UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

THE STRUCTURAL ANALYSIS BETWEEN TOTAL PRODUCTIVE MAINTENANCE, KAIZEN EVENT, AND INNOVATION PERFORMANCE IN MALAYSIAN AUTOMOTIVE INDUSTRY

SUZAITULADWINI BINTI HASHIM

A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE IN MASTER OF MANAGEMENT ACCOUNTING

(RESEARCH MODE)

FACULTY OF MANAGEMENT AND ECONOMIC

UNIVERSITI PENDIDIKAN SULTAN IDRIS

2015

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

ABSTRACT

The purpose of this study is to investigate the relationship between Total Productive Maintenance (TPM), Kaizen Event (KE), and Innovation Performance (IP). This quantitative study developed a model for the Malaysian automotive industry which incorporates the three element. Survey questionnaires were used to investigate the relationship between the implementation of TPM, KE, and IP in 161 automotive supplier companies. Structural equation model technique was used to test the statistical analysis of the data required in the study. In order to test the reliability and validity of the instrument, reliability analysis, exploratory factor analysis and confirmatory factor analysis were conducted. Findings reveal that KE does not affect the relationship between TPM and IP. However, the study suggests that KE assists in improving IP when coupled with TPM. In short, this is a comprehensive research which has undergone detailed methodology and analysis and contributed to the limited existing literature in the development of structural relationship between TPM, KE, and IP especially in the Malaysian automotive industry. The impact of TPM practice implementation on IP increases with a mediating of KE practices in the Malaysian automotive industry. This research provides fundamental knowledge and direction for researchers in further research as well as practitioners to constantly improve IP and organizational performance through the implementation of TPM and KE.

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

ANALISIS BERSTRUKTUR ANTARA *TOTAL PRODUCTIVE MAINTENANCE*, *KAIZEN EVENT* DAN PRESTASI INOVASI DI INDUSTRI AUTOMOTIF DI MALAYSIA

ABSTRAK

Tujuan kajian ini adalah untuk menyiasat hubungan antara Total Productive Maintenance (TPM), Kaizen Event (KE) dan prestasi inovasi. Kajian kuantitatif ini membangunkan model yang menggabungkan elemen-elemen ini untuk industri automotif di Malaysia. Satu tinjauan melalui soal selidik telah dijalankan untuk menyiasat hubungan antara pelaksanaan TPM, KE dan prestasi inovasi ke atas 161 syarikat pembekal automotif di Malaysia. Data dianalisis dengan menggunakan teknik struktur persamaan model untuk menguji analisis statistik yang diperlukan dalam data kajian dalam usaha untuk menguji kebolehpercayaan dan kesahan instrumen, analisis kebolehpercayaan, analisis faktor penerokaan dan analisis faktor pengesahan telah dijalankan. Hasil dapatan kajian menunjukkan bahawa KE tidak memberi kesan kepada perhubungaan antara TPM dan prestasi inovasi. Walau bagaimanapun, kajian ini menunjukkan gabungan KE dengan TPM memberi kesan yang lebih baik kepada prestasi inovasi. Secara ringkas, ini adalah satu kajian menyeluruh yang telah melalui kaedah terperinci dan analisis serta menyumbang kepada kesusasteraan yang sedia ada dalam pembangunan kajian berkaitan hubungan struktur antara TPM, KE dan prestasi inovasi terutamanya dalam industri automotif Malaysia. Kesan pelaksanaan amalan TPM ke atas prestasi inovasi semakin meningkat dengan adanya pengantara KE dalam industri automotif Malaysia. Kajian ini juga menyediakan asas dan hala tuju bagi penyelidik dalam penyelidikan lanjut dan pengamal untuk sentiasa memperbaiki prestasi inovasi melalui pelaksanaan TPM dan KE.

