



**DEVELOPING A MODEL FOR HALAL FOOD SUPPLY CHAIN  
IMPLEMENTATION**

A thesis submitted in fulfilment of the requirements for the degree of Doctor of  
Philosophy

**Wan Marhaini Wan Omar**

Master of Business Administration (Northern University of Malaysia)

Bachelor of Science in Business Administration (Saint Louis University, USA)

**School of Business IT and Logistics**

**College of Business**

**RMIT University**

**March 2017**

## **DECLARATION**

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis/project is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and ethics procedures and guidelines have been followed.

Wan Marhaini Wan Omar

March 2017

## DEDICATION

This thesis is dedicated to:

My beloved parents,  
*Late Haji Wan Omar Wan Ali*  
*Hajjah Halimah Mohamed*

AND

My loving husband,  
*Zakaria Deraman*

AND

My beautiful children,  
*Nur Amani Batrisyia*  
*Muhammad Adib Izzuddin*  
*Nur Aisyah Alifa*

## ACKNOWLEDGEMENT

Praise for Allah s.w.t for granting me perseverance, patience and strength throughout my PhD journey. Thank Him for His blessings in making this journey a successful one. As a PhD student, a wife and a mother of three children, life has never been easy. Without His blessings and unconditional support from family and friends, the completion of this thesis could not have been accomplished. Thus, I would like to extend my sincere appreciation to those who have contributed to the completion of this thesis and supported me throughout this challenging and amazing journey.

Firstly, my deepest appreciation goes to my senior supervisor, Professor Shams Rahman, for his precious guidance, continuous support, invaluable advice and motivation. His ideas, critiques and immense knowledge have greatly improved my capability to become a better scholar and researcher. Indeed, his superior insights have helped me at every milestone of my research. Despite his busy schedule, he always gave me advice and support when I was down, lacked confidence and was depressed due to personal and family problems. I will always consider him my advisor and mentor. Thank you, Prof! My sincere thanks are also expressed to my associate supervisor, Dr Ferry Jie for sharing his thoughts, suggestions and encouragement.

My sincere gratitude is extended to the Ministry of Higher Education Malaysia and my employer, University Teknologi Mara (UiTM), Malaysia in general and in particular, Universiti Teknologi Mara Kelantan (UiTM Kelantan), Malaysia for awarding me this scholarship and financial support. Pursuing a PhD at RMIT University Melbourne would not have been possible without the financial support from these institutions.

Special thanks to the academic and administrative staff at the School of Business Information Technology and Logistics (SBITL), RMIT University for being extremely supportive and pleasant throughout my journey. I am also very appreciative of Professor Dr Zainudin Awang for guiding me with statistical advice, particularly on structural equation modelling (SEM). This thesis is also dedicated to my special friends and colleagues, who have always been good listeners when it was needed the most, suggested several ideas towards my thesis, and shared moments of happiness, sweat and tears. Thanks, mates!

My heartfelt gratitude is given to my beloved husband, Zakaria Deraman, for his endless support and constant motivation to complete my study. To my lovely children, Amani, Adib and Aisya, you are my sunshine, happiness and strength. Thank you for being with Umi throughout the hard times along this journey. To my loving mum, Halimah Mohamed, thank you for your continuous Doa and prayers. Exceptional thanks are also to my sisters, brother, mother-in-law and other family members for their constant and unconditional support. From the bottom of my heart, I thank you all. This journey would not have been completed without your prayers and supports.

*“The halal market is set to grow beyond Muslim majority countries. It should also be noted that the halal agenda has been placed at a much higher level of priorities in many parts of the world, irrespective of whether Muslims are the majority or minority in those populations. Many nations now view halal as an emerging market force and an important value proposition, capable of contributing towards their respective national economies.”*

(Dato’ Sri Mustapa Mohamed, Minister of International Trade and Industry Malaysia, speaking at WHW 2016, Kuala Lumpur, Malaysia)

## TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION .....	iii
ACKNOWLEDGEMENT .....	iv
TABLE OF CONTENTS.....	vi
LIST OF TABLES .....	xi
LIST OF FIGURES .....	xiii
LIST OF ABBREVIATIONS.....	xv
PUBLICATIONS ASSOCIATED WITH THE THESIS .....	xvii
ABSTRACT .....	xviii
CHAPTER 1.....	1
INTRODUCTION .....	1
1.1 Introduction .....	1
1.2 Research Background.....	1
1.3 Research Scope .....	5
1.4 Research Setting.....	6
1.5 Problem Identification.....	8
1.6 Research Objective and Research Questions .....	11
1.7 Methodology Used in this Research .....	11
1.8 Significance of the Research .....	13
1.9 Structure of the Thesis .....	14
1.10 Chapter Summary.....	16
CHAPTER 2.....	18
OVERVIEW OF HALAL FOOD INDUSTRY IN MALAYSIA .....	18
2.1 Introduction .....	18
2.2 The Emerging Halal Food Market and its Potential.....	18
2.3 Malaysian Halal Food Industry .....	24
2.4 Malaysian Government Plans for Halal Industry.....	28
2.5 Halal Food Issues in Malaysia.....	31
2.6 Summary .....	32
CHAPTER 3.....	34
LITERATURE REVIEW, RESEARCH FRAMEWORK .....	34
AND HYPOTHESES DEVELOPMENT.....	34
3.1 Introduction .....	34

3.2	Theoretical Foundation of the Research.....	34
3.2.1	Conventions Theory (CT).....	34
3.2.2	Resource-based View (RBV).....	37
3.3	The Concept of Halal ( <i>Permissibility</i> ).....	39
3.4	Supply Chain Management.....	44
3.5	Food Supply Chain.....	46
3.6	Halal Food Supply Chain.....	48
3.7	Systematic Literature Review of the Halal Food Management.....	52
3.7.1	Classification of Themes in the Halal Food Management Literature.....	53
3.7.2	Methodology Used in the Halal Food Management Literature.....	59
3.8	Dimensions of HFSC Implementation.....	61
3.8.1	Physical Segregation.....	62
3.8.2	Training and Personnel.....	63
3.8.3	Storage and Transport.....	64
3.8.4	Ethical Practices.....	65
3.8.5	Packaging and Labelling.....	66
3.8.6	Material Handlings.....	67
3.8.7	Innovative Capability.....	67
3.8.8	Cleanliness.....	68
3.8.9	Safety.....	70
3.8.10	Islamic Dietary Law.....	72
3.8.11	Resource Availability.....	73
3.9	Organisational Performance.....	74
3.10	Proposed Conceptual Framework.....	77
3.11	Summary.....	78
	CHAPTER 4.....	80
	RESEARCH METHODOLOGY:.....	80
	INSTRUMENT DEVELOPMENT AND IMPLEMENTATION.....	80
4.1	Introduction.....	80
4.2	Research Paradigm.....	80
4.2.1	Justification of Paradigm Choice.....	84
4.3	Research Design.....	85
4.4	Survey Instrument Development.....	90
4.4.1	Items Generation.....	92

4.4.2	Operationalization of Constructs and Scaling .....	94
4.4.3	Instrument Testing .....	96
4.5	Questionnaire.....	97
4.5.1	Section A.....	98
4.5.2	Section B.....	98
4.5.3	Section C.....	98
4.6	Population and Sampling Design.....	99
4.6.1	Sampling Frame.....	100
4.6.2	Sampling Technique .....	100
4.6.3	Sample Size.....	101
4.7	Unit of Analysis.....	104
4.8	Time Horizon .....	104
4.9	Pre-test.....	105
4.10	Pilot Study .....	108
4.11	Assessment of Dimensionality and Factor Structure through Exploratory Factor Analysis (EFA) .....	115
4.12	Main Survey.....	120
4.13	Ethical Consideration .....	121
4.14	Summary .....	122
CHAPTER 5.....		124
RESEARCH METHODOLOGY: .....		124
ANALYTICAL METHOD AND PROCEDURE.....		124
5.1	Introduction .....	124
5.2	Structural Equation Modelling (SEM).....	124
5.2.1	The Covariance-based SEM (CB-SEM) Approach .....	126
5.2.2	The Partial Least Square SEM (PLS-SEM) Approach.....	128
5.2.3	Two-Stage Approach of SEM.....	130
5.2.4	SEM Assumptions.....	132
5.2.5	Path Diagram.....	133
5.3	Assessment of the Measurement Model.....	135
5.3.1	Unidimensionality .....	135
5.3.2	Reliability.....	136
5.3.3	Validity.....	137
5.3.3.1	Content Validity.....	138



5.3.3.2	Construct Validity .....	138
5.3.3.3	Convergent Validity .....	139
5.3.3.4	Discriminant Validity .....	139
5.4	Assessment of Overall Model Fit.....	140
5.4.1	Absolute Fit Indices .....	141
5.4.2	Incremental Fit Indices .....	144
5.4.3	Parsimonious Fit Indices.....	145
5.5	Summary .....	146
CHAPTER 6.....		147
DATA ANALYSIS AND FINDINGS .....		147
6.1	Introduction .....	147
6.2	Data Screening .....	147
6.2.1	Assessment of Missing Data.....	147
6.2.2	Assessment of Outliers.....	148
6.2.3	Assessment of Normality .....	150
6.2.4	Residuals Test.....	151
6.2.5	Assessment of Multicollinearity .....	153
6.3	Response Rate.....	154
6.4	Verification of Non-response Bias.....	156
6.5	Profile of Respondents.....	157
6.6	Descriptive Analysis.....	159
6.7	Assessment of Common Method Variance and Social Desirability Bias.....	161
6.8	Structural Equation Modelling (SEM).....	163
6.9	Stage One: Confirmatory Factor Analysis (CFA).....	163
6.9.1	Full Measurement Model–First-order Constructs of HFSC Implementation .....	164
6.9.2	Construct Validity and Reliability of the Full Measurement Model.....	170
6.10	Stage Two: Structural Model.....	174
6.10.1	HFSC Implementation as a Second-order Construct.....	176
6.10.2	Construct Validity and Reliability of Full Model .....	179
6.10.3	Initial Hypothesised Structural Model.....	180
6.10.4	Final Hypothesised Structural Model.....	184
6.11	Summary of Hypotheses Testing.....	187
6.12	Summary .....	188
CHAPTER 7.....		190

DISCUSSION OF FINDINGS.....	190
7.1 Introduction .....	190
7.2 Overview of the Thesis.....	190
7.3 Discussion of the Dimensions of HFSC Implementation .....	193
7.4 The Relationship between HFSC Implementation and Marketing.....	200
Performance.....	200
7.5 The Relationship between HFSC Implementation and Financial .....	202
Performance.....	202
7.6 The Relationship between Marketing Performance and Financial.....	204
Performance.....	204
7.7 Summary .....	208
CHAPTER 8.....	209
CONCLUSIONS AND IMPLICATIONS .....	209
8.1 Introduction .....	209
8.2 Readdressing the Research Questions.....	209
8.2.1 Research Question 1 .....	210
8.2.2 Research Question 2 .....	212
8.2.3 Research Question 3 .....	213
8.2.4 Research Question 4 .....	214
8.2.5 Research Question 5 .....	215
8.3 Contributions of the Study.....	216
8.3.1 Theoretical Contributions .....	216
8.3.2 Methodological Contributions .....	218
8.3.3 Managerial Contributions .....	220
8.4 Limitations of the Study .....	221
8.5 Directions for Future Research .....	222
8.6 Concluding Remarks.....	224
8.7 Summary .....	226
REFERENCES .....	227
APPENDIX 1 – Notice of Ethics Approval.....	259
APPENDIX 2 – Participation Information.....	260
APPENDIX 3 – Consent Form.....	263
APPENDIX 4 – Questionnaire for Main Survey (English Version).....	264

## LIST OF TABLES

Table 1-1: Global interest in halal food industry.....	2
Table 1-2: Projections of the Muslim population worldwide .....	4
Table 1-3: Global cases in food authenticity issues .....	10
Table 2-1: High potential markets for halal food.....	20
Table 2-2: Halal export value by product cluster.....	26
Table 2-3: Halal parks in Malaysia.....	27
Table 3-1: Linkages between CT categories and dimensions of HFSC implementation.....	36
Table 3-2: Selected halal definitions.....	41
Table 3-3: Selected halal food supply chain definitions.....	49
Table 3-4: Halal food literature classification by halal concept theme.....	55
Table 3-5: Halal food literature classification by halal certification theme.....	56
Table 3-6: Halal food literature classification by halal product attributes theme....	56
Table 3-7: Halal food literature classification by consumer awareness of halal theme.....	57
Table 3-8: Halal food literature classification by halal marketing theme.....	58
Table 3-9: Halal food literature classification by information technology adoption theme.....	58
Table 3-10: Halal food literature classification by halal integrity theme.....	59
Table 4-1: Four research paradigms.....	82
Table 4-2: General elements of positivist approach.....	83
Table 4-3: Number of items used to measure constructs.....	93
Table 4-4: Industry experts for the pre-test.....	106
Table 4-5: Items deleted based on the pre-test results.....	108
Table 4-6: The initial and modified measurement items based on the pre-test and pilot study.....	110
Table 4-7: The EFA output.....	118
Table 4-8: Summary of the EFA output.....	120
Table 5-1: Summary of goodness-of-fit (GOF) indices.....	143
Table 6-1: Critical values for Mahalanobis Distance evaluation.....	149
Table 6-2: Multivariate outliers and Cook's Distance test results.....	149

Table 6-3: Results for normality distribution test.....	151
Table 6-4: Inter-constructs correlation matrix.....	154
Table 6-5: Breakdown of respondents based on data collection timing.....	155
Table 6-6: Locations of respondents.....	155
Table 6-7: Chi-square test for non-response bias.....	156
Table 6-8: Descriptive statistics of the constructs.....	160
Table 6-9: Result of the Harman’s single factor solution.....	162
Table 6-10: Summary of goodness-of-fit indices – Initial model.....	167
Table 6-11: Summary of goodness-of-fit indices – Final model.....	168
Table 6-12: Measurement model evaluation – results summary.....	171
Table 6-13: Discriminant validity summary for first-order constructs of HFSC implementation.....	173
Table 6-14: The underlying hypotheses in the thesis.....	175
Table 6-15: Summary result of hypotheses testing for HFSC implementation as second-order construct.....	177
Table 6-16: Validity and reliability summary for full model.....	179
Table 6-17: Result of hypotheses testing for initial structural model.....	181
Table 6-18: Summary of goodness-of-fit indices – Initial structural model.....	182
Table 6-19: Result of hypotheses testing for final structural model.....	184
Table 6-20: Summary of goodness-of-fit indices – final structural model.....	186
Table 6-21: Comparison model fit indices.....	187
Table 6-22: Summary of all results of hypotheses testing.....	188
Table 7-1: The hypotheses and summary of the results.....	192
Table 7-2: Summary of finalised measurement items based on findings.....	207

## LIST OF FIGURES

Figure 1-1: Global market for potential halal products.....	6
Figure 1-2: Malaysia’s top ten halal export destinations in 2014 (MYR in billion).....	8
Figure 1-3: The links between the overarching research objective, research questions, findings and thesis chapters.....	17
Figure 2-1: The implementation phases in the Halal Industry Master Plan (HIMP).....	29
Figure 2-2: The framework of Halal Industry Master Plan (HIMP).....	30
Figure 3-1: Schematic diagram of generic food supply chain.....	47
Figure 3-2: Publication distribution of reviewed journal articles and conference papers.....	52
Figure 3-3: Distribution of reviewed articles by research theme.....	54
Figure 3-4: Distribution of research methods applied in articles and proceedings.....	60
Figure 3-5: Type of quantitative analytical tools used in reviewed articles and proceedings.....	61
Figure 3-6: Higher level of conceptual framework.....	77
Figure 3-7: A proposed conceptual model of HFSC implementation.....	79
Figure 4-1: The linkages between ontology, epistemology and methodology..	81
Figure 4-2: Research design and stages.....	89
Figure 4-3: Survey development stages.....	91
Figure 4-4: Determination of sample size based on G*Power Analysis.....	103
Figure 5-1: Two-stage approach of structural model used in this thesis.....	132
Figure 5-2: The path diagram for this thesis.....	134
Figure 6-1: Normal P-P plot of HFSC implementation and marketing performance.....	152
Figure 6-2: Normal P-P plot of HFSC implementation and financial performance.....	152
Figure 6-3: Characteristics of the respondents.....	157
Figure 6-4: Characteristics of organisations.....	159
Figure 6-5: CFA first-order measurement model of HFSC implementation –	

Initial model.....	166
Figure 6-6: CFA first-order measurement model of HFSC implementation –	
Final model.....	169
Figure 6-7: HFSC implementation as a second-order construct.....	178
Figure 6-8: The initial structural model.....	183
Figure 6-9: The final structural model.....	185

## LIST OF ABBREVIATIONS

AMOS	Analysis of Moments Structures
ASEAN	Association of Southeast Asian Nations
AVE	Average Variance Extracted
BCHEAN	Business College Human Ethics Advisory Network
BTOS	Bartlett's Test of Sphericity
C	Cleanliness
CB-SEM	Covariance-based Structural Equation Modelling
CFA	Confirmatory Factor Analysis
CR	Composite Reliability
CT	Conventions Theory
EFA	Exploratory Factor Analysis
EP	Ethical Practices
FP	Financial Performance
GHP	Good Hygiene Practices
GOF	Goodness-of-Fit
HACCP	Hazards Analysis Critical Control Point
HDC	Halal Industry Development Corporation
HFSC	Halal Food Supply Chain
HFSCI	Halal Food Supply Chain Implementation
HIMP	Halal Industry Master Plan
HREC	Human Resource Ethics Committee
IC	Innovative Capability
ID	Islamic Dietary Law

JAKIM	Department of Islamic Development Malaysia
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
MATRADE	Malaysian External Trade Division Corporation
MH	Material Handlings
MI	Modification Indices
MIDA	Malaysian Investment Development Authority
MITI	Ministry of International Trade and Industry
MLE	Maximum Likelihood Estimation
MP	Marketing Performance
OIC	Organisation of Islamic Cooperation
PL	Packaging and Labelling
PLS-SEM	Partial Least Square Structural Equation Modelling
PS	Physical Segregation
RA	Resource Availability
RBV	Resource-based View
S	Safety
SCM	Supply Chain Management
SEM	Structural Equation Modelling
SPSS	Statistical Package for the Social Science
ST	Storage and Transport
TP	Training and Personnel
TPP	Trans-Pacific Partnership



## PUBLICATIONS ASSOCIATED WITH THE THESIS

1. Wan Omar, WM & Rahman, S 2017, "Instrument development and validation for halal food supply chain implementation", *Supply Chain Management: An International Journal* (under first review).
2. Wan Omar, WM, Rahman, S & Jie, F 2015, "Halal food chain management: A systematic review of literature and future research directions", paper presented to 13th ANZAM Operations, Supply Chain and Services Management Symposium, Melbourne, Australia, 31<sup>st</sup> May-2<sup>th</sup> June 2015.
3. Wan Omar, WM & Rahman, S 2015, "Determining Critical Factors of Halal Food Supply Chain using the Analytic Hierarchy Process (AHP)", paper presented to 29th Australian and New Zealand Academy of Management (ANZAM), Queenstown, New Zealand, 2<sup>nd</sup>-4<sup>th</sup> December 2015.
4. Wan Omar, WM & Rahman, S 2016, "Development and Validation of a Measurement Instrument for Halal Food Supply Chain Implementation", paper presented to the 21<sup>st</sup> International Symposium on Logistics (ISL 2016), Kaohsiung, Taiwan, 3<sup>rd</sup>-6<sup>th</sup> July 2016.

## **ABSTRACT**

The global demand for halal food products continues to grow as the Muslim population increases and spreads throughout the world. Malaysia has taken the initiative to position itself as a global halal food hub and the Malaysian government has developed strategies to support this objective. Since an efficient distribution system is required to fulfil the global demand for halal food, the focus of halal food management has shifted from an organisation-centred perspective to a supply chain perspective. Despite this shift in perspective, a review of the existing supply chain literature suggests that limited comprehensive research has been conducted on the halal food supply chain to date. Through a systematic literature review, we propose a conceptual model for studying the dimensions of halal food supply chain implementation as a second order construct and investigating the relationship between halal food supply chain implementation and organisational performance.

To collect data, a survey was conducted amongst 600 halal certified processed food and beverage organisations in Malaysia. A total of 240 organisations participated in this study. A two-stage approach of structural equation modelling (SEM) was employed to analyse the data and test the hypothesised relationships. The findings of this thesis largely support the hypothesised relationships proposed in the conceptual model. The results of the SEM revealed that nine out of eleven dimensions are crucial and significantly define halal food supply chain implementation as a second order construct. The findings also support the hypothesis that halal food supply chain implementation can positively affect an organisation's marketing and financial performance. Finally, the results revealed that an organisation's financial performance is impacted by its marketing performance.

This thesis has made a significant contribution to theoretical, practical and methodological knowledge by developing the first comprehensive model of halal food supply chain implementation by identifying the dimensions of the model. Furthermore, the relationship between halal food supply chain implementation and organisational performance suggests to manufacturers that the model is particularly capable of increasing the marketing performance and financial performance within the context of the halal food industry. Moreover, these findings imply the need for halal food organisations in general, and halal processed food and beverage organisations in particular, to strategically lever on the nine dimensions of the halal food supply chain implementation model. This should not go unnoticed either by practitioners or academia. Finally, this study can be used as a comprehensive reference model by manufacturers and policy-makers in the halal food industry.

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This thesis focuses on developing a halal food supply chain (HFSC) implementation model and investigates the relationship between the HFSC implementation model and organisation performance in the context of the processed food and beverage industry in Malaysia. Furthermore, this thesis will identify the critical dimensions of HFSC implementation based on a systematic literature review on halal food management and general food chains. Despite the substantial amount of research that has been performed on the different aspects of halal food management, a comprehensive HFSC implementation model in Malaysia has yet to be developed (Wan Omar, Rahman & Jie 2015). Therefore, this thesis seeks to make a further contribution to this significant area of halal food supply chain management.

