Chapter 1

Introduction

1.1 Overview

As heading towards the 21st century arena, customers are increasingly becoming more demanding and both local and international competitors are rapidly getting more advanced (Roberts: 2002, *WMG Quality Management and Techniques*). Hence, the author believes that only being effective is now not enough but also being more efficient is continuously required for a business to survive economically and prosper financially. As a result, data is increasingly viewed as a vital key corporate resource to be used daily and being relied on as a basis for future business decisions (Warren: 2003, *WMG Information System Management*). The term "corporate" implies to the author that:

1) data must be shared corporate-wide as oppose to owned by an individual,
2) data must be protected carefully to preserve corporate legacy,
3) and data must be utilized wisely to further the corporate aims.

Such global shift impact has been coming obviously to the surface since 1980s, and has centered particularly in the automobile and electronics industries (Lu: 2002, *WMG Supply Chain Management*). It is well known that, the evolution from Fordism to Toyota's Just-In-Time has shifted a once physical inventory-intensive to a virtual data-intensive production system. This implies to the author that, in innovative goods manufacturing organizations involving high engineering content, product related data plays the central role within the broad view of their corporate data. In a life cycle, product data includes (Kotecha: 2002, *Computer-Aided Design and Manufacturing*):

1) design data
2) process data
3) and production resource data

According to Niebel & Fredivalds (1999, *Methods, Standards, and Work Design*), management has realized the desirability of assigning standard times to the basic elements of work in a mass production system since the time of Frederick W. Taylor. These times are referred to as Basic Motion Times, Synthetic Times, or Predetermined Times. They are assigned to fundamental motions and groups of motions that cannot be precisely evaluated with ordinary stopwatch Time-Study procedures. They are also the result of studying a large sample of diversified operations with a timing device, such as motion-picture camera or videotape machine, capable of measuring very short elements. The time value are synthetic in that they are often the result of logical combinations of basic motions; they are basic in that further refinement is both difficult and impractical; they are predetermined because they are used to predict standard times for new work resulting from method changes.

In 1945, the time when Methods-Time Measurement (MTM) was developed by Maynard, Stegemerten, and Schwab, there has been a growing interest in the use of predetermined times as a method of establishing rates quickly and accurately without using the stopwatch or other time recording devices. Essentially, predetermined time systems are set of motion-time tables with explanatory rules and instructions on the use of motion-time values. This is referred to as a standard data method in estimating standard times, as oppose to its counterpart – the stopwatch method. When speaking of standard data today, it is referred to all the tabulated element standards, curves, alignment charts, and tables that allow the measurement of a specific job without the use of a timing device such as a stopwatch. Standard data can have several levels of refinement: motion, element, and task. The more refined the standard data, the broader its range of usage and the longer analysis time of the work content for each operation. Task standard data allows the fastest establishment of a standard time than either element or motion standard data.

This thesis is devoted to the estimation of standard times based on task standard data which utilizes large blocks of fundamental motions, since the method is being employed in its case study. The company in the case study is a large electronic component assemble-to-order manufacturer, having its Head-Quarter in Japan and network of manufacturing sites world-wide including one in Thailand, where the thesis research is conducted. Its principal products are Power Supply Units (PSUs) that represent typical characteristics of electronic product design and manufacturing. Due to the nature of the

electronics production chain in which the case study lives in, each of the case study's PSU model is highly customized to meet individual customer order and has relatively short product-life-cycle. The Production Engineers in the case study is therefore often required to establish standard times every week for new models.

The standard time data of the case study for each task were original data developed internally through the efforts of the company in the case study using its historical data of over 20 years in power supply unit manufacturing operations. When properly applied, the case study believes that its standard time data will permit the establishment of accurate time standards before the job is performed. This feature makes the use of standard data especially attractive for estimating the cost of new work, for cost quotes, and for subcontracting purposes. For this reason, importantly, the large impact on sales and benefits of the company of the case study can be made during the standard time estimation process. It is therefore of significant importance to obtain a consistent standard time estimated value from a reliable source and within a short lead-time. Standard time data of each task is associated with a set of design characteristics. The ability to estimate standard times using the standard data method is therefore dependent upon the availability of complete product design information for each model during the project bidding. This implies that management of product data can support the standard time estimation.