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

TABLE OF CONTENT

	PAGE
DECLARATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT	iv
ABSTRAK	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xiii
LIST OF FIGURES	xvi
LIST OF ABREVIATIONS	xviii
LIST OF APPENDICES	xx

CHAPTER 1 INRODUCTION

1.1	Background of Research	1
1.2	Problem Statement	7
1.3	Research Questions	9
1.4	Research Aim and Objectives	9
1.5	Significant and Contribution of Research	10
1.6	Scope and Assumption	11
1.7	Research Framework	12
1.8	Hypotheses	12

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

1.9 Research Design 13

1.10 Definition of Term 14

1.10.1 Total Productive Maintenance 14

1.10.1.1 Autonomous Maintenance 15

1.10.1.2 Planned Maintenance 15

1.10.1.3 Quality Maintenance 16

1.10.1.4 Education and Trainning 16

1.10.2 Kaizen Event 16

1.10.2.1 Follow-up Activities 17

1.10.2.2 Working Area Impact 17

1.10.2.3 Employee Skill and Effort 17

1.10.3 Innovation Performance 18

1.10.3.1 Environmental Innovation 18

1.10.3.2 Employee Innovation 18

1.10.3.3 Technology Innovation 19

1.11 Outline of Thesis 19

1.12 Summary 20

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction 21

2.2 Automotive Overview 22

2.3 Total Productive Maintenance (TPM) 24

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

2.3.1 Overview TPM 24

2.3.2 Definition of TPM 26

2.3.3 Benefits of TPM Implementation 28

2.3.4 The Implementation of TPM in Automotive Industry 32

2.3.5 TPM constructs 37

2.3.5.1 Autonomous Caintenance (AM) 41

2.3.5.2 Planned Maintenance (PM) 44

2.3.5.3 Quality Maintenance (QM) 45

2.3.5.4 Education and Training (ET) 47

2.4 Kaizen Event (KE) 48

2.4.1 Overview KE 48

2.4.2 Defintion of KE 51

2.4.3 The Benefit of KE Implementation 56

2.4.4 The Implementation of KE Practices in Automotive Industry 60

2.4.5 KE Constructs 66

2.4.5.1 Follow-up Activities (FA) 68

2.4.5.2 Working Area Impact (WAI) 69

2.4.5.3 Employee Skill and Effort (ESE) 69

2.5 Performance Measurement System (PMS) 71

2.6 Innovation Performance (IP) 74

2.6.1 IP Overview 74

2.6.2 IP Measurement 77

2.6.2.1 Environmental Innovation 77

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

2.6.2.2 Employee Innovation 78

2.6.2.3 Technology Innovation 78

2.7 The Integrated between TPM and IP 79

2.8 The Integrated between TPM Practices and KE Practices 83

2.9 The Integrated between KE Practices and IP 87

2.10 The Integrated between TPM, KE and IP 90

2.11 The Generic Framework of Contingency Theory 93

2.12 The Generic Framework of Toyota Production System Concept 103

2.13 Total Productive Maintenace and Kaizen Event from Management Accounting Perspective 108

2.14 Summary 113

CHAPTER 3 METHODOLOGY

3.1 Introduction 114

3.2 Research Design 115

3.3 Overall Structure of Research Methodology 116

3.4 Survey Methodology 119

3.4.1 Questionnaire Development 119

3.4.2 Expert Validation 120

3.4.2.1 Selection of Expert Panel (Participant) 121

3.4.3 Pilot Study 123

3.4.4 Population and Sampling of a Study 126

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

3.4.5 Data Collection 129

3.4.5.1 Treatment for Missing Data 132

3.4.5.2 Test of Response Bias 132

3.4.6 Reliability 133

3.4.7 Validity 135

3.4.8 Statistical Analysis 138

3.5 A Review on Structural Equation Modelling 140

3.6 Research Model 150

3.6.1 A Proposed Research Model 150

3.7 Research Hypotheses 151

3.8 Summary 157

CHAPTER 4 SURVEY ANALYSIS AND DISCUSSIONS

4.1 Introduction 159

4.2 Respondent Profile Descriptive Statistic 160

4.2.1 Overall Profile 160

4.3 Exploratory Factor Analysis (EFA) 163

4.3.1 EFA on TPM Constructs 164

4.3.1.1 Initial Solution Results 165

4.3.1.2 Rotated Component Matrix Results 166

4.3.2 EFA on KE Construct 167