This chapter presents an introduction to the context of this thesis by describing the research background and specifies of the research problem, followed by the formulated research objective and research questions, the significance of the research and finally how the thesis is organised.

### 1.2 Research Background

Academic literature regarding halal food management and HFSC is relatively new (Wan Omar, Rahman & Jie 2015). Halal is a unique Islamic concept (Shafie & Othman 2006) which means an act or product that is lawful and permitted if it is based on the authoritative sources (Standards Malaysia 2013). Additionally, it is considered to be a concept that contributes to achieving a better quality of life in Islamic society (Zailani et

al. 2010). Engaging in what is halal (permitted) and avoiding that which is haram (prohibited) is one of the practices of Islam. Thus, based on Islamic principles, Muslims are permitted to consume only halal, while haram is prohibited and things that cause doubt must be avoided (Al-Qaradawi 2007). In addition, halal provides guidance on how foods and drinks can be consumed specifically for Muslims (Md Nor & Ooi 2014). Moreover, halal refers to religious aspects and adheres to a very strict quality and hygiene compliance that is in line with good manufacturing practices (Mohd Yusoff 2004).

Table 1-1: Global interest in the halal food industry

Country	Description
UK	The value of imported halal food is estimated to be GBP18 billion per annum.
USA	The halal market is estimated at USD18 billion.
China	Aims to become the net importer of food products, including halal F&B within the next decade.
Japan	Halal to become one of the key contributors to Japan's economy by 2020.
UAE	This country aims to be the Sharia-compliant centre of the world, especially for Islamic banking and halal businesses.
Brazil	Aims to become the world's second top exporter of meat and poultry to Muslim-majority countries.
Australia	The world's top halal meat producer and exporter since the 1980's, followed by Argentina, Brazil, New Zealand and the United States of America; 65% of Australia's beef was exported to Indonesia, Saudi Arabia and Malaysia.
Thailand	The domestic halal food market grows by approximately 20% per year, with 8000 companies involved in halal food production.
Malaysia	Halal exports in 2014 were greater than USD11 billion. Malaysia became the largest exporter of halal ingredients, with major export destinations consisting of China, USA, Indonesia and Japan.

Source: Thompson Reuters (2015); Ministry of International Trade and Industry (MITI) (2016)

The halal food industry is indispensable to Muslims worldwide since it constitutes their daily consumption and dietary needs. Halal food encompasses meat and poultry, and incorporates processed food, dairy products, food ingredients and even non-food products. Many countries across the world, both Muslim and non-Muslim, have shown interest in the halal food industry. As presented in Table 1-1, there are growing efforts and initiatives to bring the halal food industry into the mainstream market. Moreover, the industry is being increasingly recognised as an important constituent of the global food supply chain international trade (Chawk & Ayan 2006). A recent estimate suggests that the total value of the global halal market is estimated at US\$2.3 trillion (HDC 2014). In the context of the global halal food consumption, the market size has risen progressively from US\$587.2 billion in 2004 to US\$641.5 billion in 2010 (Sungkar 2009); moreover, it is estimated to reach US\$1.6 trillion by 2018 (Beer 2014). The increase in the global halal food market expenditure can be directly translated into stronger buying power, suggesting that the market segment is potentially competitive.

The global demand for halal food products is also growing with the increase and spread of Muslim populations throughout the world. It has been projected that the global Muslim population will increase from 1.6 billion in 2010 to 2.7 billion by 2050, indicating that approximately 1.1 billion Muslim will be added to the world's population over the next 40 years (Pew Research Center 2015). Table 1-2 shows the current and projected distribution of the world's Muslim population. With a population of approximately 986 million in 2010 (62% of the total global Muslim population), the Asia-Pacific region was the largest Muslim-populated region, and is expected to maintain this status until 2050. Since 2010, the regions of Sub-Saharan Africa and the Middle East-North Africa constitute the second and third largest regions of Muslims,

respectively. Between 2010 and 2050, the Muslim population in Europe is predicted to increase by approximately three-fold, whereas in North America, it is predicted to increase by double during the same period.

Table 1-2: Projections of the Muslim population worldwide

Major Area	2010	2020	2030	2040	2050
World	1,599,700,000	1,907,110,000	2,209,270,000	2,497,830,000	2,761,480,000
Asia-Pacific	986,420,000	1,139,990,000	1,273,030,000	1,380,160,000	1,457,720,000
Sub-Saharan Africa	248,420,000	329,740,000	428,400,000	543,470,000	669,710,000
Middle East-North Africa	317,070,000	381,140,000	443,140,000	500,870,000	551,900,000
Europe	43,470,000	50,470,000	57,180,000	63,980,000	70,870,000
North America	3,480,000	4,890,000	6,590,000	8,410,000	10,350,000
Latin America-Caribbean	840,000	890,000	930,000	940,000	940,000

*Source: Pew Research Center (2015)*

The rapid increase in the halal food business is attributed to both the growth and spread of the Muslim population in Muslim countries and territories, as well as the growth of the Muslim population in the non-Muslim regions (e.g., Europe, North America, China, and India). Due to the sheer size of the Muslim consumer base, the halal food business has transformed into a major global food business (Lodhi 2009); however, this has made the global halal food supply chains more complex. The complexity arises due to the increased number of halal products, their sourcing centres and distribution lead time, as well as special characteristics associated with halal foods.

The availability of prepared halal foods has grown in importance; however, one of the greatest challenges facing all major food manufacturers is the matter of securing a consistent food supply chain. Today, advances in food technology and distribution have also exposed more Muslims to various ingredients and manufactured foods (Talib, Zailani & Zainuddin 2010). Issues concerning food consumption have always been debated, particularly in reference to the halal status of the food that is consumed. In this case, a model of how to design and manage the halal food supply chain is vital for food

manufacturers to comprehend and implemented for them to ensure credibility and trust to the Muslim consumer.

To date, limited research has been conducted on issues relating to the halal food supply chain (Lodhi 2009; Wan Omar, Rahman & Jie 2015). The majority of studies have focused on the marketing aspects (e.g., consumer awareness) halal products and the purchasing behaviour of Muslim consumers. In addition, product adoption and branding were some of the popular topics in earlier research (Wan Omar, Muhammad & Omar 2008; Lada, Tanakinjal & Amin 2009; Golnaz et al. 2010; Alam & Sayuti 2011; Wilson & Liu 2010; Hanzaee & Ramezani 2011). Recent studies on halal also focused predominantly on meat and poultry (Bonne & Verbeke 2008; Lever & Miele 2012; Nakyinsige, Man & Sazili 2012; Omar, Jaafar & Osman 2013). Moreover, only a little effort has been made on developing a comprehensive model for the implementation of the HFSC.

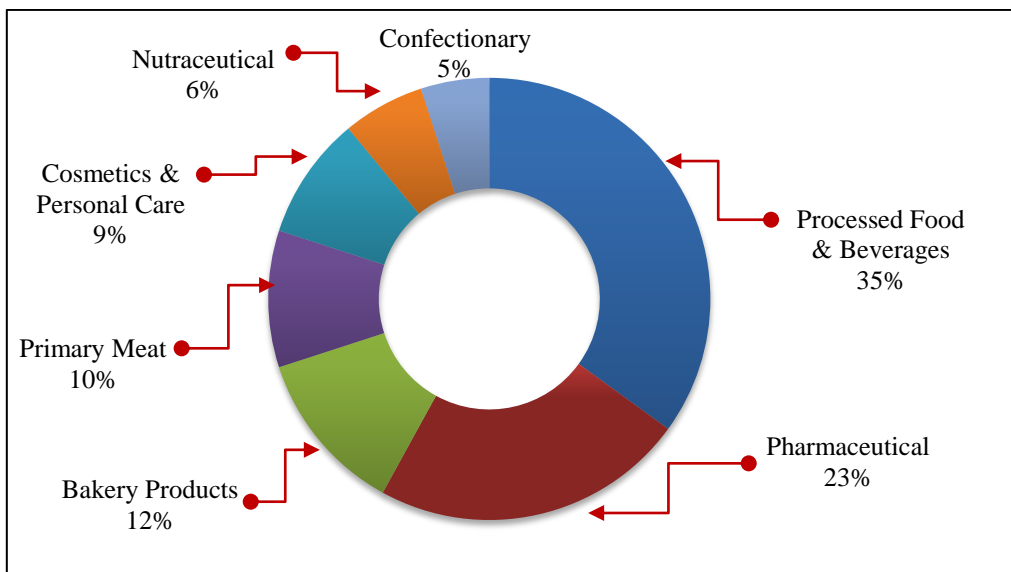
Taking a holistic view of halal and considering the multiple dimensions of halalness, our objective is to develop a comprehensive model for HFSC implementation and empirically test the relationships between HFSC implementation and the marketing and financial performance of organisations using rigorous research techniques. Furthermore, the researcher attempts to define the dimensions of HFSC implementation based on Conventions Theory (CT), which will be further discussed in Chapter 3.

### **1.3 Research Scope**

This study focuses on developing a comprehensive model for HFSC implementation and tests the model using data from halal certified processed food and beverage



manufacturers in Malaysia. Additionally, the global potential of halal products can be categorised into seven areas: i) processed food and beverage; ii) pharmaceutical; iii) bakery products; iv) primary meat; v) cosmetics and personal care; vi) nutraceutical; and vii) confectionary. As shown in Figure 1-1, 35% of the global halal market is derived from the processed food and beverage category. It is a lucrative market and a huge opportunity for halal food businesses both domestically or internationally. Therefore, processed food and beverage have been selected as the scope of the present study. The data for this study is derived from a single respondent of each participating organization who possesses relevant knowledge and experience in halal activities, supply chain management, procurement, productions and operations management.



Source: Euromonitor Reports and Halal Industry Development Corporation (HDC) (2014)

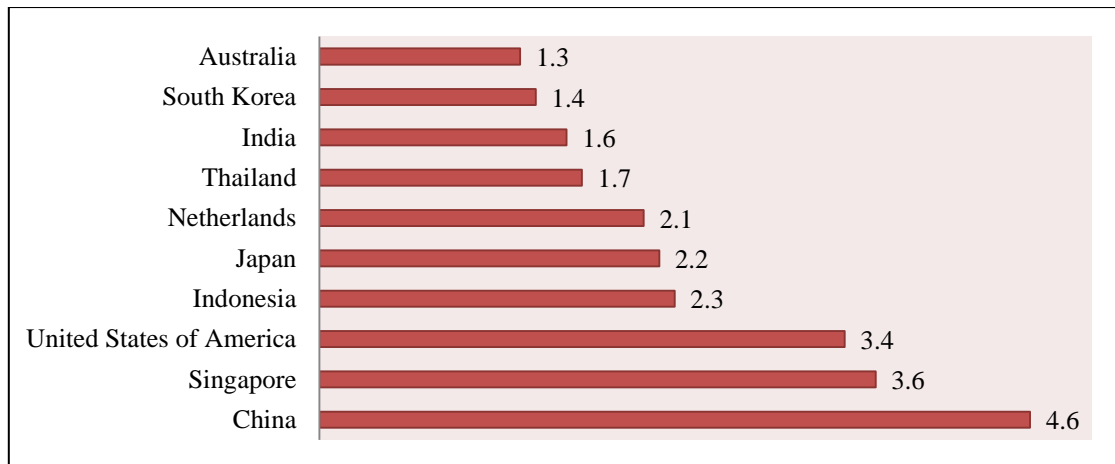
Figure 1-1: Global market for potential halal products

#### 1.4 Research Setting

Malaysia plans to become an international halal hub, and the government has made substantial effort to support this objective with various strategies and plans. These strategies and plans concerning halal began 30 years ago, and some examples of these

are: i) Second Industrial Master Plan 1996 – 2005; ii) National Agriculture Policy 1998 – 2010; iii) Ninth Malaysia Plan (9MP) 2006 – 2010; and iv) Third Industrial Master Plan (IMP3) 2006 – 2020 (HDC 2014). The establishment of the Halal Industry Development Corporation (HDC) further strengthened the government initiative to become an international halal hub. The Halal Master Plan of the Malaysian government envisages three phases occurring from 2008 to 2020. Another important aspect of the vision is for Malaysia to firstly become the global reference centre for halal integrity, and secondly, become the leader in the innovation, production and trade involving halal-related businesses (HDC 2011).

Malaysia has been claimed as the global leader in the halal industry, and its exports in 2013 amounted to US\$9.8 billion for halal products, making Malaysia one of the largest halal suppliers among members of the Organization of Islamic Cooperation (OIC) (Batrawy 2014). Each year, Malaysia exports a variety of halal foods to more than 70 countries worldwide (Talib, Zailani & Zainuddin 2010). In 2014, over 70% of Malaysian halal exports were categorised as food and beverage and ingredients, with the total exports valued at US\$10.9 billion (RM37.68 billion), a 15% increase from the previous year (Mohamed 2016). Figure 1-2 illustrates Malaysia's top ten export destinations for halal products in 2014. Malaysia is the one Muslim country with the potential to lead the halal food industry because it is a fairly progressive Muslim country. Hence, this makes Malaysia a significant research setting.



Source: Ministry of International Trade and Industry (MITI) (2016)

Figure 1- 2: Malaysia's top ten halal export destinations in 2014 (MYR in billion)

### 1.5 Problem Identification

To fulfil the global demand while using an efficient distribution system, the focus of halal food management has shifted from an organisation-centred perspective to a supply chain perspective. Halal food chains can be complex and extensive, and Muslims' food choices have changed recently (Bonne & Verbeke 2008). Indeed, halal products must be produced with recognised quality attributes and follow stringent requirements to maintain halal standards and integrity throughout the supply chain.

The HFSC is said to be vulnerable for several reasons. Firstly, there is the possibility of cross-contamination with non-halal products at various critical points throughout the supply chain process. The issue of physical contamination of halal food products is substantial because the awareness of halal requirements is still in its infancy in non-Muslim countries (Bonne & Verbeke 2008; Tieman 2011). Halal consumers worry whether the halal status of the food products can be guaranteed throughout the supply chain since most food products are now sourced from various parts of the world, including non-Muslim countries.

The next issues that exist are halal food authenticity and adulteration (Tieman, van der Vorst & Che Ghazali 2012; Wilson & Liu 2010; Fadzlillah et al. 2011). Halal food authenticity can be defined as the process by which the food is verified and has complied with the description on the label. The issue of authenticity, which commonly arises among Muslim consumers, is the need to determine whether the materials used in halal food products have not been intentionally mixed with cheaper non-halal materials. This practice is known as adulteration (Nakyinsige, Man & Sazili 2012). In most countries, food manufacturers intentionally choose to substitute non-halal species since they are cheap and widely available (Aida et al. 2005). Today, authenticity is an issue of major concern in the halal food industry since many cases have been reported worldwide, in which the adulteration of haram or mushbooh ingredients in halal foods production has occurred (Fadzlillah et al. 2011). Table 1-3 presents some of the cases regarding food authenticity throughout the world.

The image of the halal food industry also has been tarnished by several reports of fraudulent halal certification (Norman, Md Nasir & Azmi 2008; Zailani et al. 2010; Albakir & Mohd-Mokhtar 2011). In addition, there have been instances of multiple versions of an unrecognised halal logo being printed on the packaging labels of processed food products (Talib, Ali & Jamaludin 2008). This controversy has created confusion and uncertainty among consumers regarding whether the products offered are truly halal (Melatu Samsi, Tasnim & Ibrahim 2011).

Table 1-3: Global cases in food authenticity issues

Product	Country	Year	Description
Halal-certified dairy milk chocolates containing porcine (pig) DNA	Malaysia	2014	Two flavours of halal-certified dairy milk chocolates: hazelnut and roasted almond, containing porcine (pig) DNA due to random testing by the Malaysia's Ministry of Health (Jaques 2015; Mohamed et al. 2016)
Beef patty burger	UK	2013	Horse meat is detected in the beef burger.
Sausages, pizza, ready meals containing pork ingredients	EU	2009	Irish pork products were contaminated by dioxin in the animal feed in the pig farms (Tse & Tan 2011)
Salmonella outbreak in peanut butter paste	US	2008 - 2009	Contaminated peanut butter paste in the United States and Canada (Maruchek et al. 2011)
Melamine in Chinese milk products: including milk powder	China	2008	Contamination of milk and infant formula, as well as other milk based due to adulteration with melamine (Maruchek et al. 2011; Roth et al. 2008)

*Source: Adapted from Ali et al. (2014) and Jaques (2015)*

In general, research on halal food management and the HFSC is quite recent. The results of a systematic analysis of halal food management literature conducted by Wan Omar, Rahman and Jie (2015) indicate that research in the field of halal is emerging, with a primary focus on various aspects of halal, such as marketing, consumer behaviour, certification, and less research into halal supply chain issues.

Based on the above discussion, the main challenge is how to ensure that products will remain halal throughout the whole supply chain process, especially during the production and distribution stage. This study intends to solve some of the issues described above and fill some critical gaps in our knowledge concerning HFSC management. In particular, halal certified food manufacturers require references concerning the design and management of the HFSC to ensure that trust and credibility

can be built to satisfy relevant consumers. This study delivers a comprehensive model of HFSC implementation to ensure that the food products being consumed are truly halal.

## **1.6 Research Objective and Research Questions**

The overarching objective of this research is:

*'To develop a model for halal food supply chain implementation and assess the relationship between halal food supply chain implementation and organisation performance.'*

To address the main objective, the following specific research questions are formulated:

- a) What are the dimensions of halal food supply chain implementation?
- b) What are the critical dimensions of the halal food supply chain implementation?
- c) Does halal food supply chain implementation have an impact on an organisation's marketing performance?
- d) Does halal food supply chain implementation have an impact on an organisation's financial performance?
- e) Does an organisation's marketing performance impact the organisation's financial performance?

## **1.7 Methodology Used in this Research**

The study is based on a positivist paradigm since the study applied scientific methods, which is the foundation of positivist research. This study seeks to develop and validate a theoretical model comprising testable hypotheses. Consequently, quantitative methodology was employed for this study, which is also in alignment with research operationalization based on positivist assumptions and appropriate methods that entail

verification of hypotheses, as well as providing strong reliability and validity (Amaratunga et al. 2002). A pre-test was performed prior to the pilot study. The rationale is to strengthen the content validity of the survey instrument by investigating the degree of relevance of each variable item, and confirming the proposed items in the survey through the expert opinions from industry and academics.

Next, a pilot study was administered to identify the level of internal consistency and reliability of the measured items, examine comprehensibility, factor structure, dimensionality, the degree of difficulty, clarity and reasonable time allocation for respondents to answer the questionnaire. The primary survey was carried out between February 2015 and June 2015, in which a drop-and-collect method was applied in this study. This method involved the distribution of self-administered questionnaires to identified respondents. According to Brown (1993), the drop-and-collect method provides a fast, cheap and reliable research tool.

Data obtained from the surveys were screened to verify whether the data is correctly entered, there are no missing values or free outliers and to confirm that the distribution of the variables is normal. In the context of the analysis, the structural equation modelling (SEM) approach, particularly the covariance-based structural equation modelling (CB-SEM) approach, served as an analytical tool for examining the causal relationships and testing the hypotheses between the observed and the latent variables in a research model. The data is assessed using IBM SPSS Statistic version 22 for descriptive analysis and the AMOS application for SEM.

## **1.8 Significance of the Research**

This study adds to the growing body of knowledge in three aspects. First, halal food is recognised as a new research domain in food supply chain management. Based on an extensive review of the literature on halal food management, the results indicate that there is a lack of studies in the area of the HFSC (Wan Omar, Rahman & Jie 2015; Wilson & Liu 2010). To date, the holistic model of HFSC implementation has not been fully developed. Most of the literature in halal food management discusses areas of marketing, such as consumer awareness, perceptions of halal products and the purchasing behaviour of Muslim consumers (Abdul et al. 2009; Ireland & Rajabzadeh 2011; Alam & Sayuti 2011; Mukhtar & Butt 2012; Wan Omar, Muhammad & Omar 2008). In response to this gap in the literature, this study expands academic insights by extending the body of knowledge through the development of a theoretical model of HFSC implementation.

Second, the existing studies on the HFSC are predominantly case studies (Omar & Jaafar 2011; Tieman, van der Vorst & Che Ghazali 2012; Ali et al. 2014). Within the context of the quantitative method category, a vast majority of research on the halal supply chain has employed either descriptive statistics or regression analyses, which consist of less rigorous statistical methods (Wan Omar, Rahman & Jie 2015). To overcome this ‘gap,’ this study utilises covariance-based structural equation modelling as an analytical tool to examine the dimensions of HFSC implementation and investigate the association between that implementation and organisation performance.

Finally, the demand for halal food products has become a global phenomenon. Many researchers agree that halal requires a supply chain approach to remain competitive in



the market (Lada, Tanakinjal & Amin 2009; Alserhan 2010; Ibrahim & Mokhtarudin 2010). This approach will create new business opportunities in both Muslim-majority countries, as well as non-Muslim nations. However, many companies struggle to understand the halal requirements, particularly in the context of the HFSC process (Riaz & Chaudry 2004), including Malaysia. Malaysia is a developing nation that is poised to become the global halal food hub and attaining this goal will be extremely significant. This study focuses on one single industry sector (processed food and beverage) in Malaysia. Importantly, this study will provide relevant information and recommendations to assist manufacturers in developing and improving their policies and strategies involved in the HFSC.

## **1.9 Structure of the Thesis**

This thesis is arranged into eight chapters, with the remainder of this thesis structured as follows.

Chapter 2 discusses the scenario of the halal food industry in Malaysia, especially in the context of processed food and beverage. This chapter also identifies the issues and challenges faced by the local companies in the industry.

