THE IMPORTANCE OF INDUSTRIAL ENGINEERING IN SMALL & MEDIUM INDUSTRIES: A TIME STUDY IN MANUFACTURING INDUSTRY

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ABSTRACT

In this thesis, the knowledge on implementation of IE is studied theoretically through a time study in SMI. The study is to find the standard times of the employee and find out a solution to maximum the labor efficiency based on the knowledge of IE and the time study results. This study was mainly carried out by preparing the letter to industry, industry visit, process listing, data collection, analysis of the data, result and discussion of the data, and conclusion. In this time study, WS Food Trading is a small industry with the limited and traditional ways of management. The study will show the data collection procedures from parts division to standard get. Study show that the WS food trading doesn't have the knowledge about the standard times getting and the knowledge on implementation of IE for the industry. So after the study, it is hope that the results analysis and the solution came out will contributed for the company.

ABSTRAK

Dalam thesis ini, pengetahuan mengenai perlaksanaan Kejuruteraan Industri telah diaplikasikan dengan pengajian masa di dalam IKS. Kajian ini adalah untuk mendapatkan piawaian masa untuk pekerja melakukan sesuatu kerja dan mencari penyelesaian untuk memaksimumkan kecekapan pekerja. Thesis ini dijalankan dengan penghantaran surat lawatan, lawatan ke kilang, cara data dicatat, pengumpulan data, menganalisi data, keputusan dan perbicangan data serta kesimpulan. Thesis ini akan mencatatkan cara pengumpulan data dari pembahagian kerja sampai masa piawaian didapati. Kajian ini juga menunjukkan WS Food Trading tidak mempunyai sebarang pengetahuan dalam mendapatkan masa piawaian dan tentang kejuruteraan industri. Akhirnya, berharap keputusan dan cadangan penyelesaian dari kajian ini boleh menyumbangkan kepada syarikat itu..

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LIST OF ABBREVIATIONS

HQ	-	Headquarters
IE	-	Industrial Engineering
NT	-	Normal time
SMI	-	Small Medium Industry
ST	-	Standard time

CHAPTER 1

INTRODUCTION

1.1 General Introduction

Industrial Engineering can be defined as the planning, scheduling, and control of the activities that transform inputs into finished goods and services. We can also define it as "a field of study that focuses on the effective planning, scheduling, use, and control of a manufacturing or service organization through the study concepts from design engineering, industrial engineering, management information systems, quality management, production management, accounting, and other functions as they affect the operation. (APICS Dictionary, 1995)

Other's definition:

'...is concerned with the efficient conversion of an organization's resources into the goods or services that it has been set up to provide.' (Barnett, 1996)

'...is concerned with creating, operation and controlling a transformation system which takes inputs of a variety of resources and produces outputs of goods and services which are needed by customers.'(Naylor, 1996)

". . . is concerned with all activities involved in making a product or providing a service: it is responsible for the transformation of various kinds of inputs to useful outputs.'(Waters, 1991)

'...is the management of systems or processes that create goods and/or provide services.'(Stevenson, 1993)

1.2 Historical

There are some major events over the past three centuries that have contributed to the development of Industrial engineering. There are variety of technological and management developments that are same with other business study.

In 1700, Sweden: Christopher Polhelm set up a business which recognized the advantages of mechanization and the division of labour. He recorded that ' nothing increase demand so much as low prices. Therefore there is a great need of machines and appliances which will dismish the amount or intensity o heavy work.'

In 1952, USA : Peter Drucker identified the principles underlying 'management by objectives' (MBO).

In 1956, USA : Armand Feigenbaum coined the term 'total quality control' (TQC)

In 1760, France: Jean Perronet undertook calculations to determine the number of man-hours required for each stage of pin manufacturing

In 1829 UK: Charles Babbage, a processor of mathematics. devised the principles which were to underpin digital computing. He later advocated the use of an analytical approach using precise times costs to improve manufacturing operations.

In 1881, UK: Frederick W.Taylor was proposed the classical stopwatch study (time study) and still the most widely use till now.

1.3 Objectives of the Research

1. To study and enhance the knowledge on implementation of Industrial Engineering in Industry.

2. To study and analyses the productivity performance of selected small medium industries (SMI).

3. To come out a proposal/solution for enhancing the productivity in selected SMI industry.

1.4 Scope

This project is focuses on time studies in small & medium industry. The scopes are:

a. Study in time studies (method and implement)
b. Select a task/model, layout or line assembly of area to be studied
c. Data collection
d. Establish a standard time
e. Propose the possible solution for productivity improvement

1.5 Problem statement

Many of the enterprises especially the SMI don't know the important of Industrial Engineering and don't have the knowledge about these and they just follow the traditional way of management. They don't know the benefit of the Industrial Engineering.

