# **INTRODUCTION**

The necessity to solve challenging issues arising throughout wartime operations served as the first impetus for developing Linear Programming in the 1940s. After World War II, many businesses quickly realized the importance of Linear Programming to solve and make important business decisions. To this day, many Business organizations use Linear programming as a tool to make decisions concerning the pricing of the products and supply chain management.

George Bernard Dantzig, professor emeritus of operations research and computer science is the person behind the invention of “Linear Programming” and is also considered to be the person who developed the “Simplex Method”.

## **LINEAR PROGRAMMING**

When the organization is vast and employs a varied number of resources, it's imperative to make every decision by considering a lot of variables. This is where Prescriptive Analytics is used. When a business organization decides to make various decisions concerning profit, sales, cost, etc every business needs to answer an important question which is “ What do we need to do to achieve this?”. Prescriptive Analytics is such tool that any organization employs to make these crucial decisions. Prescriptive Analytics employs various factors, resources, past performances, and other aspects for the organization to make an informed decision. Linear programming is one way which prescriptive analytics employs to help solve any problem with help of Mathematical models.

As per Merriam-Webster, Linear programming is defined as “ a mathematical method of solving practical problems (such as the allocation of resources) using Linear functions where the variable involved is subject to constraints.”

Linear programming helps the business organization to make informed decisions only when they can make the mathematical model of any problem they are seeking to find a solution to. To do this, the following aspects have to be taken care of :

1. They need to define the objective or aim in mathematical terms.
2. The input variables which determine the objective should be definitive and quantitative.
3. The constraints or restrictions considered should be quantifiable and quantitative.
4. The relationship between the objective and inputs has to be Linear.

Once the organization makes sure the above aspects are adhered to, it can move on to the next step which is creating a Linear Programming Problem. Following are the steps involved:

1. Decision Variables – This is used to formulate and achieve the objective function.
2. Objective Function – This defines what the business objective is in terms of mathematical form.
3. Constraints – This needs to be defined to understand what kind of factors are affecting a particular problem.
4. Non-Negativity Constraint – This needs to be defined to make sure there are no negative aspects while defining the issues of the problem.

Linear Programming consists of various methods a particular problem can solve and represented. They are the following:

1. Linear Programming using Simplex Method.
2. Linear programming using Graphical Method.
3. Linear Programming using R.

**APPLICATIONS OF LINEAR PROGRAMMING IN THE REAL WORLD**

As stated earlier, Linear programming can be used to solve various real-world problems. Following are a few areas where linear programming can be used in the aspect of business problems:

1. Product Planning.
2. Marketing Mix.
3. Product Distribution.
4. Product Definition.
5. Quality.
6. Set Production Quota Guidelines.

# **ADVANTAGES AND DISADVANTAGES OF LINEAR PROGRAMMING**

For any individual or organization, it’s imperative to understand the pros and cons before considering any solution to solve any problem.

Following are the advantages of Linear Programming:

* This helps us to make the best use of productive assets. In other words, a Linear programming tool acts as a decision-making tool to successfully utilize all the resources.
* The solutions offered by a Linear programming model are realistic and can be implemented in real-life situations.
* This helps to narrow down the constraints or limitations of any particular problem.
* This helps us to make decisions that will help us in saving time and money in terms of small and large scales.

Following are the disadvantages of Linear programming:

* This model considers only one objective.
* Linear programming does not consider the effects of uncertainty and time.
* The parameters always need to be constant, which is not realistic.
* There is no definitive conclusion that the solution derived is always integer-valued.

# **CONCLUSION**

Why is Linear programming still used for solving real-world problems? –

In this modern era of technology and vast amounts of data, It has become important to understand and determine which data is useful and can be leveraged to one’s advantage. Such a study of data can be called “Data Analytics”. When applied to business models, Data Analytics is referred to as “Business Analytics”. Prescriptive Analytics is also one of the branches of Data Analytics. Other branches of Data Analytics include Descriptive Analytics, Diagnostic Analytics, and Predictive Analytics. Even though the concept of Linear programming has its fair share of limitations when it comes to solving definitive business problems with large sets of data, Organizations tend to lean towards this model as it helps them optimize and efficiently use their resources. As stated earlier, Data is playing a huge role in understanding customer satisfaction and market variances. Therefore it has become very much imperative to follow the linear programming method not to understand the market but also to be successful in the market. In conclusion, Even though the model was developed in the 1940s, it is still powerful enough to adapt and assist modern-day advancements.

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