

TOTAL MANUFACTURING E-PLATFORM

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Special dedicated to my beloved parents, family and fellow friends, who had strongly encouraged and supported me in my entire journey of learning.

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ABSTRACT

This project is to build up a manufacture monitoring system that is able to work out an accurate data collection for the appropriate analysis so that to provide a solution or guide line to the workers, and thus automate the FMEA (Failure Mode Error Analysis) system. The difficulty on achieving the production goal due to the inefficient of the real time problem solving system has been a great issue in manufacturing since long time ago. Besides, the lack of proper and accurate tools to analyze the data collected from machine also results in less utilization of automated data collect and analysis system. Hence, the objective of this project is to automate the FMEA system so that to increase the workers efficiency and optimize the machine performance. This monitoring system is able to collect and analyze the data from machines. The proper guide line and solution will then be provided and displayed to the workers and management level respectively. The data will be collected by using PLC and be analyzed by the Visual Basic.Net based system. The guide line and solution will then be generated from the system.

ABSTRAK

Projek ini adalah untuk membina suatu sistem pemantauan perkilangan yang mampu memngumpul data yang diperlukan untuk analisis yang tepat bagi memberikan penyelesaian atau garis panduan kepada para pekerja, dan dengan demikian men-automasikan FMEA (Failure Mode Analisis) sistem. Kesulitan dalam mencapai matlamat pengeluaran disebabkan kekurangan kecekapan daripada sistem masalah penyelesaian masa nyata telah menjadi isu besar dalam bidang pembuatan sejak lama. Selain itu, kurangnya alat yang tepat dan sesuai untuk menganalisis data yang dikumpul dari mesin juga menyebabkan kekurangan pemanfaatan sistem mengumpul dan menganalisis data automatik. Oleh kerana itu, tujuan projek ini adalah untuk mengotomatisasikan sistem FMEA supaya meningkatkan kecekapan pekerja dan mengoptimumkan prestasi mesin. Sistem monitoring ini mampu mengumpul dan menganalisis data dari mesin serta menyediakan dan memaparkan garis panduan yang tepat dan penyelesaian kepada para pekerja dan bahagian pengurusan masing-masing. Data akan dikumpulkan dengan menggunakan PLC dan dianalisa oleh sistem berasaskan Visual Basic.Net, dan garis panduan dan penyelesaian kemudian akan dihasilkan daripada sistem.

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LIST OF ABBREVIATION

PLC	- Programmable Logic Controller
QC	- Quality Control
PC	- Personal Computer
FAQ	- <i>Frequently asked questions</i>
OEE	- Overall Effectiveness Equipment
I/O	- Input/Output
GUI	- Graphical User Interface
OOP	- Object-Oriented Programming
VB	- Visual Basic
CPU	- central processing unit
PIC	- Programmable Interface Controller
LHS	- Left Hand Side
RHS	- Right Hand Side
FMEA	- Failure Mode Error Analysis
SCADA	- Supervisory Control And Data Acquisition System
FYP	- Final Year Project

CHAPTER I

INTRODUCTION

There are reasons of why Total Manufacturing E-Platform is designed, and how it is going to solve the existing problems. In this chapter, a brief introduction on the system will be discussed, and a comparison between the existing system with the this system will be made.

1.1 Introduction

Accurate data collection and appropriate analysis could save millions of dollars for the industries. The management personal has to keep their focus on performing detail analysis and improvement as an ongoing activity throughout the year. Data analysis is never to be a great deal for the management in industries, but analyzing them accurately and according to requirement should be the main objective of the data collection in industries.

A universal data collection system which will be incorporated with a software as an analysis tool that could be the best practice in assisting the management by all means on decision making. In general, this system can be best utilized in any industrial nature in afford to improve quality issues, production factors and a better supervision tool for all level of people in industries.

The real time system captures valuable information from a certain machine and interprets this data into understandable figures with detail analysis for improvements. Such automated software creates solution instantly according to changes in the production process which could be affected by many factors like human, machine, supporting department etc. True collected data and accurate solution is a vital tool and key for the management to move forward for better yield within their resources.

1.2 Objective

This project is mainly designed to enhance the efficiency of the FMEA system of manufacture to increase the productivity of industry. The objectives are stated as the following:

- i. To automate the Failure Mode Error Analysis (FMEA) system.
- ii. To increase the efficiency of the operation management level.
- iii. To control the workers efficiency by which it provides the real time guidelines and solution to workers/operator.