Such tool to help engineers manage both data describing products and the process of developing products is referred to as a Product Data Management (PDM) system (CIMdata, 1997: *Product Data Management: The Definition.*). To address the above issue this thesis proposes a development of Product Data Management system for the estimation of standard times. Product Data Management system supports the standard time estimation in two aspects. First, it makes engineers estimate a product's manufacturing standard time quickly, thus indicating potential labor costs before production is begun. Second, manufacturing times are an important part of the total product cost, hence accurate estimation of these standard times help to determine appropriate price quoting.

1.2 Rationale of the Thesis

1.2.1 Background of the Case Study

The case study of this thesis is the standard time estimating process for power supply units, which is responsible by the Engineering department of a leading electronics component manufacturing company located in Thailand. The company in the case study is a large corporate having its Head Quarter in Japan with many manufacturing sites world-wide such as in Thailand, China, Korea, Japan, UK, and Mexico. The business in the case study is growing and having increasing number of customer orders for customized power supply units. The life cycle of each power supply unit is considered to be short. As a result, not only that the amount of product data is overwhelming, but also the engineers are frequently required to estimate standard time for each order.

1.2.2 Current Situation of the Case Study

In estimating standard time, the current working practices are:

1) Memorization – Firstly, the product data is often recalled through familiarity and experience, otherwise the next method is used;
2) Documentation – Secondly, the product data may then be found in the file cabinets, otherwise the next method is used:
3) Internet – Thirdly, the method is to search for the product data online in websites of the suppliers, and if it is not yet available the last method is used;
4) Consultation – Finally, when those above methods still do not provide the necessary product data, a contact to the Head-quarter in Japan is requested.

1.2.3 Problem Analysis of the Case Study

Standard time estimation involves data such as:

1) Description of the product and its technical system to be made,
2) Knowledge about the manufacturing systems and technologies,
3) Recognition of the markets regarding raw materials and semi-finished goods,
4) Application of standard time estimation method.

The amount of these data has increased and begins to constrain the manual system of Product Data Management in the case study. The constrain leads to long lead-time in estimating standard time and the estimated standard time are often subjective.

1.3 Statement of Problem

The difficulties associated with standard time estimation lie in several aspects including:

1) Lack of sufficient manufacturing knowledge – Either because the freshly recruited employees may not have the necessary knowledge or experience.
2) Lack of product data availability – Estimating the standard time required complete product data otherwise the estimating process could not be proceeded, which is usually the case;
3) Lack of convenient accessibility to product data – Some product data reference documents are scattered throughout the factory;
4) Lack of contextual integrity – There is no formal detailed procedure established to guide how to estimate standard time, individual employees have their own ways of estimating standard time, which lead to some inaccurate estimation;

1.4 Objective of the Thesis

The objective of the following thesis is to develop a Product Data Management system that will support the manufacturing standard time estimation for the case study.

1.5 Scope of the Thesis

The thesis will cover:

1) A case study of Product Data Management system for the standard time estimation process in a customized power supply unit manufacturing,
2) A review of available Product Data Management systems in general,
3) Conceptual and physical designs of the selected Product Data Management system,
4) Conclusion of results and further recommendations.

1.6 Methodology of the Thesis

1) Study theories and related literatures
2) Study current working practice, procedure and to determine possible improvement area in the standard time estimation (business level)
3) Identify required data and work flow (logical level).
4) Select and develop suitable improvement tool (physical level).
5) Implement, collect feedback and conclude (platform level).

