



Faculty of Engineering

**THE IMPACT OF USING AUTOMATION TECHNOLOGY IN
HIGH TECHNOLOGY MANUFACTURING COMPANY**

Matius Juanis

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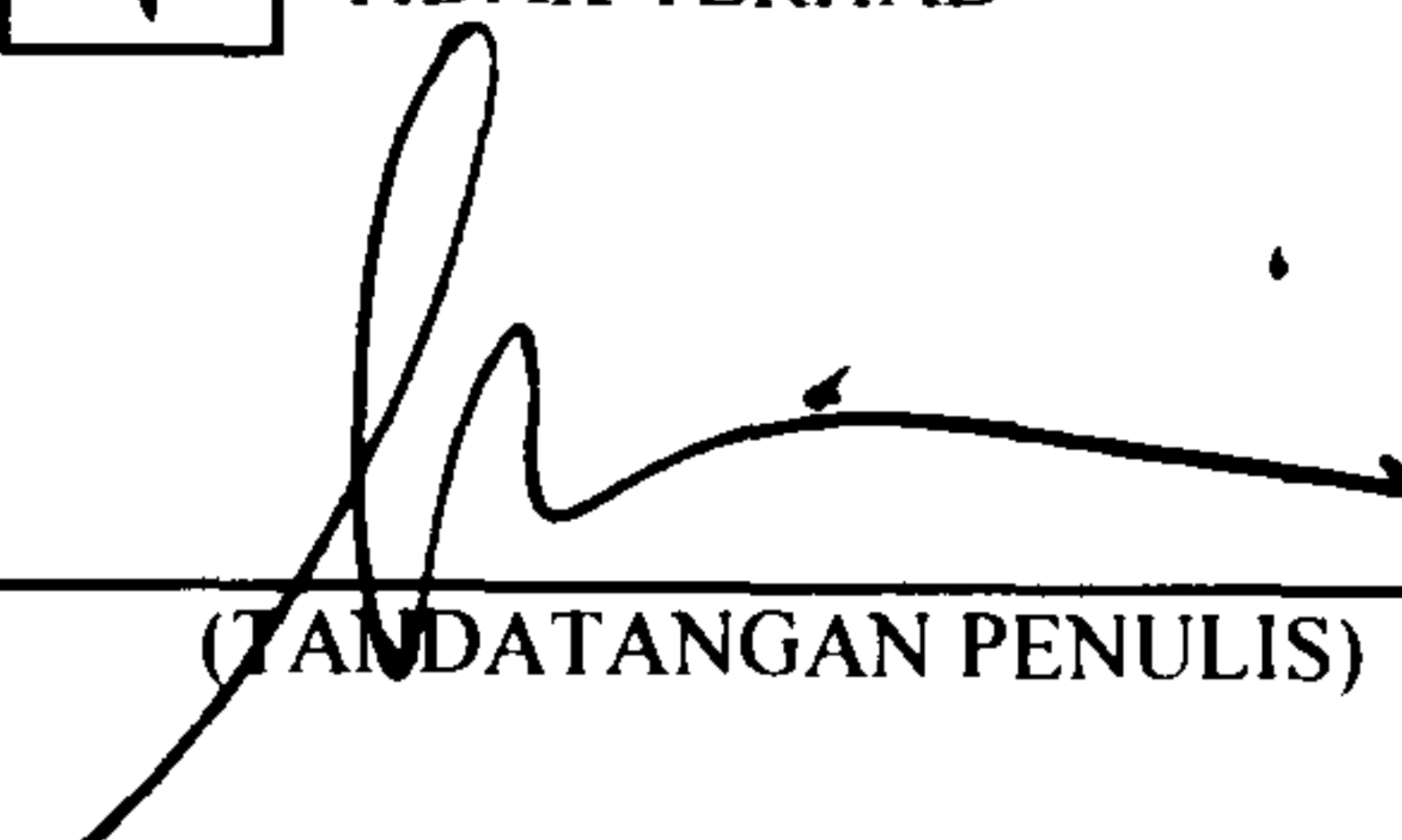
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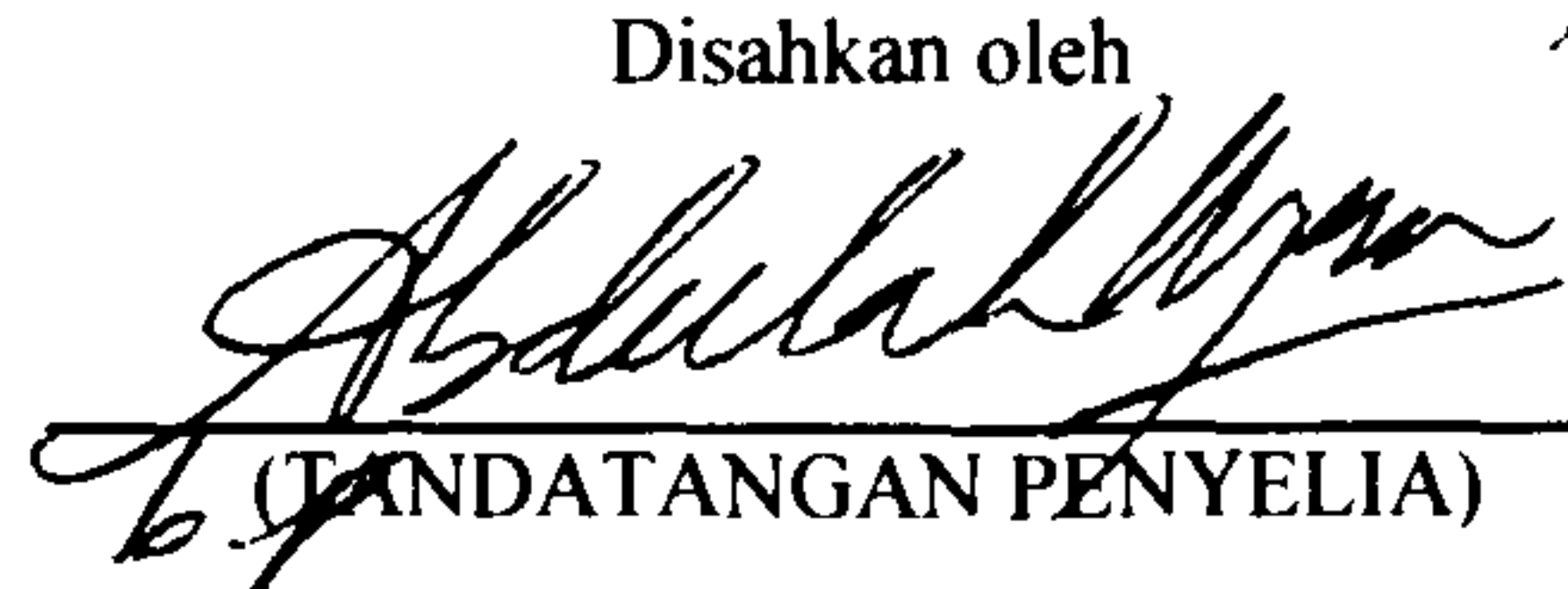
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Alamat tetap: _____
KAMPUNG NADAU
P/S 95, PEKAN NABALU
89257 TAMPARULI
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Title : The Impact of Using Automation Technology in High
Technology Manufacturing Company.

