



# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Productivity Improvement Using Workstudy Assessment At A Communication Manufacturing Company

SESI PENGAJIAN: 2008/09 Semester 2

Saya **HASLINA MOHAMMAD**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \*\*Sila tandakan (√)

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

Alamat Tetap:

No. 18 (lot 161), Jalan 7,

Kampung Melayu Sri Gombak

68100, Batu Caves, Selangor

Cop Rasmi:

**EFFENDI BIN MOHAMAD**  
Pensyarah  
Fakulti Kejuruteraan Pembuatan  
Universiti Teknikal Malaysia Melaka

Tarikh: 18 MEI 2009

Tarikh: 21/5/2009

\*\* Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.



# **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

## **Productivity Improvement Using Work Study Assessment At A Communication Manufacturing Company**

Bachelor Degree Project is submitted in accordance with the requirements of the  
Universiti Teknikal Malaysia Melaka for the Degree of  
Bachelor of Manufacturing Engineering (Robotic)

By

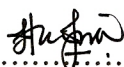
**Haslina Binti Mohammad**

Faculty of Manufacturing Engineering

2008

## DECLARATION

I hereby, declared this report entitled “Productivity Improvement Using Workstudy Assessment At A Communication Manufacturing Company” is the results of my own research except as cited in references.

Signature :  .....

Author's Name : HASLINA BINTI MOHAMMAD

Date : 22<sup>nd</sup> MAY 2009

## APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTEM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Robotic and Automation) with Honours. The members of the supervisory committee are as follow:



.....  
(Signature of Principal Supervisor)

**EFFENDI BIN MOHAMAD**  
*Pensyarah*  
Fakulti Kejuruteraan Pembuatan  
Universiti Teknikal Malaysia Melaka

## **ABSTRACT**

Project Sarjana Muda is one of the requirements needed for all UTeM students to fulfill their Bachelor Degree course. The study is about the productivity improvement using work study assessment at a communication manufacturing company. There are many techniques used for productivity improvement; still there are no definite techniques to be used. So, this study is will focus on a productivity improvement of a communication manufacturing company by using work study method that is using time study and process flow analysis. This study at Multitone Electronics Sendirian Berhad will has its objectives to manage time study for product module RPR 750 and RPR 580 and 2 Way Repeater, analyze the difference of the work study between products for different time line and determine the performance activity in productivity and to calculate man power capacity that is required by the production to complete the order. This is to improve the productivity of the company. By using calculation and process flow observation also the un-needed workstation can be identified and be reduce so that the number of workers needed for each assembly process of the products can be reduce so that the productivity can be improve.

## **DEDICATION**

This thesis is dedicated to my parents, En. Mohammad and Pn. Salmah and also for my family members, my brothers and my sister who provide the most supportive atmosphere of loving and caring that help me cope with the situation.

## **ACKNOWLEDGEMENT**

First of all, I am really grateful to almighty Allah S.W.T because the strength that he gave me, finally I have finished my Project Sarjana Muda II without any delay. I am also very grateful to Almighty Allah S.W.T for granting me the wisdom and strength to face and overcome the challenges and obstacle to accomplish this PSM II.

I thank my academic supervisor, En Effendi bin Mohamad for giving advice, having time to cope with my behavior and giving so much help during the time to finish this report. I also thank Pn Rohana because of her help for me to gain a lot of knowledge throughout the study.

Secondly, I would like to thank the Factory Manager, Mr Krishna Muniandy for giving me the opportunity to learn, improve, and apply my skills in the industrial field. I would also like to thank my supervisors, Mr Jeevanandam Selvaraj and Mr Rozlie Mohd Yasin for guiding and helping me since we started to collect data for the study

