

DIAGNOSTICS SYSTEM FOR MANUFACTURING

PROCESS PROBLEMS (DSMPP)

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To my beloved husband.
To my honorable mother and father

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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 rangkaian 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 perbaiki 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 rangkaian kehadapan dan pencaharian pertama kedalaman. Analisa menunjukkan bahwa sistem ini dapat membantu para pekerja untuk mendiagnosis kerosakan 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

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENTS	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xi
	LIST OF FIGURES	xii
	LIST OF APPENDICES	xiv
1.	CHAPTER 1 PROJECT OVERVIEW	
	1.1 Introduction	1
	1.2 The Background of the Study	3
	1.3 Statement of the problem	4
	1.4 Objective of the project	5
	1.5 Scope of the project	5
	1.6 Importance of project	6
	1.7 Summary	7
2.	CHAPTER 2 LITERATURE REVIEW	
	2.1 Introduction	8
	2.2 Knowledge Base System	9
	2.2.1 Knowledge Base	9
	2.2.1.1 Definition of Knowledge Base	9
	2.2.1.2 Type of Knowledge Base	11
	2.2.2 Expert System	12
	2.2.2.1 Definition of Expert System	12
	2.2.2.2 Key component of an Expert System	13

2.2.3	Reasoning in ruled base systems	15
2.2.4	Comparison of chaining methods	16
2.2.5	Search Strategies used in Problem Solving	17
2.2.6	Type of Task Carried Out by Expert System	20
2.2.7	Advantages of Expert System	21
2.3	Knowledge Management System	23
2.3.1	Definition	23
2.3.2	The purpose of KMS	24
2.3.3	Knowledge Management Architecture	24
2.3.4	Impacts KMS to Organizational Effectiveness	26
2.3.5	Knowledge strategy goals	27
2.4	Manufacturing Process	28
2.4.1	Definition	28
2.4.2	Manufacturing systems	29
2.4.2.1	Production Characteristics	29
2.4.2.2	Mechanization and Automation	30
2.4.2.3	Assembly	31
2.4.2.4	Quality Control	31
2.4.2.5	Function of Quality Control	32
2.5	Benchmarking Study	33
2.5.1	Integrated Diagnostic system for production and service	33
2.5.2	Knowledge-based expert system in manufacturing	34
2.5.3	An On-Line Diagnostic Expert System for Intelligent Manufacturing	35
2.6	Summary	37
3.	CHAPTER 3 RESEARCH METHODOLOGY	
3.1	Introduction	38
3.2	System Framework	38
3.3	Project Methodology	40
3.2.1	Planning Phase	40
3.2.1.1	Project Initiation	41
3.2.1.2	Project Management	41
3.2.2	Analysis Phase	41
3.2.2.1	Analysis Strategy	42
3.2.2.2	Requirements Gathering	42
3.2.2.3	System Proposal	42
3.2.3	Design Phase	43
3.2.3.1	Design Strategy	43
3.2.3.2	Architecture Design	43
3.2.3.3	Designing Database and file specification	44
3.2.3.4	The Program Design	44
3.2.4	Implementation Phase	44
3.2.4.1	System Construction	44
3.2.4.2	Installations	45

3.2.4.3	Support Plan	45
3.4	System Development Methodology	51
3.5	Hardware and Software Requirements	51
3.6	Project Schedule	53
3.7	Summary	53
4.	CHAPTER 4 ANALYSIS AND DESIGN	
4.1	Introduction	57
4.2	Organization Analysis	57
4.3	As Is Process	59
4.3.1	Production Process Operation	59
4.3.1.1	Flowchart Operation Process	59
4.3.2	Detection the Tiles Defects	62
4.3.3	Production Classification	62
4.3.3.1	Grade A	63
4.3.3.2	Grade B	64
4.3.3.3	Grade C	64
4.3.4	The Tiles Inspection	65
4.3.5	Identify the knowledge base	66
4.3.5.1	The Tiles Defect and Probable causes	66
4.3.5.2	The Tiles Defect and Classification	67
4.3.6	Knowledge Representation	69
4.3.6.1	Rule Base	70
4.3.6.2	Decision Three	74
4.3.6.3	The User Interface	76
4.3.7	Knowledge Management	84
4.4	To-be-Process	86
4.5	System Architecture	92
4.6	Physical Design	94
4.6.1	Database Design	95
4.6.2	Program (Structure) Chart	95
4.6.3	User Interface Design	97
4.7	Summery	99
5.	IMPLEMENTING AND TESTING	
5.1	Introduction	100
5.2	System Implementation	100
5.2.1	Database Development	101
5.2.2	System Development	104
5.2.2.1	Product	106
5.2.2.2	Symptom	107
5.2.2.3	Defect	108
5.2.2.4	Causes	110
5.2.2.5	Process	112
5.2.2.6	Sub Process	112

