

## FACILITY LAYOUT DESIGN OF LIBRARY USING SYSTEMATIC LAYOUT PLANNING

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### ABSTRACT

*Facilities in a library must be well planned and arranged in a layout such a manner that the objective of increase in productivity and efficiency of library operations achieved. There are different techniques and approaches for facility layout design; among this systematic layout planning approach is adopted for design library facility layout in this paper. A simplified framework for the application of systematic layout planning for the design of library facility layout is proposed by making enough modifications in the basic approach.*

**Keyword:** Facility layout, Library layout, Systematic layout planning, Relationship chart, Layout planning.

### 1. INTRODUCTION

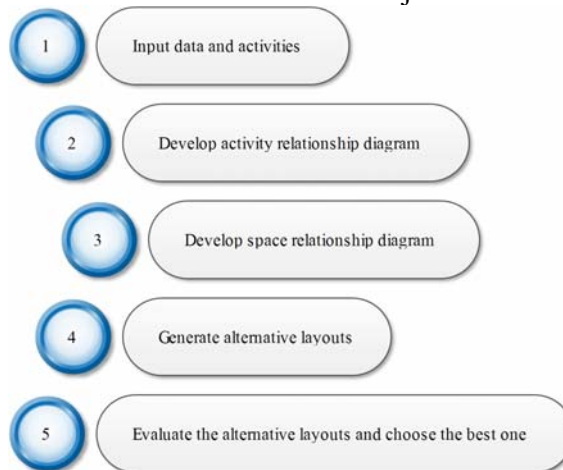
The physical arrangements like building and equipments that make the work easier are known as facilities. Planning and design of layout of these facilities arrangement is very important such that it has tremendous impact on the quality of daily operations. A good layout results in minimization of workers movement, material handling and waiting time of customers. This will increase the productivity, customer satisfaction and better utilization of space. A library is a physical building or room where organized collection of resources that made available to a defined community for reference or borrowing. Bureau of Indian standards recommends that a library should have a stack room, librarian room and reading space of 40 to 120 chairs. The stack room must be equipped for accommodating 6000 to 10000 books. Enough furniture, equipments also provided to meet the operation requirements of a library. All these facilities arranged in such a way that activities of library carried out in an efficient manner. There are many techniques and approaches are available for the facility layout design. Among this systematic layout planning is most popular approach which utilizes a systematic and sequential approach for facility layout design.

This paper attempts to study about the application of systematic layout planning approach to facility layout design of library. A simplified and modified framework for the systematic layout planning is also proposed in this work.

### 2. SYSTEMATIC LAYOUT PLANNING (SLP)

Systematic layout planning developed by Richard Muther and associates [1] which involve step by step facility layout design from input data to the evaluation of generated layouts. This

technique can be successfully applied for both production and service facilities. The major steps involved in systematic layout planning are shown in fig1. The systematic layout planning starts with data collection regarding the activities, product, quantity, time and schedule. Based on these input data an activity relationship diagram is drawn with the help of flow analysis and activity analysis. Then a space relationship diagram is prepared by considering the availability and requirement of space constraints. A number of alternative layouts are generated by incorporating the results from relationship diagrams. These layouts are evaluated and select the best one that meets our objectives.



*Figure 1: Steps in systematic layout planning*

### **Data collection**

The first step which collects enough data and information needed for the design of layout. The data or information about product, activity, schedule, time and quantity are collected.

### **Flow analysis and activity analysis for activity relationship diagram**

Flow analysis is concerned with quantitative measures of movement between department and activities; while activity analysis deal with non-quantitative factors that influence the location of departments. Flow analysis is carried out by the help of either flow process chart, flow diagram or from-to chart. Flow process charts uses symbols like circle, arrow, square, triangle and D for representing operation, transport, inspection, storage and relay respectively. Vertical lines are used to connect these symbols in the sequence they are performed. Flow diagram represents the probable movement of materials in layout by drawing lines. The from-to chart is a matrix that contains numbers representing a measure of material flow between departments or activities. Flow diagram is adopted in this work for flow analysis.

Activity analysis is done with the help of constructing an activity relationship diagram and activity relationship chart. An activity relationship chart is a matrix whose elements represent relationship among activities or departments. To represent desirable or undesirable level of closeness between departments letter codes are used. A for absolute necessary, E for especially important, I for important, O for ordinary closeness, U for unimportant and X for undesirable.

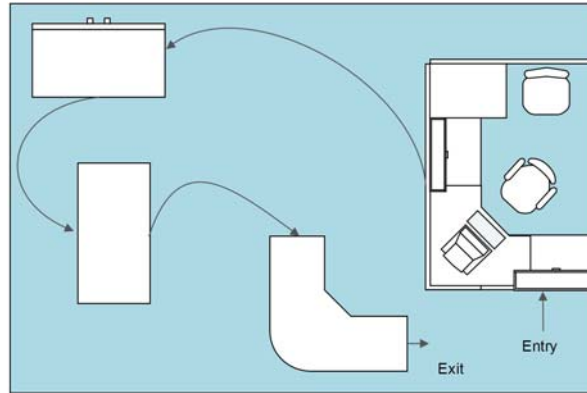


Figure 2: Flow diagram example

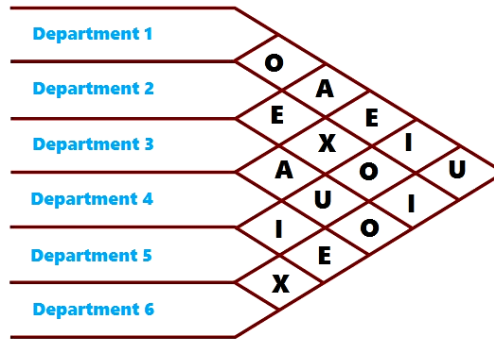


Figure 3: Activity relationship chart example

Then certain numerically weighted ratings are assigned to closeness values for calculating total closeness rating (TCR) for each department. The departments are then arranged with TCR values. From this activity relationship chart an activity relationship diagram is constructed to depict spatially the relationships of these activities.