# TABLE OF CONTENTS

Abstract	i
Acknowledgement	ii
Table of Contents	iii
List of Figures	vi
List of Tables	vii
List of Appendices	viii
<b>1. INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Overview of the study	1
1.3 Problem Statement	2
1.4 Objective of the study	2
1.5 Scope of the study	3
1.6 Challenge faced	3
1.7 Significant of study	4
1.8 Project methodology	5
1.9 Expected Result	7
<b>2. LITERATURES REVIEW</b>	<b>8</b>
2.1 Introduction	9
2.2 Productivity	9
2.2.1 Productivity Techniques	11
2.3 Productivity Resource	15
2.3.1 Equipment utilization	16
2.3.2 Labor Utilization	16
2.3.3 Labor Efficiency	16



2.4 Work Study	17
2.4.1 Method Study	19
2.5 Standard	20
2.5.1 Objective of Standard	21
2.6 Work Measurement	22
2.6.1 Definition	22
2.6.2 Application	22
2.6.3 Standard Time	22
2.6.3.1 Allowance	24
2.6.3.2 Time standard and their uses	27
2.6.3.3 Time standard technique	29
2.6.3.4 Motion Economy	30
2.6.4 Work Measurement Technique	33
2.6.4.1 Time Study	33
2.6.4.2 Important of Time Study	34
2.7 Production Time	35
2.7.1 Definition	35
2.7.2. Correlation in Production Time	35
2.8 Manual Assembly Lines	36
2.8.1 Fundamental of Assembly Line	38
2.8.2 Assembly Workstations	38
<b>3.0 METHODOLOGY</b>	<b>40</b>
3.1 Introduction	40
3.2 Project Methodology	41
3.2.1 Project Title Selection	43
3.2.2 Problem Statement Identification	43
3.2.3 Find Literature Review related to topic	43
3.2.4 Data Collection	43
3.2.4.1 Primary Data	44
3.2.4.2 Secondary Data	44

3.2.5 Planning Methodology	44
3.2.6 Gantt Chart	45
3.2.7 Data Gathering and Process Mapping	45
3.2.8 Data Analysis	45
3.2.9 Discussion	45
3.2.10 Conclusion	46
3.3 Flow Chart involve in Establishing Standard Time	47
3.3.1 Analyze the job	48
3.3.2 Standardization	48
3.3.3 Selection of operator	48
3.3.4 Explanation to Operator	48
3.4 Stopwatch Time Study	50
3.5 Data Analysis	50
3.6 Time Study Procedure	50
3.7 Gantt Chart	52
<b>4.0 COMPANY BACKGROUND</b>	54
4.1 Company Background	54
4.1.1 Company Name	54
4.1.2 Company Logo	55
4.1.3 Company Motto	55
4.1.4 Company Objective	55
4.1.5 Company Policy	55
4.1.6 Company Location	56
4.1.7 Company Map	58
4.2 Organization Chart	59
4.3 Introduction of Company	60
4.4 Company Service and Product	61
<b>5.0 RESULT AND DISCUSSION</b>	63
5.1 Introduction	63

5.2 Data Collection	64
5.3 Time study	64
5.4 Standard Time	65
5.5 Rating factors and Allowance	66
5.6 Process Flow Chart	67
5.7 Process Plan Layout	68
5.8 Results for Cycle Time	69
5.9 Standard Time Results [Before Improvement]	71
5.9.1 Product: RPR 750 pager series	72
5.9.2 Product: RPR 580 pager series	74
5.9.3 Product: 2 Way Repeater	75
5.10 Process Flow [Before Improvement]	76
5.10.1 Product RPR 750 pager series	77
5.10.2 Product RPR 580 pager series	80
5.10.3 Product 2 Way Repeater	83
5.11 Standard Time Results [After Improvement]	85
5.11.1 Product: RPR 750 pager series	85
5.11.2 Product: RPR 580 pager series	87
5.11.3 Product: 2 Way Repeater	88
5.12 Process Flow [After Improvement]	90
5.12.1 Product RPR 750 pager series	90
5.12.2 Product RPR 580 pager series	93
5.12.3 Product 2 Way Repeater	96
5.13 New Process Plan Layout	98
5.14 Calculation of Productivity for Assembly Process	100
5.14.1 Product: RPR 750 series	100
5.14.2 Product: RPR 580 series	102
5.14.3 Product: 2 Way Repeater	103
5.15 Summary	104
<b>6.0 CONCLUSION AND SUGGESTION</b>	<b>105</b>