Chapter 3 presents an extensive review of the literature on the theoretical foundation, empirical research and associated evidence related to the topic. Based on an extensive literature review, the researcher highlights the knowledge gaps, as well as develops the proposed conceptual model and research hypotheses.

Chapter 4 presents the research methodology of this study, which focuses on instrument development and implementation. It discusses and justifies the chosen research

paradigm, methodologies of choice, the research design process, development of research instruments, data collection procedures, pre-test, and pilot test. Finally, the ethical considerations related to the conducting of this study are presented.

Chapter 5 discusses the analytical method and procedures used in the study. Thus, it explains the statistical procedures that were used, which consist of structural equation modelling that is applied in the data analysis later in Chapter 6.

Chapter 6 presents the data analysis of the study. This chapter will discuss the data preparation, data cleaning and descriptive analysis of the study. It provides an analysis of the initial findings, including a descriptive analysis and reliability of the variables. The demographic profile of the participants and responding companies will also be presented in this chapter. Furthermore, this chapter discusses how to assess the unidimensionality of the variables, validate the instrument, confirm the measurement model and test the underlying hypotheses using the two-stage approach of covariance-based structural equation modelling. The objective of the first stage is to obtain a valid and reliable measurement model in order to proceed with the analysis of the structural model.

Chapter 7 presents the discussion of the findings. The findings are discussed in relation to the hypotheses. Then, the findings are compared to prior studies in the literature.

Chapter 8 presents the contributions and conclusions of the research. The contributions are discussed from both managerial and theoretical perspectives. Secondly, the research questions identified in Chapter 1 are revisited based on the obtained results. Finally, this

chapter will highlight the final conclusions originating from the research findings, the limitations of the study and directions for future research.

Figure 1-3 illustrates the relationship between the overarching research objective, research questions, research findings and the thesis chapters.

### **1.10 Summary**

This chapter begins with a general description of the introduction followed by the relevant research background. This section also discusses the phenomenon of the halal food industry, how it became a global concern and why it is an interesting area to investigate. In the section of problem identification, the issues regarding the vulnerability of the HFSC are highlighted. Contamination, authenticity and the use of fraudulent halal logos are the major issues in the global halal food industry. Lastly, a brief discussion of the methodology used and significance of the research is presented.

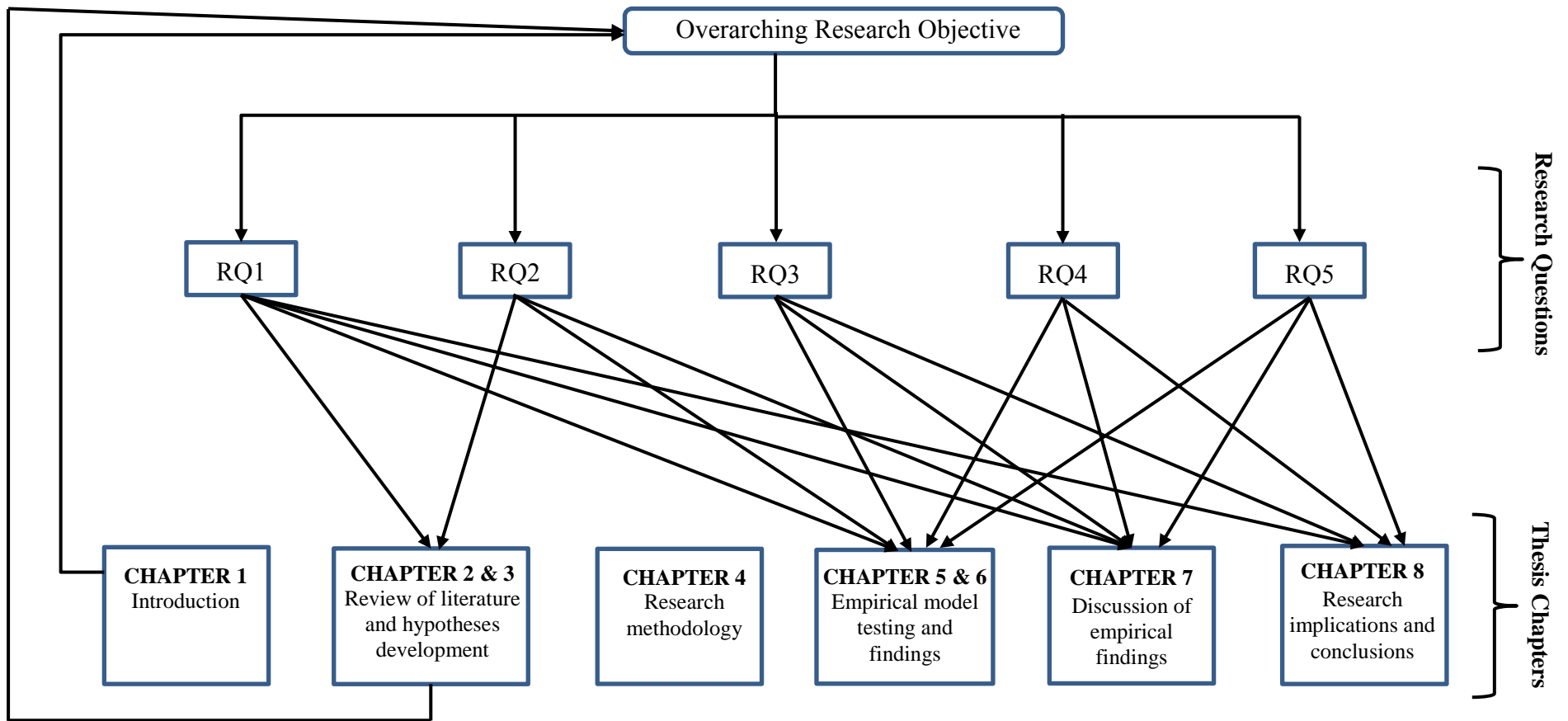


Figure 1-3: The links between the overarching research objective, research questions, findings and thesis chapters

## **CHAPTER 2**

### **OVERVIEW OF HALAL FOOD INDUSTRY IN MALAYSIA**

#### **2.1 Introduction**

Asia has become the most rapidly developing region for halal products, driven by countries like Indonesia, Malaysia, Pakistan, China, and India. Some countries have been effectively advancing themselves as halal production regions, research and international hubs, including Malaysia. Currently, Malaysia has been progressing well as a leading country in the global halal industry, and its market size is estimated to be US\$1.9 billion with 90% contributed by the food industry (GIFR 2013). Moreover, the Halal Industry Development Corporation (HDC) was developed as a one-stop non-government agency to facilitate the development of the halal industry. In addition, halal parks were established to facilitate the growth of the industry and to ensure that the halal integrity is practiced by the participating companies throughout the supply chain. Ultimately, the halal industry in Malaysia provides substantial opportunities for manufacturers. This chapter explains the emergence of the halal food market and its potential opportunities. This chapter also reviews the current status of the halal food industry in Malaysia (i.e., in the processed food sector), government policies and plans for the halal industry in Malaysia.

#### **2.2 The Emerging Halal Food Market and its Potential**

The halal food market is considered a lucrative business, and there is growing enthusiasm from numerous countries, both Muslim and non-Muslim. A current estimate reported that the global halal trade is now valued at US\$2.3 trillion (HDC 2014). Therefore, the global demand for halal food is increasing, and has become one of the

fastest growing market segments. The global halal food market was valued at US\$795 billion in 2014 and is expected to grow to US\$2.5 trillion by 2019 (APFI 2016).

The sizeable and growing Muslim population as a whole drives the development of the halal food market, in addition to the growing economic development in Muslim nations and the rise of potential halal markets in non-Muslim nations (e.g., China and India) (HDC 2014). The Muslim population is approximately 25% of the world's total population, and majority are populated in regions such as South East Asia (e.g., Malaysia and Indonesia), the Middle East (e.g., Saudi Arabia and Iran) and North Africa (e.g., Egypt and Morocco) (Kabir 2014). Based on data from the Pew Research Centre (2015), nearly 62% of Muslims live in the Asia-Pacific region, which thus constitutes a huge market potential for halal food. Table 2-1 below shows the global markets with a high potential for halal products. These markets denote a new opportunity for halal food organisations to build a platform for future growth.

The halal market is no longer confined only to Muslims countries and has now spread to non-Muslim nations (Kurokawa 2011). Previously, the consumption of halal food was focused in the regions with predominantly Muslim populations. It is in non-Muslims countries that halal food has provided a new benchmark for safe, clean and hygienic forms of food (Talib, Ali & Jamaludin 2008; Zulfakar, Anuar & Ab Talib 2014). Non-Muslim countries such as Thailand, the Philippines, China, and India have been at the forefront of tapping into the global halal market.

Table 2-1: High potential markets for halal food

Largest Muslim Population		Highest Purchasing Power	
Indonesia	China	Saudi Arabia	UAE
Pakistan	Ethiopia	Turkey	USA
India	Algeria	Iran	Algeria
Bangladesh	Morocco	Malaysia	Singapore
Turkey	Sudan	Qatar	Indonesia
Egypt	Afghanistan	Russia	Egypt
Iran	Iraq	France	The Netherlands
Nigeria		Libya	

*Source: Global Islamic Finance Report (GIFR) (2013), Halal Food Information Center (2016)*

The increased global trade has also prompted the demand for halal food and potentially made the market turning into the mainstream market (Al-Harran & Low 2008). Based on a report issued by International Trade Centre (ITC) (2015), the halal food industry will be transformed into a noteworthy market segment sooner than expected if these nine drivers are engaged.

The first driver is consumer awareness. Consumer awareness in the halal food industry has already significantly affected on the advancement of the market over the last ten years. Changes in consumer's way of life crosswise over eras globally reflect changes in shopping, food consumption and dietary habits. Today, the need for both processed and healthy food has increased to new industry subsectors of the food market (e.g., the halal market). Furthermore, there is also a new wave of lifestyle changes rising amongst young, highly educated, savvy and affluent Muslims, who embrace an 'Islamic contemporary with global lifestyle' (GIFR 2013). This new generation of Muslims prefer a modern lifestyle and are more engaged in the global economy as consumers, manufacturers, employees, retailers and traders. Thus, this group has created a global interest for mainstream products and services that comply with Islamic qualities.

The second driver is economics. The halal industry has become an important element in the economic landscape over the past decade. Moreover, government and corporate initiatives have given rise to the economic profile of the halal products. The emergence of halal industries generates many economic activities, such as creating many opportunities for entrepreneurs, driving export growth, research, and innovation, training, conferences and trade exhibition. For example, in Malaysia and Thailand, the collaboration, known as public-private halal initiatives, has had a significant impact on the economy by promoting the development of SMEs and boosting halal food exports.

Technology has assumed a critical role in upgrading the food industry. Numerous issues regarding technology have had an impact on the halal food industry. Technological advances in food production have prompted a vast increase in processed foods. In the halal business, this has created a need to improve the standards and certification, especially in the area of food processing, micro-ingredients and additives. Another issue concerning technology is where test kits are created for use by both manufacturers and consumers. These kits are required when shared production lines are continuously used and there is a need to test for haram ingredients, such as porcine DNA in food products. By having the technology, track-and-trace methods, such as radio frequency identification (RFID), is extensively used by logistics service providers. However, in the halal industry, this track-and-trace technology is still in its initial stages.

There has been continuous growth in the awareness and acceptance of values among Muslim societies. The halal market reflects the shared values of good food, cleanliness, health, as well as concern for animals and the environment. To date, the market growth reveals that there is a convergence of halal and mainstream markets in delivering



authenticity, ethics, a sense of spirituality into the diet and general way of life. Therefore, this convergence becomes a significant catalyst to ensure that the development and spread of this halal food market proceeds into the mainstream market in the future.

Integrity becomes a significant driver in the halal supply chain. The manufacturers involved in the halal industry must safeguard and demonstrate integrity throughout the supply chain. Halal in terms of logistics means that halal products should have dedicated storage, handling, and transportation facilities that are segregated from non-halal products (Tieman 2011). The reason for dedicated assets is to avoid cross-contamination with non-halal products. If supply chain integrity can demonstrate cost-effectiveness, then it is most possible to become a driver for the expansion of the halal market in the future.

The next driver is the eco-ethical aspect. The eco-ethical aspects in the halal market are more applicable to ‘halal and tayyib’ which means that the product is not only halal but wholesome, pure, healthy and safe. The tayyib values should be an inherent part of the halal system, but ultimately given less attention than the halal. Similarly, as another eco-ethical aspect, sustainability should be an inherent part of ‘halal and tayyib’ concept. For example, few halal food companies in the United States (e.g., Saffron Road and Crescent Foods) have incorporated their ‘green’ elements of their product designs, packaging and marketing campaigns. The combination of these eco-ethical aspects as a concept can bring halal foods into the mainstream market in the future.

Today, food security has become a worldwide concern, and its effect can likewise be felt in the halal food market. For countries that are relying on the imported food, chances of exposing to food-security risks are high. Few strategies have been introduced to address this issue. One of the strategies is encouraging the exporter's countries to use technology, such as hydroponics, large-scale irrigation and air-conditioned livestock farms especially for poultry and dairy products. The other strategy is when importers can make a direct investment in agricultural land and food manufacturing companies in the exporters' countries. By doing this, food-security risks can be reduced. This trend is said to be increased and is most likely a significant driver in the future halal food industry.

In the context of political perspective, there have been major changes implemented by the government to move halal food products into the mainstream market. According to this report, the major changes or initiatives that have been implemented by the government from most countries in the halal food industry are the establishment of halal standards, audit and certification procedures, accreditation, export promotions and other related initiatives. The government believes that the halal industry cannot be taken for granted and these developments can open new market opportunities. These developments have demonstrated that the policymakers now value the size and importance of the halal market, which it will lead as a recognizable segment of global commerce.

There was a significant number of global halal food issues, such as fraudulent halal certification and physical contamination of halal food products. For that reason, halal is being applied in the legislation in most countries throughout the world. For example,

Malaysia amended the Trades Description Act in 2011, stating that the Malaysia halal logo is officially permitted to be used for both domestic and imported halal products, and only can be issued by certifier approved by JAKIM (Zakaria 2008). This law and associated regulations certainly indicate that this country is committed to developing its halal sector.

Based on the explanation above, halal food issues have become a global concern and proper strategies are importantly required to ensure that the halal market segment can move to next phase of future market growth.

### **2.3 Malaysian Halal Food Industry**

The Malaysia's food industry is becoming a sophisticated industry supplied by both domestic and imported products. The lifestyles of Malaysians have changed due to the rapid economic growth in the late 80's and early 90's (MGCC 2011). They have become more brand conscious, and the demand trend shifted on convenience, healthy, organic and processed fresh food. The Malaysian food and beverage retail market are expected to grow by around 10% per annum (NZTE 2012). As for 2016, the revenue for food and beverage in Malaysia is expected to amount US\$22.5 million and will reach US\$76 million by the year 2020 (Statista 2015).

In Malaysia, the processed food and beverage industry had become an important component of the food industry. This industry is primarily dominated by small and medium size companies and predominantly Malaysian-owned. The major sub-sectors for the processed food and beverage industry are fishery, livestock, dairy, cocoa, fruits and vegetable, and functional/health food products (MGCC 2011).

For the past few years, the preferences of Malaysian consumers on halal food products have changed. The demand for halal food in the Malaysian market has increased tremendously since 60% of the population is Muslim. The expectation of the halal standard in food products has extended from meat to non-meat products, such as snacks, confectionary, dairy and bakery. Halal is rapidly becoming distinctly perceived as another benchmark for quality, cleanliness and safety. Furthermore, halal certified products, including food products, have added value to this industry in Malaysia. The market for the halal food industry is promising. For this reason, most retailers, food, and beverage manufacturers and foodservice operators are motivated to ask for halal certificates for non-meat based food products and ingredients.

The Malaysian government has undertaken significant support in promoting Malaysia as an international halal hub. One of the efforts is working in close collaboration with the Organization of Islamic Conference (OIC) countries to suggest the Malaysian Halal Standard as the benchmark for an international halal standard. In fact, the halal food industry in Malaysia has given numerous opportunities for Malaysian manufacturers. A few years ago, the potential value of the halal food industry ranged approximately between US\$600 billion and US\$2.1 trillion (MGCC 2011). Regarding the product categories, food and beverage were the biggest Malaysian halal exports by product clusters since 2012 (HDC 2015) (see Table 2-2).

The total halal export value has increased by approximately 14.8% from 2013 to 2014 to values of MYR32.8 billion and MYR37.7 billion, respectively. Furthermore, China, Singapore and the US have been listed as the top three Malaysian export destinations since 2012. Malaysia exports of halal products (i.e., food and beverage products) to a

group of countries, such as Asia-Pacific Economic Cooperation (APEC), Association of Southeast Asian Nations (ASEAN) and Trans-Pacific Partnership (TPP) (HDC 2014). Malaysia now has the potential to be a leading producer of processed food and beverages in the global halal market if a proper model of halal food supply chain is initiated.

Table 2-2: Halal export value by product cluster

Product Cluster	Halal Export Value (MYR BIL)		
	2012	2013	2014
Food & Beverage	12.27	13.27	15.48
Ingredient	10.62	10.62	12.16
Palm Oil Derivatives	5.06	4.83	5.30
Cosmetic & Personal Care	1.73	2.03	2.31
Industrial Chemical	1.93	1.69	1.92
Pharmaceutical	0.38	0.41	0.51

*Source: Halal industry development corporation (HDC) (2015), MYR=Malaysian Ringgit, (USD1=MYR4.42)*

Another initiative was undertaken by the Malaysian government to support the development of the halal industry and to facilitate the country moving towards a global halal hub, is the development of the Halal Parks. According to HDC (2014), Halal Parks are communities of halal-oriented businesses built on a common property where the infrastructure and other services are provided. In addition, Halal Parks is a huge base consisting of multiple operators involved in the halal industry production and services. Most of Halal Parks are equipped with excellent infrastructure and a series of ‘green’ sanitary systems.

Currently, there are 24 fully operational Halal Parks throughout Malaysia (Refer Table 2-3). These Halal Parks are developed based on clusters; biotech halal, agriculture, halal industrial and SME halal clusters (HDC 2014). The Halal Parks that are compliant with

the requirements and guidelines specified by Halal Industry Development Corporation (HDC) will obtain the HALMAS Certificate issued by the HDC. At present, 13 Halal Parks have been awarded HALMAS status. These Halal Parks will obtain an advantage from the preferential policies provided by the Malaysian Investment Development Authority (MIDA). In addition, many incentives are provided by the Malaysian government to the participating companies, including halal park operators, halal industry players and halal logistics operators. The benefits could consist of income tax exemption, investment tax allowance, import duty exemption and sales tax for cold room equipment, exemption from import duty on raw materials and others.

Table 2-3: Halal Parks in Malaysia

<b>Halal Parks</b>	<b>State</b>	<b>Size (Acres)</b>
Selangor Halal Hub	Selangor	1000
PKFZ Halal Flagship Zone	Selangor	100
Melaka Halal Park	Melaka	164
Techpark@enstek	Negeri Sembilan	480
POIC Lahad Datu	Sabah	272
Tanjung Manis Halal Food Park	Sarawak	77000 hectares
Penang International Halal Park	Penang	100
ECER Pasir Mas Halal Park	Kelantan	108
ECER Gambang Halal Park	Pahang	200
Pedas Halal Park	Negeri Sembilan	100
POIC Tanjung Langsat	Johor	280
PERDA Halal Park	Penang	100
Sedenak Industrial Park	Johor	700
Kedah Halal Park Sg. Petani	Kedah	35
Perlis Halal Park, Padang Besar	Perlis	50
Terengganu Halal Park	Terengganu	2
Pengkalan Chepa Halal Park	Kelantan	2
Mara Halal Park Kuala Perlis	Perlis	-
Mara Halal Park, Tambun	Perak	-
Mara Halal Park, Kuching	Sarawak	-
Labuan Halal Distributive Hub	Sabah	100
Sabah Halal Park, Sepanggar	Sabah	-
Perak Halal Park, Simpang Pulai	Perak	-
Prima Agri Halal Park	Selangor	100

*Source: Halal industry development corporation (HDC) (2014)*

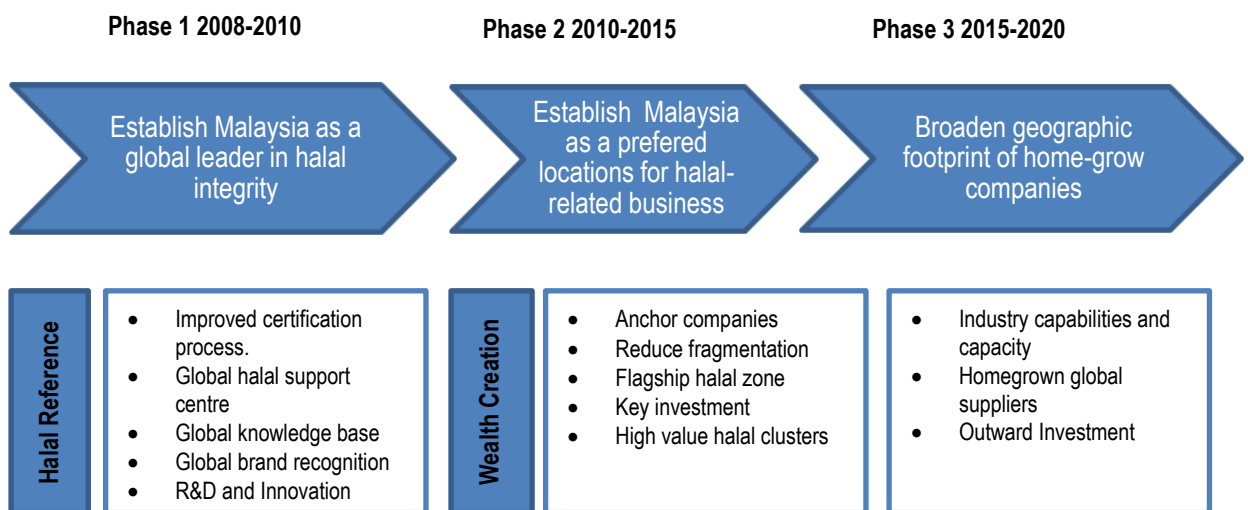
The benefits arising from the establishment of the Halal Parks by the Malaysian government are: (i) to attract foreign investment; (ii) to support local SMEs; (iii) to transfer halal production factories into the parks for convenient management; (iv) to reduce the adverse effects created by the halal industry towards the environment; and (v) to improve the economic performance of the participating companies. Thus, the total investment from the Halal Parks is now valued at US\$2.5 billion, offering 5200 employment opportunities to the local people. Moreover, there are 18 multi-national corporations (MNCs) and 110 SMEs who participated in the Halal Parks throughout Malaysia (HDC 2014).