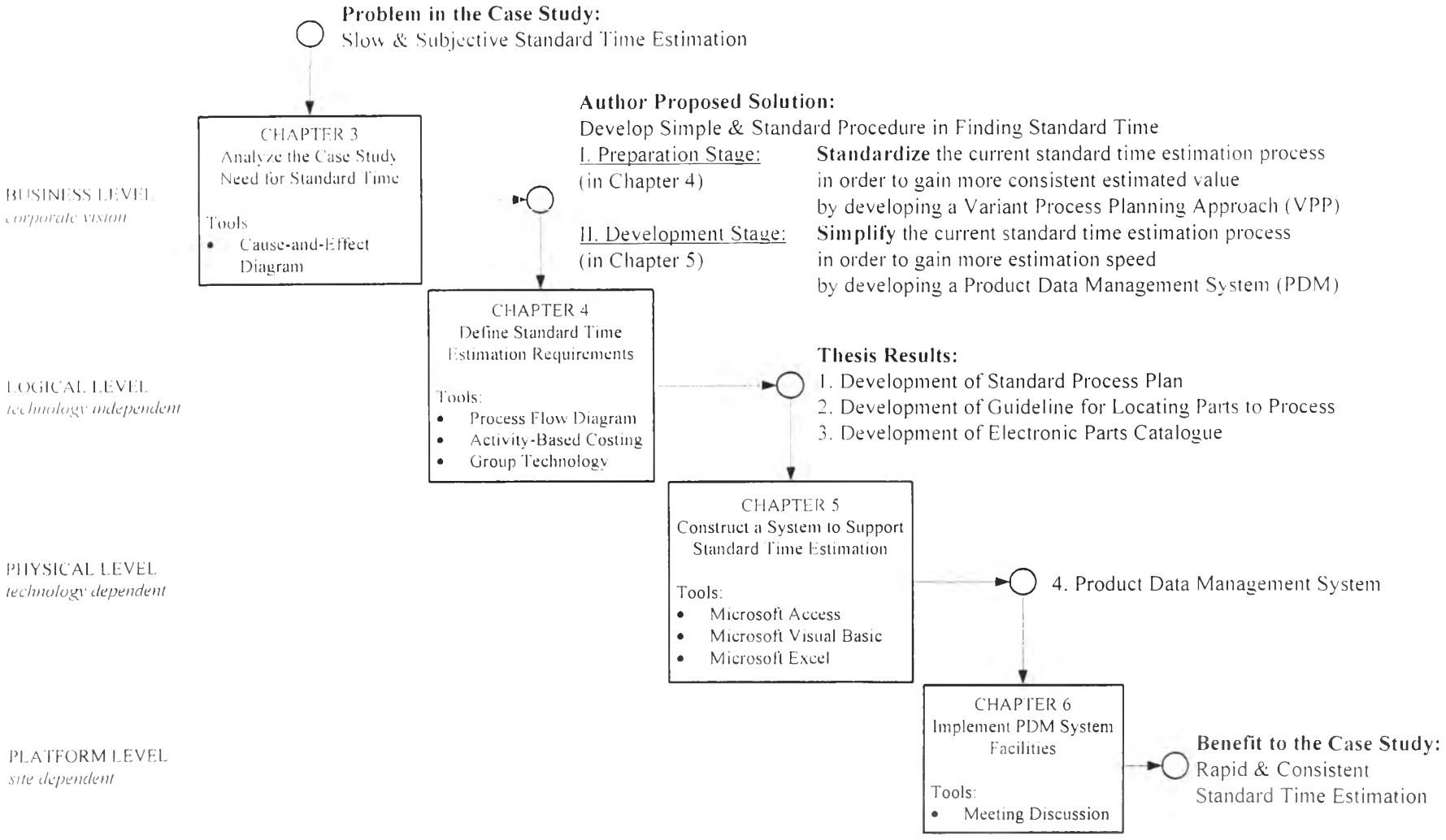

Figure 1.1: Methodology

1.7 Research Schedule of the Thesis

The thesis is scheduled as shown in Table1.1.

Table 1.1: Thesis Schedule

Activities	Year 2003					
	July	Aug.	Sept.	Oct.	Nov.	Dec.
1) Requirement analysis						
2) Literature review						
3) Development of a PDM system						
4) Thesis Documentation						

1.8 Expected Results

The expected result of this thesis is to have a Product Data Management system for the manufacturing standard time estimation in the Engineering department of the case study. The Product Data Management system consists of:

1) Product data needed in the standard time estimation
2) Algorithm in estimating the standard time
3) Technical definitions of the product data
4) Applications of the Product Data Management system

1.9 Expected Benefits

1) More consistent time standard result
2) Duplicate time studies on similar operations are eliminated
3) Standards are established much more rapidly
4) Less experienced, less trained persons can calculate time standards
5) Rapid and accurate estimates for labor costs may be made before actual production is begun.