6.1 Conclusion	105
6.2 Suggestion for Improvement	106
6.3 Other Improvement Method	106
6.3.1 Operators' factor	106
6.3.2 Work Instruction Procedures [Standard Operation Procedures]	107
6.3.3 Minimize the waste in the process	108

<b>REFERENCES</b>	109
-------------------	-----

## **APPENDICES**

A	Job/Worksite Analysis Guide
B	Cycle Time RPR 750 series
C	Time Study RPR 750 series
D	Cycle Time Flow RPR 750 series
E	Cycle Time 2 Way Repeater
F	Cycle Time Flow 2 Way Repeater
G	Cycle Time RPR 580
H	Time Study RPR 580
I	Working Instruction Procedures RPR 751

## LIST OF FIGURES

1.1: Project Methodology Flow	6
1.2: Overall Research Methodology Flow	7
2.1: Pareto chart	13
2.2: The cause and effect diagram	14
2.3: Example of Process Flow Chart	15
2.4: Example of Histogram	16
2.5: Method study and work measurement	19
2.6: Structure of standard time	25
2.7: Configuration of Manual Assembly line	39
3.1: Project Methodology Flow	43
3.2: Overall Project Methodology Flow Chart	44
3.3: Flow Charts of the steps involved in establishing standard time	49
3.4: Systematic Procedure for Method and Work Measurement	51
4.1: Company Logo	57
4.2: Company's building from front view	59
4.3: Company's building from side view	59
4.4: Company Map	60
4.5: Organization Chart	61
5.1: Plant Layout for RPR 750 and RPR 580	71
5.2: Plant Layout for 2 Way Repeater	72
5.3: Graph for Standard Time in RPR 750 Assembly	76
5.4: Graph for Standard Time in RPR 580 Assembly	77
5.5: Graph for Standard Time in 2 Way Repeater Assembly	79
5.6: RPR 750 Flow Assembly Process	81
5.7: RPR 750 Series Flow Layout	82
5.8: RPR580 Flow Assembly	84
5.9: RPR 580 series flow Assembly	85
5.10: 2 Way Repeater Flow Assembly	87

5.11: 2 Way Repeater Assembly Flow	87
5.12: Graph for Standard Time in RPR 750 Assembly	89
5.13: Graph for Standard Time in RPR 580 Assembly	90
5.14: Graph for Standard Time in 2 Way Repeater Assembly	92
5.15: Flow Assembly for RPR 750	94
5.16: RPR 750 series flow Assembly [After Improvement]	95
5.17: Flow Assembly for RPR 580 [After Improvement]	97
5.18: RPR 580 series flow Assembly [After Improvement]	98
5.19: 2 Way Repeater Flow Assembly [After Improvement]	100
5.20: 2 Way Repeater Flow Assemblies [After Improvement]	100
5.21: New Plan Layout for RPR 750 and RPR 580	101
5.22: New Plan Layout for 2 Way Repeater	102

## LIST OF TABLES

2.1: Techniques for Setting Time Standards	31
2.2: The principle of motion economy, based upon Gilberth's pioneering work Motion economy eliminates wasteful movements.	32
2.3: Products Usually Made on Manual Assembly Lines	38
3.1: Gantt Chart PSM I	54
3.2: Gantt Chart PSM II	55
5.1: Cycle Time data for product RPR 750	72
5.2: Cycle Time Data for product RPR 580	73
5.3: Cycle Time Data for 2 Way Repeater	73
5.4: Standard Time for product RPR 750	75
5.5: Standard Time for product RPR 580	77
5.6: Standard Time for product 2 Way Repeater	78
5.7: RPR 750 Process Descriptions and Standard Time	80
5.8: RPR 580 Process Descriptions and Standard Time	83
5.9: 2 Way Repeater Process Descriptions and Standard Time	86
5.10: Standard Time for product RPR 750 [Improve]	88
5.11: Standard Time for product RPR 580 [Improve]	90
5.12: Standard Time for product 2 Way Repeater [Improve]	91
5.13: RPR 750 Process Descriptions and Standard Time [Improve]	93
5.14: RPR 750 Process Descriptions and Standard Time [Improve]	96
5.15: 2 Way Repeater Process Descriptions and Standard Time [Improve]	99
5.16: Sign of Flowchart Modules	101