#### **2.4 Malaysian Government Plans for Halal Industry**

Halal in Malaysia commenced more than 30 years ago with various strategies and plans. Halal certification letters were first issued in 1974 by the Research Centre of the Islamic Affairs Division of the Prime Minister Office, primarily for products that met halal criteria. The initiative was further expanded in 1994, when halal certification was issued in the form of a halal certificate with a halal logo. Furthermore, in 1998, halal inspections were carried out by a government-appointed company named Ilham Daya. Four years later, the Department of Islamic Development Malaysia (JAKIM) was authorized by the government to conduct all halal certification activities. The halal industry in Malaysia was developed based on one of the main thrusts in Malaysian Economic Development. As part of this initiative, the Halal Industry Development Corporation (HDC) was established in 2006. The HDC is the only government-mandated company in the world with the role of coordinating and developing the national halal industry (Azman & Masron 2012).

The importance of the halal industry is indicated with the inclusion of its strategies in the Second Industrial Master Plan (1996-2005), in the National Agriculture Policy (1988-2010), in the Ninth Malaysia Plan (9MP) (2006-2010) and in the Third Industrial Master Plan (IMP3) (2006-2020). The introduction of The Third Industrial Master Plan (IMP3) (2006-2020) by the Malaysian government incorporates the plan to establish Malaysia as a global halal hub. Moreover, several programs and policies have been strategized to support this vision. Malaysia should grab the lucrative halal market share at local and international levels. Solid infrastructure and transportation accessibility will provide major opportunities for Malaysia to succeed in its vision.

In 2008, another extended plan known as the Halal Industry Master Plan (HIMP) was introduced by the Halal Industry Development Corporation (HDC) to drive the development and growth of the halal industry in Malaysia as a global halal hub by 2020. The vision of HIMP is to: 1) position Malaysia as the global reference centre for halal integrity know-how; and 2) become the global leader in the innovation, production and trade of some halal-related sectors (HDC 2014). The implementation phases described in HIMP are shown in Figure 2-1.

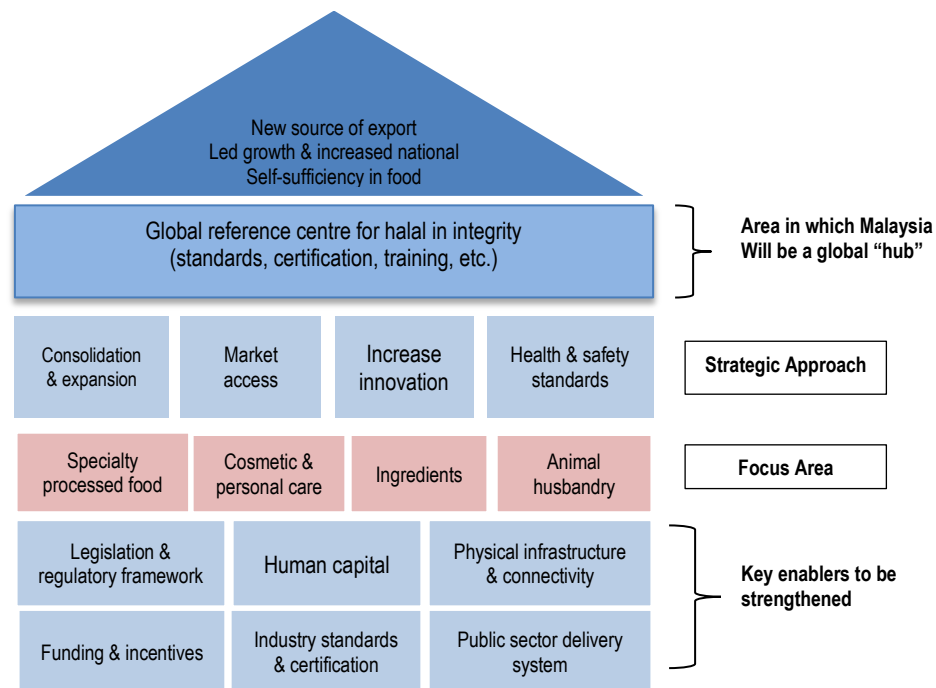


Source: Halal industry development corporation (HDC) (2014)

Figure 2-1: The implementation phases in the Halal Industry Master Plan (HIMP)



The framework of the Halal Industry Master Plan (HIMP) consists of complete dimensions: the area in which Malaysia targeted to become a global hub, the strategic approach, the focus areas and the key enablers (refer Figure 2-2). HIMP has four industry focus areas: 1) specialty processed food; 2) cosmetics and personal care; 3) ingredients; and 4) animal husbandry. For this reason, Malaysia is focusing on increasing the growth in the number of consumer goods industries and developing key industries that will enable it to become a prominent manufacturer of identified halal products. As a force to be recognized in the development of both halal knowledge and industry, as well as to generate international confidence among halal exporters, Malaysia must consider absolute halal integrity-based practices and adherence to ‘halalness’ at every level of the production value chain (Azman & Masron 2012).



Source: Halal industry development corporation (HDC) (2014)

Figure 2-2: The framework of the Halal Industry Master Plan (HIMP)

## **2.5 Halal Food Issues in Malaysia**

It is imperative for Muslims to search for halal products and services. When it is related to food consumption, halal and haram is an extremely subtle and serious matter to Muslims (Abdul Latif 2006). With the intention of becoming the global halal food hub, Malaysia offers an extensive choice of halal foods to consumers both locally or internationally. However, the issues of the halal food industry in Malaysia continue to increase. Among the halal issues that have arisen include hygienic practice issues at processing premises, cross-contamination issue, food adulteration issue, and fraudulent use of the halal logo.

Although Malaysia has established halal standards and proper guidelines for halal food production, preparation, handling, and storage, there remain many cases in which halal standards were ignored and reported. Moreover, there are some food production companies that have been suspended by JAKIM due to contamination of food products. In a report by Satibi (2012) claimed that one of the food productions in Selangor had stored halal raw materials and pork in cold storage together. Obviously, this retailer did not follow proper halal food general guidelines of the Malaysian Standard. This situation appeared to raise doubt among Muslim consumers regarding the authenticity of the halal food.

Furthermore, other cases have also reported on the issues of food adulteration, in instances in which food manufacturers have intentionally mixed halal and non-halal materials in the halal food products. This issue does not only involve local products but imported products as well. In 2011, halal food consumers in Malaysia were shocked when the New Zealand brand product “Golden Churn” pure creamery butter was found

to be non-halal. The Islamic Development Department of Malaysia (JAKIM) confirmed that the butter contained pig DNA (BERNAMA 2011). The same issue was reported three years later when two flavours of Cadbury chocolate had been recalled from the market in Malaysia. Cadbury Dairy Milk hazelnut and Cadbury Dairy Milk roast almond bars tested positive for pig DNA during testing for non-halal substances (Jaques 2015; Mohamed et al. 2016). The issue of food adulteration continues to be an ongoing issue, and a number of cases have been reported by JAKIM. Last year, Muslim consumers were distracted again regarding halal food issues. JAKIM has announced that some of the fish ball products on the market have been mixed with animal blood plasma, including pig (Joni 2015). Thus, the safety of halal food for Muslim consumption remains in doubt.

Another issue is the fraudulent use of the halal logo. This situation also appeared to cast doubt as there were quite some food processing companies that have used a fake halal logo to attract Muslim consumers. For example, in 2014, a noodle and a fish ball manufacturing company from Penang used a fake halal logo which is not certified by authorising bodies (BERNAMA 2014). Further investigation and action have been taken for both companies; however, this incident has created uncertainty among the Muslim consumers and consequently, affected their food product selection.

## **2.6 Summary**

The halal food industry has evolved rapidly and became one of the main contributors to the Malaysian economy. This chapter highlights the importance of the halal food industry, especially in the context of processed food and beverage sub-sectors. The issues that have arisen in this industry were also discussed, indicating that Malaysia

halal food manufacturers need a comprehensive reference in supply chain implementation. The following chapter will discuss in detail, how to develop a conceptual model of halal food supply chain implementation explained by the selected underpinning theories.

# **CHAPTER 3**

## **LITERATURE REVIEW, RESEARCH FRAMEWORK AND HYPOTHESES DEVELOPMENT**

### **3.1 Introduction**

This chapter reviews the literature related to the proposed HFSC implementation model used in this thesis. This includes a discussion of the halal concept, a systematic literature review on halal food management, the development of the dimensions of HFSC implementation and organisation performance, supply chain management, food supply chain and the concept of HFSC. The following section discusses the related theoretical foundation for this study. The final section will provide an overview of the proposed model and the specific relationships which will be tested in the form of hypotheses

### **3.2 Theoretical Foundation of the Research**

This section discusses the two theories which act as the foundations for this study:

#### **3.2.1 Conventions Theory (CT)**

In this thesis, conventions theory (CT) has been used as a theoretical foundation to explain the HFSC implementation model as a second-order construct. To date, CT has been broadly adopted in an agro-food context (Vannoppen, Van Huylenbroeck & Verbeke 2004; Straete 2004). The theory is defined as ‘a set of mechanisms and rules involving the content of product specifications, roles of third parties, strategies of product differentiation and labelling and also used for defining and recognizing the quality of products and for solving problems related to quality uncertainty’ (Bonne & Verbeke 2008, p.37). The classical view of the theory suggests that the success of

implementation is primarily focused on the connection between management, production techniques, processes, product nature and the quality of products (Wilkinson 1997a).

Furthermore, the theory suggests different rules and norms apply at various points along the food chain based on diverse categories or regimes (Murdoch, Marsden & Banks 2000; Ponte & Gibbon 2005). Six major conventions categories have been introduced in previous studies on food namely commercial conventions, domestic conventions, industrial conventions, public conventions, civic conventions and ecological conventions. This theory has been applied in the context of processed foods and beverages, such as chocolates (Cidell & Alberts 2006); wine (Ponte 2009); salted fish production (Lindkvist & Sánchez (2008); and yogurt (Murdoch, Marsden & Banks 2000) to justify the theoretical basis of those studies.

In this study, CT provides a strong foundation to explain how HFSC implementation as a second-order construct has been defined by the underlying dimensions or first-order constructs. To obtain a high-quality and successful implementation in the context of the HFSC, this model is appropriate; however, for this study, only four categories were selected to explain how the dimensions of the construct were derived.

Firstly, under public conventions, organisations should be able to offer a differentiated product with reliable packaging and labelling. The customer only recognises products based on their brands, trademarks and packaging. Next, for commercial conventions, the quality of the implementation is evaluated by the commercial quality of the goods and how the goods are produced. Elements, such as innovation capability, state-of-art

processing, methods of production, selection of equipment, improved quality control, and minimising cost, are among the notions of commercial conventions that must be considered (Murdoch, Marsden & Banks 2000). On the other hand, industrial conventions looks at the standardisation of physical characteristics or attributes, such as hygienic, cleanliness and food security as the important variables that needs to be implemented when determining the quality of food products in the industry. The fourth category is civics conventions, which is concerned with the environmental and societal implications of food production. In the context of ethical practices, this category suggests that organisations should have the ability to manufacture the products in a morally approved and/or environmentally friendly way. In general, the food chains might have a different alignment with the conventions category, depending on type of food, production process and standards to be complied.

Table 3-1: Linkages between CT categories and dimensions of HFSC implementation

<b>Conventions category</b>	<b>Category description</b>	<b>Dimensions</b>
Public conventions	Public and consumers' concern on trademark, brand, reliable packaging and labelling of products.	<ul style="list-style-type: none"> <li>• Packaging and labelling</li> </ul>
Commercial conventions	Evaluated by commercial quality of goods such as capability to innovate, methods of production, processing along the chain, selection of equipment, standardisation and minimising cost.	<ul style="list-style-type: none"> <li>• Innovation capability</li> <li>• Physical segregation</li> <li>• Material handlings</li> <li>• Storage and transport</li> </ul>
Industrial conventions	Evaluated as per standardisation of physical characteristics as the most important factor in determining quality of products.	<ul style="list-style-type: none"> <li>• Cleanliness</li> <li>• Safety</li> <li>• Islamic dietary law</li> </ul>
Civic conventions	Products are high in quality if produced in an ethical and/or environmentally friendly way.	<ul style="list-style-type: none"> <li>• Ethical practices</li> </ul>

Based on the above discussion, most of the proposed dimensions can be explained using relevant regimes of CT. Table 3-1 presents the linkages of the similarities between the theory's categories and the dimensions of the study. Therefore, the majority of the dimensions that have been selected to define the HFSC implementation model as a second-order construct can be supported by this theory. The development of constructs (i.e., dimensions) of the HFSC implementation will be discussed in the next section.

### **3.2.2 Resource-based View (RBV)**

Resource-based View (RBV) is a widely-accepted theory in supply chain management literature (Hsu et al. 2011), which views an organisation as a collection of unique and inimitable resources that provides the basis for its strategic competition and performance (Shi & Yu 2013). In this study, RBV is used to explain the relationship between the implementation of the HFSC model and organisational performance which specifically focuses on both marketing and financial performance. According to RBV, it is assumed that the competitive advantage may be sustained by binding resources that are valuable, rare, imperfectly imitable and substitutable (Barney 1991). Organisation resources can be defined as all assets, capabilities, organisational processes, firm attributes, information, and knowledge controlled by an enterprise that enables the firm to conceive of and implement strategies with the goal to improve its efficiency and effectiveness (Barney 1991; Daft 2012; Sarkis, Zhu & Lai 2011). For example, the supply chain is said to be an inimitable competitive weapon which can provide the capability for product and process improvement (Manzouri & Rahman 2013).

This theory suggests that if the organisation has all related resources together combined with certain capabilities, it may ease the implementation and enhance performance. It



has been highlighted that an organisation creates performance advantages by integrating sets of resources to enhance organisational capabilities (Shi & Yu 2013). These resources and capabilities are the key source of an organisation's success, which can lead to competitive advantage and performance (Sarkis, Zhu & Lai 2011). The development of resources and capabilities may be demonstrated through improvements in various organisational performance metrics. In addition, organisations with valuable, inimitable and non-substitutable resources excel in the marketplace (Hsu et al. 2011).

The RBV argues that variation in organisation performance is the result of resource ownerships and capabilities that have varied productivity (Makadok 2001). This is supported by Day (1994) which stated that "it is not possible to enumerate all possible capabilities because every business develops its configuration of capabilities that is rooted in the realities of its competitive market, past commitments, and anticipated requirements." This study uses RBV to assess the importance of HFSC implementation on the organisational performance. All the proposed dimensions for this study are the combination of the resources and capabilities that should be linked to the organisations during the implementation of the HFSC, with the aim to improve the organisation's marketing and financial performance. To summarise these ideas, this study asserts that the HFSC implementation model, as evinced by cleanliness characteristics, safety, Islamic dietary law, physical segregation, material handlings, storage and transport, packaging and labelling, ethical practices, training and personnel, innovative capability and resource availability, positively affects organisational performance. Therefore, it is how organisations utilise their capabilities in these HFSC areas to enhance marketing performance and financial performance.

### 3.3 The Concept of Halal (*Permissibility*)

Halal is an Arabic term which means an act or product that is lawful and permitted (Al-Qaradawi 2007). Moreover, halal is also a concept that contributes to achieving a better quality of life in Islamic society (Zailani et al. 2010). Linguistically, the word “halal” is derived from the verb “Halla” meaning “to be or become lawful, legal, licit, legitimate, permissible, permitted, allowable, allowed, admissible, un-prohibited and unforbidden.” The meaning also can be extended “to untie, unfasten, unbind, undo, unravel, loosen, unloose, unfix, unwind, unscrew, untangle, disengage and free” (Al-Jallad 2008). In the Quran, there are several Surahs that explain the rules of halal pertaining to food and which guide Muslims in their customary practices. These Surahs repeat the recommendations for Muslims to eat only wholesome things which are lawful. All the contents or ingredients of the food must comply with Islamic dietary law.

*O ye people! Eat of what is on earth, Lawful and good; and do not follow the footsteps of the evil one, for he is to you an avowed enemy.*

The Noble Qur'an: Surah Al-Baqarah 2:168

*Eat of the lawful and good things with which Allah has provided you and be thankful for the favors of Allah if it is He you worship.*

The Noble Qur'an: Surah Al-Nahl 16:114

*Eat from the good things with which We have provided you and do not transgress therein, lest My anger should descend upon you. And he upon whom My anger descends has certainly fallen.*

The Noble Qur'an: Surah Taha 20:81

*And eat of what Allah has provided for you [which is] lawful and good. And fear Allah, in whom you are believers.*

The Noble Qur'an: Surah Al-Maidah 5:88

For the past decade, the definition of halal has been comprehensively extended and the meaning of halal has been discussed in a broad perspective. Dollah, Yusoff and Ibrahim (2012) elaborate that halal covers the aspects of slaughtering, storage, display, preparation, hygiene, sanitation and must not be harmful to human health. In addition, halal principles encompass issues of sustainability, environmental friendliness, food safety and care for animal welfare (Rezai, Mohamed & Shamsudin 2011).

Halal is said to be a benchmark for quality since the products have been handled with a high level of hygiene, produced in a clean environment as well as meeting a standard of safety and nutrition. In a supply chain context, the halal concept (especially for foods) is truly from the farm to the table, and requires nutritious items to be prepared from permissible ingredients in a clean and hygienic manner. It is obligatory for Muslims to only consume halal food and use halal products. Table 3-2 lists the selected halal definitions. These definitions are selected mainly due to comprehensiveness and cover the majority of the variables used in this study.

Table 3-2: Selected halal definitions

Authors	Definition
Pahim, Jemali & Mohamad (2012)	The halal concept consists of anything that is free from any element that is prohibited by Sharia law with an emphasis on hygiene, safety and the wholesomeness of the food or product. These are the factors that provide the basis of a healthy diet that promotes the Islamic way of life.
Verbeke et al. (2013)	As a product characteristic, halal refers to the nature, origin and the processing method of food designated for Muslim consumers. Halal is a typical credence process attribute, thus an invisible and intangible quality characteristic that can hardly be evaluated or ascertained by individual consumers, even upon or after consuming the good.
Bahrudin, Illyas & Desa (2011)	The word halal means permitted, allowed, authorized, approved, sanctioned, lawful, legal, legitimate or licit. Islam places a very strong emphasis on cleanliness in everything.
Shaari, Ottot & Kermin (2013)	Halalan Toyyiban concept focuses on the overall production chain of which the food produced should be free from any harmful products and ingredients, and uses only permissible ingredients (free from forbidden and wrongful sources) that are consistent with Sharia law.
Rezai, Mohamed & Shamsuddin (2011)	Halal principles are no longer just the Muslim practice of slaughtering the animals but also encompass such issues of sustainability, environmental friendliness, food safety and care for animal welfare
Al-Qaradawi (2007)	Halal is an Arabic word meaning lawful or permitted. Halal foods refer to a hygiene, and healthy foods accord with the teachings of the Quran and Sunnah of the Prophet, <i>Ijma'</i> (consensus) and <i>Qiyas</i> (deduction of analogy according to the Syafie or any one of the Hanafi, Maliki or Hanbali School of thought or fatwa approved by the relevant Islamic authority).

Source: Compiled by author

In this sense, Islam prohibits certain foods and drink, but it is not unique in this aspect as other religions also have similar restrictions and prohibitions (e.g., kosher rules for Jews and beef prohibitions for Hindus and Buddhists). Based on Islamic jurisprudence, there are four distinct categories of food in Islam according to its permissibility: halal, haram, mashbooh and makrooh (Lodhi 2009). The term halal is used to describe foods that are lawful and permitted for Muslims to consume as stated by Islamic dietary laws found in the Quran, Hadith (books that recorded the sayings and practices of the Prophet Muhammad) and in the fiqh (jurisprudence) of the Muslim jurists. Halal food is often perceived as having been specially processed to achieve the highest standards of quality (Riaz & Chaudry 2004).

In Islamic dietary law, there are rules and prohibitions on food and drink, as well as for the slaughtering, processing and serving any of those that need to be complied (Nasir & Pereira 2008). Mashbooh food is a term referring to foods, in which the permissibility becomes doubtful or suspect due to its nature or condition; therefore, it should be avoided to safeguard people's faith. Moreover, makrooh foods refer to detested or discouraged and encompasses all those foods which are not haram or mashbooh but have other reasons for being disliked. In general, this food is not approved, but consuming it invokes no penalty and is not liable to punishment (Lodhi 2009; Kamali 2010).

Based primarily on the source of the Quran and Hadiths, Islam has specified broad legal rules to categorise an organisation's input, process and output covering activities, products, and services into generally permissible/lawful (halal) and non-permissible/prohibited/unlawful (haram). Upon these legal rulings, the boundaries of what are halal and haram are referred (Standards Malaysia 2014). The Islamic legal rulings on what is lawful (halal), represented by obligatory (wajib), and permissible (recommended, permissible, disliked). Determination of lawful (halal) and unlawful (haram) should be guided by the following legal rules:

1. The boundaries of what is halal.
  - a. Obligatory (wajib) – that shall be included and/or performed.
  - b. Recommended (Mustahab or sunat) – that should be included and/or performed.
  - c. Permissible (Mubah or harus) – which is neither encouraged nor discouraged.