1.3 Problem Statements

Over the decade, plenty of research have been done on increasing the productivity of industry. Those research consists of enhancing the industry facilities, enhancing the used technologies, enhancing the management system, and enhancing the FMEA system. However, **the utilization of automated data collection and analysis system is still not reach the requirement of industry.** The real time data collect and analysis system should be developed in finding the root causes and preventions to reduce the production down time. Apart from that, **the inefficiency of the communication between the management and the production lines is the main factor of increasing the production down time.** The delay of transferring the production performance data to the management has caused the late response from

the management over the errors. Besides, **the less utilization of the automated management system also results in wastage of time.** There are many routine failures that occur daily, and in fact, these failures can be solved by the workers themselves without going through the management.

1.4 Scope of Total Manufacturing E-Platform

This system designed Visual Basic.Net based system that is able to enhance the RCA (root cause analysis) in manufacturing sector. The research will focus on the industrial environment, manufacturing RCA, Programmable Logic Controller (PLC), and Microsoft Visual Basic.Net 2005. The data will be collected from the machine through the PLC and stored in a database. The data from the database will then be analyzed based on the Overall Equipment Effectiveness (OEE) concept and Seven Quality Control Tools (7QC tools) concept. At the final stage, the system will provide a guideline with a solution to the workers and management through display screen. Besides, sensors will be added in the system based on the industrial needs for respective failures detection purpose.