4.3.2.1 Initial Solution Results 167

4.3.2.2 Rotated Component Matrix Results 168

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

4.3.3 EFA on IP 169

4.3.3.1 Initial Solution Results 169

4.3.3.2 Rotated Component Matrix Results 170

4.4 Reliability Analysis 171

4.5 Confirmatory Factor Analysis (CFA) 172

4.5.1 First Order Confirmatory – Multiple Factors 172

4.5.1.1 TPM Construct with Four Factors 173

4.5.1.2 KE Construct with Three Factors 175

4.5.1.3 IP Mearures with Three Factors 178

4.6 Test of Hypotheses 180

4.6.1 Correlation Analysis of TPM Constructs in Malaysian Automotive Industry 181

4.6.2 Critical Success Factors of TPM implementation in Malaysian automotive industry 183

4.6.3 Mediating Effect of KE in Malaysian Automotive Industry 185

4.7 Discussions and Implications 188

4.7.1 Results of TPM, KE, and IP Measurement Model 188

4.7.2 Implementation of SMP in Malaysian Automotive Industry 191

4.7.3 Mediating Effects of KE 194

4.8 Summary 195

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction 197

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

5.2	Research Contribution	198
5.2.1	Dissemination of Knowledge through Publications	199
5.3	Fulfillment of Research Objectives	199
5.4	Limitation for Future Research	200
5.5	Recommendation for Future Research	202

REFERENCES 204

APPENDICIES

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

LIST OF TABLES

Table		Page
1.1	Objectives of the National Automotive Policy	4
1.2	The Policies in Proton	4
2.1	The Summary of the Benefits in TPM Implementation	31
2.2	The Summary of TPM's Previous Studies Conducted in Various Industries and Countries	35
2.3	The Item Involved with Various TPM Pillars	40
2.4	Definition of KE Practices from Previous Study	52
2.5	The Step of KE Implementation	54
2.6	The Summary of Other Benefits by Various Authors	59
2.7	Summary of KE Practice in Various Industries	64
2.8	KE Construct from Previous Studies	67
2.9	Previous Studies about KE	68
2.10	The Summary of Item Kaizen Event Construct from Various Authors	71
2.11	Dimension Operational of Innovation Performance	75
2.12	Measurement Element of Innovation	76
2.13	The Summary of TPM Study Related to IP	82
2.14	The Summary of Previous Study Used Contingency Theory	95
2.15	The Basic Contingency Framework	102
3.1	Summary of Survey Questionnaire Design	120
3.2	Feedback from Expert TPM and KE Practices	122
3.3	Position of the Panel of Experts	122

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

3.4	Summary of Comments and Suggestions from TPM and KE Experts and Practitioners	123
3.5	The Profile of the Respondent (n=26)	124
3.6	Pilot Result of Internal Consistency Analysis for TPM constructs, KE Constructs and IP measurement	126
3.7	Summary of the Research Sampling	129
3.8	Summary of Chronology of Collects Data	131
3.9	Summary of Final Dataset	132
3.10	Guidelines for Developing Questionnaire	134
3.11	Summary of Past-related Research using SEM Approach	149
4.1	The Profile of the Respondent (n=229)	162
4.2	KMO and Bartlett's Test for TPM constructs	164
4.3	Results of Total Variance Explained for TPM Items	165
4.4	KMO and Bartlett's Test for KE constructs	167
4.5	Results of Total Variance Explained for KE Item	168
4.6	KMO and Bartlett's Test for IP Measures	169
4.7	Results of Total Variance Explained for IP Items	170
4.8	Results of Internal Consistency Analysis for TPM Constructs, KE, and IP Measures	171
4.9	Regression Weights of Four TPM Constructs	175
4.10	Regression Weights of Three KE Construct	177
4.11	Regression Weights of Four IP Measures	180
4.12	Assessment of Multivariate Normality	181
4.13	The Estimated Strength of the Relationship between Two Variables	182
4.14	Correlation Matrix between TPM Constructs	183

