DIAGNOSTICS SYSTEM FOR MANUFACTURING PROCESS PROBLEMS (DSMPP)

OKFALISA

UNIVERSITI TEKNOLOGI MALAYSIA

To my beloved husband.
To my honorable mother and father

ACKNOWLEDGEMENT

I would like to thank my supervisor PM.Dr.Naomie Salim and my co supervisor Dr.Wong Kuan Yew for the help and advice they have offered me during my studies. I am also grateful for the examiners PM.Wardah and Dr.Razak for correction and suggestions. I would like to give a very special thank to Mr.Jamaludin bin Parmin, Mr.Zulkifli, Miss. Hayati and Mr. Firdaus Saleh from White Horse Ceramics for the data and discussion. I also wish to thank to Universitas Islam Negeri Sultan Syarif Kasim Riau and Pemerintahan Daerah Propinsi Riau for the sponsorships.

My thanks go as well to my family, especially for my beloved husband, my daughter “Rara”, my father and my mother for the supporting and praying. I also wish to thank my friends, Fikri, Imam, Hafiz, Zarnelly, Mimi and Wiwied for the discussion and friendship.

ABSTRACT

Facing the market competition, fulfilling the customer satisfaction and increasing the product quality in manufacturing firms motivated investigation and diagnosis in their production output failure. To gain correct and accurate diagnostic, the entire process must be recorded and controlled in every step of manufacturing. In this project, a prototype system has been developed to record the knowledge base that was used to diagnose the source of tiles defects and to recommend action to solve the problems. This system consists of two main components, the knowledge base component and the inference engines. The knowledge base has been developed by analyzing the data and information that is related to the tiles defect, such as symptoms, probable causes, types of defect, processes, sub processes, tile classifications and recommended actions. On the other hand, the inference engines has been built by implementing the forward chaining method to root the causes of defect and depth first search in searching procedures. The analysis proves that this system can help workers in the company to diagnose tiles defect and solve problems regarding the defect. Besides that, the system can also help share and transfer knowledge among knowledge workers in manufacturing firm.

ABSTRAK

Bagi menghadapi persaingan pasaran, memenuhi kepuasan pengguna dan meningkatkan kualiti produk di sektor pembuatan, kajian terhadap punca kegagalan produk perlu dilakukan. Untuk mengenal pasti kegagalan produk, keseluruhan rantaian proses pembuatan perlu direkod dan dikawal setiap saat. Didalam project ini, satu prototipe sistem telah dibangun untuk merekodkan pengetahuan berkenaan dengan punca-punca kerosakan jubin dan langkah-langkah perbaikkan yang boleh diambil. Sistem ini terdiri dari dua bahagian, yaitu pangkalan pengetahuan dan engine carian. Pangkalan pengetahuan dibangun dengan menganalisa setiap data maupun informasi berkaitan dengan kerosakan jubin, berupa informasi gejala kerosakan, penyebab kerosakan, jenis-jenis kerosakan, proses pembuatan yang mengalami kerosakan, klasifikasi jubin dan cadangan penyelesaian untuk setiap kerosakan. Sementara itu engines carian dibangun dengan menerapkan kaidah rantaian kehadapan dan pencaharian pertama kedalaman. Analisa menunjukkan bahwa sistem ini dapat membantu para pekerja untuk mendiagnosis kerusakan jubin dan mengatasi setiap kerosakan yang dijumpai dalam proses pembuatan. Selain itu, sistem ini juga dapat membantu proses penyebaran pengetahuan dikalangan pekerja profesional dalam suatu perusahaan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

PROJECT OVERVIEW

1.1 Introduction

The ability to mechanize or automate has become a major requirement of those manufacturing fields that are planning to compete well into the future that combines process expertise, advanced software and mechanical systems in unique and creative ways. Regardless of the precautions and best efforts of all management in the company, a time may come when one of the products dies in the field. Usually the cause is either improper use or the failure of a part.

Safety concerns have become more important in product design and how to produce well of product quality. But the great pressure is to develop new products fast. So developers often lack the time to fully test product-quality features. As a result, the manufacturing companies must be sure that the companies have a program in place to effectively and efficiently respond to product failures. Otherwise the rush to market may levy a "pay me now or pay me later" tax on company profits. The manufacturing companies must be prepared to react quickly to hazards that might arise when one of its products fails. It must also be ready to give customers enough information to correct the problem.

Unfortunately, many manufacturing companies lack a program that outlines how to investigate and diagnose product failures. An incident can have serious consequences. There must be a prompt investigation to diagnose its root causes.

After a failure, it is imperative that a representative of the manufacturer quickly visit the site of the incident. The representative should ask some basic questions during the diagnostic, including:

- Was the product defect?
- What is the product defect?
- How does the defect product conditions?
- What the common causes of the product defect?
- How to manage or solve the problem occurred?
- Which parts of the manufacturing process causes the defects?

Actually all the problems especially in production must be communicated to all employees. Personnel must be aware of their responsibilities if a product fails. Sometimes the causes are in the machine problems but it is not impossible that the causes are the human factors, dereliction of duty. Knowing the root causes of the defect or fail product needs special skill, experiences and knowledge base from the experts in manufacturing area including machines, manufacturing process, specification standard production process (ISO) and controlling. To gain the correct and accurate diagnostic, the entire processing root must be recorded and controlled on every step of manufacturing process, from the incoming raw material in mixing or grinder process, preparation/semi manufacturing, building/assembly, curing, inspection until product claims after sales service.