Time study is one of the methods of work measurement in setting the labor standard times. It is important to understand the human effort and increase the effectively and efficiently of the worker. Beside that, cost and time estimates prior to production can be know.

So, it is important for SMI in understand the benefit and important of Industrial engineering since they are crucial to the economic growth process and play in important role in the country's overall production network.

1.6 Methodology

The methodology of this project can be seen in Figure 1.1 while the Gantt chart of the project schedule is shown in Figure 1.2.

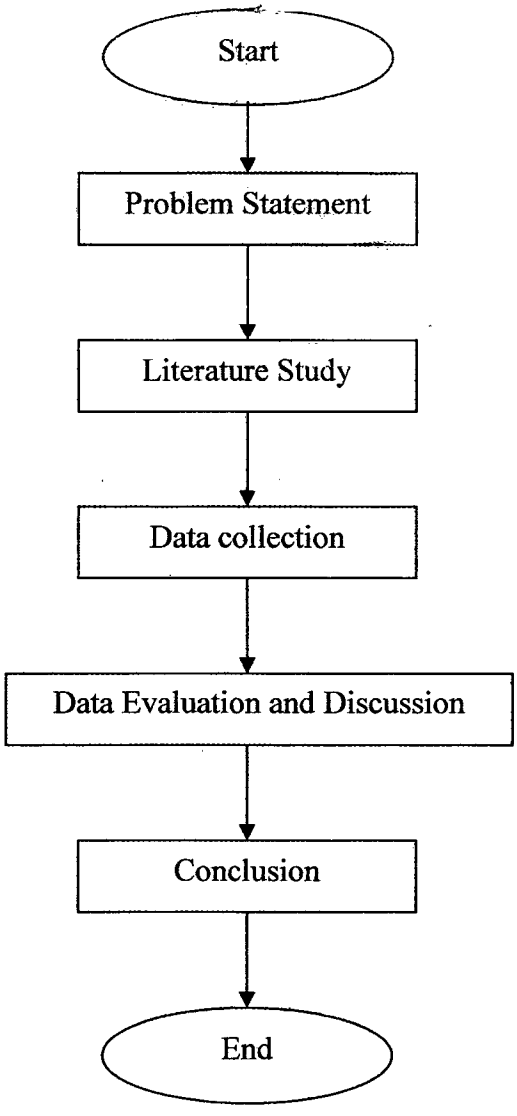

Figure1.1: Flow chart of project methodology

Gantt Chart/ Project Schedule for semester II 2006/07 (Thesis I)

	Project Activities	Week															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Title selection																
2	Objective and scope																
3	Project background																
4	Flow chart and Gantt chart																
5	Literature review																
6	Search for company																
7	Prepare a letter to industry																
8	Chapter 1: Introduction																
9	Chapter 2: Literature Review																
10	First visit to the company																
11	Chapter 3: Methodology																
12	Draft I																
13	Submit draft I																
14	Presentation preparation																
15	Presentation																

Gantt Chart/ Project Schedule for semester I 2007/08 (Thesis II)

	Project Activities	Week															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Research in a company																
2	Data collection																
3	Result and Analysis																
4	Discussion and recommendation																
5	Abstract																
6	Draft II																
7	Submit draft II																
8	Presentation preparation																
9	Presentation																

Figure 1.2: Gantt chart of the project schedule

CHAPTER 2

LITERATURE REVIEW

Chapter 2 introduces the fundamental concepts that are necessary to understand and step using to make time study in an organization. These include the definition and procedure of the time study. Besides that, it is also briefly talk about the definition, benefits, and strategies of IE to make our work more efficiently.

2.1 Work Measurement Studies

Work Measurement Study is a general term used to describe the systematic application of industrial engineering techniques to establish the work content and time it should take to complete a task or series of tasks. Work measurement is a productivity improvement tool. Before improvements can be made, the current productivity level of an organization must be measured. This measurement is then used as a baseline to determine if improvement projects have resulted in genuine improvement.

Work measurement helps to uncover non-value added areas of waste, in consistency, and non-standardization that exist in the workplace. Work measurement studies uncover ways to make work easier, and to produce products or services more quickly and economically.

There are various ways in which work may be measured and a variety of techniques have been established. The basic procedure, irrespective of the particular measurement technique being used, consists of three stages;

i. an analysis phase in which the job is divided into convenient, discrete components, commonly known as elements;

ii. a measurement phase in which the specific measurement technique is used to establish the time required (by a qualified worker working at a defined level of performance) to complete each element of work;

iii. a synthesis phase in which the various elemental times are added, together with appropriate allowances (see below), to construct the standard time for the complete job.