Author's Name : Matius Juanis

Matric Number : 6002

Has been read and approved by;

Mr.Rasli Muslimen
(Supervisor)

(Date)

**THE IMPACT OF USING AUTOMATION TECHNOLOGY IN HIGH
TECHNOLOGY MANUFACTURING COMPANY**

MATIUS JUANIS

**This project is submitted in partial fulfillment of
The requirements for the degree of Bachelor of Engineering with Honours
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**KESAN PENGGUNAAN TEKNOLOGI AUTOMASI DALAM
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SYARIKAT**

MATIUS JUANIS

Projek ini merupakan salah satu keperluan untuk
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ABSTRACT

The application of automation technology plays an important role for improvement of manufacturing technology in our countries. The convergence of advanced technology in electronic fields, electrical fields, mechanical fields and control fields made this system as a smart system which direct or indirectly effects in high technology manufacturing. A brief explanation about the impact of using automation technology in high technology manufacturing based on theory and practical approach done in this thesis. The main objective of this study is to find the impact of using automation technology in high technology manufacturing in Sarawak, Malaysia. The general objective of this study is to explore the implementation of automation technology in Sarawak, Malaysia with respect to high technology manufacturer. Specifically, the objectives of this study to determine the reasons and impacts of using automation technology, to explore the development phases that are involved in the implementation of automation technology and determine the advantages and disadvantages of using automation technology in the selected high technology manufacturer in Sarawak, Malaysia. Others objective is to constructs this project is to make it as used for references for new generation and can be a sourcebook. Included in this thesis or project, there are few recommendations for those who interested to pursuing this project to more advanced level or using this as a source of reference in order to understand automation manufacturing system especially the impact of using automation technology in high technology manufacturing company especially in our country.

