

THE CAUSAL EFFECTS OF BALDRIGE EXCELLENCE FRAMEWORK AND
LEAN IN THE MALAYSIAN ELECTRICAL AND ELECTRONICS
MANUFACTURING INDUSTRY

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ABSTRACT

The aim of this research is to construct a comprehensive performance measurement model using the 2019-2020 Baldrige excellence framework criteria that examines the Malaysian Electrical and Electronics (E&E) industry. The criteria in this framework are leadership, strategy, customers, measurement, analysis and knowledge management (MAKM), workforce, operations and results. The previous study in the context of Business Excellence (BE) was focused more on aspects of quality management, organisational context, company performance but it often excluded the deployment of continuous improvement tools. Based on the research gaps, this research would like to assert the potency of the leadership of Baldrige setting as a driver that contributes positively to the Lean practice and BE elements of the company. The present study also integrating the Lean practices with Baldrige excellence framework to predict operations and the results of company performance. This integration may bridge the literature gap whereby the past studies have been conducted Lean, BE and operational performance individually. BE outcomes were achieved in both financial and non-financial performance metrics and the BE Models, Leadership theory and Lean model also guided the theoretical framework. The study also employed stratified random sampling from four sub-sectors of the E&E industry. A total of 156 respondents responded to the survey questionnaire from 488 companies that were sampled. This equates to a 32.0% response rate. The collected data were analysed using SPSS 23.0 and SmartPLS 3.3.2. The analysis found significant and positive relationships between strategy, operations and Lean practices on the achievement of BE. The results of this study promoted a better understanding of the BE in the E&E industry and its implications for activities concerning Lean practices, thus contributing to a wider body of knowledge. The survey instrument which combining Lean and BE was validated in this research can be reused in the other manufacturing sector studies on the initiatives deployment to predict business performance. Therefore, it contributes to the methodology perspective. The findings

of the research can become a reference, which can help the company focus on the right things in promoting excellence in their organisation and then pursuing BE Awards. Practical adoption of leadership and Lean practices may improve infrastructural decision areas of manufacturing strategy and the outcomes of this study may also be beneficial to policy makers of the Malaysian government and agencies such as Malaysia Productivity Corporation (MPC) and Ministry of International Trade and Industry (MITI). The scope of this study was limited because it was restricted to the Malaysia's E&E industry only. As a suggestion, future research could be conducted by involving other industries.



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ABSTRAK

Tujuan penyelidikan ini adalah untuk membina model pengukuran prestasi secara komprehensif menggunakan kriteria kerangka kerja Kerangka kecemerlangan Baldrige 2019-2020 yang mengkaji industri Elektrik dan Elektronik (E&E) Malaysia. Kriteria dalam kerangka kerja ini adalah kepemimpinan, strategi, pelanggan, pengukuran, analisis dan pengurusan pengetahuan (MAKM), tenaga kerja, operasi, dan hasil. Kajian di konteks *Business Excellence* (BE) yang dilakukan sebelum ini lebih tertumpu kepada pengurusan kualiti, konteks organisasi, prestasi syarikat dan selalunya mengecualikan penggunaan alat penambahbaikan berterusan. Berdasarkan jurang penyelidikan ini, penulis ingin memastikan potensi kepemimpinan pengatur Baldrige sebagai penggerak dan memberi sumbangan positif terhadap amalan Lean and elemen BE syarikat. Kajian ini juga mengintegrasikan amalan Lean dengan kerangka kerja cemerlang Baldrige untuk meramalkan operasi dan hasil prestasi syarikat. Integrasi ini dapat merapatkan jurang literatur di mana kajian-kajian lepas telah dilakukan Lean, BE dan prestasi operasi secara individu. Hasil BE telah dicapai dalam metrik prestasi kewangan dan bukan kewangan. Kerangka teori dipandu oleh BE Model, teori Kepimpinan dan Lean model. Kajian ini menggunakan persampelan rawak berstrata dari empat subsektor industri E&E. Sebanyak 156 responden telah menjawab soal selidik tinjauan dari 488 syarikat dan ini menghasilkan kadar respons sebanyak 32.0%. Data yang dikumpulkan dianalisis menggunakan SPSS 23.0 dan SmartPLS 3.3.2. Analisis ini mendapati bahawa terdapat hubungan positif yang signifikan antara strategi, operasi dan praktik Lean terhadap pencapaian BE. Hasil kajian ini dapat mempromosikan pemahaman yang lebih baik tentang BE dalam industri E&E dan implikasinya terhadap aktiviti yang berkaitan dengan praktik Lean sehingga menyumbang pada badan pengetahuan yang lebih luas. Hasil penyelidikan ini boleh menjadi rujukan yang dapat membantu syarikat memberi tumpuan kepada perkara yang betul dalam mempromosikan kecemerlangan dalam organisasi mereka dan seterusnya memperoleh *BE Awards*. Penerapan kepemimpinan praktikal dan