- d. Disliked (Makruh) – which is offensive and should be avoided but not in strictly prohibitory terms.
2. Unlawful (haram) – which is strictly prohibited.

According to the Standards Malaysia (2014), halal food products consist of food and drink and/or their ingredients permitted under the Shariah Law and that meet the following conditions:

- a. does not contain any parts or products of animals that are non-halal to Muslims or any parts or products of animals which are not slaughtered according to Shariah law;
- b. does not contain najis according to Shariah law;
- c. safe for consumption, non-poisonous, non-intoxicating or non-hazardous to health;
- d. not prepared, processed or manufactured using equipment contaminated with najis according to Shariah law;
- e. does not contain any human parts or its derivatives that are not permitted by Shariah law;
- f. during its preparation, processing, packaging, storage or transportation, the food is physically separated from any other food that does not meet the requirements stated in items a., b., c., d. or e., or any other things that have been decreed as najis by Shariah law.

Today, halal has entered the realm of business and trade and become a global symbol for quality assurance and lifestyle choice (Hanzaee & Ramezani 2011). Apart from food, this realm of halal may extend to all consumables, such as toiletries, cosmetics, pharmaceutical and other services. This claim has been supported by Dali et al. (2009) who stated that halal is a universal term that applies to all facets of life and can be

applied in relation to food products, meat products, cosmetics, personal care products, food ingredients, pharmaceutical and food contact materials. Thus, it covers activities of daily life, from consumption to business practices and how we generally perform transactions.

Halal has the characteristic of *Toyyib* (wholesomeness) which means good, pure, clean, pleasant, delightful, delicious and healthy to the body (Jalil & Musa 2012). Halal and *Toyyib* have merged and are referred to as *Halalan Toyyiban*, which focuses on the production of food which should be free from any harmful ingredients, and should be prepared in accordance with Sharia law (Shaari, Ottot & Kermin 2013). The general principle concerning food according to Islamic teachings is that everything is halal except impurities (or mixed with impurity), harmful substances and intoxicants (Al-Qaradawi 2007). Therefore, it is compulsory for Muslims to eat good and healthy food and to avoid all that is forbidden.

### **3.4 Supply Chain Management**

According to Tan (2001), supply chain management (SCM) encompasses the entire value chain from the extraction of raw materials until the end of its useful life. SCM focuses on how a firm can enhance its competitive advantage by utilising its suppliers' processes, technology and capabilities (Tan et al. 1999). It can also be defined as the integration of suppliers, manufacturers, distributors and customers, in which raw materials move from suppliers to manufacturers who assemble them into the finished products and organise delivery to the customers (Jie 2008). Dittmann (2012) believes that the supply chain includes all the materials and information flowing across the entire

chain from end-to-end, even extending outside the firm, backward to the suppliers and forward to the customers.

SCM can be defined as integrated planning, co-ordination, and control of all business processes and activities to deliver superior consumer value at the lowest cost to the supply chain while satisfying the variable requirements of the other stakeholders in the supply chain (van der Vorst 2000). Therefore, SCM is not only the process of delivering orders and creating value to customers, but also deals with all aspects of bringing a product to the market from the raw materials stage to the final product. The understanding and practicing of SCM have become an essential prerequisite to being competitive in the global market and enhancing profitability.

SCM has emerged as a powerful tool for organisations to maintain their competitiveness in a global economic system. This approach has compelled businesses to improve their quality control methods, preserve quality products, enhance industrial networks and increase customer satisfaction (Rahman et al. 2008). In the era of globalisation, adopting SCM is a potential advantage that many organisations should pursue to improve their profits, distribution channels and customer satisfaction. The ability to sequence and coordinate the information, material and cash creates a competitive advantage for the organisations.

Conventional SCM does not address the importance of Islamic values in designing and measuring the performance of a halal supply chain. Therefore, it is necessary to have halal elements on the supply chain model, especially in the context of the HFSC.



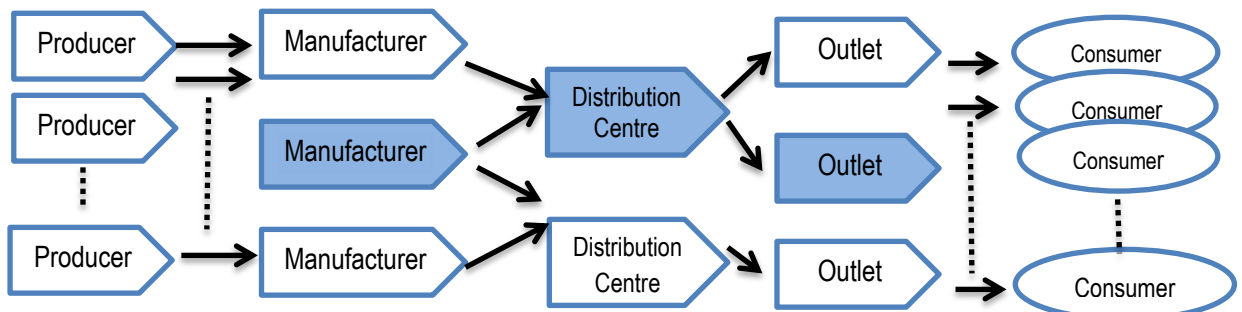
### **3.5 Food Supply Chain**

The food supply chain is a network of food-related businesses involved in the production of food products as it moves from manufacturer to the end-user, and each firm belongs to at least one supply chain (i.e., it has at least one supplier and one customer) (van der Vorst 2000). Figure 3-1 depicts a generic food supply chain. Food supply chains have recently undergone significant changes. Our current food system has been faced with high waste in the food supply chain (Aiking & De Boer 2004; Tomlinson 2013) and global sourcing issues. Food or food ingredients may be derived from countries with a less transparent food supply. For example, in 2008, the Chinese melamine scandal and the contamination of dairy products, chicken and eggs and animal feed globally showed the depth of the global sourcing of food ingredients and problems occurred when contract manufacturers became involved in today's food supply chains (Zhou & Wang 2011).

Quality and safety in a food supply chain have become a major concern in the food sector (Peter, Mateja & Mojca 2013). In other research, the food supply chain is also being assessed from the perspective of an integrated approach of quality, safety, sustainability, logistics efficiency of food products and processes along the chain which is 'from farm to fork' (Manzini & Accorsi 2013). It is extremely important to the food industry to guarantee that the food is of high quality and integrity by delivering transparent information along the entire food chain. Therefore, this practice is associated with increased confidence among consumers. Consumers only consume food that can be fully trusted, ask for safety guarantees and transparent information (Beulens et al. 2005).

On the other hand, food supply chains are increasingly complex and dynamic. Van der Vorst (2000) believes that food supply chains have some additional characteristics, such as shelf life constraints, variability in product quality, legislation, unpredictable demand and specific logistics requirements that make these networks more unique, resulting in more dynamic, uncertain and complex networks. For this reason, information systems, quality and safety standards, as well as governing mechanisms are required to achieve transparency in the food supply chain (Trienekens et al. 2012).

According to Vlajic, van der Vorst and Haijema (2012), the food supply chain needs to be robust, in which factors, such as managed, managing and information systems, as well as the organization structure must be consistently integrated. The issue of corporate social responsibility (CSR) in the food supply chain has also been discussed, and eight components have been identified: 1) animal welfare; 2) environment; 3) community; 4) biotechnology; 5) health and safety; 6) fair trade; 7) procurement; and 8) labour and human rights (Maloni & Brown 2006). Based on the literature pertaining to the food supply chain discussed above, some of the dimensions of the HFSC implementation model can be added.



Source: Adopted from van der Vorst (2000)

Figure 3-1: Schematic diagram of a generic food supply chain

### **3.6 Halal Food Supply Chain**

Food production and trade has been described as the weak link in the halal value chain (Tieman 2015). As food chains are increasingly becoming longer and more complex, Muslims are concerned about the content of the foods they consume and how such foods are produced (Bonne & Verbeke 2008). Globalisation in the food supply chain has exposed contemporary Muslim scholars to deal with issues of biotechnology, unconventional sources of ingredients, synthetic materials, innovations in animal slaughtering and meat processing that guide Muslim consumers in their choices (Fischer 2011).

Today, the demand for halal food products is growing as the number of Muslims throughout the world increase. In this scenario, Muslim consumers require much greater assurance of the halal food they consume, to reduce the possible risk of contamination. As argued by Lada, Tanakinjal and Amin (2009), Omar, Jaafar and Osman (2013) and Tieman, van der Vorst and Ghazali (2012), halal certainly requires a contamination-free supply chain that conforms to the halal requirements from the source to the point of consumer purchase. Consequently, the HFSC is vital to food manufacturers to deliver credibility and trust to Muslim consumers.

The HFSC refers to the process of managing halal food products, beginning from the point of origin to the point of consumption and involving different parties from suppliers to end-users. Activities include sourcing, warehousing, transportation, handling of products, inventory management, procurement, marketing and order management, which must all comply with the general principles of Shariah law. Based on recent studies, some significant definitions of the HFSC are listed in Table 3-3.

The main goal of the HFSC is to achieve the customer satisfaction and ensure that the halal status of the food product remains intact throughout the entire process of the supply chain (Bahrudin, Ilyas & Desa 2011). Globalised supply chains increase the complexity of halal food integrity, and the problem becomes enormous when suppliers or sub-suppliers are located in other non-Muslim countries where the involvement of non-Muslims is unavoidable (Ali et al. 2014). The possibility of halal food becoming non-halal is greater when the food requires traveling a long distance and involves many handling points. This issue can be critical if the parties involved throughout the supply chain process do not fully understand the concept of halal and the importance of maintaining the integrity of halal. Cross-contamination will occur if halal food products are placed together with non-halal products. This will lead to dissatisfaction of halal food consumers and unnecessary non-consumable halal food wastage.

Table 3-3: Selected halal food supply chain definitions

<b>Authors</b>	<b>Definition</b>
Che Man et al. (2007)	The process of planning, implementing and controlling the efficient flow and storage of halal-certified product from the source to the demand point.
Tieman (2009a), (2009b)	The process of managing the procurement, movement, storage and handling food products through the organization and the supply chain in compliance with the general principles of Sharia law.
Zulfakar, Anuar & Ab Talib (2012)	Process of managing Halal food products from different points of suppliers to different points of buyers/consumers, which involved various parties, who are located at different places, who may at the same time, involved with managing non-Halal food products, with the purpose of satisfying the needs and requirements of both (Halal and non-Halal) customers.
Lodhi (2009)	The halal food supply chain requires conforming to the Islamic dietary laws at all stages from production to consumption. Hence, the intentional addition of any amount of prohibited food or material is not allowed into the food chain at any stage, and strict control of all stages is essential to ensure the integrity of the halal product.
Omar & Jaafar (2011)	Halal supply chain involves activities of the supply chain which begins from the point of origin to the point of consumption regarding Sharia Islamic perspectives.

*Source: Compiled by author*

There are several studies which have been conducted on developing the framework of the HFSC. First, a study by Tieman, van der Vorst and Che Ghazali (2012), initiated the first model to address the halal supply chain principles using a focus group as the method of data collection. The study was conducted to determine the halal supply chain performance and the principles in halal supply chain management. However, this research primarily investigated general halal goods and did not focus on any particular halal food product. Furthermore, the study only concentrated on the robustness of the model by looking at the relationship between supply chain resources, business processes and network structure. Moreover, the study did not concentrate on investigating the critical dimensions or factors that built a holistic model of HFSC implementation. In addition, the study examined the supply chain performance not the impact on the organisational performance. Some of the elements from this study are taken into consideration in the development of the HFSC implementation model.

The second study on halal supply chain was conducted by Omar and Jaafar (2011). The study emphasised the identification of factors that lead to an effective halal supply chain, with a focus on the poultry industry. This study is a form of qualitative research since the data was collected through in-depth interviews. A proposed conceptual framework was developed, consisting of three factors (halal animal feed, proper slaughtering and appropriate segregation) that led to an effective halal supply chain. It was found that the study only concentrated on the supply chain of the poultry industry, in which the supply chain process may differ from other types of halal food, especially processed foods and beverages. Furthermore, the study also did not investigate the impact of the model on the organisational performance. Relevant elements from this

study are also taken into consideration as part of the variables for the development of the HFSC implementation model.

The third study on halal supply chain was conducted by Zulfakar, Chan and Jie (2014), who investigated the factors and issues that influence the development of halal meat supply chain operations in the Australian market. This exploratory study applied a semi-structured interview as a method of data collection. Obviously, this study only focused on the meat supply chain and not on other types of halal food. Similar to the above research, the supply chain process might be different for other categories of halal food. Based on these findings, ten factors were found to influence the operations of the Australian halal meat supply chain. This study also did not examine the relationship on the organisational performance. Nevertheless, relevant factors from the research can be applied in this thesis for the purpose of model development.

Although there are some studies on the HFSC, developing a HFSC implementation model has not been comprehensively discussed. Most of the above-mentioned studies focused on a generic halal supply chain. Thus, this area of HFSC management is under-researched, especially for quantitative research which applies rigorous statistical methods in the context of processed food and beverage.

Today, the majority of Muslim consumers are still lacking in the skills and time to monitor how supply chain activities are handled, and they are also unable to check whether cross-contamination has occurred (Bonne & Verbeke 2008; Ngah & Zainuddin 2012). Although halal standards were introduced to regulate production, preparation, handling and storage to a certain degree, they cannot confirm that a product is halal at

the time of consumption. Thus, a truly comprehensive and well-managed supply chain management approach needs to be developed and adopted to ensure the global availability of halal food products.

### 3.7 Systematic Literature Review of the Halal Food Management

A systematic review was conducted in the halal food management literature. This review was conducted by investigating peer-reviewed journal articles and conference proceedings published between 2003 and 2015. Major bibliographic databases were used, such as Business Source Premier (EBSCO Host), Emerald Insight, Science Direct (Elsevier), Scopus, Springer Link, and IEEE Xplore to search for relevant articles. These databases were selected due to their wide coverage of halal food topics. A total of 107 journal articles and 47 conference proceedings were identified and their distribution is shown in Figure 3-2. Based on this analysis, an upward trend is observed, manifesting the increasing interest in research in the area of halal food management since 2011. The figure also shows that more than 50% of the peer-reviewed articles and papers were published between the period of 2011 and 2013.

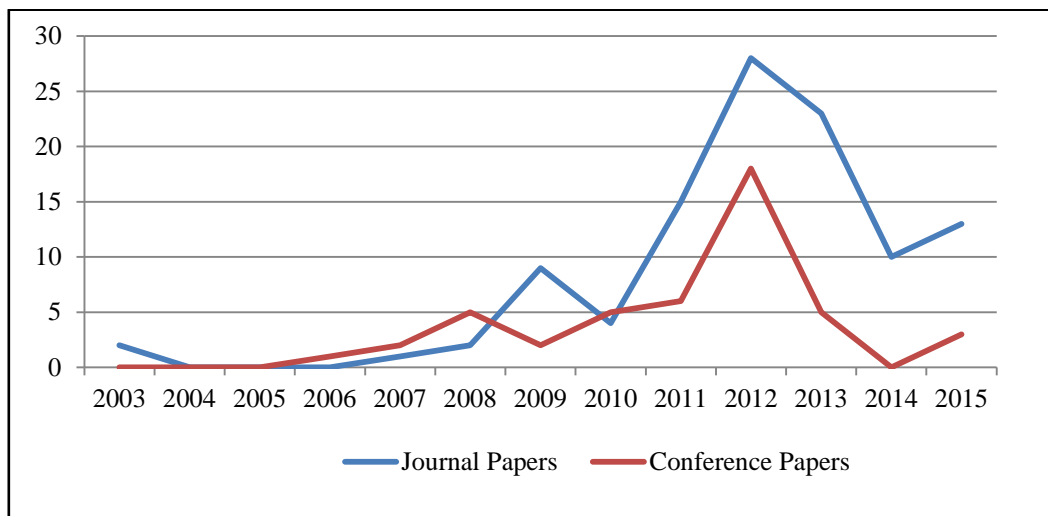


Figure 3-2: Publication distribution of reviewed articles and papers

### **3.7.1 Classification of Themes in the Halal Food Management Literature**

The important aspect that emerges from this review is the generation and classification of research themes. This review resulted in eight distinct research themes. The process was initiated by searching literature with the keywords <Halal> and <Halal food> and delimitating the results to only peer-reviewed journal articles and conference papers published in the main bibliographic databases. The resultant themes are the concepts of halal, halal certification, halal product attributes, consumer awareness of halal, halal marketing, information technology adoption in halal, halal integrity and HFSC management. Figure 3-3 shows the distribution of reviewed papers by research themes.

The result demonstrates that over 19% (30) studies focused on consumer awareness and purchasing behaviour on halal products among the Muslim and non-Muslim consumers. Unfortunately, the research regarding the HFSC remains extremely limited. Over 12% (20) studies were concerned with issues regarding HFSC management and over 13% (21) studies addressed the issue of halal certification. The prior studies discussing the concept of halal, in general, total over 14% (23), becoming the second most popular theme among halal researchers. The details of each theme are discussed further.



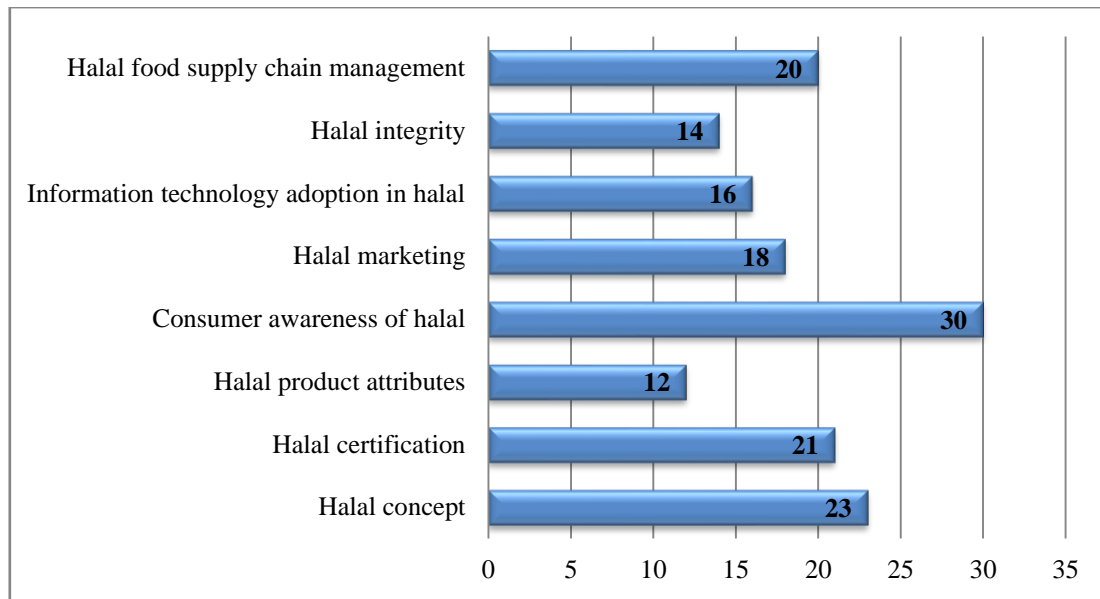


Figure 3-3: Distribution of reviewed articles by research theme

Some of the prior studies discussed the general concept of halal, particularly understanding the parameters of halal and haram. Dollah, Yusoff and Ibrahim (2012) claimed that understanding the halal concept is critical since it is mentioned eight times in the Holy Qur'an. Kamali (2010) and Qureshi et al. (2012) studied the parameters and methods of halal, whereas Khattak et al. (2011) and Malboobi & Malboobi (2012) attached the concept with the role of biotechnology in the food industry as a source of synthetic materials. In fact, halal is an integral element of Toyiyb (wholesomeness) which literally means good, pure, clean, pleasant, delightful, delicious and healthy to the body (Jalil & Musa 2012). Consequently, halal and Tayyib have merged and are referred to as 'Halalan Tayyiban'. Table 3-4 provides a summary of the literature related to the general concept of the halal theme.

Table 3-4: Halal food literature classification by halal concept theme

Research theme	Selected studies
Halal concept	Khattak et al. (2011); Husain et al. (2012); Ruževičius (2012); Qureshi et al. (2012); Kamali (2010); Regenstein, Chaudry & Regenstein (2003); Rahman et al. (2012); Rarick et al. (2011); Omar, Jaafar & Osman (2013); Fadzlillah et al. (2011); Dollah, Yusoff & Ibrahim (2012); Sirajuddin et al. (2013); Hashimi & Salleh (2010); Malboobi & Malboobi (2012)

Several studies in halal food management were conducted regarding halal standards and certification. Halim & Salleh (2012) studied from the perspective of the possibility of developing a uniform halal standard among all members of the Organization of Islamic Countries (OIC). The Malaysian halal standard has been studied extensively to be considered as the global model for halal certification. Research conducted by Zakaria (2008) has highlighted this issue and suggested that the Malaysian halal standard is the most stringent in the world.

Moreover, Daud et al. (2011) investigated the gap between importance and performance factors in the implementation of Standards Malaysia (2009), which is also known as MS1500:2009 in the halal industry. In their research, Shafie & Othman (2006) discussed the issues and challenges faced by marketers when dealing with halal issues. For them, halal should create a “win-win” situation for all parties involved, including the government, public and manufacturers. Few researchers have studied the perceptions and attitudes of manufacturers or owners of the company towards halal certification (Abdul, Ismail & Mustapha 2013; Marzuki, Hall & Ballantine 2012). A summary of these studies is provided in Table 3-5.