5.2.2.7	Recommendation	112
5.2.2.8	Question	113
5.2.2.9	Answer	113
5.2.2.10	Rule Base	113
5.2.2.11	Diagnose	115
5.2.2.12	Login	116
5.3	Test Result/System Evaluation	116
5.3.1	Unit Testing	117
5.3.2	Black box Testing	117
5.3.3	White box Testing	124
5.3.4	Usability Testing	125
5.4	User Manual	126
5.5	Summery	126
6.	ORGANIZATIONAL STRATEGY	
6.1	Introduction	127
6.2	Roll Out Strategy	128
6.2.1	Installation of Infrastructure Process	128
6.2.2	Trainings	129
6.2.3	System Implementation Process	130
6.2.4	The Organizational Support	130
6.3	Summery	130
7.	DISCUSSION AND CONCLUSION	
7.1	Introduction	132
7.2	Achievements	132
7.3	Constraints and Challenges	133
7.4	Aspiration	135
7.5	Summery	135
	REFFERENCES	137
	APPENDICES A-K	139 - 250

LIST OF TABLES

TABLE NO	TITLE	PAGE
3.1	Activities in Project Development Phase	46
3.3	Software required to developing the system	52
4.2	Hardware and Software Specification	94
5.1	Table Black box Testing Process	118

LIST OF FIGURES

FIGURES NO	TITLE	PAGE
2.1	Key Component of an Expert System	14
2.2	A Depth First Search	18
2.3	A Breadth First Search	19
2.4	Heuristic Search	19
2.5	Knowledge Management Architecture	25
2.6.	The KM/OM/OL Model (Jennex-Olfman, 2002)	27
2.7	Major Interaction between manufacturing and other industrial activities	29
2.8	Principle of Integrated Quality control	32
2.9	Architecture of Integrated DES	34
2.10	Simplified frameworks in influence diagram Knowledge base	36
3.1.	System Framework	39
3.2	Gantt chart	55
4.1	Production Process Flowchart	60
4.4	Examples of defects- 1	67
4.5	Examples of defects-2	68
4.6	Examples of defects-3	68
4.7	Examples of defects-4	69
4.8	The Rule Base Process	70
4.9	The semantic Network	71
4.10	Decisions Three Diagram	75
4.11	The structure of DSMPP system	77

4.12	Dialogues route analysis process	78
4.13	Knowledge Management Structure	85
4.14	Use Case Diagram	87
4.62	Class Diagram	89
4.63	State Chart Diagram: User Class	90
4.64	State Chart Diagram: Tile Class	91
4.65	DSMPP System Architecture	92
4.66	The Structure Chart of DSMPP System	96
4.67	Window Navigation Diagram for DSMPP System	98
5.1	Knowledge base relationship	101
5.2	Rule base relationships	102
5.3	The symptom page	107
5.4	The symptom_def page	108
5.5	The Defect Page	109
5.6	The Defect Relation Page	110
5.7	The Cause Page	111
5.8	The Cause Relation Page	111
5.9	The Rule Base Page	115
5.10	Login Page	116
5.34	Diagnose Page	188
5.35	Result Page	189
5.36	Diagnose-causes Page	189

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Quality Control Plan and Form Report	139
B	Manual ways to detect the defect	144
C	Sequences Diagram	146
D	Tiles Defect and Probable Causes Table	176
E	Organization Chart of White Horse Ceramic	191
F	Usability Testing Form	192
G	Rule Base	194
H	Use Case Description	198
I	Class Diagram	224
J	Database Design	234
K	User Manual	238

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.