amalan Lean dapat meningkatkan hasil keputusan infrastruktur strategi pembuatan. Hasil kajian ini juga bermanfaat bagi penggubal dasar kerajaan dan agensi Malaysia seperti Perbadanan Produktiviti Malaysia (MPC) dan Kementerian Perdagangan Antarabangsa dan Industri (MITI). Skop kajian ini terhad kerana ia hanya terbatas pada industri E&E Malaysia sahaja. Sebagai cadangan, penyelidikan pada masa hadapan boleh dilakukan dengan melibatkan industri-industri lain di Malaysia. Walaubagaimanapun, kajian ini telah berjaya merangkumi metrik ukuran prestasi kewangan dan bukan kewangan yang berasal dari Kerangka kecemerlangan Baldrige 2019-2020 yang menyumbang kepada jurang pengetahuan dari perspektif metodologi.



PTTHM
PERPUSTAKAAN TUNKU TUN AMINAH

TABLE OF CONTENTS

TITLE	i
DECLARATION	ii
ACKNOWLEDGMENT	iii
ABSTRACT	iv
ABSTRAK	vi
TABLE OF CONTENTS	viii
LIST OF TABLES	xiv
LIST OF FIGURES	xvi
LIST OF ABBREVIATION AND SYMBOLS	xviii
LIST OF APPENDICES	xx
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Background of the study	1
1.3 Problem statement	7
1.4 Research questions	13
1.5 Research objectives	13
1.6 Significance of the study	14
1.6.1 Significance of the research to the academics	15
1.6.2 Significance of the research to the practitioners	15
1.7 Scope of the study	16
1.7.1 Operational definitions	16

1.7.2	Results of company performance	17
1.7.3	Leadership	17
1.7.4	Strategy	18
1.7.5	Customers	18
1.7.6	Measurement, analysis, and knowledge management (MAKM)	18
1.7.7	Operations	19
1.7.8	Workforce	19
1.7.9	Lean practices	19
1.8	Organisation of this study	20

CHAPTER 2 LITERATURE REVIEW 20

2.1	Introduction	20
2.2	Underpinning theory	20
2.2.1	Business Excellence Models (BEMs)	21
2.2.2	Business excellence in the Malaysian context	29
2.2.3	Leadership theory	33
2.2.4	Leadership within the context of excellent organisations	36
2.2.5	Lean Model	39
2.3	Evolution of excellence	41
2.4	Business excellence	43
2.5	Previous Empirical Studies - Leadership	48
2.6	Previous Empirical Studies – Strategy	51
2.7	Previous Empirical Studies – Customers	52



2.8	Previous Empirical Studies - Measurement, analysis and knowledge management (MAKM)	53
2.9	Previous Empirical Studies – Operations	55
2.10	Previous Empirical Studies – Workforce	56
2.11	BE best practices and Lean: Evidence from successful companies	58
2.12	Previous Empirical Studies - Lean Practices	59
2.13	Summary of research hypotheses	65
2.14	Research Framework	66
2.15	Summary	69
CHAPTER 3 RESEARCH METHODOLOGY		70
3.1	Introduction	70
3.2	Research philosophy	70
3.3	Research design	74
3.4	Population and sampling	75
3.5	Unit of analysis	78
3.6	Survey measurement	78
3.7	Expert Validation	81
3.8	Pilot Test	83
3.9	Reliability and validity of the instrument	85
3.9.1	Reliability	85
3.9.2	Validity	85
3.9.3	Content validity	86
3.9.4	Construct validity	86
3.9.5	Previous study using reliability and validity	87



3.10	Data collection strategy	87
3.11	Source of data	88
3.12	Method of data analysis	88
3.13	PLS-SEM technique	94
3.14	Data cleaning and screening	96
3.15	Summary	96

