



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**APPLICATION OF FACILITY LAYOUT SOFTWARE:
CASE STUDY AT ISUZU HICOM MALAYSIA**

Thesis submitted in accordance with the partial requirements of the Universiti
Teknikal Malaysia Melaka for the Bachelor of Manufacturing Engineering
(Manufacturing Management) with Honours

By

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Faculty of Manufacturing Engineering

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS TESIS*

**JUDUL: APPLICATION OF FACILITY LAYOUT SOFTWARE:
CASE STUDY AT ISUZU HICOM MALAYSIA**

SESI PENGAJIAN: 2009-2010

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ABSTRACT

This report focused on the optimization of facilities layout in an automotive factory using CRAFT method. CRAFT is one of the earliest layout algorithms presented in the literature and used commonly to solve layout problem. CRAFT significantly can increase the productivity when applied while layout planner simultaneously improves the quality of the final solution by generating and numerically evaluating a large number of layout alternative in short span of time. The main purpose of doing this study is to select and identify the tools to solve the facility layout problem before designing the new improvement layout. The scope of this project is the facility layout and the distances. In order to conduct this study, the methodologies used are based on the objectives and it will be done at Isuzu Hicom Malaysia. In these report the comparison across the new proposed layouts with the current layout shows that the higher difference of the flow distance is contributed by the new layout 3 where the difference in flow distance travel is 109.48meter

ABSTRACT

Laporan ini berfokus pada meningkatkan susun atur kemudahan di industri kereta dengan menggunakan kaedah CRAFT. CRAFT merupakan salah satu algoritma susun atur yang paling awal dibangunkan dalam sejarah dan menggunakan susun atur umum untuk menyelesaikan masalah. CRAFT secara teori dapat meningkatkan produktiviti bila diterapkan sementara penganalisis susun atur secara bersamaan meningkatkan lagi penyelesaian akhir dengan menghasilkan dan menilai secara berangka sejumlah besar alternatif susun atur dalam jangka masa yang singkat. Tujuan utama melakukan kajian ini adalah untuk memilih dan mengenal pasti alat untuk menyelesaikan masalah susun atur kemudahan sebelum merancang susun atur perbaikan baru. Ruang lingkup projek ini adalah kemudahan susun atur dan jarak. Dalam rangka untuk melakukan kajian ini, metodologi yang digunakan didasarkan pada tujuan dan itu akan dilakukan di Isuzu Hicom Malaysia. Dalam report itu perbandingan susun atur kemudahan yang baru dicadangkan dengan susun atur kemudahan yang ada sekarang ini menunjukkan bahawa perbezaan yang lebih tinggi merupakan jarak aliran daripada susun atur kemudahan 3 baru mana perbezaan dalam aliran perjalanan jarak 109.48meter

DEDICATION

To my beloved father, mother and friends, thank you for the support and encouragement.

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Alhamdulillah, thanks to Allah the Almighty for His will, I have the chance to finish up my Projek Sarjana Muda 2 (PSM 2) report from the very word till end point within the specified period.

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TABLE OF CONTENTS

ABSTRACT	ii
ABSTRACT	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
List Of Figure	ix
List Of Table	xi
CHAPTER 1	1
INTRODUCTION	1
1.0 The Concept Of Facilities Layout	1
1.1 Problem Statement	2
1.2 Research Objective	3
1.3 Research Scope	3
1.4 Research Methodology	4
1.5 Organization Of Report	4
CHAPTER 2	7
LITERATURE REVIEW	7
2.0 Introduction	7
2.1 Background of Facilities Layout	8
2.2 Objective of Facility Layout	9
2.3 Types of Facilities Layouts	10
2.4 Non-Traditional Types of Layout	13
2.5 Why We Need Facility Layout	17
2.6 Review of literature in Facilities Layout	18