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

4.15	Mean Perception of CSFs by Degree of TPM Practices	184
4.16	Regression Weights of the Relationship between TPM, KE and IP Measures	187
4.17	Direct (DE) and Indirect Effect (IE) Analysis for Malaysia Automotive Industry	188
4.18	Summary of EFA, Reliability and CFA Results	189
4.19	Summarizes of Results CFA Multiple Factor for TPM, KE, and IP	190
4.20	Summary of Results on Measurement Model of TPM, KE and IP Measures	191

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

LIST OF FIGURES

Figure		Page
2.1	The Pillar of TPM Practices	38
2.2	The Step of Autonomous Maintenance Implementation	43
2.3	The step of Planned Maintenance Implementation	45
2.4	The Effect of ET on the Employee and the Organization in Achieving Organizational Excellence	48
2.5	A Model of TPM and KE Implementation Program	91
2.6	The Stage of Relationship between Maintenance, KE, and Innovation	93
2.7	Moderation Form of Fit Model	99
2.8	Meiation Form of Fit Model	99
2.9	The Basic Contingency Framework	101
2.10	The Structural Relationship between TPM, KE, and IP	102
2.11	TPS's House	104
3.1	Overview of Overall Structure Research Methodology	118
3.2	The Outline the Research Analysis Steps	140
3.3	The Model of the Structural Relationship between TPM, JIT, TQM and Manufacturing Performance	144
3.4	Conceptual SEM for Taiwan and Hong Kong Data	145
3.5	Model of TQM, ISO/TS16949, and Organizational Performance	146
3.6	Model of Knowledge Management Initiative, TQM practice and Organizational Innovation Performance	147
3.7	The Proposed Mediating Research Model	151
4.1	The output path diagram for four factors TPM model	174

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

4.2	The output path diagram for three factors KE model	176
4.3	The output path diagram for three factors IP model	179
4.4	CSFs of TPM Implementation in Malaysian Automotive Industry	184
4.5	Inner and Outer Regression Weights for the Structure Relationship between TPM and IP with a Mediation of KE Practices for Malaysia Automotive Industry	186

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

LIST OF ABBREVIATIONS

AFTA	Asean Free Trade Area
AGFI	Adjusted Goodness of Fit Index
AIMS	Automotive Institute of Malaysia
AM	Autonomous Maintenance
AMOS	Analysis of Moment Structures
BPR	Business Process Reengineering
CBU	Complete built-up
CEPT	Common Effective Preferential agreements Tariffs
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Indexes
CSF	Critical Success Factors
EFA	Exploratory Factor Analysis
ESE	Employee Skill and Effort
ET	Education and Training
FA	Follow-up Activities
GFI	Goodness Fit Index
IATF	International Automotive Task Force
IP	Innovation Performance
JIT	Just In Time
KE	Kaizen Costing
KE	Kaizen Event
KMO	Keiser Meyer Olkin
KSA	Knowledge, Skill, and Attitude
KVP	Kelab Vendor Perodua
MITI	Ministry International Trade and Industry
MP	Manufacturing Performance
NAP	National Automotive Policy
NFMP	Non Financial Manufacturing Performance
OEE	Overall Equipment Effectiveness