ABSTRAK

Pengaplikasian teknologi automasi memainkan peranan yang penting dalam industri negara kita. Gabungan teknologi terkini dalam bidang elektronik, elektrik, mekanikal dan bidang kawalan membuatkan sistem ini menjadi sebuah sistem yang canggih di mana secara langsung dan tidak langsung memberi kesan kepada teknologi tinggi dalam pembuatan. Secara ringkasnya tentang kesan penggunaan teknologi automasi dalam pembuatan teknologi canggih diterangkan secara teori dan praktikal dalam projek ini. Objektif utama kajian ini adalah untuk mengkaji kesan pembuatan dalam teknologi automasi di Sarawak, Malaysia. Objektif istimewa kajian ini pula, adalah untuk menilai sebab penggunaan teknologi automasi, membuat penilaian terhadap fasa pembangunan hasil pelaksanaan teknologi automasi dan juga menilai kebaikan dan keburukan penggunaan teknologi automasi dalam pembuatan teknologi tinggi di Sarawak, Malaysia. Objektif lain mengapa kajian ini dibuat adalah untuk menjadikannya sebagai bahan rujukan atau buku rujukan utama kepada generasi baru. Dalam projek ini terdapat beberapa panduan ataupun nasihat kepada sesiapa yang berminat untuk membuat kajian yang lebih mendalam tentang tajuk ini atau menggunakan kajian ini sebagai rujukan untuk memahami aplikasi teknologi automasi terutamanya kesan penggunaan teknologi automasi dalam teknologi pembuatan canggih sesebuah syarikat di Sarawak, Malaysia.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter gives an overview of manufacturing automation, problem statement and objective of the study. It is included the scope and limitation of the study, and its contributions.

1.1 An overview of Manufacturing Automation

Manufacturing automation can be defined as a process of converting raw materials, and the sequence of process through which the product will be manufactured (Skinner, 1985). Manufacturing as considered as relevance to bring about development in the manufacturing sector is the black bone of any industrialized nation. Its importance emphasized by the fact that, as an economic activity, it's comprises of approximately 20% to 30% of the value of all goods and services produced (Serope & Schmid, 2001). A country's level of manufacturing activity is directly related to its economic health as according to Claypol, Fetyko & Pearson (1999) the higher the level of manufacturing activity in the related country the higher the standard of living of its peoples.

Manufacturing also involves activities in which the manufactured product is itself used to make other products. Examples of these products are large presses to shape sheet

metal for car bodies, machinery to make bolts and nuts, and sewing machines for making clotting. An equally important aspect of manufacturing activities is the servicing and maintenance of this machinery during its useful life.

Alongside with the fact that the manufacturing automation could bring about national development, Malaysia government has promoting the Privatization Master Plan to implement the automation technology in Malaysia (Asian Development Bank, 1991).

This development plan were highly recommended and considered as one of the most influences the rapid growth of Malaysia economic status.

Responding from the present manufacturing sector development phenomenon as it is crucial in determination of research perspective; focus of this study are on the impacts of the implementation of automation technology in the high technology manufacturing in Malaysia who is directly relevant to the study of manufacturing development. This is much more interesting and relevant to bring it into critical discussion when human life arises into complexity through the invention of automation technology.

1.2 Problem statement

Traditionally, economic progress and development in Sarawak have been achieved mainly through the exports of primary commodities. However, there is virtually no example of nations which managed to industrialize through strategy of resource exploitation and the export of low value-added primary commodities. Natural resource advantage is a strategic advantage. But mere ownership of natural resources does not necessarily conger advantage to those who own them in international competition.

Competitive advantage in natural resources depends not in ownership but on access to raw materials and how ones add value to these resources. Hence, it is not surprising that Sarawak, Malaysia, despite being a world class supplier of the related manufactured outcome.