1.5 Methodology Briefing

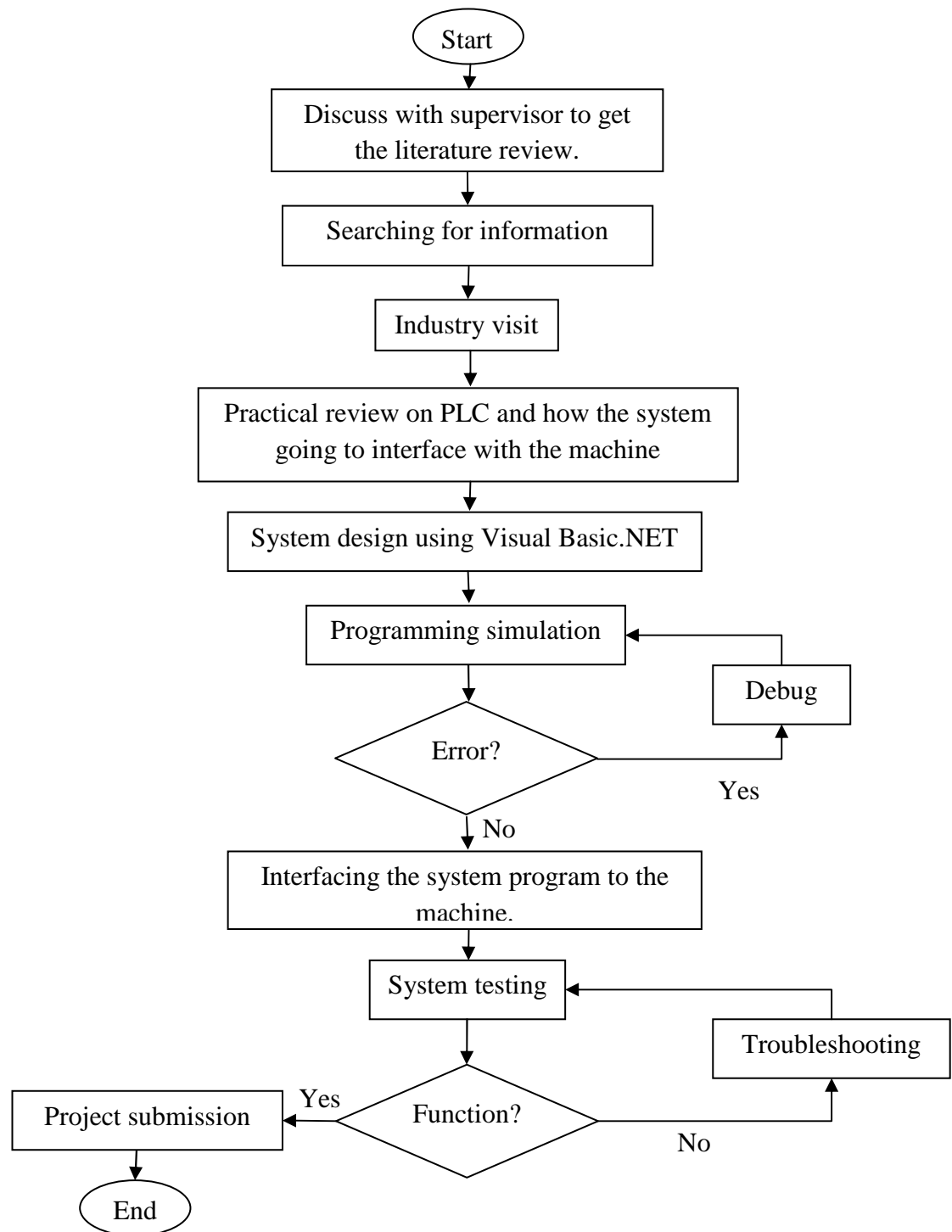


Figure1.1: Total Manufacturing E-Platform Development Flow Chart

1.6 Existing system

1.6.1 Supervisory Control And Data Acquisition System (SCADA)

SCADA is an universal supervisory system that is commonly in used by many of the industries. It collects data from various sensors at a factory, plant or in other remote locations and then sends this data to a central computer which then manages and controls the data [1]. However, SCADA is more focus on prevention for the occurring of production fault where as the system to be designed is more focus on providing the solution after the occurring of the production fault.

1.7 Introduction to Total Manufacturing E-Platform

In general, this system is a real-time manufacturing supervisory system that used to guide the workers or operators when failures occur during the manufacturing in production lines. Figure 1.2 shows that the data collected from the sensors are being processed, and analyzed in the system. A series of guideline will then be displayed to the workers and technicians. In essence, this system is focusing on providing solution for the failures that is unable to be solved in automation system. Such failures may cause machine break down, reject units, low quality units, etc., and must be repair or handled manually by workers.

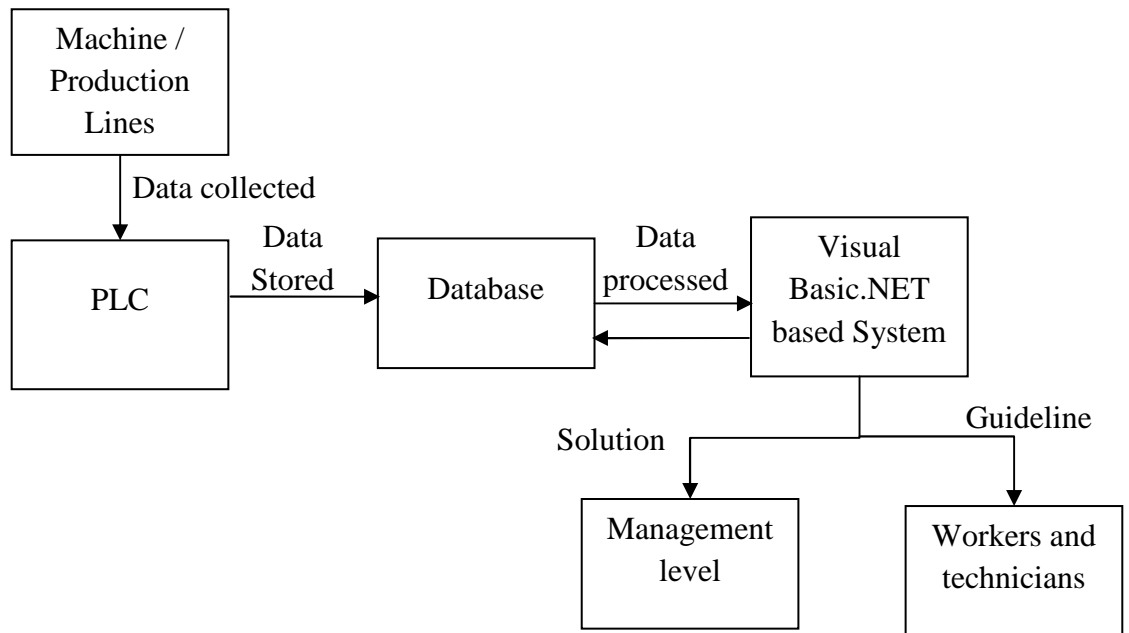


Figure 1.2: Total Manufacturing E-Platform block diagram

CHAPTER II

LITERATURE REVIEW

This chapter will discuss about the background of the research on Total Manufacturing E-Platform. The theories and concepts that will be used are explained in detail here.

