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Selection of layout alternative using factor evaluation

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Abstract

In the present study layout have been selected with evaluation. All the necessary steps for the evaluation have been discussed in detail. The selection stage of any solution tool is very important step. In the present study an evaluation method used for the analysis of facility layout has been discussed. A practical case study of an automobile industry has been taken. There were two alternatives at the evaluation stage of design process, and the factor analysis method has been implemented for selecting the best among them. The score for alternative 1 and 2 are as: 965 and 829 respectively, therefore alternative 1 is selected as best among these. This study is very helpful for the layout designer for selecting the best layout. In future this method can be implement on other industries with more number of alternatives.

Keywords: factors analysis; facility layout; evaluation; selection;

1. Introduction

Facility Layout is the configuration of Departments, Work centers, and Equipment, whose design involves particular emphasis on movement of work, customers and materials through the system [1-3]. Layout planning is planning that involves decisions about the physical arrangement of Economic Activity Centers needed by a facility's various processes [4,5]. The main objectives of facility layout planning involve [1,6-9] :Reduce operating costs; Minimize Material handling costs; Utilize Space efficiently; Utilize Labor efficiently; Eliminate Bottlenecks; Facilitate Communication and interaction between workers, between workers and their supervisors, or between workers and customers; Reduce manufacturing Cycle Time and customer service time; Eliminate wasted or Redundant Movement, etc.

Evaluation is the most important stage for any problem [10-12]. It should be carried out very carefully, and the method of evaluation depends upon the type of problem. For a single problem,

there may be more than one method available, for evaluation of the layout the available methods [13-15] are given below:

- Factor analysis or also called Weight factor comparison method.
- List the advantages and disadvantages
- Ranking based on selected consideration.
- Tally of gain and losses expected.
- Rating of alternatives verses objectives.

In the present study factor analysis method is discussed. It has been implemented on a real case study problem of an automobile part manufacturing industry. This paper is organized as: introduction in section 1, layout analysis detailed out in section 2, section 3 represents results and discussion followed by conclusion in section 4

2. Layout analysis

This method selects the factors or the considerations on which the decision has been made, each factor was given a weight value according to its importance [15-18] .The alternatives were then rated on one factor at a time. The rated value was multiplied by the weight value. The weight rating was totaled for each alternative and numerical comparison was made. This method involved management and the experts from the similar field in the selecting and weighting the factors, and in rating the alternative at each factors. Specified criteria were used to evaluate the layout and factor analysis method was used to measure the weight of each criterion against each layout.

Steps of factor analysis method

Step 1: Select the factors; Step 2: Provide weights to each factor; Step 3: Rate the alternatives on each factor; Step 4: Multiply the rates with the weights of each factor; Step 5: Sum the values for each column for each alternative; Step 6: Select the alternative with higher total value as best

This method is implement to a case industry. The following criteria were specified by the management of the industry:

i. Space utilization
ii. Management and control
iii. Flow of material
iv. Internal household and employee satisfaction
v. Ease of maintenance
vi. Preferred closeness
vii. Attractiveness of layout

Each criterion (i – vii) was given a weight in term of the importance there of. The total weight of seven criteria should be equal to hundred. Each alternative was then given a rating score between 0 - 10, where zero means that the alternative did not at all take the criterion in to consideration and ten means the layout was excellent in terms of the specified criterion. The rating score that each alternative achieved was then multiplied by the weight of that specified criterion. The total score of each alternative was then calculated. The alternative with the highest score was then selected as the best layout for the facility.

3. Results and Discussion

The factor analysis method has been implemented on a case study. The table 1 below shows the results of implementation.. This table demonstrates the criteria and the weight for teach alternative with final score

Criteria	Weight	Alternative-1	Score	Alternative-2	Score
1	25	8	200	9	225
2	10	7	70	7	70
3	22	8	176	9	198
4	8	9	72	9	72
5	14	6	84	8	112
6	16	8	128	7	112
7	5	7	35	8	40
Total	100		865		829

As shown in the table 4.1, the different scores for alternative one and two are 865 and 829 respectively. This means that alternative-1 with the highest score, was the best layout in term of the criteria that was specified.

4. Conclusions

The analysis part of any solution tool is very important step. In the present study an evaluation method used for the analysis of facility layout has been discussed. A practical case study of a automobile industry has been taken. There were two alternatives at the evaluation stage of design process, and the factor analysis method has been implemented for selecting the best among them. The score for alternative 1 and 2 are as: 865 and 829 respectively, therefore alternative 1 is selected as best among these. This study is very helpful for the layout designer for selecting the best layout. In future this method can be implement on other industries with more number of alternatives.

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