Faculty of Information and Communication Technology

MAINTENANCE MODELLING TOOLS WITH SPECIAL REFERENCE TO INCOMPLETE DATA

Abd. Samad bin Hasan Basari

PhD in Information and Communication Technology

2009

MAINTENANCE MODELLING TOOLS WITH SPECIAL REFERENCE TO INCOMPLETE DATA

ABD. SAMAD BIN HASAN BASARI

A thesis submitted

in fulfillment of the requirements for the degree of Doctor of Philosophy

in Information and Communication Technology

Faculty of Information and Communication Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2009

DECLARATION

I declare that this thesis entitle "Maintenance Modelling Tools with Special Reference to Incomplete Data" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature	:	....
Name	:	**ABD. SAMAD BIN HASAN BASARI**
Date	:	28 AUGUST 2009

DEDICATION

Dear Allah

I devoted my life and death to You, Allah. May my life is within Your guidance.

Dear My Parent

Thank you for your sacrifice and love. No such compensate except from Allah.

Dear My Beloved Wife

Your support, patience and encouragement give me strength to finish this study. May Allah bless us.

Dear Teachers

Thank you for all the knowledge. May your knowledge are beneficial and useful for all humanity.

Dear My Siblings

Thank you for your support and love. May Allah forgive us.

Dear My Children

May Allah guide and protect us to be good Muslims.

ACKNOWLEDGEMENT

In the Name of Allah, Most Gracious, Most Merciful,

First and foremost, all praise to Allah, Subhanahu-wa-Ta'ala, the Almighty, Who gave me an opportunity, courage and patience to carry out this work. I feel privileged to glory His name in the sincerest way through this small accomplishment. I seek His mercy, favour and forgiveness.

Acknowledgment is due to Universiti Teknikal Malaysia Melaka and Government of Malaysia for providing financial support for this work.

I would like to express my deepest gratitude to my Thesis Supervisor, Prof. Dr. Nanna Suryana Herman and Prof. Dr. Mohammad Ishak Desa for their constant support and constructive guidance throughout this research. Special thanks also to Prof. Dr. Shahrin Sahib, PhD colleagues and friends, interim evaluation committee and CMMS research team, Nizam, Azirah and Zuraida. Not leaving out staffs from the Faculty of Information and Communication Technology, Postgraduate Study Centre and Study Leave Unit. I would also like to thank Palm Oil Mill managements especially En. Abu Bakar Suradi, En. Ahmad Taredi Musa, En. Bakhtiar Kamalludin and Mr. Lee Mang Cheang for their cooperation. Lastly, I am deeply indebted to my family, my wife and my children for their patience and encouragement during the period of this research.

Abd. Samad Hasan Basari, Melaka, March 2009.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND GLOSSARY

AHP	*A*nalytic *H*ierarchy *P*rocess, a method which can allow the decision makers to model a complex problem in a hierarchical structure showing the relationship of the goal, criteria, sub criteria and alternatives.
AI	*A*rtificial *I*ntelligent
CMMS	*C*omputerised *M*aintenance *M*anagement *S*ystem
CN	*C*riticality *N*umber, a number used in FMECA to represent components/machines criticality with a specific formula based on probability theory.
CPO	*C*rude *P*alm *O*il, a palm oil which is one of a final product at POM.
Decision Analysis	A decision support technique that utilise AHP, FLRB and DMG.
Defuzzification	A process to derive a crisp value from a fuzzy function. The crisp value then presented in a meaningful value that could be understand by the users.
Delay Time	The time lapse from when a defect can be first identified at an inspection to the time that the defect causes a failure (breakdown).

DMG	*D*ecision *M*aking *G*rid, a method to conduct prevention action analysis.
DSS	*D*ecision *S*upport *S*ystem
ESS	*E*nhance *S*ubjective *S*urvey, a computer-based survey form aims to collect all information needed in developing maintenance model.
FFB	*Fresh F*ruit *B*unches, a fresh ripe fruit plucked from palm tree to be processed at POM.
FLRB	*F*uzzy *L*ogic *R*ule *B*ase, a rule base technique adopted from fuzzy logic theory.
FMECA	*F*ailure *M*ode, *E*ffect and *C*riticality *A*nalysis, a bottoms-up method of analysing a system design or manufacturing process in order to properly evaluate the potential of failures.
FTA	*F*ault *T*ree *A*nalysis, a top-down method of analysing a system in order to properly evaluate the potential of problems.
Fuzzification	A process to classify a membership function and universe of discourse in the fuzzy logic theory.
HLA	*H*ow *L*ong *A*go
HML	*H*ow *M*uch *L*onger
IT	*I*nformation *T*echnology
KKSBP	*K*ilang *K*elapa *S*awit *B*ukit *P*asir
KKSS	*K*ilang *K*elapa *S*awit *S*emenchu
KSUB	*K*ilang *S*awit *U*nited *B*ell