CHAPTER 4 RESULTS AND DISCUSSION **98**

4.1	Introduction	98
4.2	Data screening	99
4.2.1	Missing values	99
4.2.2	Checking for outlier	100
4.2.3	Assumption of normality	102
4.2.4	Assumption of linearity	105
4.2.5	Assumption of homoscedasticity	106
4.2.6	Assumption of multicollinearity	107
4.2.7	Assumption of multiple regression	108
4.3	Response rate	109
4.4	Test of early and late responses	111
4.5	Demographic profile	112
4.5.1	Profile of the respondents	112
4.5.2	Profile of the respondent companies	115
4.6	Analysis according to research objectives	117
4.7	PLS-SEM analysis	120
4.7.1	Measurement model analysis	120
4.7.2	Validity and reliability	126



		xii	
	4.7.3	Formative measurement	131
4.8	Discussion		144
	4.8.1	The influence on leadership towards Lean practices, strategy, customers, MAKM, workforce, operations and the results of company performance	144
	4.8.2	The influence on strategy towards customers and the results of company performance	148
	4.8.3	The influence of customers, MAKM and operations towards the results of company performance	148
	4.8.4	The influence of workforce towards operations and the results of company performance	150
	4.8.5	The Lean practices will influence towards operations and the results of company performance	151
	4.9	Summary	152
	CHAPTER 5 CONCLUSION AND RECOMMENDATION		154
	5.1	Introduction	154
	5.2	Recapitulation of the study	154
	5.3	Research contributions and implications	156
	5.3.1	Theoretical contributions	156
	5.3.2	Methodological contributions	158
	5.3.3	Managerial implications	159



PTTA AUTHM
PERPUSTAKAAN TUNJUNGAN AMINAH

5.4	Limitations of the study and recommendation for future research	162
5.5	Conclusion	163
	REFERENCES	165
	APPENDICES	193
	VITA	



LIST OF TABLES

2.1	A comparative analysis of BE model criteria	24
2.2	Traditional leadership approaches	35
2.3	Summary of research hypotheses	66
2.4	Constructs for measurements	68
3.1	Comparison of research philosophical positions and research assumptions in business and management research	72
3.2	Structure of E&E industry	76
3.3	Stratification of the sampling	76
3.4	Survey instrument construct	79
3.5	Pilot test use exploratory factor analysis	83
3.6	Reliability and validity checking used by selected studies	86
3.7	Guidelines on PLS applications	92
4.1	Analysis of usable data	99
4.2	Missing value test	100
4.3	Standardized scores for each variable (before removed outliers)	101
4.4	Standardized scores for each variable (after removed outliers)	101
4.5	Test of normality	103
4.6	Skewness and Kurtosis analysis	104
4.7	Collinearity Diagnostics among predictor variables	108
4.8	Respond rate of selected studies in Malaysia	110
4.9	The T-test results between early and late respondents	111
4.10	Profile of the respondents	114
4.11	Respondents in E&E sub-sector	115

4.12	Number of employees in the participating companies	116
4.13	Number of years of operation of the participating companies	116
4.14	Annual sales turnover (2018) for the participating companies	117
4.15	Types of ownership	117
4.16	All constructs and their mean and standard deviation	118
4.17	Result of reliability and convergent validity	127
4.18	Discriminant validity using Fornell-Larcker criterion	129
4.19	HTMT criterion	130
4.20	Measurement properties for formative constructs	134
4.21	New measurement properties for formative constructs	135
4.22	Standardized Root Mean Square Residual (SRMR)	136
4.23	Lateral collinearity assessment	139
4.24	Hypotheses testing results	143



LIST OF FIGURES

2.1	Deming Criteria based on the philosophy of Deming 14 Points and PDCA Cycle	27
2.2	2019-2020 Baldrige Excellence Framework	27
2.3	EFQM Excellence Model	28
2.4	2020-2025 Malaysia Business Excellence Framework	30
2.5	Toyota Production System House	40
2.6	Relationships between theoretical framework and research hypotheses	65
2.7	Theoretical framework	67
3.1	The ‘research onion’	71
3.2	G*Power 3.1 analysis for total sample size	77
3.3	Inner versus outer model in a SEM diagram	91
3.4	PLS-SEM evaluation guideline	95
4.1	Histogram and normal probability (P-P) plot on residuals	105
4.2	Scatterplot analysis for testing the assumption of homoscedasticity	107
4.3	Scatterplot analysis for testing the assumption of multiple regression	109
4.4	The reflective-reflective measurement model (Leadership, strategy, customers, MAKM, workforce and operations)	124
4.5	The Formative Measurement Model (Lean practices and Results)	126
4.6	HTMT ratio	131
4.7	Redundancy analysis for assessing convergent validity	133