2.1 Seven QC Tools

In industry manufacturing, quality control is an essential part in maintaining the quality of the production within the requirement range. Seven QC tools are fundamental instruments to improve the quality of the product that are used to analyze the production process, identify the major problems, control fluctuations of product quality, and provide solutions to avoid future defects. Statistical literacy is necessary to effectively use the seven QC tools. These tools use statistical techniques and knowledge to accumulate data and analyze them.

Seven QC tools are utilized to organize the collected data in a way that is easy to understand and analyze. Moreover, from using the seven QC tools, any specific problems in a process are identified. [3]

In essence, the seven QC tools include:

- check sheet,
- fishbone diagram,
- control chart,
- histogram,
- Pareto chart,
- scatter diagram, and
- stratification

2.1.1 Check Sheet

It is a structured, prepared form that used to collect data for analysis purpose. When an event or problem is to be observed, the form is to be designed as simple as possible to ease for collecting data.[3]

2.1.2 Fishbone Diagram

It is used to identify the possible failures root causes according to the different categories. In industry, there are six general categories of factors such as measurement, manpower, machines, materials, methods, and environment.[3]

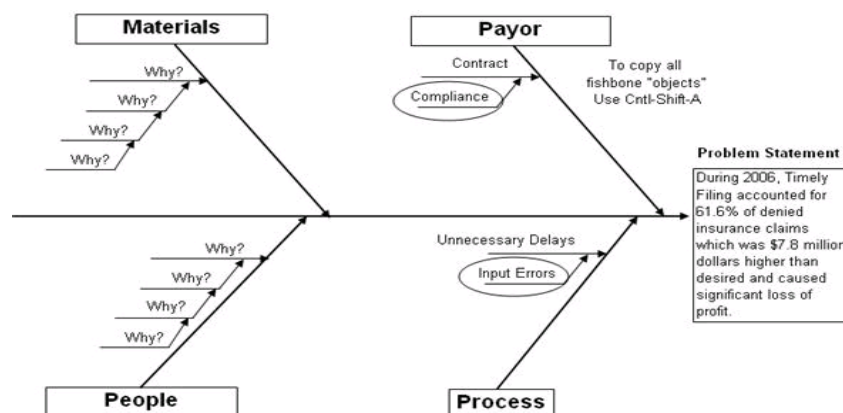


Figure 2.1: Fishbone diagram

2.1.3 Control Chart

It is a graph that used to study how the process changes over time. The data are analyzed in time variation. There are upper limit, lower limit and average that determined from the historical data. Data collected are then compared to these values and thus a conclusion can be drawn on whether the data are consistent (process in control) or unpredictable (process out of control, affected by special causes).[3]

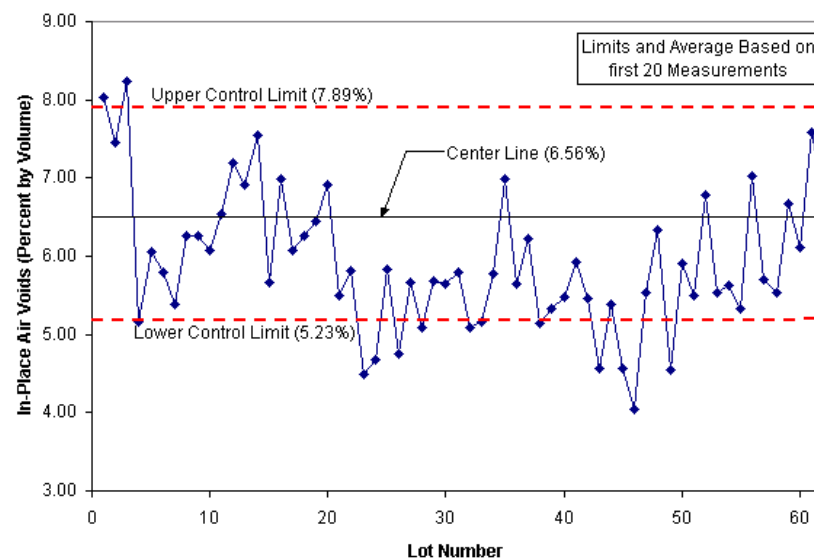


Figure 2.2: Control chart

2.1.4 Histogram

It is a frequency distribution that used to observe how often each different value occurs in a set of data. In industry, it can be used to observe the frequency of each reject occurs within a period of time.[3]