Redesign of office layout using activity relationship chart (ARC) at the “X” department administration office of a “Y” university

Wahyukaton¹, Ghina Affifah²

¹Industrial Engineering Department, Engineering Faculty, Universitas Pasundan
   Jl. Setiabudi 193 Bandung, West Java, Indonesia, wahyukaton@unpas.ac.id
²Industrial Engineering Department, Engineering Faculty, Universitas Pasundan
   Jl. Setiabudi 193 Bandung, West Java, Indonesia, ghnaff04@gmail.com
   wahyukaton@unpas.ac.id, ghnaff04@gmail.com

Abstract. Administration office at “X” Department is a room for managing papers and letters administration, documentation, archiving, and also a room for communication to lecturers and students and office administrators. This room needs to have good layout in order to support the activity for all elements within the department. Redesign the office layout will reduce the time to wait for completing the letters which are needed by the students and the lecturers. This paper’s objectives are to improve the information flow and data flow, to reduce the documents stack, and to create a comfortable office to meet the facility layout principles. Activity Relation Chart (ARC) is been used to redesign the office layout by distributing questionnaires to the students and officers and lecturers to obtain the preference of closeness to construct the chart. The result is to redesign the desk into “L” shape to reduce the movements. Also, this result was explained later by a simulation using ARENA.

Keywords: ARC, layout, office, facility, simulation

1. Introduction

Facility layout is an activity to analyze, to concept, to design, and to realize the system for goods producing or services. Generally, facility layout is described as floor plan, a physical facility to optimize the relationship of officers, workers, materials flow, information flow, and a needed procedure to obtain effective and efficient effort [1]. The scoop of facility layout is not only for manufacture problems, also it is been applied to office, transportation, warehousing, packaging, and so on, and those fields corresponding to input, process, and output. In manufacturing fields, the input, process, and output could be tangible, raw materials and components, but in office layout, the input, process, and output would be intangible like information flow and data flow.

The administration office is dealing with documents, papers, letters to run the administration for the department. This paper’s objectives are to improve the information flow and data flow, to reduce the documents stack, and to create a comfortable office to meet the facility layout principles, in this paper, Activity Relationship Chart (ARC) is been used.
2. Method

Facility layout is an activity to analyze, to concept, to design, and to realize the system for goods producing or services. Generally, facility layout is described as floor plan, a physical facility to optimize the relationship of officers, workers, materials flow, information flow, and a needed procedure to obtain effective and efficient effort [1]. The scope of facility layout is not only for manufacture problems, also it is been applied to office, transportation, warehousing, packaging, and so on, and those fields corresponding to input, process, and output. In manufacturing fields, the input, process, and output could be tangible, raw materials and components, but in office layout, the input, process, and output would be intangible like information flow and data flow.

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Facilities in an office must be well planned and arranged in a layout such a manner that the objective of increase in productivity and efficiency of an office operations achieved. There are different techniques and approaches for facility layout design; among this systematic layout planning approach is adopted for design office facility layout in this paper is chosen Activity Relationship Chart (ARC) to meet the objectives. A simplified framework for the application of systematic layout planning for the design of office facility layout is proposed by making enough modifications in the basic approach.

This technique can be successfully applied for both production and service facilities. The systematic layout planning starts with data collection regarding the activities, closeness, rooms, equipment. Based on these input data an activity relationship diagram is drawn. 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 the objectives [2]. Simplified Systematic Layout Planning is especially useful in job shops or process layouts, where there are many different products that are produced in limited quantities. Where there is no consistent process flow, the development of a relationship chart may be the best data you have to determine relative placement of separate work areas. The value of a relationship chart should not be ignored in product-oriented layouts or production lines. The six-step process will aid you in locating all the necessary support functions. [5][6]

2.1 Variables for Questionnaire

The questionnaires were distributed to three groups of respondents, which were lecturers, officers, and students. For those three groups, the questionnaire’s variables are as follows,

| Administration Desk (AD) | LR1 | LR2 | MDB | IB | SIB | DC | PM | OR | T |
|--------------------------|-----|-----|-----|----|-----|----|----|----|----|
| Lecturer Room 1 (LR1)    |     |     |     |    |     |    |    |    |    |
| Lecturer Room 2 (LR2)    |     |     |     |    |     |    |    |    |    |
| Mark Display Board (MDB) |     |     |     |    |     |    |    |    |    |
| Information Board (IB)   |     |     |     |    |     |    |    |    |    |
| Seminar Information Board (SIB) |     |     |     |    |     |    |    |    |    |
| Documents Cabinet (DC)   |     |     |     |    |     |    |    |    |    |
| Photocopy/Printer Machine (PM) |     |     |     |    |     |    |    |    |    |
| Officer Room (OR)        |     |     |     |    |     |    |    |    |    |
| Toilet (T)               |     |     |     |    |     |    |    |    |    |