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

PCA	Principal Component Analysis (PCA)
PM	Planned Maintenance
PMS	Performance Measurement System
PVA	Proton Vendor Association
QA	Quality Assurance
QC	Quality Manager
QM	Quality Maintenance
RAM	Reticular Action Model
RAMONA	Reticular Action Model or Near Approximation
RMSEA	Root Mean Square Error Approximation
SEM	Structural Equation Model
SMEs	Small Medium Enterprise
SPSS	Statistical Package for Social Sciences
TEI	Total Employee Involvement
TLI	Tucker Lewis Index
TPM	Total Productive Maintenance
TPS	Toyota Production System
TQC	Total Quality Control
TQM	Total Quality Management
WAI	Working Area Impact
WCM	World Class Manufacturing

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

LIST OF APPENDICES

A1	The survey instrument
B1	An example letter sent to quality expert
B2	An example cover letter for pilot study
B3	An example cover letter for final survey
B4	An example follow-up letter for final survey
C1	Result of total variance explained for TPM items
C2	Result of total variance explained for KE items
C3	Result of total variance explained for IP items
D1	Summary results of rotated factor matrix –Varimax with Kaiser Normalization (TPM)
D2	Summary results of rotated factor matrix –Varimax with Kaiser Normalization (KE)
D3	Summary results of rotated factor matrix –Varimax with Kaiser Normalization (IP)
E1	Result of reliability analysis for TPM constructs
E2	Result of reliability analysis for KE constructs
E3	Result of reliability analysis for IP measures
F	List of publications
F-1	First page: International Journal of Engineering Research and Development
F-2	First page: Business Management and Strategy
F-3	First page: International Journal of Engineering Research and Applications
F-4	First page: International Journal of Physical and Social Sciences
F-5	First page: Journal of Operation Management
G	List of Participation
G-1	Innovation Poster, Regional Entrepreneurship Development Symposium
G-2	AKEPT poster
H	List of awards

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

H-1	Best Invention (university category) ITEX 2012
H-2	Gold Award ITEX 2012
H-3	Gold Award IDD UITM 2012

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

CHAPTER 1

INTRODUCTION

1.1 Background of Research

The automotive industry is an important industry to the Malaysian economy. The sector's contribution to the economy is large and closely related to manufacturing and services industries. Malaysian automotive industry began with the import of vehicles which then progressed to assembly operations and the development of the automotive component industry. Malaysia is a country which places an emphasis on progress in the automotive sector to develop to a higher level of sustainable economy. Since the establishment of the Proton in 1985, Malaysia has succeeded in developing the country's automotive industry in a distinctive class with local design capabilities. Besides that, Malaysia has collaborated with other countries to increase the capabilities of the automotive industry with a larger scale operation. Since 2010,

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

Malaysia is ASEAN's largest vehicle market with annual sales of more than 500, 000 vehicles; only 10% of vehicles are made and assembled overseas (MITI, 2010).

However, after a number of major global automotive companies such as Toyota and Honda decided to make Thailand and Indonesia as an automotive hub for their vihicles products, the Malaysian automotive industry felt threatened. There were growing challenges in the Malaysian automotive industry. The country has dropped to third place after Thailand and Indonesia (MITI, 2014). Thus, the strategic direction and policy framework for the automotive industry must be reviewed. The Malaysian automotive industry must focus on quality improvement to fulfill the specific needs and to exceed the customer expectations (Rahman et al., 2009).

Generally, automotive industry is the most actively involved industry with multiple practices such as quality effort, low production cost, continuous improvement activities, development of supply chains, and adoptability advanced technology. These practices are adopted in this industry in order for Malaysia to achieve World Class Manufacturing (WCM) which emphasises the systematic and effective practices in manufacturing process. Besides that, the organisation’s capabilities should provide worls class performance element in their management process to achieve WCM, such as reducing cost (Kennedy and Widener, 2008; Johansson and Siverbo, 2009), higher quality (Ittner and Larcker, 1995), higher motivation (Towry, 2003), and safety (Nachiappan et al., 2009).

WCM is a different set of concepts, principles, policies and techniques for managing and operating a manufacturing company. It is one of the broadest

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

philosophies focusing primarily on production and includes more structural changes such as new production technology (Vokurka & Davis, 2004). Other than that, WCM is a process-driven approach where implementations usually involve the following techniques such as high employee involvement, cross functional teams, multi-skilled employees, continuous improvement, and zero defects. Therefore, organisations engaging in WCM strategies must focus on improving operations and strive to eliminate waste.