It is therefore, clear that for industrialization in Malaysia to succeed, it will have a produce products based on design innovation, specialized niche product segments and marketing efforts which eventually lead to own brand names and reputations. In other words, for Malaysia to industrialize, it need to produce product which are knowledge-intensive and with a using of automation technologies. There is therefore, a need to create innovation and productive capacities in not only the traditional resource-based industries, but also in new industries that will sustain Sarawak's competitiveness in the future.

Besides, of the important and emphasis on automation technologies as its may have greater impact on Sarawak, Malaysia's industrialization, it will continue to be an integral part of development planning and philosophy. Donnelly et al (2002) said, we must understand the automation implementation in this rapidly changing nature to make our live is much more harmony. As according to Morshidi (2000), industrializing Malaysia is now a recognized feature of contemporary life. Automation implementation seems to be the most relevance to bring about advancement of Sarawak, Malaysia's technology status globally. Hence, based on the anecdotal information about the important of automation technology it should be of interest to explore automation implementation in the high technology manufacturing in Malaysia aspect in order to address the following questions.

1. What are the reasons of using automation technology in high technology manufacturing in Sarawak, Malaysia?
2. What are the impacts of using automation technology in high technology manufacturing in Sarawak, Malaysia?
3. What are the development phases in the process of implementing the automation technologies being taken by the selected high technology manufacture in Sarawak, Malaysia?
4. What are the advantages and disadvantages of using automation technologies in the high technology manufacturing in Sarawak, Malaysia?

1.3 Objective of the Study

This project is concentrated into the topic of impact of using automation technology in high technology manufacturing company. This thesis will collect data and some practical. These projects more to the theory and survey work to finding the relevant data.

The general objective of this study is to explore the implementation of automation technology in Sarawak, Malaysia with respect to high technology manufacture.

Specific objectives of this study are as follows:

1. To determine the reasons and impacts of using automation technology in the selected high technology manufacture in Sarawak, Malaysia.
2. To explore the development phases that is involved in the implementation of automation technology in the selected company high technology manufacture of Sarawak, Malaysia.

3.To determine the advantages and disadvantages of using automation technology in the selected high technology manufacture in Sarawak, Malaysia.

1.4. Scope and limitation of the study

Only three high technology manufacture will be used in this study. These companies which being selected for this study is: KOMAG, Taiyo Yuden, and 1st Silicon. These companies were located in Kuching, Sarawak. These companies were selected based on the list of high technology manufacturing companies in Sarawak by the Chief Ministry Department. Samples consist of three categories of workers namely management staff, engineer/supervisor, and labor.

In addition, respondent will be randomly selected for the in-depth study. The researcher will use the self-administered questionnaires to solicit more information and to further analyze the automation implementation in Sarawak, Malaysia. The researcher then would collect the sets of questionnaires whenever answered by the respondents completely. The other instruments would also being used for the purpose of completing the research.

The scope of the study is limited to the automation implementation in the high technology manufacturing perspective according to Rosenberg (2002), automation technology is one of the most important concept in globalizing country. This study concerning with the automation technology implementation in the high technology manufacturing company in Sarawak, Malaysia.

1.5. Contribution of the study.

The basis for the project is the understanding on the present automation implementation in high technology manufacturing lead to minimize operation of the labor, and that developing a better understanding and analysis than currently exist is a precondition for the development of fairer, more equitable and just social arrangements.

The study will provide some insights into the implementation of automation technology in Malaysia, which promoting and facilitating development program in Malaysia. The study will also provide some suggestions to the stakeholder who trying to enhances the automation technology implementation in Sarawak, Malaysia. Furthermore, the results of the study may serve as a guidelines or basis for the company's owner in preparing their development program as a tool to provide more interesting development programs.

Lastly, these findings will supplement the existing body of knowledge concerning the dynamic of using automation technology in the high technology manufacturing. It will also be beneficial to those who intended to do an in-depth study on automation technology such as students, researchers and the stakeholders.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter described the definition of automation, the concept of automation manufacturing, types of automation manufacturing, reason for automating, and finally the discussion of the selecting machines for manufacturing process in automation were take place. The other specific discussion would also include in this chapter.

