ABSTRACT

The Indian media and entertainment industry are of the fastest growing industries in the country. The status of the Tamil Movie productions attains new heights in the recent times. Movie making is a process which takes a number of days to years to complete. This research, proposes to create a model by Optimization technique for the effective pre-production stage of the Tamil movie making to fulfill the goal of maximizing the profit of production. The tool identify the genre of the movie is Simplex method.

Keywords: Pre-Production, Casting, Linear Programming, Simplex Method and Project Object Model (POM)

Introduction

The Production cost of Tamil Movies is increasing steadily due to the economic growth. Hence it is a time for the producers to adapt an optimization technique to the celluloid industry. Linear programming is the mathematical technique for the optimum allocation of limited resources such as labour, material, machine, capital, energy, and so on, to several computing activities, such as products, services, jobs, new equipment, projects, and so on, on the basis of given criterion of optimality. The simplex method examines the linear programming problem in a systematic manner, repeating the steps of the algorithm until an optimal solution is reached. Here the software POM is applied to solve the linear programming problem of 11 decision variables and 14 constraints.

Methodology and materials

Data Collection

The Tamil Movies released during the years 2010 has been taken for the study. The genres of all the movies are grouped in ten major categories. The details of Tamil Movies produced in 2010 are given to the sixty respondents and they are informed to fill the questionnaire given to them. From the available data, it is evident that the Kollywood viewers like the movies falls under the genre Drama and Romance. The action and comedy grabbed the next two positions respectively (Figure 1). When we compared the data of movies taken against the hit movies a different scenario is observed in Figure 2.

Table 1 Data Collection on Genres of Tamil Movies [1] (Source: Wikipedia)

<table>
<thead>
<tr>
<th>Genre</th>
<th>No of movies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>10</td>
</tr>
<tr>
<td>Adult</td>
<td>6</td>
</tr>
<tr>
<td>Adult Comedy</td>
<td>7</td>
</tr>
<tr>
<td>Crime</td>
<td>1</td>
</tr>
<tr>
<td>Drama</td>
<td>34</td>
</tr>
<tr>
<td>Disney</td>
<td>3</td>
</tr>
<tr>
<td>Fantasy</td>
<td>4</td>
</tr>
<tr>
<td>Horror</td>
<td>1</td>
</tr>
<tr>
<td>Masala</td>
<td>9</td>
</tr>
<tr>
<td>Music</td>
<td>15</td>
</tr>
<tr>
<td>Mystery</td>
<td>2</td>
</tr>
<tr>
<td>Romance</td>
<td>23</td>
</tr>
<tr>
<td>Sci-Fi</td>
<td>7</td>
</tr>
<tr>
<td>Thriller</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
</tr>
</tbody>
</table>

![Fig 1 Shows composition of genres of Tamil Hit Movies in 2010](image)

Linear Programming Problem

Linear programming problem [LPP] essentially consists of three Components (i) The activities (Variables) and their relationship (ii) The Objective function and (iii) The constraints such as job. Here the decision variable which decides the genre of a movie is represented by \( X_1, X_2 \ldots \ldots X_n \). All decision variables are continuous, controllable and non-negative. That is, \( X_1 \geq 0, X_2 \geq 0 \ldots \ldots X_n \geq 0 \), the objective function is represented in one of two forms Optimize (Maximize or Minimize) \( Z = c_1 X_1 + c_2 X_2 + \ldots + c_n X_n \).

3. Where \( Z \) is the measure of performance variable, Which is a function of \( X_1, X_2 \ldots \ldots X_n \). The \( c_1, c_2 \ldots \ldots c_n \) are parameters or uncontrollable variables that give the contribution of a unit of respective variables \( X_1, X_2 \ldots \ldots X_n \) to the measure of performance \( Z \). budget of the movie. There are always some certain limitations (or constraints) on the use of limited resource like Artist, Technician, Cine equipment, weather etc. Such constraints must be expressed as a linear equalities or inequalities in terms of decision variables. The solution of the LP model should satisfy the constraint.