Table 3-5: Halal food literature classification by halal certification theme

Research theme	Selected studies
Halal certification	Lam & Alhashmi (2008); Halim & Salleh (2012); Zakaria (2008); Razalli, Yusoff & Roslan (2013); van Spiegel et al. (2012); Razalli, Abdullah & Yusoff (2012); Abdul, Ismail & Mustapha (2013); Daud et al. (2011); Talib, Zailani & Zainuddin (2010); Marzuki, Hall & Ballantine (2012); Rezai, Mohamed & Shamsudin (2011); Ruževičius (2012); Nordin, Noor & Samicho (2012); Nordin et al. (2009); Shafie & Othman (2006); Lam & Alhashmi (2008);

Product attributes are part of the holistic concept of halal and should reflect halal products regarding cleanliness, safety, health and nutrition (Mohamad & Hassan 2011). In the manufacture of halal products, it is imperative that all possible sources of contamination are eliminated, which can be accomplished by ensuring the production lines and equipment used are thoroughly cleansed and sanitized. Quality assurance also reflects the safety and quality of both products and processes (Talib, Ali & Jamaludin 2008). Cleanliness, sanitation and safety of the products are considered to be the foundations of halal food preparation and have been widely discussed in the halal food literature (Bonne & Verbeke 2008; Verbeke et al. 2013; Abdul et al. 2009; Daud et al. 2012; Talib, Zailani & Zainuddin 2010; Kamali 2010; Zainalabidin, Golnaz & Mad 2011). Table 3-6 summarises the studies related to halal product attribute themes.

Table 3-6: Halal food literature classification by halal product attributes theme

Research theme	Selected studies
Halal product attributes	Bonne & Verbeke (2008); Verbeke et al. (2013); Abdul et al. (2009); Daud et al. (2012); Talib, Zailani & Zainuddin (2010); Kamali (2010); Zainalabidin, Golnaz & Mad (2011); Talib, Ali & Jamaludin (2008); Lam & Alhashmi (2008)

Most of the current halal food literature discusses how consumer awareness studies are related to consumer perception of halal products and purchasing behaviour of Muslim and non-Muslim consumers. Examining how Muslim consumers decide to purchase

halal products and analysing Muslim consumer attitudes toward halal food have become a popular topic among researchers in halal studies (Abdul et al. 2009; Ireland & Rajabzadeh 2011; Alam & Sayuti 2011; Mukhtar & Butt 2012; Wan Omar, Muhammad & Omar 2008). Few studies have also investigated the attitude of non-Muslim consumers toward halal products and the extent to which they understand the halal principles being applied in the market (Rezai, Mohamed & Shamsudin 2012; Danesh, Chavosh & Nahavandi 2010). A summary of these studies is provided in Table 3-7.

Table 3-7: Halal food literature classification by consumer awareness of halal theme

Research theme	Selected studies
Consumer awareness of halal	Abdul et al. (2009); Ireland & Rajabzadeh (2011); Ahmed (2008); Alam & Sayuti (2011); Kordnaeij, Askaripoor & Bakhshizadeh (2013); Rahim et al. (2012); Lada, Tanakinjal & Amin (2009); Rezai, Mohamed & Shamsudin (2012); Mukhtar & Butt (2012); Dali et al. (2009); Esfahani & Shahnazari (2013); Hanzae & Ramezani (2011); Marranci (2012); Zainalabidin, Golnaz & Mad (2011); Soesilowati (2010); Nawai et al. (2007); Ambali & Bakar (2012); Salman & Siddiqui (2011); Wan Hassan & Awang (2009); Omar et al. (2012); Halim et al. (2013); Rahman et al. (2011); Borzooei & Asgari (2013); Dali et al. (2007); Nooh et al. (2007); Danesh, Chavosh & Nahavandi (2010); Wan Omar, Muhammad & Omar (2008)

Issues about marketing, such as positioning, branding, packaging and labelling have emerged as one of the important topics for research in halal food management. Placing the product in the mind of consumers, known as positioning, is an important marketing strategy which should be applied when the product is a new entrant on the market. For this reason, determining the right attributes for the halal product will lead towards the successful positioning of the product on the market (Daud et al. 2012). Moreover, Ab Talib & Johan (2012) investigated detailed issues related to halal packaging. They believe that the process of packaging and labelling products must also be considered to create a genuine and wholesome halal product. The same thing applies to halal

branding, in which identifying the factors that can influence customer attitudes and awareness towards the halal brand, particularly regarding food products has been discussed comprehensively in the previous literature (Kordnaeij, Askaripoor & Bakhshizadeh 2013; Wilson & Liu 2010 and Nooh et al. 2007).

Table 3-8: Halal food literature classification by halal marketing theme

Research theme	Selected studies
Halal marketing	Talib & Johan (2012); Daud et al. (2012); Wilson & Liu (2010); Borzooei & Asgari (2013); Ahmed (2008); Kordnaeij, Askaripoor & Bakhshizadeh (2013); Dali et al. (2009); Di Foggia et al. (2011); Ibrahim & Mokhtarudin (2010); Alserhan (2010); Nooh et al. (2007); Rarick et al. (2011); Shaari, Ottot & Kermin (2013)

Some research involves venturing in the development of a halal traceability and tracking system. The reason for establishing a system is to improve halal transparency in the production chain (Zailani et al. 2010). Bahrudin, Ilyas and Desa (2011) claimed that the latest tracking and tracing technology that can tackle most of the related problems, such as tracking, tracing, monitoring, informing and updating data or product status, is a Radio Frequency Identification (RFID) tag. This innovation has been supported by Norman, Md Nasir & Azmi (2008) in their research, in which RFID was found to be the best tracking system to verify the halal brand, trademark or logo on food packaging.

Table 3-9: Halal food literature classification by information technology adoption theme

Research theme	Selected studies
Information Technology adoption	Lam & Alhashmi (2008); Machfud et al. (2011); Bahrudin, Ilyas & Desa (2011); Yang & Bao (2011); Melatu Samsi, Tasnim & Ibrahim (2011); Shafii & Khadijah (2012); Tan, Razalli & Desa (2012); Zailani et al. (2010); Tan, Razalli & Husny (2012); Di Foggia et al. (2011); Fadzlillah et al. (2011); Norman, Md Nasir & Azmi (2008); Yang & Bao (2010); Junaini & Abdullah (2008)

Another major issue in halal food management is halal integrity. Halal integrity becomes the key factor in developing a well-trusted HFSC in the current complex and competitive environment. The authenticity of halal can be achieved if the integrity is constantly monitored. Authentication can be defined as the process by which the verified food has complied with the description provided on the label (Dennies 1998; Nakyinsige, Man & Sazili 2012). The authenticity issue which commonly arises among halal consumers is the need to determine whether the materials involved in halal food products have not been mixed with cheaper non-halal materials (Nakyinsige, Man & Sazili 2012). The literature also discussed issues, such as the lack of control of halal food, the importance of protecting the halal food's authenticity and avoiding halal food adulteration (Mursyidi 2013; Fadzlillah et al. 2011; Verbeke et al. 2013). Authenticity leads to the concept of halal integrity. Bahrudin, Illyas and Desa (2011); Zulfakar, Anuar and Ab Talib (2014); Ali, Tan and Makhbul (2013) have specifically discussed this issue in their research.

Table 3-10: Halal food literature classification by halal integrity theme

Research theme	Selected studies
Halal integrity	Nakyinsige, Man & Sazili (2012); Mohamad & Hassan (2011); Mursyidi (2013); Tieman (2011); Fadzlillah et al. (2011); Zulfakar, Jie & Chan (2012); Bahrudin, Illyas & Desa (2011); Zulfakar, Anuar & Ab Talib (2014); Ali, Tan & Makhbul (2013); Verbeke et al. (2013)

### 3.7.2 Methodology Used in the Halal Food Management Literature

The above-explained procedure yielded into the distribution of research methodology in the halal food management literature. As shown in Figure 3-4, five types of research methods were investigated, and it is not surprising that most the articles and papers used a review of the literature (39%) in describing various issues in halal food management. The second most commonly used method is quantitative. Approximately 24% and 28%

of the reviewed papers were applied case study and quantitative methods, respectively. Out of 39 studies in the quantitative method category, 30 studies (over 75%) used either descriptive statistics or simple regression (see Figure 3-5). Only five studies applied more rigorous statistical methods, such as CB-Structural Equation Modelling and PLS-Structural Equation Modelling.

In quantitative research, using rigorous statistical methods to analyse the data and generate an output become the main concern. The result contrasts with the trend in the research of halal food management, in which using rigorous analysis is under-utilized. This can be explained by the fact that most of the research in halal food management has applied less rigorous statistical methods and were not empirically applied using a holistic model.

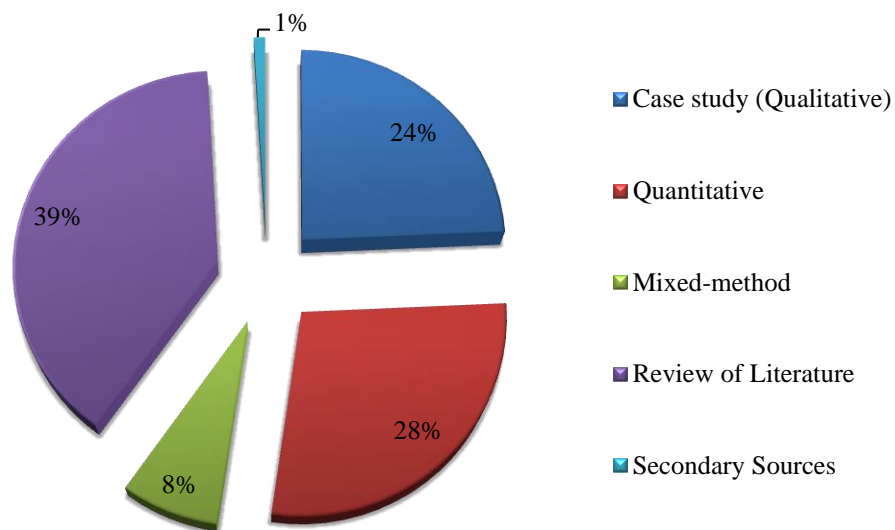


Figure 3-4: Distribution of research methods applied in articles and proceedings

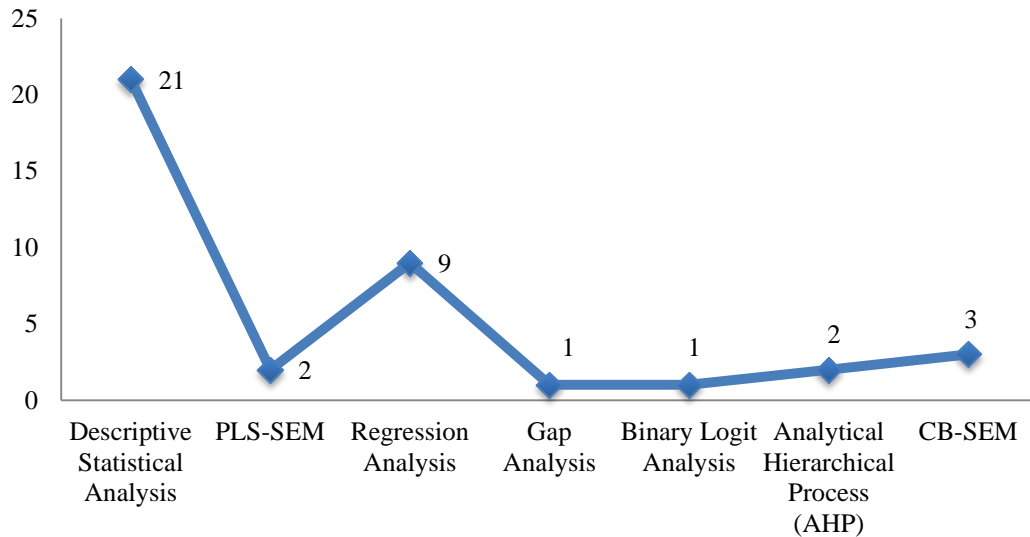


Figure 3-5: Type of quantitative analytical tools used in reviewed articles and proceedings

Based on the above discussion, the research in halal food management in general and the HFSC in particular, is relatively new. Most prior research was not conducted comprehensively or in holistic manner. Lack of using rigorous methodology and/or more comprehensive analysis has supported the argument that there is a clear gap that needs to be filled in. For this reason, doing more comprehensive study on halal food supply chain is needed. Therefore, this study is relevant to be conducted. The preceding section describes the key dimensions of HFSC implementation.

### 3.8 Dimensions of HFSC Implementation

From the systematic publications reviewed on halal definitions, halal food management and general food chain, eleven dimensions were identified to define the halal food supply chain implementation model. These dimensions are comprised of physical segregation, training and personnel, storage and transport, ethical practices, packaging and labelling, material handlings, innovative capability, cleanliness, safety, Islamic dietary law and resource availability.



### **3.8.1 Physical Segregation**

The process is one of the categories in operation strategy (Slack, Chambers & Johnston 2010). During the manufacture of halal products, it is imperative that all possible sources of contamination are eliminated during the production lines (Riaz & Chaudry 2004). Physical segregation means that halal foods should not be in direct contact or mixed with other non-halal products or elements during the supply chain process to preserve its halal status. Halal food products, particularly those without proper packaging, are very vulnerable and have the highest risk of contamination if it is not handled separately during production, transportation and storage activities. Previous studies (Tieman 2013; Talib, Ali & Jamaludin 2008; Lodhi 2009), as well as various halal standards have repeatedly pointed out the need to physically segregate halal products to prevent any intentionally or unintentionally, direct contact with elements that can defeat the halal status.

Food products manufactured for Muslim consumers must comply with halal criteria. These entail the nature, origin and processing methods of the food products (Bonne & Verbeke 2008; van der Spiegel et al. 2012). For Muslim consumers, trust in halal meat and food relates to the process attributes and how it is processed. During the processing stage (e.g., storage and display), halal products must be physically segregated from non-halal ones to prevent cross contamination (Nakyinsige, Man & Sazili 2012). Thus, the manufactured products should be free of contamination and should not come into contact with non-halal substances during its preparation, production and storage. To facilitate halal food segregation, Lodhi (2009) and Khan (2009) highlighted the need for dedicated infrastructure to transport, store and market halal products. Dedicated

infrastructure, such as transport, warehouses, storage places and handling equipment, minimise the possibility of halal products being mixed with non-halal products.

### **3.8.2 Training and Personnel**

According to Mondy and Mondy (2012), training is one of the functions in personnel and human resource development. The personnel must pursue additional training to improve current skills and develop new ones with the assumption that training leads to a higher standard of living and a better job. Training for workers is crucial to lead them to achieve high-level skills and productivity, which contribute to developing a quality workforce.

The emergence of the halal food industry becomes more important as the demand for halal food products continues to rise. To develop a sustainable pool of knowledgeable workers and professionals in the halal industry, training is required, and management should be able to ensure everyone is well-trained (Tieman, van der Vorst & Ghazali 2012). In Standards Malaysia (2009), it was stated that personnel should be trained in halal to ensure compliance with the Sharia principles. The organisations that implementing the halal food supply chain must ensure that the workers are aware and understand the halal requirements to minimise the probabilities of human error in the production of halal food products. According to Pahim, Jemali and Mohamad (2012), the need for training in the halal industry, specifically in halal logistics, is vital to ensure that consumers experience a complete halal supply chain. Furthermore, training in the halal food industry is vital to ensure that integrity is delivered throughout the supply chain and to keep pace with the global demand for halal food products. It can be

supported by Gowen and Tallon (2003), which indicates that training plays a major role in the success of supply chain practices.

Some studies were conducted to underline the importance for the need of knowledgeable and well-trained employees in halal food productions, such as pre-slaughter, slaughtering, processing and preparation, procurement, packaging, storage, transportation, and tracking and tracing (Riaz & Chaudry 2004; Soong 2007; Shafii & Khadijah 2012; Samsi, Ibrahim & Tasnim 2012). In addition, Riaz and Chaudry (2004) mentioned that it is important that Muslim employees act in a supervisory role, ensure no livestock is tortured (stunned) and only proper tools (such as sharp knives) and techniques are used. Thus, to have an effective HFSC implementation, the personnel must be trained and equipped with the skills and knowledge of the Islamic guidelines and principles towards the halal concept.

### **3.8.3 Storage and Transport**

Transportation and storage for halal foods requires special attention in the modern food supply chain (Lodhi 2009). According to Standards Malaysia (2009), all halal food that is stored, transported, displayed, sold and served shall be categorised and segregated at every stage to prevent from being contaminated with products that are non-halal. Riaz and Chaudry (2004) deemed transportation, storage, and distribution activities to be the most crucial components in maintaining the halal food integrity. Warehousing or storage is used as a storage area and switching facility. Proper storage could preserve the quality of the halal food products (Omar, Jaafar & Osman 2013). For example, the strength of fresh meat storage will have a significant impact on the quality and safety of the meat (Bonne & Verbeke 2008). Tieman, van der Vorst and Che Ghazali (2012)

emphasise that halal products should have a dedicated storage zone or racks, and there should be no mixing of halal and non-halal products in the same cold room.

The importance of separate transportation to minimise potential cross-contamination is stressed by Tieman (2013). There should be no mixing of halal and non-halal bulk products, on one pallet or load carrier and refrigerated container (Tieman, van der Vorst & Che Ghazali 2012). There should be no mixing between halal and non-halal goods on a load carrier or in a common vehicle (Ngah & Zainuddin 2012) and they must be kept separately in storage during transportation and distribution to prevent contamination (Tieman 2011; Zailani et al. 2015). Hence, dedicated storage and transport are significantly important in halal food supply chain implementation.

#### **3.8.4 Ethical Practices**

The development of halal products must be ethical and thus, consistent with the Sharia principles. The ethical features consist of: being environmentally friendly, considering animals' welfare; having an organic character; respectful of Islamic financing and possess fair trade attributes (Mohamad & Hassan 2011). Al-Qaradawi (2007) emphasised the principle of permissibility, in which it is not only limited to the things and objects being used, but also includes all human actions and behaviours. Additionally, having ethical producers who are practically involved in fair trade and socially responsible within the entire production chain constitute a major concern in the halal industry (Sungkar 2010). In practice, a sale transaction is to be regarded as legal if it is made through the mutual consent of the parties concerned, whereby taking advantage and charging high prices are forms of exploitation and are forbidden in Islam (Mohammed 2013). Additionally, manufacturers are not allowed to use harmful

ingredients or engage in unethical conduct that may undermine consumers. Thus, the ethical practices can positively define the HFSC implementation.

### **3.8.5 Packaging and Labelling**

Food packaging and labelling are crucial stages in the HFSC. Islamic practices require honest trading of food products and proper labelling. The process of packaging and labelling products must also be considered to create a genuine and wholesome halal product (Ab Talib & Mohd Johan 2012). In food labelling, disguising any facts, such as the source of the ingredients is prohibited in Islamic jurisprudence (Lodhi 2009). The information provided in halal food products must be accurate and require complete sources of all ingredients, including incidental or hidden ingredients that may affect the halal status of the product. Furthermore, the authorised certification logo and organisation contact details must be visible.

Packaging can be defined as all products made of any material of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from the raw materials to processed goods and from the producer to the consumer (Prendergast 1995). Therefore, packaging should be used to contain, preserve and provide physical protection to the final goods. There are many issues related to the packaging of halal food products (Ab Talib & Mohd Johan 2012), and one of the issues is the packaging material. Packaging material and containers are essential to keep the product safe and presentable. Food packaging must not be made from non-halal substances and if it is made from the raw material of animal origin, then it requires proper halal certification (Soong 2007). Unclassified animal-origin sources may turn the stored food into *mashbooh* or questionable due to cross contamination (Lodhi 2009). In fact, handling of

packaged halal food products should not be mixed with those used for non-halal products (Talib, Zailani & Zainuddin 2010).

### **3.8.6 Material Handlings**

Jaafar et al. (2011) suggested that halal food products require different procedures for handling, storage and product management. All equipment used for all unit operations should be solely dedicated to halal production (Nakyinsige et al. 2012). Dedicated equipment and facilities used for non-halal products cannot be used for halal products. In other words, devices, utensils, machines and processing aids used for the processing of halal food should be designed and constructed only for halal food (Standards Malaysia 2009). If the equipment and machines were previously used or in contact with prohibited najis, it must be washed and ritually cleansed as required by Sharia law. Therefore, it is important for the manufacturers to provide dedicated equipment to ensure the halal status of the food product is truly delivered.

### **3.8.7 Innovative Capability**

Innovation is a new way of doing something or “new stuff that is made useful” (McKeown 2008). From an organisational perspective, innovation refers to the successful implementation of creative ideas within the organisation (Amabile et al. 1996). Innovation also can be linked to performance and growth through improvements in efficiency, productivity, quality, competitive positioning and market share (Guan & Ma 2003; Chen & Paulraj 2004). An organisation with a strong innovation tends to possess distinctive competencies and views (Quintana-García & Benavides-Velasco 2005).

An organisation with limited tangible resources that wants to pursue supply chain management strategies might need a strong, innovative capability if they want to pursue new opportunities in complex and risky markets (Hsu et al. 2011). The capability to innovate should be part of the management since it is among the most important factors influencing organisational performance. The innovative capability is considered critical to an organisation achieving strategic competitiveness (Conner 1991). Furthermore, improvement in innovative capability dimensions can increase the export growth in the manufacturing industry (Guan & Ma 2003).

In the context of the halal food industry, management must be involved in innovation, such as venturing in the development of a halal traceability and tracking system. These can be established for improving halal transparency in the production chain (Zailani et al. 2010). Technological innovation in the organisations can shape a better brand image and enhance the competitive ability of the halal products in halal markets. This was proven from the study by Yang and Bao (2011), which used the integrated application of the RFID, EAN/UCC-128 bar code, Pdf417 2-D barcode, GSM technology and Internet technology to trace the halal quality of the beef products and to establish a critical information database for the quality of halal beef products'. Therefore, improvement of innovation capability in the halal food industry is important in the period of rapid technological changes and a highly competitive market.