To achieve WCM, Malaysia has put the national automotive policy as a basis and foundation of development and growth for the local automotive industry. The overall National Automotive Policies (NAP) objectives are to generate sustainable economic value. This will maximize the long term contribution of the automotive sector to the national economy and at the same time provide benefit to Malaysian consumers. Therefore, this industry still needs the support of government policies in order to become more competitive internationally.

The NAP aims to produce optimal transformation and integration of national industry into the regional and global industry network. The government is targeting growth and increased competitiveness of Malaysian automotive industry through the resolution of structure issues such as the small scale of economies, high production costs and the low level in knowledge and technology. Expanding and competitive global environment requires urgent transformation. Consequently, the government has outlined the objectives of the national automotive sector as shown in Table 1.1 below.

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

Table 1.1

Objectives of the National Automotive Policy

- Ensure orderly development as well as long term competitiveness and capability of the domestic automotive industry as a result of market liberalization;
- Create a conducive environment to attract new investment and expand existing opportunities;
- Enhance the competitiveness of the national car manufacturer through strategic partnership;
- Foster the development of the latest, more sophisticated technology in the domestic automotive industry;
- Develop high value-added manufacturing activities in niche areas;
- Enhance Bumiputera participation in the domestic automotive industry;
- Improve safety standard for consumers and promote environment-friendly opportunities; and
- Enhance the implementation of current NAP's policy instrument

Source: MITI (2010)

Based on the NAP objectives, the automotive organizations are required to make substantial changes in their management systems either in maintenance systems, using the equipment, continuous improvement, investment in technology and innovation (Nachiappan et al., 2009). Furthermore, based on NAP, Proton has set the outlines of core value for the organization such as quality, customer focus, innovation, teamwork, speed, caring and honesty. This was followed by Proton's policy of seeking to make improvements in terms of quality, shown in Table 1.2 below:

Table 1.2

The Policies in Proton

- Ensure quality as the Number One work ethics in all operations;
- Establish an effective and efficient Quality System based on the requirements of ISO 9001:2008 standards;
- Provide adequate skills and knowledge to all levels of personnel through systematic and structured training programmes;
- Provide a culture and environment of continuous learning, improvement and innovation towards total quality excellence;
- Provide a conducive, safe and healthy working environment in which people like to work and prosper.

(Source: Annual PROTON, 2011)

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDID
N IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI P

There are similarities as well as differences between the aspects highlighted by the government and automotive companies. The goals to be achieved by the government and automotive companies in this country are indeed diverse. The government is geared towards resolving the issues related to cost, use of technology, and the highest international standards. On the other hand, the automotive companies place more emphasis onwork environment, the production innovation, employee skills, and work ethic. As such, there are some practices that can be applied across the board to achieve the desired goals.

Based on the situation faced by the automotive industry, the Total Produvtive Maintenance (TPM) practice is a practice which can assist in solving the issues of cost, technology, and work environment. It is also affects the innovations' performance which have been set by the automotive company. Hoever, it must be supported by the other practice in order to improve the Innovation Performance (IP) is Kaizen Event (KE).

TPM is a unique Japanese philosophy, which has been developed based on the productive maintenance concepts and methodologies. This concept was first introduced by Nippon Denso Co. Ltd. of Japan, a supplier of Toyota Motor Company, Japan in the year 1971. TPM is an innovative approach to achieve the goal of zero breakdowns, zero abnormalities, zero defects and zero accident (Ncube, 2006). TPM practices are an efficient and strategic planning for business management. The TPM approach directly affects the level of efficiency and effectiveness in the manufacturing organization (Ncube, 2006; Jackson 2000).

UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKA
DRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PENDIDIKAN SULTAN IDRIS UNIVERSITI PEN