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Research Paper

Optimization of Resources in Construction Using Linear Programming and With System Approach

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ABSTRACT
This paper demonstrates the use of linear programming methods as applicable in the construction company. Many construction companies are still established to derive financial profit. In this regard the main aim of such establishment is to maximize the profit. This project is on using linear programming technique to derive the maximum profit from resource management of building construction.Nowadays, managers are evaluated by their decision-making. Linear programming is one of the strongest techniques which can be used by managers to solve problems considering/subject to the settings of the problem.In this project, data will be collected from the Public Work Department. Using Linear Programming Problems the data should be solved and the same data will be implemented in PRIMAVERA (P6). The results from the above two were compared and the optimal result can be adopted. Thus the resource will be optimized and come to the conclusion of project.

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I. AIM

Linear programming is used in business to find maximum profit or minimum cost.

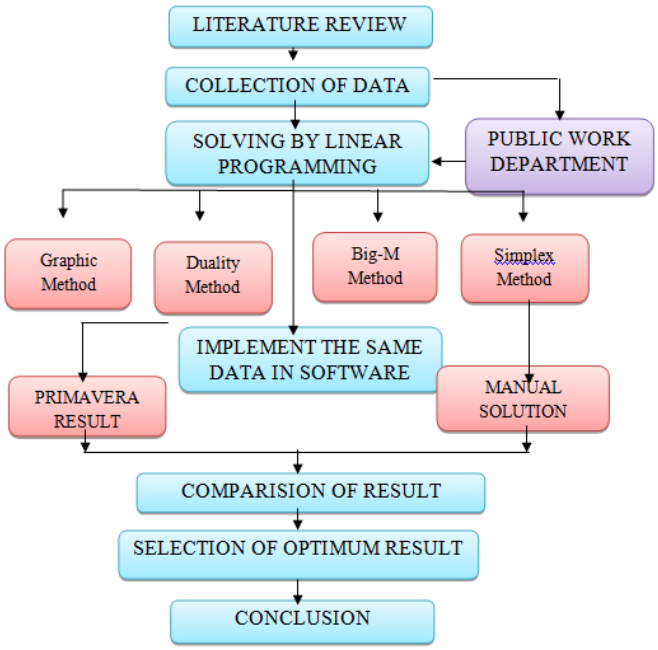
1.1 OBJECTIVE

- To maximize the profit or minimize the cost.
- To identify the feasible region from the linear programming problem.
- To optimal allocation of limited resources.

II. LITERATURE REVIEW

Maryam Solhi Lord (et all.,), Mar. 2013
The managers are evaluated by their decision-making. Linear programming is one of the strongest techniques which can be used by managers to solve problems considering subject to the settings of the problem. By applying the linear programming, the managers are trying to maximize their profit on one hand, and minimize their costs on the other.
Zolfa Abdul Fattah Shalaby (etall.,), 2014
In this paper, focuses upon how it is possible to create optimal solution to the problem of production planning through spreadsheet software packages. This opens new application horizons and new methods of teaching management science. A numerical example is given to show the importance of this new technique.
Al-kuhali K. (et all.,), 2012
The production of Flat Panel Monitor of four sizes and will point more the products that contribute the main function of profit. Methodology: For the Optimization of the profit of LCDs manufacturing company, the linear programming and sensitivity analysis methods were applied. The four constraints of the LCDs production planning are (1) acquire of line space for production, (2) the assembly of products, (3) Quality control and assurance Hours (4) and packaging of material. Results: In all three scenarios the total profit is optimum and increases from scenario 1 to scenario 3. The difference between the profit of scenario 1 and scenario 2 is 257625, and gap between scenario 2 and scenario 3 is 171750. Conclusion: the three scenarios for the production of the LCDs present the varying consequences of the maximum profit for the company. However, the third scenario is the most optimal solution for the maximization of the objective function.

III. METHODOLOGY



DATA COLLECTION

RAWMATERIALNEED FORBRICKSTRUCTURE	QUANTITYAVAILABLEFORSTRUCTURE
Manpower(no's)	11550
Cement(50Kgbag)	4500
Sand (cft)	23400
Brick (no's)	49950

T3.1 Quantityofresourceavailableforbrickstructure

Resources	Ground Floor(per day)	FirstFloor(perday)	Second Floor(per day)
Manpower(no's)	45	43	41
Cement(50Kgbag)	20	18	13
Sand (cft)	89	86	86