### **3.8.8 Cleanliness**

Cleanliness is one of the important aspects that must exist in a life of human being. It can be defined as the state of being clean, or the acts of keeping things clean (Cambridge Dictionaries Online). Islamic teachings have emphasised the concept of

cleanliness not only in terms of clothing, building and its surrounding area (Abdul Rahim 2005) but also in food (Riaz & Chaudry 2004). The wholesome concept of purity and cleanliness is one of the most important values that must be practiced to form a healthy and dynamic community, as well as the environment. In addition, the important concept of cleanliness and purification is also stressed in the Quran as:

*“...who purifies it prospers, and he who corrupts it is ruined”.*

(Surah Al-Shams: 9-10)

*“Truly, Allah loves those who turn to Him constantly and He loves those who keep themselves pure and clean”.*

(Surah Al-Baqarah: 2-222)

Focusing on cleanliness is one part of halal as a holistic concept and it should apply to halal food manufacturing, from the farm to the table (Mohamad & Hassan 2011; Hanzae & Ramezani 2011). Cleanliness and sanitation of the products are considered to be the foundations of halal food preparation, which should be in line with the halalan toyyiban concept. In handling halal foods, the premises and food preparation process must be kept clean and free of elements which may cause infestation or flies, rats, cockroaches, lizards and other such pests (Shafie & Othman 2006). Equipment must frequently be washed and proper cleaning must also be performed through the production lines to ensure all possible sources of contamination are eliminated (Riaz & Chaudry 2004).

According to the ICCI-IHI Alliance Halal Standard (2010), in halal food production, the organisation shall ensure that the spillage of najas or non-halal elements is cleaned according to: i) ritual cleansing standards for severe najas; and ii) existing hygiene



standards for medium najis. Furthermore, the organisation must establish a comprehensive and standard cleaning program for its premise (e.g., Hazards Analysis Critical Control Point (HACCP), Good Hygiene Practices (GHP), or other programs specified by ISO 22000:2005). The organisation shall also use food grade cleaning chemicals for cleaning usage and disposed of the contaminated prepared food based on local disposal regulations and Sharia requirements.

Proper food hygiene results in healthy, clean and wholesome food (Amjadi & Hussain 2005). This is in line with the concept of halal food which physically needs to be clean, safe to consume, healthy and nutritional. Thus, it is suggested that cleanliness should be applied throughout the food supply chain process from primary production through to the final stage for consumption.

### **3.8.9 Safety**

Food safety is of prime importance to consumers and professionals in the food sector (Badrie et al. 2006). Safety becomes a major concern and criteria of choice since consumers are faced with a wide range of competitively priced food products. For this reason, every food product must be safe to consume, as well as taste good and be aesthetically pleasing (Wilcock et al. 2004). Recently, issues of foodborne illness have increased globally and international food trade is disrupted over food safety and quality requirements frequent disputes (Aung & Chang 2014). In fact, unsafe food could cause many severe life-long diseases, ranging from diarrhoeal diseases to various forms of cancer (Aung & Chang 2014).

Food safety can be defined as an assurance that a food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use (CAC 2003). Wilcock et al. (2004) describe food safety as potential undesirable residues in foods which range from natural to environmental contaminants to agrochemicals, veterinary drugs, growth promoters and packaging components. Therefore, food safety refers to the process of avoiding contaminated food or all hazards that may make food harmful to the health of the consumer. The issues are not negotiable since it can make affected people suffer from diseases. The implication of food safety is not only for the people consuming it, but also imposes severe economic burdens on a nation, such as the rejection of foods by importing countries (Shears, Zollers & Hurd 2001). De Jonge et al. (2008) mentioned that successive food incidents can place consumer confidence and trust in the safety of food under pressure.

In the context of halal food products, the growth of the international halal food trade has increased the issues regarding the environmental impact of the HFSC. One of the problems concerning food safety across many countries in the world is food spoilage. According to Aung and Chang (2014), food spoilage is wasteful, costly and can affect trade and consumer confidence. Most of the foods are perishable and have limited shelf life and thus, require safe and minimal contamination during manufacturing, and rapid chilling and temperature control along the supply chain (Martin & Ronan 2000). Failure to do this can cause microbial growth and spoilage of food, which lead to foodborne illness. Halal food manufacturers should focus both on Islamic processing techniques, as well as the safety and quality of both products and processes (Talib, Ali & Jamaludin 2008).

Food safety hazards may occur at a variety of points throughout the food chain. The same process is applied to halal food manufacturing, in which safety elements must be focused at every control point during primary processing. Hence, food safety is a responsibility shared by all supply chain members, from manufacturers, processors, distributors, retailers or consumers.

### **3.8.10 Islamic Dietary Law**

Religion plays a major role in people's lives through shaping their beliefs, knowledge, attitudes and even food habits (Ireland & Rajabzadeh 2011; Kordnaeij, Askaripoor & Bakhshizadeh 2013; Wilson & Liu 2010). Riaz and Chaudry (2004) reasoned that Islam is a way of life and not merely a religion of rituals, but rather rules and manners governing the life of the individual Muslim. One of the important aspects of Muslim life is food and dietary code. For a Muslim, the basic guidance for laws concerning food are revealed in the Holy Quran (the divine book), as well as explained and recorded in the Hadith (the compilation of the traditions of the Prophet Muhammad) (Bonne & Verbeke 2008); these constitute the two major sources of Islamic dietary law.

According to Islamic dietary law, all food products are permitted except those that are forbidden, such as alcohol, pork, blood, meat from cadavers, and meat of animals that have not been slaughtered according to Shari'ah law (Riaz & Chaudry 2004; van der Spiegel et al. 2012). A Muslim who adheres to the Islamic dietary law is a symbol of faith towards his or her religion, and they should avoid foods that do not meet their dietary standards (Riaz & Chaudry 2004; Bon & Hussain 2010). Muslims believe that eating halal foods is good for physical health and spiritual development, since it fulfils

God's commandment. For this reason, HFSC implementation should follow the Islamic dietary law to ensure that the activities are in line with the Sharia principles.

### **3.8.11 Resource Availability**

Resources refer to the firm's strategic assets, which include brand name, superior channel access, a favourable cost structure, technological capability, R&D capability, reputation and patents (Oliver 1997). Thus, resources can also be defined as the input into the production process, which include capital equipment, skills of individual employees, patents and brand names (Grant 1991, p.118). Resources may be acquired in a simple state and combined by the firm in distinctive combinations that are not easily traded (Mathews 2006).

In the halal food industry, management must ensure the availability of resources, such as the workforce, infrastructure, machinery and equipment and financial capital before halal production is fully operational (Standards Malaysia 2009). It is important for the organisation to provide and maintain the infrastructure needed to achieve conformity to product requirements, which includes: (i) buildings, workspace, prayer room, ablution facilities and other associated utilities for Muslims; (ii) hardware and software equipment; (iii) supporting services, and; (iv) the eateries within the premise of the organisation shall provide halal foods and beverages. Non-halal foods and beverages (if any) shall be segregated accordingly. Furthermore, the organisation should ensure all the resources used in organisational activities are obtained from halal sources. Regarding manpower, management is required to appoint a member of the organisation's management as the Sharia compliance officer (Standards Malaysia 2014). This is important to ensure the smooth running of the halal business. Therefore,

resource availability can be considered as one of the dimensions of the HFSC implementation model.

Based on this conceptualisation of the HFSC implementation model as having the dimensions of cleanliness, safety, Islamic dietary law, physical segregation, material handlings, storage and transport, packaging and labelling, ethical practices, training and personnel, resource availability and innovative capability, the following hypotheses is proposed:

*H<sub>1a-k</sub>: Halal food supply chain implementation is positively defined by (a) cleanliness, (b) safety, (c) Islamic dietary law, (d) physical segregation, (e) material handlings, (f) storage and transport, (g) packaging and labelling, (h) ethical practices, (i) training and personnel, (j) innovative capability and (k) resource availability.*

### **3.9 Organisational Performance**

Organisational performance refers to how well a firm achieves its non-financial goals (e.g., market share, new product introduction, product quality, marketing effectiveness, manufacturing value-added and other measures of technological efficiency), as well as its financial goals (Yamin, Gunasekaran & Mavondo 1999). The purpose of measuring organisational performance is to identify success and whether the customers' needs are being met, reveal the weaknesses in the organisation's business process, remove any bottlenecks and ensure that the decisions are based on facts and lead to solid improvements. Numerous studies have suggested that SCM is a key driver of firm performance (Kannan & Tan 2005; Ou et al. 2010).

Continuously striving for the competitive advantage has led organisations to structurally prepare themselves at the global level. Managers must now begin to develop the knowledge, skills and necessary strategies from the supply chain level to compete with other rivals in the market (Green & Inman\* 2005). The ability of organisations to succeed in competitive markets is primarily caused by their internal capabilities and competences (Barney 1995; Hsu et al. 2011). Based on prior literature, SCM has been recognised as a powerful tool for enhancing the relationship between suppliers and customers; therefore, improving customer satisfaction, and firm performance is essential (Ou et al. 2010). The effects of SCM on improving the organisation performance in manufacturing industries have been extensively documented (Li et al. 2006) and widely considered to be an effective management tool to maintain business stability, growth and prosperity.

To date, no studies have been performed on the relationships between HFSC implementation and organisational performance. Interestingly, Talib, Zailani & Zainuddin (2010) emphasise that halal-oriented business should be considered a new business paradigm, and the companies that adopt this concept as a long-term strategy will enjoy better business performance. The focus of halal food management has shifted from an organisation-centred perspective to a supply chain perspective. Since halal food has become a global issue; the management of the halal food supply chain has become an integral part of the halal food business.

The impact on organisational performance has been widely discussed in the context of green supply chain management, green logistic management, entrepreneurial supply chain management and the just-in-time selling strategy (Green & Inman\* 2005; Mitra &

Datta 2014; Lai & Wong 2012; Hsu et al. 2011). However, no clear relationship has been discussed between HFSC implementation and organisation performance in the literature. By defining and focusing on the dimensions of HFSC implementation, this study expects that it will have an impact on the organisational performance.

In this study, the research aims to examine two performance variables, marketing performance and financial performance, of which have been the dominant model in empirical strategy research. The typical indicators that will be adapted to measure marketing and financial performance include sales growth, market share, product development, market development, profitability and return on investment (ROI) (Li et al. 2006; Green & Inman\* 2005; Wu et al. 2006; Yamin, Gunasekaran & Mavondo 1999; Shi & Yu 2013). These measures have been widely used in previous research because they are the primary yardsticks for most stakeholders (Chen & Paulraj 2004; Flynn et al. 2010). Therefore, it can be hypothesised that HFSC implementation is positively related to an organisation's marketing performance and financial performance:

*H<sub>2</sub>: Halal food supply chain implementation is positively related to an organisation's marketing performance.*

*H<sub>3</sub>: Halal food supply chain implementation is positively related to an organisation's financial performance.*

Researchers have emphasised the importance of customer and market performance for superior financial performance (Hooley et al. 2005). Kosan (2014) suggests that marketing may influence changes in the market share and sales, which can positively lead to an increase in profit. In addition, marketing capabilities help an organisation

build and maintain a long-term relationship with customers and channel members (Song, Di Benedetto & Nason 2007), as well as create a strong brand image that allows the organisation to achieve superior firm performance (Ruiz-Ortega & García-Villaverde 2008). Improving marketing performance measures, such as market share, customer satisfaction, brand equity, product differentiation and innovation have an impact on financial performance (Kosan 2014). There also has been little research that empirically demonstrates the relationship between brand image, equity and financial performance (Park & Srinivasan 1994; Aaker 1996; Kim, Kim & 2003). Hence, it can be hypothesised as:

*H<sub>4</sub>: An organisation's marketing performance is positively related to organisation's financial performance.*

### **3.10 Proposed Conceptual Framework**

Based on the research constructs and underpinning theories of previous studies, a high-level conceptual framework has been developed and presented in Figure 3-6. This study intends to investigate the relationship between HFSC implementation and organisational performance.



Figure 3-6: Higher level conceptual framework

The details of the framework are presented in Figure 3-7. Eleven dimensions were identified to define HFSC implementation as a second-order construct. Cleanliness, safety, Islamic dietary law, physical segregation, material handlings, storage and



transports, packaging and labelling, ethical practices, training and personnel, resource availability and innovative capability are the identified dimensions. Next, the model investigates the relationship between HFSC implementation and organisational performance, specifically regarding marketing and financial performance. The final relationship is to examine whether marketing performance positively affects financial performance.

### **3.11 Summary**

This chapter discussed a literature review related to the evolution of the HFSC and identified the dimensions of the HFSC implementation model. Based on the extensive literature review and theoretical foundation of CT, we propose a conceptual model with 11 dimensions: cleanliness, safety, Islamic dietary law, physical segregation, material handlings, storage and transport, packaging and labelling, ethical practices, training and personnel, innovative capability and resource availability. These dimensions are proposed to define HFSC implementation as a second-order construct.

This chapter also discusses the establishment of the research hypotheses. Four hypotheses were posited related to confirming the dimensions of the HFSC implementation model and testing the relationship between the HFSC implementation model and organisational performance. All the hypotheses will be tested using data derived from halal certified organisations in Malaysia. The next chapter will discuss the details of instrument development and implementation.

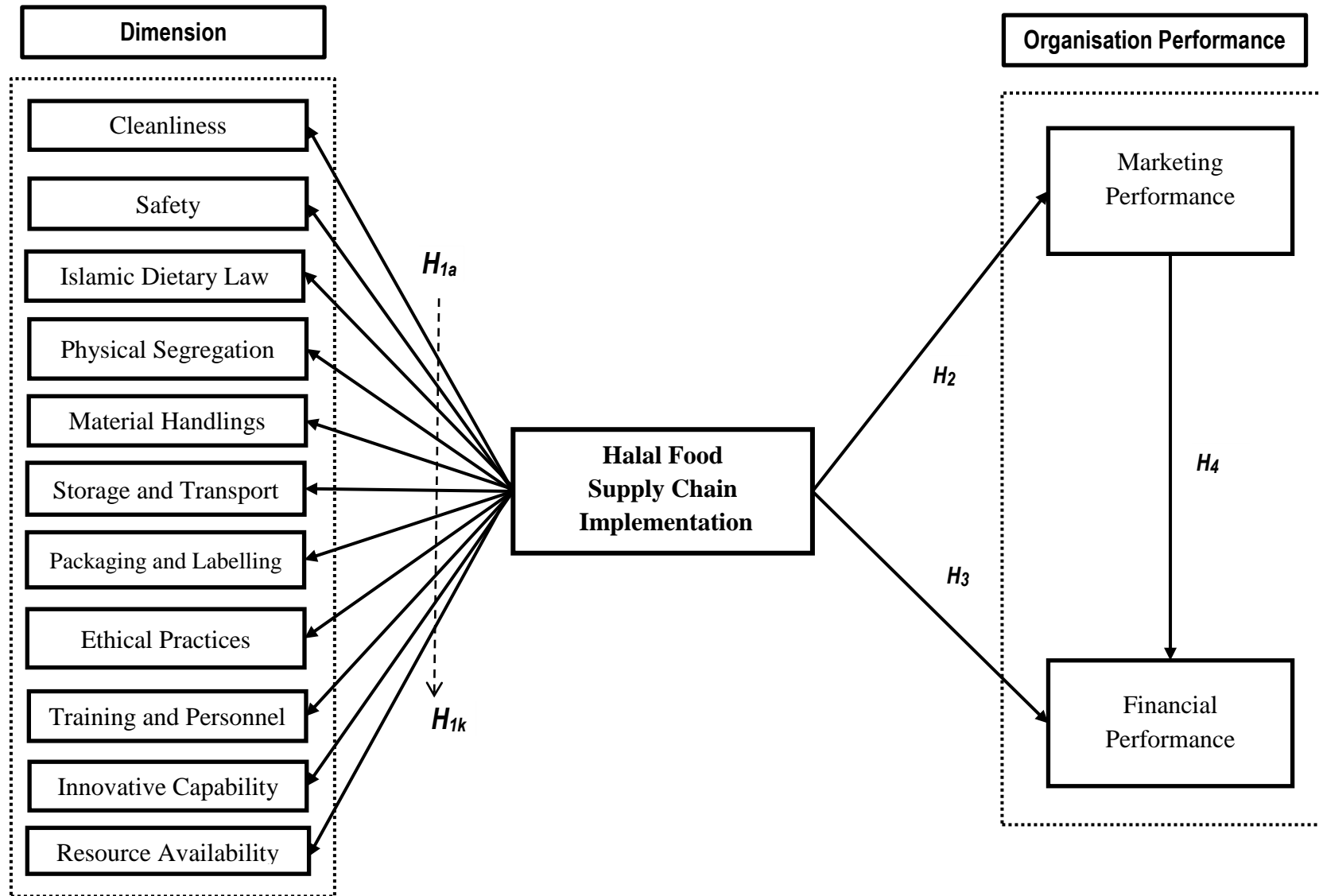


Figure 3-7: A proposed conceptual model of HFSC implementation

## **CHAPTER 4**

### **RESEARCH METHODOLOGY: INSTRUMENT DEVELOPMENT AND IMPLEMENTATION**

#### **4.1 Introduction**

This chapter presents the methodology focusing on the instrument development and implementation to examine the conceptual model proposed in Chapter 3. The chapter begins with an overview of the research paradigm. The next section explains the research design and stages employed in this research. A quantitative research technique using a survey questionnaire was employed to investigate the conceptual framework and hypotheses. This is followed by a description of the process used to design the research instrument. Section 4.6 and 4.10 explains the population, sampling, unit of analysis, time horizon and instrument testing. The following two sections (4.11 and 4.12) deliberate the topics of exploratory factor analysis (EFA) and main survey. Section 4.13 presents the ethical issues that were considered in this study. Finally, section 4.14 provides a summary of the chapter.

#### **4.2 Research Paradigm**

The design of a research study always begins with selecting a topic and research paradigm (Creswell 2013). Research paradigms can be viewed from many sources. Bryman and Bell (2007) viewed a paradigm or philosophy as the significant justification for pursuing a basic understanding of a particular topic. In brief, a paradigm can be regarded as the “basic belief system or worldview that guides the investigator” (Guba & Lincoln, 1994, p. 105). The classic definition of a research paradigm is given by Kuhn (1970), who stated that a research paradigm is the set of common beliefs and

agreements shared between scientists about how problems should be understood and addressed.

In addition, Guba (1990) emphasised that research paradigms can be characterised through their ontology, epistemology and methodology. Technically, ontology is “reality”, epistemology is the relationship between that reality and the researcher, and methodology is the technique used by the researcher to discover that reality. More importantly, ontology and epistemology guides the researcher to create a holistic outlook of how knowledge is viewed and which suitable approach can be used to acquire that knowledge and the right methodological strategies that can be used to discover the knowledge. The relationship between them can be illustrated in the Figure 4-1 below.

<b>Ontology</b>	<b>Epistemology</b>	<b>Theoretical perspective</b>	<b>Methodology</b>	<b>Methods</b>	<b>Sources</b>
<b>What is reality?</b>	What and how can I know reality/ knowledge?	What approach can we use to acquire knowledge?	What procedure can we use to acquire knowledge?	What analytical tools can we use to acquire knowledge?	What data can we collect?

*Source: Hay (2002), Crotty (1998) and Patel (2015)*

Figure 4-1: The linkages between ontology, epistemology and methodology

To determine the best or most appropriate research paradigms and approaches to undertake in this study, prior relevant research paradigms were examined. The purpose is to check which research group or research behaviour this study belongs to. For this reason, the relevant research paradigms based on the elements of ontology, epistemology and common methodologies were addressed. Four research paradigms

were tabulated to show the difference among them as proposed by Sobh and Perry (2006). Considering the information given, this study can be categorised under the positivist approach.

Table 4-1: Four research paradigms

Element	Paradigm			
	Positivism	Constructivism	Critical Theory	Realism
Ontology	Reality is real and Apprehensible	Multiple local and Specific “constructed” realities	“Virtual” reality shaped by social, economic, ethnic, political, cultural, and gender values, crystallized over time	Reality is “real” but only imperfectly and probabilistically apprehensible and so triangulation from many sources is required to try to know it
Epistemology	Findings true – researcher is objective by viewing reality through a “one-way mirror”	Created findings – researcher is a “passionate participant” within the world being investigated	Value mediated findings – researcher is a “transformative intellectual” who changes the social world within which participants live	Findings probably true – researcher is value-aware and needs to triangulate any perceptions he or she is collecting
Common methodologies	Mostly concerns with a testing of theory. Thus mainly quantitative methods such as: survey, experiments, and verification of hypotheses	In-depth unstructured interviews, participant observation, action research, and grounded theory research	Action research and participant observation	Mainly qualitative methods such as case studies and convergent interviews

Source: Sobh & Perry (2006)

The positivist paradigm has been defined by many scholars over several decades. Burrell and Morgan (1979) and Hirschheim (1985) define it as an epistemology which seeks to explain and predict what happens in the social world by searching for

regularities and causal relationships between its constituent elements. A positivist approach implies that a researcher begins with a general cause and effect relationship that he or she developed based on the relevant causal law in general theory. The positivist paradigm assumes that the social world can be studied in the same way as the natural world, and it aims to test a theory or describe an experience (O’Leary 2004). Positivism predominates in science, including the social sciences, and assumes that science quantitatively measures independent facts about a single apprehensible reality (Healy & Perry 2000). Therefore, the data and its analysis are value-free, and data do not change because they are being observed. Methodologically, all research under the positivist paradigm should be quantitative and the methods include surveys, trials, experiments and verification of hypotheses. Rigorous analysis is employed in such studies and research hypotheses are carefully tested through analysing the data set. Table 4-2 summarise the elements of the positivist approach.