CHAPTER 3	27
Rearch metodologi and CONCEPT OF CRAFT	27
3.0 Introduction.....	27
3.1 Experimental Design.....	27
3.2 Background of CRAFT Method	30
3.3 Advantages of Method.....	33
3.4 Disadvantages of Method	33
3.5 CRAFT Algorithms	34
3.6 Conclusion	34
 CHAPTER 4	 36
ORGANIZATION BACKGROUND	36
4.0 Introduction.....	36
4.1 Company profile	36
4.2 Objectives of Company	40
4.3 Vision of Isuzu Hicom Malaysia Sdn.Bhd.	41
4.4 Mission of Isuzu Hicom Malaysia Sdn.Bhd.	41
4.5 Company’s product.....	42
4.6 Production flow process	45
4.7 Departments at Isuzu Hicom Malaysia.....	47
4.8 Revised the Existing Layout.....	56
4.8 Conclusion	58
 CHAPTER 5	 59
CRAFT SOFTWARE.....	59
5.0 INTRODUCTION	59
5.1 CRAFT SYSTEM.....	60

5.2	Craft software in visual basic.....	60
5.5	Transfer from (x, y) input to matrix input	65
5.6	Summation distance between department centriods	66
5.6	Conclusion	68
CHAPTER 6		69
RESULT AND ANALYSIS		69
6.0	Introduction.....	69
6.1	Current layout	70
6.2	Propose layout 1.....	72
6.3	Propose layout 2.....	74
6.3	Propose layout 3.....	76
6.3	Propose layout 4.....	78
6.3	Propose layout 5.....	80
6.7	Comparison across layout.....	82
6.8	Conclusion	83
Chapter 7.....		84
CONCLUSION		84
7.0	Introduction.....	84
7.1	Background of Research.....	84
7.2	Research Findings.....	85
7.3	Recommendation for further research	86
7.4	Conclusion	86

LIST OF FIGURE

Figure 1. 1	The research methodology	5		
Figure 2. 1	Flowline (Product) layout. (Sources: Plant Location and Layout, (Abha Kumar, 2003))	10		
Figure 2. 2	Functional (Process) layout. (Source: Plant Location and Layout, Abha Kumar, 2003)).....	10		
Figure 2. 3	Cellular (Group) layout.(Source: Operation Management, Stevenson)11			
Figure 2. 4	A U-shaped production line (Source: Operation Management, Stevenson)	11		
Figure 3. 1	Experimental design.....	28		
Figure 3. 2	Solution Quality and Solution Time of Solution Approaches to Facility Layouts Problems. (Sources: Construction Heuristics, Thonemann)	32		
Figure 4. 1	Logo of Isuzu Malaysia.....	37		
Figure 4. 2	Map of Peninsula Malaysia and the location of the	38		
Figure 4. 3	Area view of Isuzu HICOM Malaysia Sdn Bhd (IHMSB).....	38		
Figure 4. 4	Organisation chart for Isuzu HICOM Malaysia Sdn Bhd (IHMSB)....	40		
Figure 4. 5	MTB 145	Figure 4. 6	MTB 140 crew	42
Figure 4. 7	MTB 150 Dx and DXL	42		
Figure 4. 8	MTB 170 PB.....	42		
Figure 4. 9	MTB 170 UV	43		
Figure 4. 10	HICOM Handalan (FSS).....	43		
Figure 4. 12	ISUZU D-MAX.....	44		
Figure 4. 13	: Body assembly at.....	45		
Figure 4. 14	: Workers assemble.....	45		
Figure 4. 15	: White body truck is paint at Paint Shop	46		
Figure 4. 16	: Painted body is going to	46		