The techniques used to measure work can be classified into those that rely on direct observation of the work, and those that do not. For example, some techniques, such as predetermined motion-time systems and the use of synthetic or standard data can provide times from simulation or even visualization of the work. However, the data on which such techniques are based were almost certainly based on earlier observation of actual work.

Work measurement involves the use of engineered labor standards to measure and control the amount of time required to perform a specific task or tasks. Labor standards are most commonly associated with manufacturing or production environments.

2.1.1 Use of standard time:

In an organization the standard time need to make the work more efficiency for determine:

a) Labor content of items produced (the labor cost)

b) Staffing needs (how many people it will take to meet required production)

c) Cost and time estimates prior to production

d) Crew size and work balance

e) Expected production (get know what constitutes a fair day's work)

f) Basis of wage incentive plans (reasonable incentive provided)

g) Efficiency of employees and supervision (a standard is necessary against which to determine efficiency)

2.1.2 Factor

The choice of a suitable measurement technique depends on a number of factors including:

a. the purpose of the measurement;
b. the level of detail required;

c. the time available for the measurement;
d. the existence of available predetermined data;
e. the cost of measurement.

2.1.3 Work Measurement Techniques

Under the work measurement umbrella there are a number of techniques for collecting the information necessary to develop engineered labor standards:

a) Standard Time Data (Standard Data)

b) Predetermined Time System

c) Work Sampling

d) Time Studies

2.1.3.1 Standard Time Data (Standard Data)

Standard Time Data (Standard Data) is a generic term given to a collection of time values. Standard data uses work elements from time studies or other work measurement sources making it unnecessary to restudy work elements that have been timed adequately in the past. These element times are extracted from studies and applied to jobs or tasks with the same element. Some examples of standard data development include graphs, tables, charts, formulas and spread sheet programs.

2.1.3.2 Predetermined Time Systems

Predetermined Time Systems are a technique of motion study and time standards development. The motions of the work or task performed are recorded. Each basic motion has a time value associated with it. Once all the motions for the task have been recorded, the time values are totaled and the standard time for the operation is developed.

2.1.3.3 Work Sampling

Work Sampling is a random sampling technique (statistical sampling theory) that involves observing the worker at randomly selected times and recording the type of activity that is observed at that instance. Work sampling is most commonly used to collect information for allowance calculation, to determine the distribution of work activities, and to determine the productive and non-productive utilization of workers.

2.1.3.4 Time Study

Time Study is the most widely used work measurement technique that employs a decimal minute stopwatch to record and determine the time required by a qualified and well-trained person working at a normal pace to do a specific task under specified conditions. The result of the time study is the time that a person suited to the job and fully trained in the specified method will need to perform the job if they work at a normal or standard pace.

2.2 Time Studies

The classical stopwatch study, or time study, originally proposed by Frederick W.taylor in 1881, is still the most widely used time-study method. A time-study procedure involves timing a sample of a worker's performance and using it to set a standard.

2.2.1 Why time study make?

The purpose of the time study is to:

- Establish Standard Times
- Rate Operator performance
- Gain information to calculate overall production capabilities and data for capacity planning.
- Establish the total Work content of finished goods.

2.2.2 What are the benefits of the time study?

- Knowledge about Standard Times to be expected
- Ability to estimate total Work content
- Operators can be appraised on factual grounds
- Some labor regulation might require Standard Times on the basis of solving labor disputes.

2.2.3 How time study procedure will be?

i. Define the task to be studied (after method analysis has been conducted)

ii. Divide the task into precise elements (parts of a task that often take no more than a few seconds)

iii. Decide how many times to measure the task (the number of job cycles or samples needed)

iv. Time and record element times and rating of performance

v. Compute the average observed (actual) time. The average observed time is the arithmetic mean of the times for each element measured, adjusted for unusual influence for each element:

Average observed cycle time = $\frac{\text{sum of the times recorded to perform each element}}{\text{number of cycles observed}}$

vi. Determine performance rating (work pace) and then compute the normal time for each element.

$$Normal\ time = (Average\ observed\ time)\ x\ (Performance\ rating\ factor)$$

The performance rating adjusts the observed time to what a normal worker could expect to accomplish. For example, a normal worker should be able to walk 3 miles per hour. He or she also able to deal a deck o 52 cards into 4 equal piles in 30 seconds. A performance rating of 1.05 would indicate the observed worker performs the task slightly faster than the average.

Numerous videos specify work pace on which professionals agree, and benchmarks have been established by the Society for the Advancement of Management. Performance rating, however, is still something of an art.

vii. Add all the normal times for each element to develop the total normal time for the task.

viii. Compute the standard time. This adjustment to the total normal time provides for allowances such as personal needs, unavoidable work delays, and worker fatigue:

$$Standard\ time = \frac{Normal\ time}{1 - allowance\ factor}$$