also explained. No person or organization can succeed without making the right decision. So making decisions in today's social and business environment can be a daunting task. It is proposed to use co-ordinated planning strategies in the area of personnel management to reduce the cost of a particular training program adopted by the overcrowded institution, including both educators and non-educators. The institute wishes to send its staff a training program that is essential for environmental development at a low cost.

Keywords:

Linear Programming, Parallel System, Planning Strategies, Operations & Research, Training Program.

1. INTRODUCTION

Linear planning is a way of making a statistical model that is useful in the allocation of limited resources such as personnel, building materials, equipment, time, cost etc. for several compelling tasks. It is known that OR came into existence as a discipline during World War II to manage scarce resources. Although a particular model and art of OR can be traced back to World War I when Thomas Edison (1914-1915) made an effort to use the strategy board to find a solution to reduce shipping losses on enemy ships. About the same time, A.K.Erlang, a Danish engineer, conducted tests to test the flexibility of telephone locations using automatic dialing equipment. The name OR was coined as a result of research into military operations during World War II. Thereafter a team of experts in Mathematics, Economics, Statistics, Engineering and other natural sciences was established as specialized units in the military to deal with strategic issues and problems of various military issues. Following the success of this team OR was very helpful. After the end of World War II, efforts were made to apply the OR approach to social issues related to business, industry, research and development etc. Many labor investigators continued their research after World War II; as a result many important developments were made in OR strategies. In 1947, G. Dantzig developed the concept of a system that is compatible with its solution.

Most business or planning problems involving resources can be converted into mathematical problem. The only important condition is everything details should be available. These problems were involved it contains two major components, one of which is also functional another issue. If both purposes work Barriers are line, then they can be built as a line system problem. Here the line means what changes involved in delays and deliberate action should any power. There are some common types of linear implementation of the programs provided in this paper, but the list is available showing that it is incomplete after creating 1000 problems, there will be another problem

2. PROPERTIES AND ASSUMPTIONS

The problem of linear programming may be stated as that of the optimization of linear objective function of the following type: $Z= C_1X_1+ C_2 X_2+ C_3X_3+\ldots\ldots\ldots\ldots\ldots\ldots+ CnXn$.

Subject to the linear constraints of the form:

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + a_{1n}x_n \ (\leq,=,\geq)b_1$$

$$a_{21}x_1 + a_{22}x_2 + \ldots\ldots\ldots + a_{2n}x_n (\leq,=,\geq)b_2$$

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$$a_{m1}x_1 + a_{m2}x_2 + \ldots\ldots\ldots + a_{mn}x_n (\leq,=,\geq)b_m$$

Where $x_1, x_2, x_3\ldots\ldots\ldots\ldots\ldots x_n \geq 0$

These are called the non-negative constraints.

PROPERTIES AND ASSUMPTIONS IN LINEAR PROGRAMMING PROBLEM:

The Linear system model is based on balanced thinking, continuity of addition, certainty, and complete selection. This is provided in the details below

1) **Equality:** The level of change (slope) of the objective work and the imposed constraints regarding particular decision variability remain the same.
2) **Additions**: Principles on objective performance and equity measurements should be added
3) **Continuity:** Decision variance can take any fractional value and therefore continues as contradicts the number in the environment.
4) **Assurance:** Prices for all model models are assumed to be known for certainty.

3. FORMULATION OF LINEAR PROGRAMMING PROBLEM

In this section we will discuss about the formulation of linear programming problem. They are as follows:

A. Determine the objective of the problem
B. Identify decision variables and conditions involved
C. Formulate objective function
D. Formulate constraints
E. Express the non-negativity constraints
F. Check whether all the conditions are satisfied.

Decision Variables:

These are junior and senior staff from the institution. It is represented by X_1 and X_2 respectively. These variables are used in the two models formulated under the academic and non - academic staff of the institution.

X_1 = Junior Staff, X_2 = Senior Staff

Objective Function:

In any business set up the main aim is to minimize cost and in this case; it is a minimization problem because the cost of training of staff to the establishment has to be minimized. Therefore, the objective function is given by:

Minimize: $Z = C_1X_1 + C_2X_2$

Where C_1 and C_2 are average costs associated to training of junior and senior staff for academic and non- academic staff in the institution; for this study, the cost units are unity in both cases.