Figure 4. 17 : Finish truck is going to Tester Line.....	47
Figure 4. 18 Isuzu Hicom Malaysia Sdn.Bhd. General Layout.....	48
Figure 4. 19 Layout in body shop.....	49
Figure 4. 20 Trim & Final 2 Layout.....	50
Figure 4. 21 Layout in Workshop.....	51
Figure 4. 22 General flows across department.....	57
Figure 5. 1 The pseudo code for reading input data.....	61
Figure 5. 2 Flow of Craft Software.....	62
Figure 5. 3 The pseudo code for randomly generate layout design.....	63
Figure 5. 4 The pseudo code for Randomly generate layout design.....	64
Figure 5. 5 The pseudo code for calculate department centriod.....	65
Figure 5. 6 Coordinate of X and Y.....	65
Figure 5. 7 The pseudo code for transfer from (x, y) input to matrix input.....	66
Figure 5. 8 The pseudo code for Euclidean distance.....	67
Figure 5. 9 The pseudo code for summation distance between department centriods.....	68
Figure 6. 1 Figure of current layout.....	71
Figure 6. 2 Result of detail exchange from Craft.....	72
Figure 6. 3 Result of Differences current layouts with new layout_1.....	72
Figure 6. 4 New Layout_1.....	73
Figure 6. 5 Result of detail exchange from Craft.....	74
Figure 6. 6 Result of Differences current layouts with new layout_2.....	74
Figure 6. 7 New Layout_2.....	75
Figure 6. 8 Result of detail exchange from Craft.....	76
Figure 6. 9 Result of Differences current layouts with new layout_3.....	76
Figure 6. 10 Result of detail exchange from Craft.....	78
Figure 6. 11 Result of Differences current layouts with new layout_4.....	78
Figure 6. 12 New Layout_4.....	79
Figure 6. 13 Result of detail exchange from Craft.....	80
Figure 6. 14 Result of Differences current layouts with new layout_5.....	80
Figure 6. 15 New Layout_5.....	81

LIST OF TABLE

Table 2. 1	Summaries of literature review	19
Table 4. 1	Data of size and building area	54
Table 4. 2	Grouped departments after revised	56
Table 6. 1	Comparison in total flow distance between layouts.....	82

CHAPTER 1

INTRODUCTION

1.0 The Concept Of Facilities Layout

Facility layout is an arrangement of machines, departments, workstations, storage areas, aisles, and areas within an existing or proposed facility. (Irani and Huang,2000) Layouts have far-reaching implications for the quality, productivity, and competitiveness of a firm. Layout decisions significantly affect how efficiently workers can do their jobs, how fast goods can be produced, how difficult it is to automate a system, and how responsive the system can be to changes in product or service design, product mix, and demand volume (Abha Kumar, 2003).

They are three basic common type of layout that is use in Manufacturing. They are process layout, product layout, and fixed-position layout. Each type of layout plays a different role or different purpose.

The facilities layout deal with the arrangements of work areas and equipments. The basic theme behind the arrangement of work areas is to produce the product economically, to provide the service effectively, and to provide a safe and good physical environment for the users that is, the workers and/or the customers. They have a lot of benefit of using a layout like;

a)Minimum Handling of Materials:

A good plant layout takes into consideration the various flows of materials inside the plant this can minimizing the handling of materials. The choice of the material handling equipment and the systems of storage of materials, have a lot to do with the way the plant facilities are laid out.

b)Minimum Damage and Spoilage of Materials:

If adequate consideration regarding handling and storage of materials is given, it automatically minimizes damage and spoilage of materials.

c)Reduced Congestion of Materials, Machinery and Men:

A good physical layout should eliminate confusion in the plant. By doing, it not only makes the life of the supervisor easier but also contributes towards overall improvements in the productivity of the shop.

d)Flexibility with Regard to Changing Production Conditions:

A good layout, that is a good spatial system, should be one that is adaptable or flexible enough to take care of probable future changes in the volume of production in the range of products manufactured, and changes in the method/processes of production.

1.1 Problem Statement

Isuzu Hicom Malaysia Sdn Bhd (formerly known as Malaysian Truck & Bus Sdn Bhd) is located in Pekan, Pahang Darul Makmur. Isuzu is famous for producing commercial vehicles and diesel engines - it produced 16 million diesel engines in 2003 alone, which can be found in vehicles all over the world. In Isuzu Malaysia,

they produce about eight types of vehicle and they are only one type for the passenger vehicle and the rest are for the commercial vehicle like medium and heavy duty trucks.

The plant at Pekan, Pahang was build on 1994, and the area cover about 100 acre and occupying plant facilities like production building, offices, gatehouse, and warehouses. As an old factory building the with the limited worker which have a knowledge about the Facilities Layout, the arrangement of the factory department and machine are not in smooth flow. Therefore the optimum space utilization does not garneted. As a result, problem such as long products and workers travel distance, which lead to waste the time, is an obvious incident.