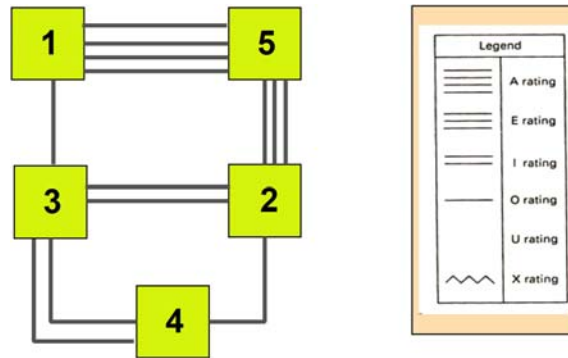


Figure 4: Activity relationship diagram example

**Space relationship diagram**

Before constructing space relationship diagram space availability and space requirement is analysed. Industrial standards or regulations can be used to determine the space requirement. This space consideration is then combined with activity relationship diagram to obtain space relationship diagram. Then the space templates are modified and adjusted and the relative locations of the activities are shifted as necessary to accommodate practical limitations and necessary to accommodate practical limitations and other considerations.

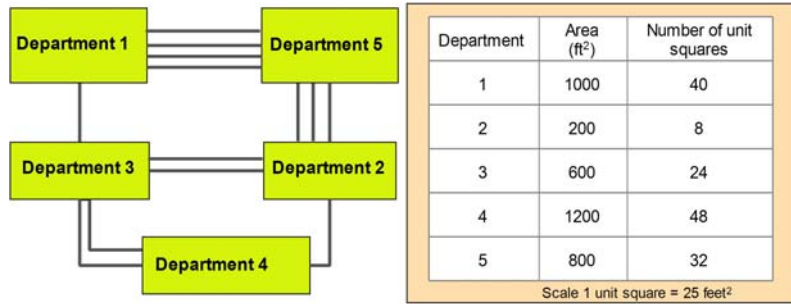


Figure 5: Space relationship diagram example

**Generate alternative layouts**

A number of alternative component designs, a number of alternative overall designs, or a number of alternative detailed designs are generated.

**Select the best layout**

From the alternative layouts select the best layout that meets the design objectives. Implement the layout and evaluate it periodically for further modifications. Techniques such as mathematical programming models, queuing models and simulation models can be used for the evaluation of alternative layouts [3].

**3. FRAMEWORK FOR THE APPLICATION OF SYSTEMATIC LAYOUT PLANNING (SLP) IN LIBRARY FACILITY LAYOUT DESIGN**

A simplified framework for the application of systematic layout planning is proposed in this work and it can be modified according to the type of complexity and nature of the facility layout problem. The framework can be adopted by the planners to arrange library facilities in a systematic manner to achieve the design objectives.

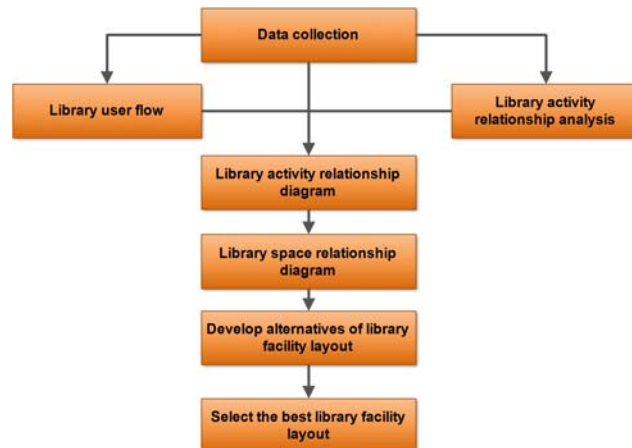


Figure 6: Framework for systematic layout planning for library facility design

Library facility layout planning starts with data collection about the facilities, requirements, location and other factors which has significant impact on the layout. In case of library flow of material is viewed as flow of library user. Most of the libraries having stack room, librarian room, issue and return counter, catalogue cabin, readers desk, computer desk and magazine or journal display area. The flow diagram of movement of user is constructed by

considering the possible movements between the various library sections. During library visit a user usually goes through a series of activities like book return, catalogue search, magazine reading, reference reading, taking books, internet browsing etc. The sequence of these activities sometime follows a pattern otherwise not. The best layout is one in which meets the user requirements in correct sequence. A library activity relationship diagram is constructed based on the findings from the activity analysis of library users and staffs. Next step is the developing space relationship diagram by considering the space available and requirement. It gives location and space allocated to each section. Based on these diagrams various alternative layouts are generated and evaluate these layouts using different techniques or comparison with meeting the maximum objectives of design. This evaluation process ends in an optimum solution of best layout.

Different computer simulation tools such as CRAFT, ALDEP etc can be employed to assist the layout design process based on systematic layout planning. This framework can be modified to layout problem of libraries with multi-floor facilities and complex activities.

#### **4. CONCLUSION**

Layout planning of facilities in a library becomes an inevitable activity which influences the performance and productivity of library functions. The decisions about layout have long-term consequences such that they must be made with careful planning. Systematic layout planning approach is modified to meet the design objectives of library facility layout design which leads to maximum satisfaction to the employees, management, and library users. The framework is simplified such that the application to an existing layout modification can be easily executed. The inclusion of considering cost factors and multi-floor facility problem solving methods to the framework will make it more advanced and advantage tool in the field of layout design.

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