2.1 Definition of Automation

Automation is a technology which concerned with the application of mechanical with the application of mechanical, electronic, and computer-based system to operate control production (Groover, 2000). This technology includes:

- (i) Automatic machine tools to process parts
- (ii) Automatic assembly machine
- (iii) Industrial robots
- (iv) Automatic material handling and storage systems
- (v) Automatic inspection systems for quality control
- (vi) Feedback control and computer process control
- (vii) Computer systems for planning, data collection, and decision making to support manufacturing activities. The examples of industries using these

types of systems include: metalworking, electronics, appliances, aircraft and many more.

2.2 The Concept of Automation Manufacturing.

Automation manufacturing are used to produce a products where using programmable machines. Numerically controlled (NC) machine tools were developing to fulfill the contour machining requirements of complex aircraft parts and forming dies. The first NC machine tool was developed by Parsons Company and MIT in 1952. The first-generation numerically controlled units used digital electronics circuits and did not contain any actual central processing unit than was called NC or hardwired NC machines tools. In 1970s, computer numerical control (CNC) machine tools were developed with micro computers used as control units. With the advances in electronic and computer technology, current CNC systems employed several high-performance microprocessors and programmable logical controllers that work in a parallel and coordinated fashion. Current CNC systems allow simultaneous servo position and velocity control of all axes monitoring of the controller and machine tool performance, online part programming with graphical assistance, in-process cutting process monitoring and in-process part gauging for completely unmanned machining operations. Manufacturing offer most these features as option (Jiranek, 1986).

2.3 Main types of Automation Manufacturing.

Automation production systems as according to Ayers and Miler (1983) can best be classified into three basic types as discusses in the following sub-title. Types of automation are fixed automation, programmable automation, and flexible automation.

2.3.1 Fixed automation

This type of automation manufacturing is a system in which the sequence of processing operation is fixed by equipment configuration (Kalpakjian & Schmid, 2001). There are usually simple of sequence in this operation. It is the integration and coordination of many such operations into one piece of equipment that make the system complex. The typical features of fixed automation are:

- (i) The high initial investment for custom-engineered equipment,
- (ii) The high production rates, and
- (iii) The relatively inflexible in accommodating product changes.

The economic justification for fixed automation is found in products with very high demand rates and volumes. The high initial cost of the equipment can be spread over a very large numbers of units, thus making the unit, thus making the unit cost attractive compared to alternative methods of production. Examples of fixed automation include mechanized conveyors, but the workstations along the lie were manually operated) and machining transfer lines (beginning around 1924).

According to V.Kumar fixed automation refers to the use of custom-engineered (special purpose) equipment to automate a fixed sequence of processing or assembly operations. It is typically associated with high production rates and it is relatively difficult to accomodate changes in the product design. This is also called *hard automation*. Fixed

automation makes sense only when product designs are stable and product life cycles are long. The primary drawbacks are the large initial investment in equipment and the relative inflexibility.

2.3.1.1 Advantages of fixed automation.

The advantages of fixed automation when consider high demand volume, long product life cycles are;

- i. decreased cycle time
- ii. infrequent setups, automated material handling
- iii. fast and efficient movement of parts
- iv. Maximum efficiency
- v. Low unit cost.

2.3.1.2 Disadvantages of fixed automation.

There are some problems when implementing the fixed automation in manufacturing system.

- i. Large initial investment
- ii. Inflexibility.

2.3.2 Programmable automation

The production equipment is designed with the capability to change the sequence of operations to accommodate different product configurations. The operation sequence is controlled by a program, which is a set of instructions coded so that the system can and interpret them (Groover, 1982). New programs can be prepared and entered into the

equipment to produce new products. Some of the features that characterize programmable automation include:

- (i) High investment in general-purpose equipment
- (ii) Low production rates relative to fixed automation
- (iii) Flexibility to deal with changes in product configuration
- (iv) Most suitable for batch production

Automated production systems that are programmable are used in low and medium volume production. The parts or products are typically made in batches. To produce each new batch of a different product, the system must be programmable with the set of machine instructions that correspond to the new product. The physical setup of the machine table and the required machine setting must be entered. Examples of programmable automation include numerically controlled machine tools (first prototype demonstrated in 1952) and industrial robots (initial applications around 1961, although the technology has its roots in the Jacquard loom (1801)).

2.3.2.1 Advantages of programmable automation.

Major advantages of programmable automation in manufacturing operation as follows;

- i. Flexibility to deal with changes in products.
- ii. Low costs for large batches.
- iii. More flexible than hard automation (fixed automation).
- iv. Smaller volumes of many different parts.