Lines of knowledge base obtained from the experts should be communicated, from top management downwards because it will be reflected to the product quality, management process, company profit and responds to the critical competitor.

In this study, the researcher proposes a prototype of the management system that aid to diagnose the source of product defect in manufacturing and besides troubleshooting information for any type failure production by studying the defect characteristic of knowledge management in manufacturing process, the quality of the product can be controlled.

In order to capture the domain knowledge base concepts in diagnostics system for manufacturing process problems (DSMPP), case study is doing on manufacturing company in Johor Bahru, White Horse Ceramics Industries Sdn.Bhd located in Pasir Gudang.

The remaining part of the study is divided into three chapters. The second chapter presents the literature review; while the third presents the research methodology. The initial findings and analysis are discussed in chapter four.

1.2 The Background of the Study

The manufacturing industries are facing a rapidly changing landscape and new challenges are evolving. The competitive edges and innovation that can be developed include integrating quality services into well - established manufacturing processes for efficiency and effectiveness. The manufacturing challenges for the industrial practices in the twenty first century are concerned with the manufacturing solution, not just products and machines and build with confidence and guaranteed performance but also industries are giving tighter specifications and are asking for manufacturers to be responsible for the manufacturing losses caused by the failure of the manufacturing product.

To ensure the production quality and fulfill the customer satisfaction, technologies are needed to monitor the performance of manufacturing process and the flow of activity run based on the procedure. The problems occurred in manufacturing are caused by the defect in the machines or human factor problems such as the operator of the machines mechanism. When an unknown error is resident in a production, others trust and build upon it. The longer it goes undiscovered, the more disruptive the effect to other processes.

The proposed of this project, Diagnostics System for Manufacturing Process Problems (DSMPP) is to help by diagnose the sources of product defects and gives the solutions to suggest troubleshooting to manage and maintain the defects.
Diagnostic of cause the defect is obtained from the expertise's knowledge and managed in a database system for knowledge management sharing for all components in the manufacturing firm. The defect knowledge management is hoped to reduce the problems and increase the effectiveness and efficiency in manufacturing process.

1.3. Statement of the problem.

The problem statements of this project are:

1. What are the characteristics of the system that can aid diagnostics of product defects in manufacturing firm?
2. How can a system to diagnose the source of defect product for manufacturing firm be building knowledge base with forward chaining in inference engines?
3. How effective is a system to diagnose the product defect help in manufacturing firm?

This study attempts to provide answers to these questions and other related ones. The researcher intends to use a relevant system development methodology to develop a prototype of diagnostic system for manufacturing process problems which use knowledge base with forward chaining concept method rules in inference engines procedure. The system which enhances to diagnose source of defect problems and support problem solving to manages and handles the process problems. The tool will be tested at White Horse Ceramics Industries Sdn.Bhd.

1.4. Objective of the project

The main objective of the project is to build a prototype of system to diagnose the source of product defect in manufacturing process problems, another objective are:

- To study the characteristics of defect knowledge management in manufacturing process.
- To build a prototype of management system that can help to diagnose the source of product defect in manufacturing firm.
- To test the prototype of the system that can help to diagnose the product defect in manufacturing firm.

1.5. Scope of the project

In developing this project, I have determined and set the limit and scope for the case study of this project. The scopes are:

i. The manufacturing process special for automate machine problems defects
ii. The prototype of the system are limited for use in ceramic industries manufacturing
iii. The diagnostic of defect problem is to be traced to glazing and firing processes.
iv. The defect or rejected product is only regarding to line production for certain type of ceramic tiles.
v. The diagnostics for the sources of product defects is through forward chaining concept method rules in inference engines procedure.
vi. The system that will be developed will only be used by top level management, quality control department and research & development department.

1.6. Importance of project

By implementing ICT strategies in manufacturing company, specifically DSMPP system, it is hoped that it can bring some effective and efficient improvement to company for managing the product defect in manufacturing process problems. The project will give a new way management concept to face the competitor in business field.

Some benefits of the system for the organizations, manufacturing firms, engineers, Quality Assurance personnel are:

1. Organization:

   i. Propose effective management strategies to the top management.
   ii. Give the business a superior competitive advantage, and offer better service and improve customer satisfaction by producing the good quality of the product.
   iii. Pervade information technology and communication (ICT) concept in business organization.

2. Manufacturing Firms:
   i. Help in reducing the defect products in manufacturing production.
   ii. Help in diagnosing the product defects which influencing in manufacturing process and production.
3. Engineers
   i. Manage the knowledge sharing in the company after the experts left.
   ii. Manage the expertise's knowledge and skill to diagnose the product defect.
   iii. Sharing the knowledge for the new worker.
4. Quality Assurance , Quality Control, R&D personnel
   i. Give the solving problems for each causes of the defect for maintenance in effectiveness and efficiency.
   ii. Help in diagnosing the defect problems in production processes.
   iii. Sharing the knowledge representation for reducing the defects.

1.7 Summary

In this first chapter a brief introduction about the project and how the project is going to be implemented has been discussed. The problem background and statement has also been discussed in this chapter to give an introduction of the project and to explain why this project has been proposed. The objective, scope and the importance of this project have also been pointed out. Hopefully, by developing the project successfully, the objective and aim of the project can be achieved.