T3.2 Quantityofresourcerequiredforeach floor

FLOOR	PROFIT(Rs)
Ground Floor	567000
FirstFloor	729000
SecondFloor	567000

T3.3 Average Profit for Three Floors

ID	Activitydescription	Duration	Predecessor
1	Earthworkexcavationforfoundation	5	-
2	Earthworkopenexcavationforseptictank	3	1
3	Cementconcretemix1:5:10	15	1
4	RandomRubbleMasonryincementmortar 1:5	5	2,3
5	Refillingthebasement withexcavatedearth	2	4
6	Supplyingandfillinginfoundation andbasementwith stonedust	4	5
7	Roughstonedrypackingfillingusingstones	2	5
8	Dampproofcourseincementmortar1:4	8	5
9	Supplyinganderectingshuttering	10	6,7,8
10	Supplyinganderectingwater tightsteel	**3**	**9**
11	Cement Concretemix1:1.5:3	3	9
12	Supplying,fabricatingandplacinginpositionofmild steel	7	9
13	Brickpartitionwallsusingcountrybricks	35	10
14	Precastreinforcedcementconcreteslab	10	13
15	Weatheringcourseconcreteusingbrokenbrick	15	14
16	CeilingplasteringandfinishingalltheexposedRCC surfaces	20	15
17	Plasteringwithcementmortar1:5	10	16
18	Providing blackboardin twolayers ofcementmortar1:3	5	16
19	Pre-constructionanti-termitetreatmentplintharea	2	17
20	Pavingthefloorwith Rajasthan kotastone	5	11,12,19
21	Pavingthefloorwitheurocontiles	10	18,20
22	Supplyingandfixingcupboard shutter	3	21
23	Manufacturingsupplyingandfixingofsteeldoors	10	22
24	Manufacturingsupplyingandfixingofsteeldoors	9	23
25	Supplyingandfixingofmildsteelwindow	5	24
26	Manufacturing supplying and fixing in position steelsheetedwindows	10	23,24
27	Supplyingandfixingirongrillsforwindows, ventilators	4	26
28	Supplyingandfixingsteelbalsustrades	3	27
29	SupplyingandfixingG.I.pipehandrails	5	27
30	Providingreinforcedcementconcretejally	20	27
31	Whitewashingthreecoat	7	28,29,30
32	Distemperingtwocoats	5	31
33	Paintingthewallswith twocoats	5	31
34	Supplyingandpaintingnewironwork	3	31
35	Drillingofborewell	2	32
36	SupplyofPVCplaincasingpipes	2	35
37	Supplying,layingandjoiningP.V.C.pipes	2	36
38	SupplyingandfixingofPVCwatertank	3	37
39	Totalvalueofelectricalwork	2	38
40	ProvisionforRainwaterHarvesting	2	39
41	Provisionforlabourwelfarefund1%	2	39
42	Provisionforfoundationstonelaying	2	40
43	Provisionforadvertisementcharges	2	38,39,42
44	ProvisionforGeophysicalsurvey	2	41,43
45	Provision for Documentationcharges	2	44
46	Provision forPhotographiccharges	2	45
47	ProvisionforNameboardarrangement	5	46
48	Provision forFrontelevation	5	46,47
49	Provisionforpettysupervisioncharges	5	48
50	Finishingwork	0	49

T3.4 DESCRIPTION DETAILS

PROCEDURE FOR SIMPLEX METHOD

STEP 1

Convert the linear programming (LP) to standard form. Check the objective function is maximizes or minimize.

STEP 2

To introduce the slack variables convert the inequality constraint into equality constraint.

STEP 3

Find the initial basic feasible solution.

STEP 4
To compute the net evaluation.
STEP 5
To find the entering variable.
STEP 6
To find the leaving variable.
STEP 7
To drop the leaving variable and introduce the entering variable.
STEP 8
To repeat the step 4 until the optimum feasible solution is obtained.
STEP 9
Finally the optimum solution was obtained.

IMPLEMENT THE DATA WITH SYSTEM APPROACH

In this linear programming problem can be solved in computer program by using different software. The software's are PRIMAVERA, MATLAB, LINDO, and AMPL etc. In this project PRIMAVERA is used.

PRIMAVERA

Resource Balancing

Resource Balancing is a process that gives an idea about availability of sufficient resources to perform the activities in the chosen project according to the plan. During resource balancing, an activity is only scheduled to occur when its resource demands are met. To accomplish this, tasks may be delayed to resolve conflicts related to resource availability. The resources in a project can be smoothened and also leveled.

Resource Leveling

The network technique focuses on time element and assumes that unlimited resources are available for assigning to the activities to satisfy the time schedule.But when resources are limited, the "critical path" and "slack" lose their significance. Activity may be delayed due to non-availability of resources as well as due to change in the sequence of tasks. The process of distribution of available resources to meet the objectives of various activities constituting a project is called "Resource Allocation" or "Resource Loading". This is done in a way so that the project completion schedule is least affected. The act of taking a project with people assigned to a bunch of tasks and making it so that they don't have to work overtime is called Resource Levelling.

IV. CONCLUSION

This paper gives more ideas about optimization of resources, and also states that the managers have tried to maximize the profit in one hand and minimize the cost on other hand. The linear programming model is used by the managers to determine the most economical arrangement of finance to arrange the best times to start and finish the projects. In this paper I have studied various journal papers about the resource optimization and I have understood the application of linear programming in resource optimization in construction industry. It is recommended that linear programming method is adoptable for optimization of resources in construction industry.

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