1.2 Research Objective

In general the objective of this research is to design a new layout that can be improved the space utilization of the Isuzu Company.

The specific objectives of this research are listed below:

- i. To identify the performance measure suitable for facility layout
- ii. To design the new improved layout

1.3 Research Scope

This research is focusing on layout optimization of Isuzu Hicom Malaysia Layout. The data from the industry such as actual layout size is required. The research will also be focused to the single performance measure that is distance. Therefore, productivity, quality and so on will not be considered.

1.4 Research Methodology

The methodology for this research is as an illustrated in Figure 1.1.

Basically, the first step is to identify the problem that occurs in the industry. After finding and understand what is the problem, the second step is to identify what are the best tools or technique that can be used to solve the problem base on the situation. For this research, the method used to optimize the layout is CRAFT method. CRAFT is selected because of its ability to capture the initial layout with reasonable accuracy. Then, collection of the data is conducted to have a correct input for this research. Using all the data that have been collect and the method that have been use, a new layout is generated. Analyze the new layout with the old layout. The final step is to form a conclusion about the information that whatever the new layout are make any improvement or not.

The progress of this research following the given methodology is as illustrated in Table 1.1. Overall the project has program as planned.

1.5 Organization Of Report

Chapter 1 presents the introduction of the research conducted which is background, problem statement, objective, scope, research methodology and organization of report. This chapter, explains how the subtopics influence each other in this research.