# **CHAPTER 1**

## **Introduction**

### **1.1 Introduction**

The study is about the work study assessment for productivity improvement at communication manufacturing company. This chapter will be overview the study and the statement of problem related to the study. Chapter 1 will provide the objectives of the study and scopes to ensure that the objectives can be achieved. This chapter will also review the challenges faced by the communication manufacturing company and the significance of the study for the company. Lastly, this chapter contains the explanation about the methodology of the project.

### **1.2 Overview of The Study**

The productivity movement has been around for 50 years. In that time a number of techniques, methodologies and productivity strategies been developed. However, the pursuit of improved productivity still seemed important. Most organization would like to find the recipe for the ultimate productivity improvement. However with many techniques used for productivity improvement still there are no definite techniques to be used. So, this study is will be focused on a productivity improvement at a communication manufacturing company by using work study assessment. Which will be focusing on the work study, work measurement, relationship between work study and productivity improvement and methods that can be used for it thus improving productivity? To calculate the productivity improvement the tools that been used including Microsoft Excel and Flow Assembly.



### **1.3 Problem Statement**

Nowadays, organizations of all sizes are trying to stay competitive and profitable for a long-term period. Most companies have a major opportunity to reduce their cost, customer lead-time and cycle time through the application of Lean Manufacturing technologies. The purpose of this study is to identify how the work study would be important tools for companies to increase productivity thus important information required by facilities planner. Time standards are among the most basic yet important pieces of information required by the facilities planner. Time or labor standards are used for a variety of purposes in an organization. The uses include cost and budget allocation and control, production, planning and inventory management, performance evaluation and incentive pay where applicable. Using this information will also allow the company to be capable of implementing “Continuous Improvement” for a long term.

The main company that manufactures communication products, Multitone Plc in King’s Lynn, London also hopes that the branch in Malacca, Multitone Electronics to increase the productivity and become more profitable for years to come since the branch in Malacca has become the sole manufacturer for the company products. Rising productivity is related to increased profitability, lower costs and sustained competitive. For this moment the productivity of Multitone Electronics did not achieve the output planning of Multitone Plc. Therefore, time study is used to determine the problem occurring in the factory in Malacca so that solution for this problem can be created and the productivity can be increased.

### **1.4 Objectives of the Study**

Objectives of this study are to:

- 1.4.1 To obtain through understanding of work study implementation to improve productivity.
- 1.4.2 To study the manufacturing process for each of the product selected

- 1.4.3 To develop suitable time study for product selected.
- 1.4.4 To design new plan layout according to analyzed data from data collected.

### **1.5 Scopes of The Study**

This project will focus on taking the standard time of production process at some products produced by the manufacturing company and do the work study analysis to calculate the productivity of the products for a certain time line in order to compare the productivity of products. To ensure the objective is achieved, some of the important elements must be considered. There are:

- 1.5.1 Collect reading material on work study and productivity improvement in order to understand the study.
- 1.5.2 Studying for manufacturing process and present time study for selected products used in the selected company
- 1.5.3 Suitable time study model for products (RPR 750, RPR 580 and 2 Way Repeater) in the selected company were develop.
- 1.5.4 New plan layout is design according to improvement that has been done.

### **1.6 Challenge Faced**

Since the selected manufacturing communication company did not have a standard system for the standard time of the production assembly, to develop the standards time of each product, the process has to begin from early stage. Each of the data has to be collect from cycle time of each process in the product assembly flow and then will be calculated to get the standard time. The work performance rating of each operator has to be identified and the work allowance has to be calculated in order to set up the standard time.