Table 1. Closeness
### Table 2. Layout Variables, Ordinal Scale 1 – 5 for agreement

| Sub Variable       | Indicators       |
|--------------------|------------------|
| Desk layout        | U shape          |
|                    | L Shape          |
| Cabinet layout     | U shape          |
|                    | L Shape          |
| Orientation        | In the middle of the room |
|                    | At the corner of the room |

### Table 3. Waiting room Variables, Ordinal Scale 1 – 5 for agreement

| Sub Variable | Indicators       |
|--------------|------------------|
| Bench        | Long bench       |
|              | Chair            |
| Orientation  | Outside the room |
|              | Inside the room  |

2.2 **Activity Relationship Chart (ARC)**

The objective of ARC is to obtain a closeness relationship from every activity within office or factory organization. To explain the degree of closeness among activities in ARC, symbols are used, which are A, E, I, O, U, and X.

- **A**: Absolutely necessary
- **E**: Especially important
- **I**: Important
- **O**: Ordinary closeness
- **U**: Unimportant
- **X**: Undesirable

2.3 **Layout**

Layout is a decision to determine a long term for an operation efficiency. There are many effects based on layout decision, such as capacity, process, flexibility, cost, work environment quality, customer contact, and enterprise image. The effective layout will help the enterprises to support their business’s strategy for differentiation strategy, low cost, and quick respond.

In order to planning a layout, it needs to,
1. High benefit of rooms, facilities, and labors.
2. Improvement of information flow, material flow, labor flow
3. Increase work morale and a better safety
4. Increase enterprise and customer interaction
5. Increase flexibility

To describe layout, a block layout is used regarding relationship among activities.

2.4 **Simulation**

Plant layout design requires diverse field of knowledge. Among others the application and use of computers become an advantage. Computer can perform tedious computations and generate several alternative solutions much more rapidly and effectively than manual procedures. [3]

Simulation is a method to duplicate or to describe a real system characteristic. The early idea of simulation is to imitate the real system as mathematically, then to learn the characteristics and operational characters, and decision is made based on a simulation eventually. With this method, the real system will remain untouched until a benefit or loss is found based on a simulation. A simulation software ARENA is used to modelling a redesign layout.
3. Result and Discussion
After questionnaires been distributed, collected, and summarized, all questions are valid and the questionnaire is reliable.
The ARC can be formed as follows,

![Diagram showing the Activity Relationship Chart]

**Figure 1.** Activity Relationship Chart

**Table 4.** Closeness of ARC

| Code | Closeness                                      |
|------|-----------------------------------------------|
| 1    | Using the same record                         |
| 2    | Using the same personal                       |
| 3    | Using the same room                           |
| 4    | Personal relationship level                   |
| 5    | Paperwork relationship level                  |
| 6    | Paper flow sequence                           |
| 7    | Using the same work flow                      |
| 8    | Using the same equipment and facility         |
| 9    | Noisy, dirty, dusty, etc.                     |
| 10   | Anything might need                           |

Based on the processed questionnaires, the chosen administration desk layout is “L” shape, cabinet layout is “U” shape, and long bench for the waiting room, with regards to ARC, then the layout redesign of the administration office will be as follows,

![Diagram showing the Layout Redesign]

**Figure 2.** Layout Redesign
The simulation using ARENA software, the result as follows,

![Figure 3. Key Performance Indicators (KPI)](image)

![Figure 4. Queue Detail Summary](image)

The result of the simulation shows that the queue on managing documents are minimum, indicated in the Table 4 that the waiting time is 0.06, and number of waiting is under 1 person, it means that the work flow runs well.

4. Conclusion
Based on an ARC and layout redesign, the conclusion can be drawn that to improve activity flow, work flow, and information flow, the layout is using “L” shape desk, cabinet layout is “U” shape will minimize the movement and increase the efficiency in regard of managing paper work and administration work in administration office, and it has been proved by the simulation.

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