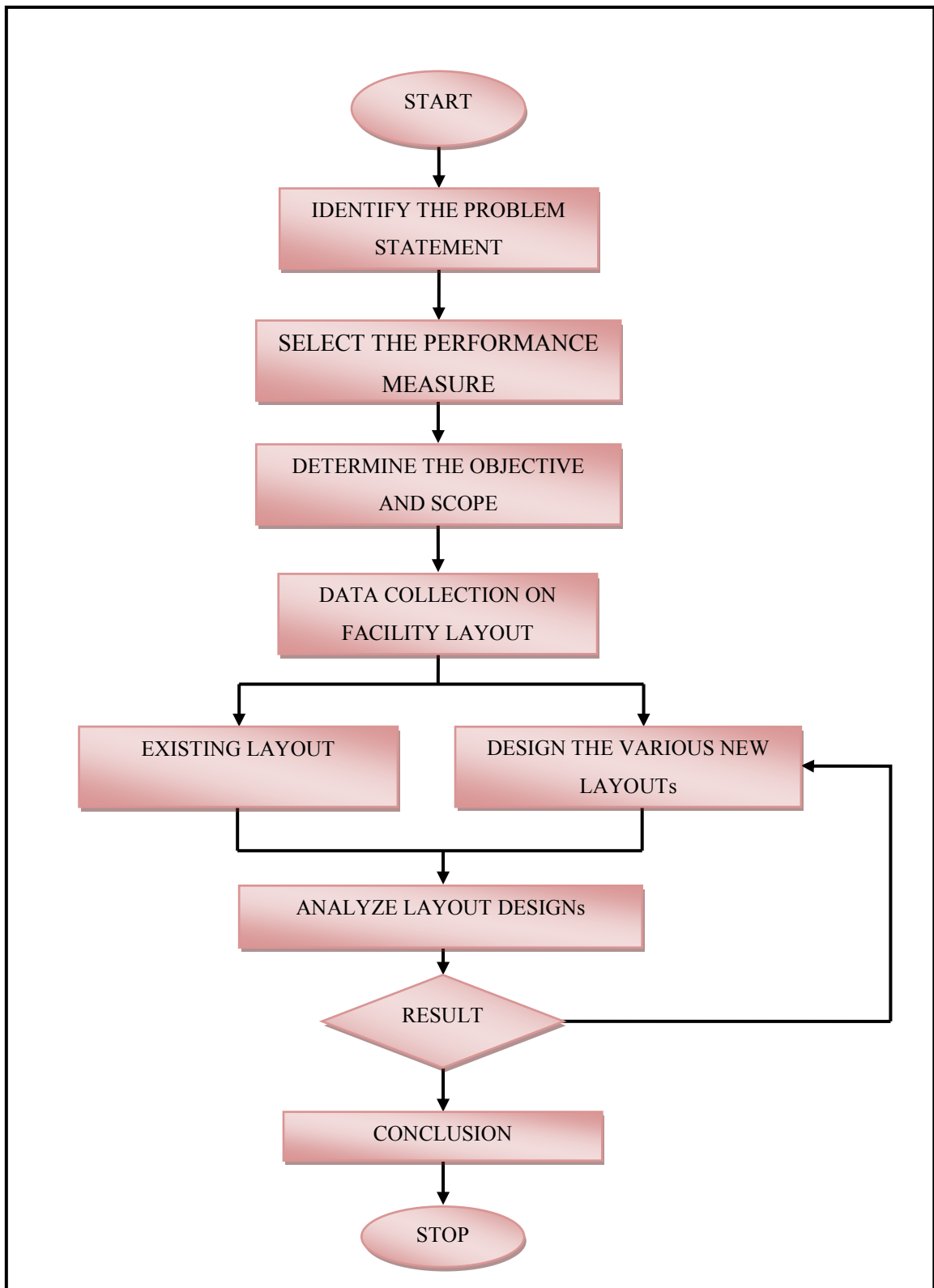


Figure 1.1 The research methodology

Chapter 2 presents the literature review on the background and basic information about the facility layout. By understand the basic of the facilities layout and the type of facilities. It may enhance the progress of this research. It reviews some basic tools that used for this facilities layout problem.

Chapter 3 presents the methodology used for conduct this research. It describes what is the CRAFT method and the uses of the tools in this research. This chapter included the background, the procedure, advantage and disadvantage of the tools.

Chapter 4 present case study for the activities concluded to get the input data. This chapter is explained about the company background and the department that IHM have. The layout of the company is also being attached.

Chapter 5 describe about the outlines the procedure adopted for developing algorithms for the craft software. For building this software Visual Basic (VB) is chosen because it was originally created to make it easier to write programs for the Windows computer operating system.

Chapter 6 presents the result and analysis performed in this research. Specifically, 5 new layouts are developed using the craft software. The flow distance of each of the layouts is then calculated using Euclidian distance formula. This chapter included the Comparison across the layouts.

Chapter 7 the developments of Craft software are success. This chapter concludes this research by presenting research background, research findings and recommendation for further research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Facilities layout concerns with finding an arrangement for work areas and equipments such that optimum performance can be achieved. A good layout minimizes handling of materials, minimizes raw materials damage, reduced conjunction and ensure layout flexibility. Those elements contribute significantly towards factory performance.

Due to the significant of having optimum layout, this chapter prepares foundation towards solving facilities layout. Specifically, Sections 2.1 describe background to the concept of facilities layout. Section 2.2 describe about the objective of facilities layout, Section 2.3 provide type of facilities layout, Section 2.4 explain Non-Traditional Types of Layout, Section 2.5 describe the needs for facilities layout and Section 2.6 review literature in facility layout before concluding the chapter

2.1 Background of Facilities Layout

Facility layout refers to the arrangement of machines, departments, workstations, storage areas, aisles, and areas within an existing or proposed facility. (Irani and Huang,2000) Layouts have far-reaching implications for the quality, productivity, and competitiveness of a firm. Layout decisions significantly affect how efficiently workers can do their jobs, how fast goods can be produced, how difficult it is to automate a system, and how responsive the system can be to changes in product or service design, product mix, and demand volume (Abha Kumar, 2003). Therefore, it is necessary to have the best layout design so that the factory operations at the optimum performance.

The determination of the best layout for a facility is a classical industrial engineering problem. The prime interest in a facilities-design problem is to determine a layout that optimizes some measure of production efficiency. The layout problem is applicable to many environments like warehouses, banks, airports, manufacturing system and many more. Each of the above applications has distinct characteristic. Some of the common objectives in any facilities-design problem as seen in would be (Nahmias 2004):

- i. to minimize cost investment for production
- ii. to utilize available space efficient
- iii. to minimize material handling cost
- iv. to reduce work in progress

Facilities layout design determines how to arrange, locate and distribute the equipment and support devices in a manufacturing facility to achieve minimization of overall time, maximization of the operational and arrangement flexibility, maximization of turnover of work-in-process and maximization of factory output in conformance with production schedule. Systematic Layout Planning (SLP) is a conceptual systematic approach that provides a process for layout design. SLP provides a systematic and structured procedure to guide layout planners through a

sequence of steps and set of conversations for identifying and evaluating various activities and alternatives involved in any layout design procedure.