Another challenge face is to identify the process that needs to include in the process. There is certain process that has been done by other assembly line for a certain product so to calculate the assembly process cycle time the process is excluded. To

simulate the process flow of each product that has been selected the main process for the product assembly is identified carefully.

In order to increase the productivity of the company, there are many challenges faced by the company in order to do so. One of the challenges is communication where the main company that is Multitone Kings Lynn is about 3000 miles away from company in Malacca and it is important to communicate with one another in order to know if the production is going well or can the order of the product be received at the promised dates and so on. If communication between these two companies fails, it will affect the company production thus will be a loss for both companies.

Another challenge that can be identified for this company is the difference of culture between these companies. Many countries do not move as quickly into business matters the way British do. Business is much more relationship driven, so you better put some effort into driving relationships with the people you need help from to get things done. The way people do business all over the world are not the same because of the culture that they have. They have adapted to the culture and it is apart of life and it is hard to separate it thus this also is a challenge faced by two company in different countries.

### **1.7 Significance of the Study**

The work study assessment for productivity improvement at this communication manufacturing company will be able to identify the main problems that causes the productivity target could not be reached. Able to implement the correct methods of work study in order to improve productivity of the company products thus increase the benefits of the company. Other significance of the study is able to help the facilities planner or the industrial engineer to determine the required number of people and workstation needed to meet the production schedule and for calculating the number of machines, work cells, assembly line balancing and staffing.