4.8	Stage one of the embedded two-stage approach	137
4.9	Stage two of the embedded two-stage approach	138



LIST OF SYMBOL AND ABBREVIATIONS

<i>AKI</i>	-	Anugerah Kecemerlangan Industri
<i>AM</i>	-	Agile Manufacturing
<i>AMT</i>	-	Advance Manufacturing Technology
<i>APO</i>	-	Asian Productivity Organisation
<i>APQO</i>	-	Asia Pacific Quality Organisation
<i>AVE</i>	-	Average Variance Extracted
<i>BE</i>	-	Business Excellence
<i>BEF</i>	-	Baldrige Excellence Framework
<i>BEM</i>	-	Business Excellence Model
<i>BPR</i>	-	Business Process Reengineering
<i>BPS</i>	-	Bosch Production System
<i>CI</i>	-	Continuous Improvement
<i>DOSM</i>	-	Department of Statistics Malaysia
<i>E&E</i>	-	Electrical and Electronics
<i>EFA</i>	-	Exploratory Factor Analysis
<i>EFQM</i>	-	European Foundation of Quality Management
<i>EFQM EM</i>	-	European Foundation of Quality Management Excellence Model
<i>ERP</i>	-	Enterprise Resource Planning
<i>FMM</i>	-	Federation of Malaysian Manufacturers
<i>JIT</i>	-	Just in Time
<i>HTMT</i>	-	Heterotrait-Monotrait
<i>KBEM</i>	-	Kanji's Business Excellence Model
<i>KM</i>	-	Knowledge Management
<i>LM</i>	-	Lean Manufacturing
<i>LMOs</i>	-	Lean Manufacturing Organisations
<i>MATRADE</i>	-	Malaysia External Trade Development Corporation

<i>MBEF</i>	-	Malaysia Business Excellence Framework
<i>MBNQA</i>	-	Malcom Baldrige National Quality Award
<i>MPC</i>	-	Malaysia Productivity Corporation
<i>MPIC</i>	-	Malaysia Productivity and Innovation Class
<i>MIDA</i>	-	Malaysian Investment Development Authority
<i>MITI</i>	-	Ministry of International Trade and Industry
<i>NIST</i>	-	National Institute of Standards and Technology
<i>PA</i>	-	Productivity Award
<i>PCA</i>	-	Principal Component Analysis
<i>PLS-SEM</i>	-	Partial Least Squares-Structural Equation Modelling
<i>PMIEA</i>	-	Prime Minister Industry Excellence Award
<i>QM</i>	-	Quality Management
<i>QMEA</i>	-	Quality Management Excellence Award
<i>SCM</i>	-	Supply Chain Management
<i>SEM</i>	-	Structural Equation Modeling
<i>SIQ</i>	-	Swedish Institute for Quality
<i>SMEs</i>	-	Small Medium Enterprises
<i>SMI</i>	-	Small Medium Industry
<i>SPRING</i>	-	Standards Productivity and Innovation Board Singapore
<i>SPSS</i>	-	Statistical Package for Social Science
<i>TPS</i>	-	Total Production System
<i>TQM</i>	-	Total Quality Management



LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Survey Questionnaire	193
B	Experts validation Form	203
C	Multivariate Outliers using Mahalanobis Method (1 st 20 high value samples)	204
D	Assumption of Normality - Histogram	205
E	Bivariate Scatterplot	209
F	Exploratory Factor Analysis	213



PTTA UTHM
PERPUSTAKAAN TUNKU TUN AMINAH

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter underlines the background of the study and is followed by a description of the problem statement. This section also includes the research questions and research objectives. Following this, a major part of the study will be presented which consists of the significance of the research for the academicians and practitioners respectively. The explanation of the scope of the study is made in the section after that. The terms used in this research are then defined conceptually and operationally. The organisation of the study is briefly explained at the end of the chapter.

1.2 Background of the study

Business environments are constantly evolving towards higher complexity while focusing on the efficiency, quality of life, environment, social embeddedness and sustainability. These factors challenging modern management practices and theories require it to be environmentally and socially robust (Enquist, Johnson & Ronnback, 2015). Boys *et al.* (2005) argued that successful organisations must prove themselves to be able to adjust to their employees' needs, be indispensable to their customers, seek to collaborate with suppliers and consider the safety, environmental and social outcomes of the organisation's performance. the overall goals of business operations have been put under the umbrella term of Business Excellence (BE).