Selection of an appropriate layout for multi-product facility poses a major challenge since the best decomposition of its material flow network is usually achieved by a hybrid layout that must combine the flow and machine grouping attributes of the three traditional layouts. But SLP design process does not describe specific method for design of batch layouts. It lacks a systematic method in varying the manufacturing focus on the batch can be composed (Muther,1973).

An effective strategy to eliminate the limitations of SLP is to combine it with another technique known as production flow analysis (PFA) which is:

- i. Incapability of generating layouts that are hybrid combination of Functional and Cellular layout.
- ii. Incapability of product routings, instead of the From-to-Chart as input data.

A layout module is defined as a group of machines connected by a material flow that exhibits a flow pattern characteristic of a specific type layout such as Functional, Flowline, Fixed-position, Cellular or Hybrid Layout (Buffa, 1964).

2.2 Objective of Facility Layout

An efficient Facility layout is one that can be instrumental in achieving the following objectives (Irani and Huang (2000):

- i. Improve productivity.
- ii. Minimize overall production time and material handling cost.
- iii. Provide enough production capacity.
- iv. Facilitate manufacturing process.
- v. Effective utilization of men, equipment and space.
- vi. Provide employees convenience, safety and comfort.
- vii. Maintain flexibility of arrangement and operation.

2.3 Types of Facilities Layouts

There are several alternative layout types that are appropriate for different product mixes and production volumes. Determination of the layout type is a major design decision because it impacts on so many other aspects of the production system. Three type of layout are considered appropriate for a manufacturing facility which are Flowline (Product), Functional (Process) and Cellular (Group) (Buffa, 1964).

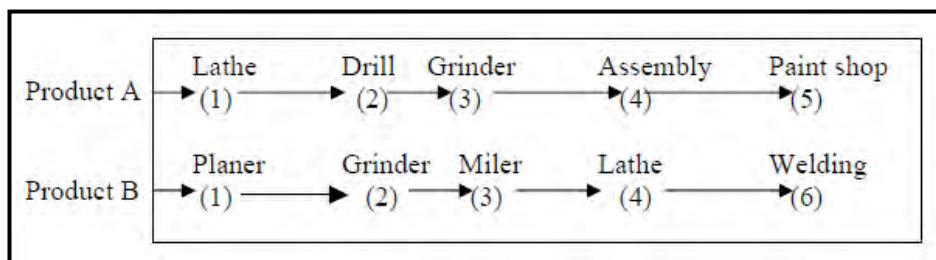


Figure 2.1 Flowline (Product) layout. (Sources: Plant Location and Layout, (Abha Kumar, 2003))

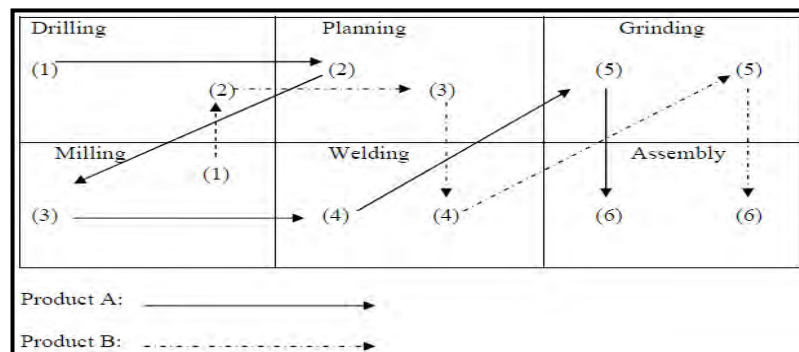


Figure 2.2 Functional (Process) layout. (Source: Plant Location and Layout, Abha Kumar, 2003))