## 1.8 Project Methodology

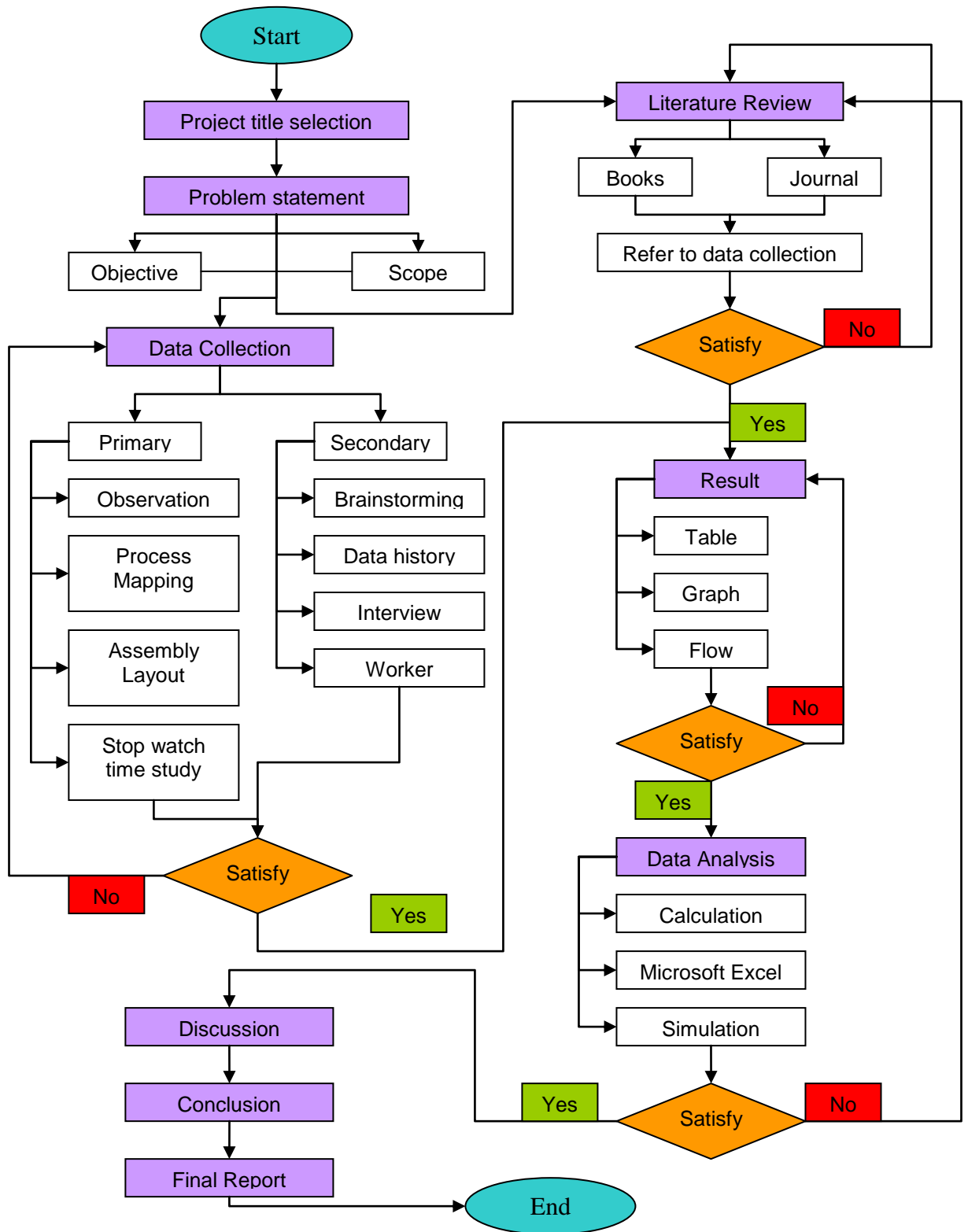
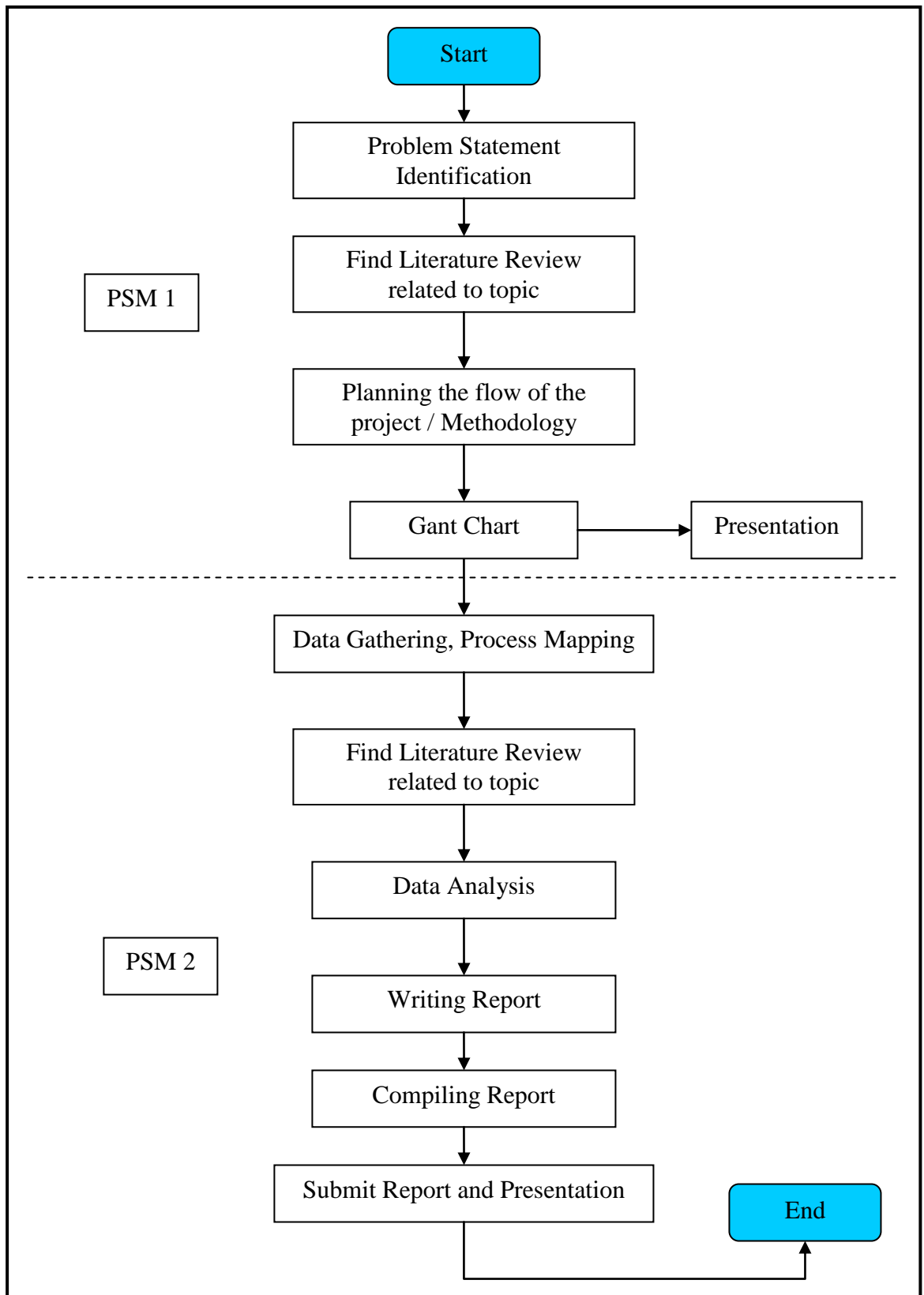