The topic of BE and its theoretical models is still worthy of the consideration of the research group even after nearly three decades of research growth. Basically, the ultimate definition of ‘business excellence’ has continuously been amended to meet the context of fast changes in the global business environment (Dahlgaard-Park & Dahlgaard, 2010). There is an ever-increasing demand to harmonise the heterogeneous measures promoted by literature and the practitioners around the world (Lu, Betts & Croom, 2011). The literature postulated that there is a valid and real need to close the gaps which not fully recognised in the failure of firms when pursuing BE (Fok-Yew, 2016). Furthermore, Sreedharan *et al.* (2017) observed that very little research has tried to address the diverse failure factors affecting BE. Next, the excellence approaches with the essential systems and tools to develop potentials that foster adaptability must be provided to the organisations. These approaches are the valid choices to promote superior performance and competitive advantage in an extremely dynamic and unstable business environment (Carvalho *et al.*, 2019). Besides, the on-going debate is focused on the organisational value of using the excellence model (Snyder, Eriksson & Raharjo, 2020). Therefore, there is a need for a critical view of the excellence models to deal with new trends in the business environment.

Nowadays, the concept of BE is a much-discussed topic. It is revered as a path to become the best-in-class performer, the best manufacturer or the best in the world in terms of manufacturing competencies or capabilities. In the era of globalisation, with the foremost companies from all around the globe, the term ‘world-class’ is considered appropriate (Sharma & Kodali, 2008; Fok-Yew, 2016). The ‘world-class’ title infers the ability to compete in worldwide competitive markets. Past studies have showed that some researchers have different interpretations of manufacturing excellence. In this study, the author has decided to use Business Excellence Models (BEM), which is suited to the research objectives and context of the study.

It was recently projected that there will be a minimum of 76 countries conducting a national BE award. The European Foundation for Quality Management (EFQM) estimates that there are at least 30,000 organisations that use the EFQM model in Europe alone. There are also 60 national and regional/state awards which base their frameworks upon the Baldrige criteria (BPIR, 2021). A majority of organisations also use the BE self-evaluation tools to discover the gaps in their business operations; this includes weakness and areas for improvement and action is

taken in order to make progress. Talwar (2011) also pointed out that these BEMs are subject to modifications in conformity with the development of the external environment outside of their organisation and reviewed a new approach to achieve excellence.

The journey towards BE is challenging and it causes many companies to plan a progressive road map of the journey that would step-by-step benefit organisations (Fok-Yew, 2016). The way of firms to attain and sustain its competitive advantages and pursue its BE is one of the fundamental challenges in the business performance area (Lu *et al.*, 2011; Dahlgaard & Dahlgaard-Park, 2006b). The quest for handling excellence and achieving BE is not an easy task. For that reason, various BE Models like Baldrige, EFQM, Deming Prize and MBEF have proposed detailed road maps as a guide to achieving excellence. Hence, the possibility of revitalising the pursuit of BE would be discussed in this study.

In today's highly competitive environment, organisations have to strive to enhance performance excellence in financial and non-financial factors. Fan and Chang (2021) found that many companies adopted the BE framework of quality awards when consider the sustainability of society and the environment. Professional literature suggests that both economic and non-economic measures should be included when designing new performance measurement systems by managers (Gosselin, 2005; Shafiq, Lasradob & Hafeez, 2017). Past studies have showed that BE addresses all facets of the entire organisation, which comprises of operational excellence and operations excellence (Wight, 2010; Jaeger & Matyas, 2016). Operational excellence principally addresses the efficiency of operations (e.g., productivity) and optimisation of the process of transforming numerous resources (i.e., input) into value-added services and products (i.e., output) (Lu *et al.*, 2011). In comparison, operations excellence signifies the subsystem of the organisation concerned with the ability of logistics and production along with the related management at a comprehensive level within the excellence approach of procedures. Therefore, the performance measures that can cover both operational excellence and operations excellence metrics are looked into closely in the present study.

Many practices have been applied by the organisations to deliver better processes, services or products, which are considered as BE, Lean, Six Sigma, TQM and Continuous Improvement are among the most common practices to be carried out (Sony, 2019). Lean is commonly concerned with the strategic and operative mind-set

changes and it was created in a manufacturing environment (Leksic, Stefanic & Veza, 2020). Lean focussed on systematically removing waste that happens in the system and is focused primarily on a production system. The Lean concepts could be applied in all elements in the above BE conceptualisation. However, Lean practices have become more prevalent in operations and lead to increased performance. Therefore, it will be our focus in this study besides the BE elements.