Constraints:

The constraint for this study is the time available for training as the program is in- service training

Department	**No. of Junior Staff**	**No. of Senior Staff**
Non-Academic Unit: Vicarage scholarship Library Registration Services	5 8 6 5 3	20 5 3 15 30
Academic Unit School of Mgt. Studies: Business Adm. Dept. Accountancy Dept. Marketing Dept. Banking and Finance Dept.	- 1 1 2	5 6 10 3
School of Applied Science: Food Tech. Dept. Science Lab Tech. Dept. Hotel and Catering Dept. Secretarial Dept. Computer Science Dept. Mathematics and Stat.. Dept. School Office s	4 3 2 1 3 - 1	10 9 8 3 - 2 5
School of Engineering: Mechanical Eng. Dept. Electrical Eng. Dept. Computer Eng. Dept. Civil Eng. Dept.	5 2 1 1	3 3 3 12

The proposed study will demonstrate usefulness of OR in social and economic problems.

Data Presentation

The data used for this study has been assumed.

List of staff in various units of departments of the institution.

(i) Non-Academic

Min. $Z = x_1 + x_2$ S.t. $5x1 + 20x2 \geq 120$

$8x_1 + 5x_2 \geq 120$

$6x_1 + 3x_2 \geq 120$

$5x_1 + 15x_2 \geq 120$

$3x_1 + 30x_2 \geq 120$ where $x_1 , x_2 \geq 0$

(ii) Academic

Min. $Z = x_1 + x_2$ S.t.

$5x_2 \geq 5$

$x_1 + 6x_2 \geq 5$

$x_1 + 10x_2 \geq 5$

$2x_1 + 3x_2 \geq 5$ where. $X_1 , X_2 \geq 0$

(iii) School of Applied Science

Min. $Z = x1 + x2$

S.t. $4x1 + 10x2 \geq 5$

$3x1 + 9x2 \geq 5$

$2x1 + 8x2 \geq 5$

$x1 + 3x2 \geq 5$

$3x1 \geq 5$

$2x2 \geq 5$

$x1 + 5x2 \geq 5$ where $x1 , x2 \geq 0$

(iv) School of Engineering

Min. $Z = x1 + x2$

S.t. $5x1 + 3x2 \geq 5$

$2x1 + 3x2 \geq 5$

$x1 + 3x2 \geq 5$

$x1 + 12x2 \geq 5$ where $x1 , x2 \geq 0$

4. PROPOSED SOLUTIONS

In this section we try to discuss about the proposed solutions for simplex method. This is as follows:

The Best Learning Solution:

Z = 21.05, x1 = 18.94, x2 = 2.10 optimum Integer optimum z = 21, x1 = 19, x2 = 2 From the solution to the problem of uneducated workers using a very large solution, Reduced targeted function is given as z = 21, x1 (Junior) staff) is 19 and x2 (senior staff) is 2 which means 19 junior staff and 2 senior staff from non-students should be sent to a training program that will cost 19 times the cost of training Junior staff and 2 more at the expense of training senior staff.

Academics School of Management Solution:

Optimum z = 2, x1 = 1, x2 = 1 From the solution of the academic staff model (School of Management) we find that sending one Junior and senior staff to a training program that will cost 1 multiplication of training costs for Junior staff and -1 multiplication of the cost of training senior staff.

School of Applied Science Solution optimum:

Z = 4.16, x1 = 1.66, x2 = 2.5 Integer optimum Z = 4, x1 = 2, x2 = 3 From the model solution we find that 2 junior and 3 senior staff members are being sent to the Training Program which will cost 2 times the cost of training for junior staff and 3 times the cost of training senior staff.

5. CONCLUSION

The purpose of this study is to apply specific planning strategies to the optimal use of staff training resources at the institution. The study uses Junior and senior staff as variables. The results show no. Junior and Senior staff from each unit (non-academic and academic) who should be referred to the training program may not be demoted. This study provides complete information on the specific planning process, one of the most widely used methods of Operations Research. This note can help students and researchers to understand the concepts and structures of a specific program.

6. REFERENCES

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