Figure 1.1: Project Methodology Flow



**Figure 1.2:** Overall Research Methodology Flow

## **1.9 Expected Result**

At the end of the project it expected that this report will contain the data of studying for manufacturing process product module RPR 750 and RPR 580 and Ekotek product the 2-Way Repeater. By the end of the study the data of standard time study for product module RPR 750, RPR 580 and 2-Way Repeater will be completed and the analysis of data to calculate the productivity of the products will also be completed. The observation of the productivity of the manufacturing company can be completed. The areas to be improved in the production line can be identified through comparing the plan layout before and after the improvement.

## **CHAPTER 2**

### **Literature Review**

#### **2.1 Introduction**

This chapter will describe about the source and history in this study which had been done by others in the work study and productivity improvement and the methods use by them. It also summarized several of work study and productivity improvement and the application related to this field that can be implemented in the industry.

#### **2.2 Productivity**

Grunberg (2004). The simplest definition of productivity is an output/input ratio. However, the question is what the ingredients formula should be. The name productivity implies that it reflects a company's production ability. The measures of productivity are a subset of the performance measurements, but they are not directly connected to the five performance characteristics. These measures are more of a utilization character. The utilization of a production process is important in improvement work, since there are often are losses to reduce.

There are many different examples of productivity measurements used in companies and organisations. These measurements are both used for monitoring and development of the daily operation as well as for long-term strategic considerations of the business. The productivity measures can be divided into three types:

- 1) Total productivity

- 2) Total factor productivity
- 3) Partial productivity measure

The three categories of productivity measurements above hierarchically arranged which offer less coverage and more detail as one moves down the list.

It is difficult to include monetary units in the productivity ratio so that productivity is properly reflected. These monetary units are often used in the productivity measures as output and input factors. A mixture of monetary and physical as well as only physical measure (hours, kg, pieces, kWh, etc) is in use by the industry.

The major drawback with monetary units is productivity measurement is that they need to be deflated, i.e. adjusted for price changes. These involve difficulties when calculating the measures. In fact, often approximation of the price changes needs to be used to make the calculations easy to handle. Many researchers, for example Grunberg (2004) and others point out this problem and recommend adjusting for price variation of the input factors when calculating productivity. However, this price-change issue is a source of “error” for productivity calculations and others suggest that monetary units should be avoided in productivity calculations in order to measure true productivity. For improvement work, it is strongly recommended that monetary units are kept separate from the productivity ratios.

A total productivity measurement is an aggregated ratio of output and all input factors. The output is often expressed as invoiced unit sold. The typical total productivity measure could be expressed by:

$$\text{Pr oductivity} = \frac{\text{Output of all products sold}}{(C + L + E + M + Q)}$$

Where: C = capital inputs;  
 L = labour inputs;  
 M = material inputs;  
 Q = miscellaneous inputs.