Business Excellence (BE) is an important contributor to adopt an all-inclusive approach that reinforces the management processes and systems to stimulate growth and improvements of productivity in an organisation. At present, more than 4,100 organisations in Malaysia have adopted the Malaysia Business Excellence Framework (MBEF) (MPC, 2019). The continuous pursuit of innovation, creativity and productivity will enable the companies to be well-positioned to grow, become more competitive and capable in meeting future challenges. Thus, a recipient of this BE Award will distinguish them against other companies for implementing best practices and recording significant productivity achievements. The award winners achieved stronger financial performance, drive innovation, are customer-centric, raise productivity and reduce operational costs. Furthermore, the adoption of best practices of BE will indirectly improve Malaysia's global competitiveness.

In Malaysia, the Industry Excellence Award or *Anugerah Kecemerlangan Industri* (AKI) was announced by the Ministry of International Trade and Industry (MITI) in 1991 to reward exceptional Malaysian organisations and to inspire continuous improvement in services and products delivered. In 2012, the AKI was subjected to a transformational phase where it revisited its concept, award categories, evaluation procedures and incentives for winners. AKI uses the Malaysia Business Excellence Framework (MBEF) as the standard criteria in the assessment process. The winner of the Prime Minister's Award are selected from both the service and manufacturing sectors with the sales turnover category respectively. The winner receives a cash prize of RM 500,000, a trophy and certificate and also enjoy great publicity where the winners are eligible to use the AKI logo for three years, are featured in the Malaysia External Trade Development Corporation's (MATRADE) publication, publicity in MITI and its agencies websites.

Another high recognition of BE is the Asia Pacific Quality Organisation (APQO) awards, which were introduced since 1985. In 2014, Malaysia hosted the Conference and won two APQO awards. The APQO President's Award of Excellence

was awarded to the Malaysia Productivity Corporation (MPC), i.e., the director-general of MPC. Another award winner from Malaysia was a security seal manufacturer, Mega Fortris (M) Sdn Bhd. The company also won the Manufacturer of the Year 2012 award in the large manufacturer's category at the Federation of Malaysian Manufacturers (FMM) Excellence Award 2012. Mega Fortis is viewed as among the top five security seal players in the world today. This electrical and electronics (E&E) company also allocates about 3 per cent to 5 per cent of its revenue for research and development (R&D) and tooling section yearly.

In 2018, Malaysia achieved the position as the 7th largest E&E exporter worldwide, it accounted for 3% of the world's E&E exports (DOSM, 2019). However, the E&E industry faces substantial challenges in sustaining growth with rising competition from Singapore, China, Taiwan and other prominent Asian countries. Hence, the E&E industry's organisations in Malaysia need to have a new set of competencies to guarantee the sustainability of growth in the market as a defence against their competitors. Furthermore, the organisations are required to take a closer look at why BE is important to sustain its long-term business (Gorenak, 2015). On the other hand, Malaysia is sandwiched between the cost-effective manufacturing economies, i.e., Vietnam and Myanmar, and the world's most innovative economic leaders, which become its biggest economic challenge (The Malaysia Reserve, 2016). Long a mainstay of Malaysia's exports, the E&E industry of Malaysia should continue to elevate its competitiveness level and value chain.

The AKI 2018 awards the winners of the Open Category for Multinational Companies (from the services and manufacturing sectors) and Manufacturing Sector (Category 1, 2 & 3). The winners from the Open Category (STMICROELECTRONICS) and Manufacturing Sector Category 2 (Indkom Engineering) in AKI 2018 were all from the E&E industry. Meanwhile, the winner of the Prime Minister's Award was won by Kumpulan Perubatan Johor (KPJ) Ipoh Specialist from the services sector. However, the total participation recorded in AKI 2018 from both the manufacturing and service sectors were only 40 companies, compared to a total of 63 in AKI 2016 (MITI, 2019). The participation had shrunk and was too low for the country. Even though for the major manufacturing sector in the country retained their share as the largest contributor for Malaysia's export in 2019, the E&E sector had less than ten companies that participated in AKI 2018 from a total of 40 companies in 2016. Comparing with the 2,135 E&E companies that are listed under the Federation of Malaysian Manufacturers

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