C. Mathematical Formulation of LPP

Optimize (Max or Min)
\[ Z = \sum_{j=1}^{n} c_j x_j + \sum_{i=1}^{m} o s_i \]
\[ z = c_1 x_1 + c_2 x_2 + \ldots + c_n x_n + o s_1 + o s_2 + \ldots + o s_n \]

Subject to the linear constraints

\[ \sum_{j=1}^{n} a_{ij} x_j + s_i = b_i \quad i = 1, 2, \ldots, m \] (constraints)

\[ x_i, s_j \geq 0 \text{ for all } i \text{ and } j \] (Non-negativity conditions)

In Matrix notations the standard form is expressed as:

Optimize (Max or Min) \( z = cx + os \)

where \( c = (c_1, c_2, \ldots, c_n) \) is the row vector,
\( X = (x_1, x_2, \ldots, x_n)^T \), \( b = (b_1, b_2, \ldots, b_m)^T \) and
\( A \) is the \( m \times n \) matrix of coefficient of variables \( x_1, x_2, \ldots, x_n \) in the constraints.

D. Simplex algorithm

The steps of the simplex algorithm [5] for obtaining an optimal solution to a linear programming problem as follows:

Step 1: Formulate the mathematical model of the given linear programming problem. There should be an objective function, subject to the constraints and Non-negative constraints.

Step 2: Set-up the initial solution.

Write down the coefficients of all the variables in the LP Model in a tabular form, as shown in Table 2, in order to get an initial basic feasible solution \([xB=B^(-1)b]\)

Step 3: Test for Optimality.

Calculate \( c_j - z_j \) value for all non-basic variables and examine the values of \( c_j - z_j \). The following three cases may arise:

If all \( c_j - z_j \leq 0 \) then the basic feasible solution is optimal.

If at least one column of the coefficients matrix (i.e. \( a_{kj} \)) for which \( c_j - z_j > 0 \) and all other elements are negative (i.e. \( a_{ij} < 0 \)) then there exits an un bounded solution to the given problem.

If at least one \( c_j - z_j > 0 \) and each of these columns have at least one positive element (i.e. \( a_{ij} \)) for some row, then this indicates that an improvement in the value of objective function \( Z \) is possible.

Step 4: Select the variable to enter the basis.

If case (iii) of step 3 holds, then identify the pivot or key column by using the equation \( ck - zk = \text{Max} \{ c_j - z_j; c_j - z_j > 0 \} \)

Step 5: Test for feasibility (variable to leave the basis).

Find the minimum ratio \( \text{Min} \{ \frac{b_i}{a_{ji}} ; a_{ij} > 0 \} \) This ratio limits the number of units of the incoming variable that can be obtained from the exchange. The division by a negative or by a zero element is not permitted. The row selected in this manner is called key or pivot row. The element lies at the intersection of key row or key column is called key or pivot element.

Step 6: Finding the new solution.

The new entries in \( C_b \) (Coefficient of basis variables) and \( XB \) (Value of basic variables) columns are updated in the new simplex table of the current solution.

Step 7: Repeat the procedure

Go to step 3 and repeat the procedure until all the entries in the \( c_j - z_j \) are either negative or zero.

Table 2

Shows Cost table for Decision variables and constraints in the pre-production stage of movie making process.

Table 3

Defining the assignment problem for Casting of Tamil Movie

A square matrix of order \( 11 \times 11 \) is obtained based on the genre of the movie. The artists for leading role are fixed based on the budget of the movie. Similar method is also applied for deciding the total salary for the technicians in the movie crew. In the cost table, the short listed artists are placed in the rows (resource) and the corresponding genres of the movies are treated as activities column. The call sheets offered by the artists to the various types of movies are indicated in the opportunity cells [8] of the cost table.

Fig 2. Shows Favorite Movie Genres of Respondents

Result

The Genre of the movie to be produced is allocated using the Simplex Method. In the LPP (table 3), Profit of each genre of a movie is the objective function and the 14 constraints involved in the pre-production stage of the different genres of Tamil movie are placed. The optimized values of the profit oriented genres are obtained at the end of iterations showed in table 4.
Shows LPP of Simplex Method to the Pre-production stage of Tamil Movie using POM [5]

Table 4
Solution of LPP obtained by Simplex Method

Future Work
The result obtained by the above method can be continued to the Casting of the shooting process by the [8] Hungarian Assignment problem. [10] This paper can be implemented in the internal details of a movie recommender system. [9] The scheme can be used to drag the producers towards economic movie production. There are several ways in which our casting system of Tamil movies can be enhanced.

Conclusion
The Pre-production stage in a movie making is completed meaningfully by the application of LPP. Simplex method using POM leads to the effective production and enriched quality of the movie. Finally, the production unit’s profit is maximized as when happened to their previous film production. This method can also be improved to do the film distribution and advertising.

REFERENCES