Table 4-2: General elements of the positivist approach

<b>Element</b>	<b>Description</b>
Methodological	All research should be quantitative, and that only research which is quantitative can be the basis for valid generalisations and laws
Value-freedom	The choice of what to study, and how to study it, should be determined by objective criteria rather than by human beliefs and interests
Causality	The aim should be to identify causal explanations and fundamental laws that explain human behaviour
Operationalization	Concepts need to be operationalized in a way that enable facts to be measured quantitatively
Independence	The role of the researcher is independent of the subject being investigated
Reductionism	Problems are better understood if they are reduced to the simplest possible elements

*Source: Crossan (2003)*

#### **4.2.1 Justification of Paradigm Choice**

This study was conducted based on the positivist approach and employed quantitative methodology. It can be justified according to a few reasons. Firstly, the current study seeks to develop and validate a theoretical model comprising testable hypotheses. This study applied the scientific method which is the foundation of positivist research strategies. Orlikowski and Baroudi (1991) viewed a study as positivist when evidence emerges from formal propositions, quantifiable measures of variables, and hypotheses testing inferences about a phenomenon or subject from the sample to a stated population. This method allows researchers to test their hypotheses based on objective measures, and in turn, leads to support for their findings (Wicks & Freeman 1998). The other advantage of applying the scientific method is when a quantitative approach entails the verification of hypotheses, providing strong reliability and validity (Amaratunga et al. 2002; Cavana, Delahaye & Sekaran 2001).

Secondly, the positivist assumption stresses that concepts must be operationalized in such a way that enables facts to be measured quantitatively (Crossan 2003). In this study, the variables (phenomenon) being investigated are the dimensions of HFSC implementation and organisational performance. Therefore, it is vital to conduct a survey involving key personnel. Consequently, this study employs a questionnaire instrument to quantify the measurement of variables, and uses rigorous statistical methods to test predetermined hypotheses concerning relationships between variables. In detail, model validation at the measurement and structural model level requires the following: assessing construct validity and reliability at measurement and structural model levels by using a structural equation modelling (SEM) technique. The

researcher's role is to interpret the analysis results against the hypotheses and ensure that the data is not misrepresented.

Finally, in the positivist assumption, the role of researcher is to be independent when a topic or subject is being examined. The researcher and reality are separate and the results should be replicable regardless of who conducts the investigation; the replication of the results is mainly for verification purposes (Creswell, 2009). Consequently, this study uses the positivist approach since it offers a new opportunity to specifically identify the critical dimensions of the HFSC implementation model and how this model impacts on organisational performance in Malaysia.

### **4.3 Research Design**

This study adopted a deductive approach with quantitative approach as the methodology to investigate the critical dimensions of HFSC implementation and their impact on the organisational performance in Malaysia's halal processed food and beverage industry sector. The use of this methodology is in alignment with the research operationalisation based on positivist assumptions. The study employed a sequential exploratory research design, which is characterised by extensive literature review, quantitative data collection, data analysis and thesis writing. Figure 4-2 illustrates the relevant information required at each stage of the research design.

At the first stage of the research design, an exploratory study was conducted with an extensive review of the literature as the primary method. The exploratory study reviewed all relevant existing models and collected information from prior studies concerning the dimensions of HFSC implementation, HFSC theoretical models, and



organisational performance (i.e., marketing and financial performance). The investigation into the dimensions of HFSC implementation are focused on cleanliness, safety, Islamic dietary law, physical segregation, material handlings, storage and transports, packaging and labelling, ethical practices, training and personnel, resource availability and innovative capability. The results from the literature review assisted the researcher in developing a conceptual model, and formulating the overarching research objectives, research questions and hypotheses. The variables chosen in the model were operationalised and referred to in the development of research instruments. A pool of new items was developed to measure HFSC implementation, and the new items were sorted and modified in an interpretive process by the researchers. Next, the items were categorised according to the underlying dimensions in the questionnaire.

The second stage involved data collection which consisted of four sequential activities: pre-test, pilot test, refinement of research instruments and the main survey. Pre-test and pilot tests were carried out before the main survey to ensure the best research measures were developed and applied. The results generated from these two activities were used to refine the measurement items in the questionnaire, particularly regarding content validity and reliability. A main survey was undertaken after the questionnaire's refinement was completed; this study utilised a main survey and cross-sectional data to test the proposed conceptual model and hypotheses. The required sample number was derived from the need to perform structural equation modelling (SEM) and was based on the sampling method used.

The third stage involved processing and examining the collected data using statistical methods. The collected data were screened to check whether they had been correctly

entered, that there were no missing values or free outliers, and to confirm that the distribution of the variables was normal. Moreover, the objective of handling of all screening activities is to avoid failure of the model estimation and crashing of the fitting programs (Kline 2005). At this stage, the cleaned data will go through the statistical analysis process, specifically exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and covariance-based structural equation modelling (SEM). The data were evaluated for completeness of responses, confirmation of the proposed conceptual model and that the results were within the acceptable range.

Drawing upon the existing literature of the HFSC, a conceptual model was developed to answer the research questions. Based on prior studies, the methods used to conduct research should be in line with the research questions (Punch 2003; Cooper & Schindler 2008). Thus, it is significant that the quantitative approach and specifically the survey method employed in this thesis. The final stage pertains to thesis writing, which focuses on interpreting results and reporting in an academic manner. Thesis writing should be properly structured, cover all stages involve and most importantly, readable.

Since this study is concerned with investigating the causal relationships between HFSC implementation as a higher-order construct and organisation performances, a questionnaire-based survey was deemed to be appropriate (Clarke 1999; Neuman 2011). In the context of statistical analysis, structural equation modelling (SEM) is used to test and estimate causal relationships among the data. The advantages of employing SEM as an analytical tool of choice are listed below:

- It allows the testing of both a measurement model and a structural model simultaneously, and affords an assessment of the model fit and individual

parameters through an array of fit-indices and tools (Koufteros, Babbar & Kaighobadi 2009)

- It allows the researcher to estimate the strength of interrelationships amongst those construct or latent constructs (Gallagher, Ting & Palmer 2008)
- It is a useful tool for research that involves multivariate data analysis. Generally, applying SEM becomes less difficult for testing hypotheses in most cases of multivariate data analysis.

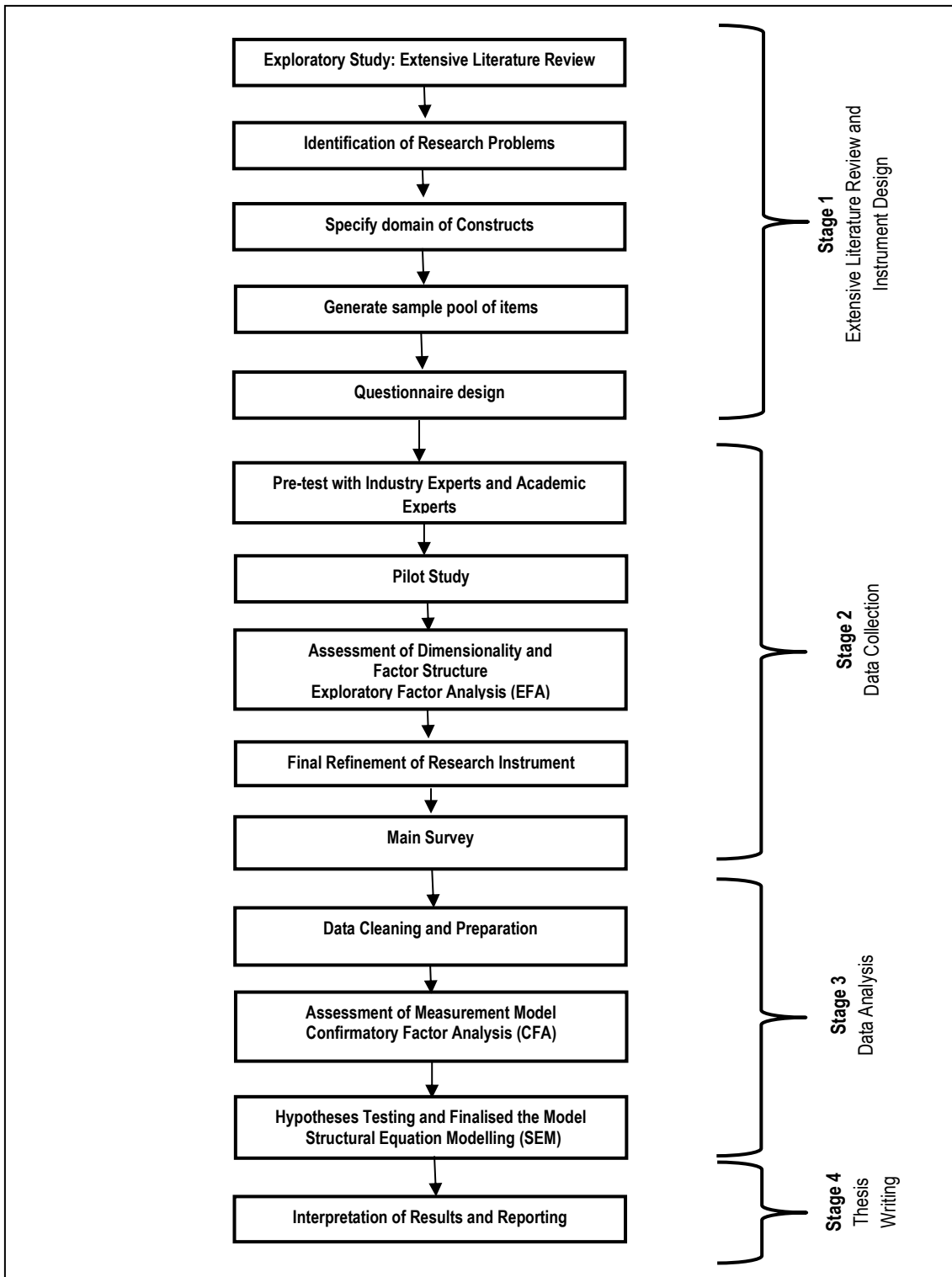


Figure 4-2: Research design and stages

#### **4.4 Survey Instrument Development**

The survey questionnaire is used as an instrument for the study since surveys are relatively quick to complete, economical to apply and easy to analyse (Bowling 1997). Generally, an operational instrument should include all the measurement content of the constructs. In this study, developing a survey questionnaire as an instrument was conducted in three stages (Figure 4-3) as suggested by Moore and Benbasat (1991). The first stage was item generation, in which the purpose was to generate an initial pool of items for each of the dimensions as first-order constructs, second-order constructs and dependant variables by identifying from the existing validated scales, and by creating additional items. The second stage consists of operationalisation of the constructs and scale development. In this stage, a suitable scale was identified to be used for the overall instrument. The final stage involves instrument testing, in which the instrument is checked for content validity and reliability. At the same time, the instrument was also revised for clarity and readability. All the stages will be elaborated in detail in sections 4.9, 4.10 and 4.11.

Generally, a good questionnaire should be simple, straight to the point and readable (Frazer & Lawley 2000). The principle aim in writing a question is to ensure that it means the same to the surveyor and respondent, who should be able to respond with as much accuracy as possible (Meadows 2003). Wording and the arrangement of questions are also important when designing the instrument. The type of question, language used and order of items may all lead to a biased response. Rattray and Jones (2007) suggest that it is best to avoid presenting controversial or emotive items at the beginning of the questionnaire.

Furthermore, the appearance and layout of a questionnaire can influence a respondent's decision on whether to respond. The main issues around the appearance and layout of questionnaires include the length of questionnaire, question, response category format, print details, pagination and instructions (Rattray & Jones 2007). It was stated that a longer questionnaire may potentially lead to fatigue or carelessness of potential respondents. However, it has been stated previously that questionnaires on topics which are relevant or interesting can be longer than questionnaires on more general topics (Oppenheim 2000; McColl et al. 2001). As a guide, a well-designed questionnaire should meet the research objectives, facilitate data collection and processing, and achieve and maintain the respondents' involvement (Miller 1999).

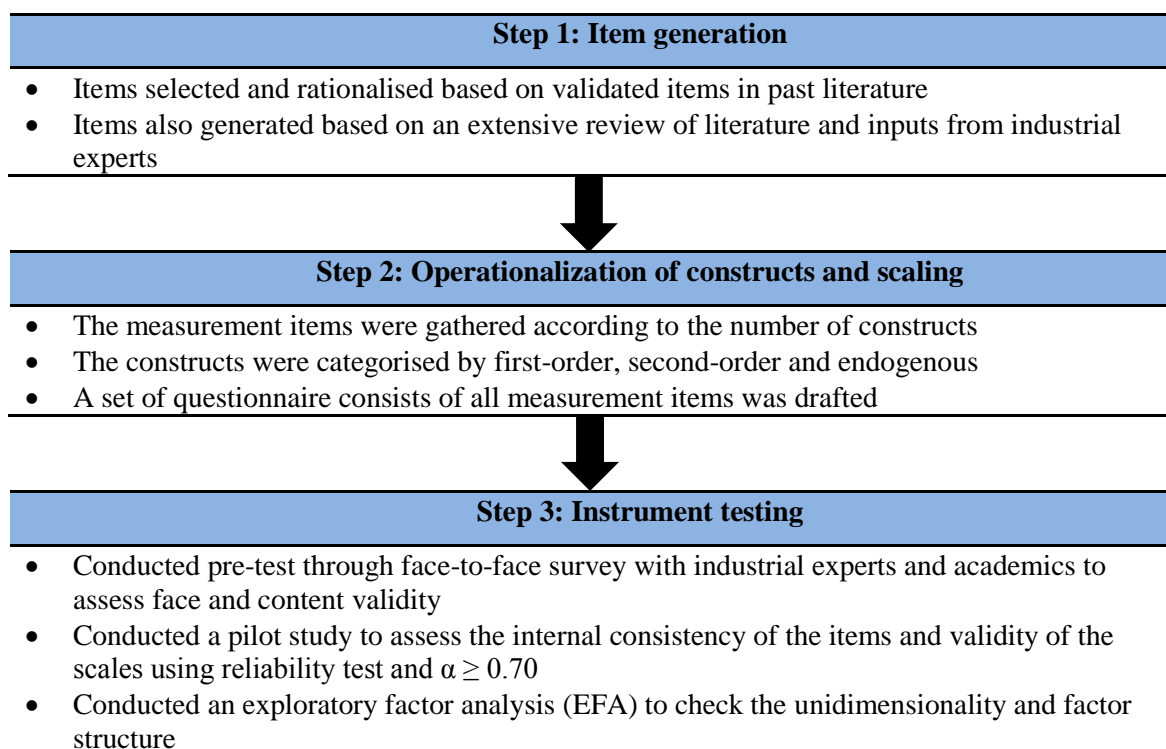


Figure 4-3: Survey development stages

#### **4.4.1 Items Generation**

Items to measure all the constructs (first-order constructs, second-order constructs and dependant variables) were generated using several approaches. First, the items were adapted from a list of potential validated items from the literature involving halal studies and food supply chain management. The second approach involves taking the items through an extensive review of the literature and input from industrial experts. Some of the constructs are developed from previous studies on the HFSC. The selected validated questions were then changed slightly to accommodate the sample chosen for this study. In developing a survey instrument, selecting the existing validated measurements is a common approach since the instruments have already been assessed for their validity and reliability (Kitchenham & Pflieger 2002).

Thus, a pool of new items was developed to measure the constructs in the study. The existing items and newly created items were placed in a common pool. An initial pool of new items was sorted and modified in an interpretive process. Once this was achieved, the items were categorised according to the underlying constructs. Again, the items were re-evaluated to eliminate those which appeared to be redundant or ambiguous. In sum, a total of 59 items were used to measure all the constructs in this study. Table 4-3 lists the number of items used to measure each of the constructs.

All the measured items will be used for the pilot survey and then the main survey after these three criteria is considered. Firstly, item reliability (reported in section 4.10) must be examined to ensure that the items are reliable, with the value meeting the minimum acceptable threshold (Cronbach alpha of 0.7 or greater). Secondly, all items must undergo further examination regarding content validity to ensure that all items measure

what is supposed to be measured. Finally, theoretical foundation and assumptions are referenced in finalising the items so that it reflects the domain of the identified constructs in this study.

Table 4-3: Number of items used to measure constructs

<b>Constructs</b>	<b>Number of Items</b>	<b>Source</b>
Physical segregation	6	Tieman (2013); Bruil (2010); <i>New items based on</i> Lodhi (2009); Riaz & Chaudry (2004); Standards Malaysia (2009); Bonne & Verbeke (2008)
Training and personnel	5	Abdul, Ismail & Mustapha (2013); <i>New items based on</i> Standards Malaysia (2009)
Storage and transports	4	Tieman (2013); Bruil (2010); <i>New items based on</i> Lodhi (2009); Riaz & Chaudry (2004); Standards Malaysia (2009)
Ethical practices	5	Ali & Al-Owaihan (2008); Tsalikis & Lassar (2009); Ali (1992)
Packaging and labelling	3	Ab Talib & Johan (2012); Lodhi (2009), Ahmed, Ahmed & Salman (2005)
Material handlings	3	Tieman (2013); Bruil (2010); <i>New items based on</i> Lodhi (2009); Riaz & Chaudry (2004); Standards Malaysia (2009)
Innovative capability	4	Guan & Ma (2003); Paulraj & Chen (2007)
Cleanliness	5	Talib, Zailani & Zainuddin (2010); <i>New items based on</i> Bonne & Verbeke (2007); Riaz & Chaudry (2004); Standards Malaysia (2009)
Safety	5	Finn & Louviere (1992); Brewer, Sprouls & Russon (1994); <i>New items based on</i> Riaz & Chaudry (2004); Bonne & Verbeke (2007); Standards Malaysia (2009)
Islamic dietary law	5	<i>New items based on</i> Riaz & Chaudry (2004); Marzuki (2012); Talib, Ali & Jamaludin (2008)
Resource availability	4	<i>New items based on</i> Standards Malaysia (2009)
Marketing performance	5	Yamin, Gunasekaran & Mavondo (1999); Li et al. (2006); Hooley et al. (2005); Hsu et al. (2011)
Financial performance	5	Yamin, Gunasekaran & Mavondo (1999); Li et al. (2006); Hsu et al. (2011); Mitra & Datta (2014); Huo et al. (2014)



#### **4.4.2 Operationalization of Constructs and Scaling**

This section explains how each of the constructs tested in this study were operationalised. To acquire the information to empirically confirm the proposed conceptual framework, the operationalisation of constructs must be clearly applied. A set of questions that consisted of all measurement items was drafted. Multi-item constructs were employed to ensure a comprehensive evaluation and minimise the level of measurement biases (Podsakoff et al. 2003). One of the reasons multi-items constructs were applied was because single items usually lack correlation with the attribute being measured and easily related to other attributes (Churchill 1979). Three to six items were applied to each construct, leading to a total of 59 questionnaire items to be answered by respondents. The range number of items used fulfilled the requirement suggested by Hair et al. (2010).

HFSC implementation as a higher-order construct was measured using 49 items and categorised by 11 underlying first-order constructs or dimensions. The 11 dimensions are cleanliness, safety, Islamic dietary law, physical segregation, material handlings, storage and transport, packaging and labelling, ethical practices, training and personnel, sufficient resources and innovative capability. Cleanliness, safety, Islamic dietary law, ethical practices, and training and personnel were assessed using five items each. Storage and transport, sufficient resources, and innovative capability, was measured by four items each. On the other hand, six items were adapted from different sources used to measure physical segregation. Furthermore, material handling, packaging and labelling dimensions were assessed with the required three minimum items. Respondents were asked to evaluate how critical each of the dimensions were to define the HFSC implementation model.

Organisational performance acts as a dependent variable or endogenous variable in this study. This construct was assessed by measuring the marketing and financial performance of the organisation. Five items were used to measure financial performance and marketing performance. In addition, financial performance was measured based on profitability, sales growth and operational cost of the organisation, while marketing performance was measured based on market share, market development, product positioning and product quality.

In the context of scale development, constructs have been operationalised using the Likert-scale. The Likert-scale is the best possible scale for measuring latent variables (Clason & Dormody 1994). It is suggested that the Likert-type scale is suitable for research related to supply chain implementation, concerns and performance measurement (Tan 2002; Yusuf et al. 2004; Swafford, Ghosh & Murthy 2008) and applying structural equation modelling (SEM) for data analysis (Tabachnick and Fidell 2011). All the constructs were measured using a seven-point Likert-scale, which ranges from (1) strongly disagree to (7) strongly agree. The key reason for applying a seven-point Likert-scale was to overcome the variability among respondents and have a better approximation of a normal response curve (Cooper & Schindler 2008). Another reason for using the scale was to avoid central tendency error due to the respondents ranking their priority in the neutrality dimension (Hampden-Turner & Trompenaars 1997). Therefore, the middle response (i.e., neutral or neither agree nor disagree) was excluded in the scale development.

#### **4.4.3 Instrument Testing**

The next stage of the survey instrument development was instrument testing. In this study, the instrument used was a questionnaire. The aim of this stage is to test the content and face validity. This is purposely done to ensure that the questionnaire was adequately compiled and provide an opportunity to revise its length, wording, clarity and instructions. Furthermore, the instrument was tested for a reliability assessment of the scales since the questionnaire contains many items. This instrument testing was conducted using a two-stage approach involving a pre-test and pilot study.

In the pre-test stage, the survey instrument was given to expert panels to evaluate the content and face validity, instructions, clarity of items and representativeness. The expert panels were selected based on their vast experiences and background in the subject matter. In this study, six expert panels consisting of four industry experts and two academic experts were selected due to their expertise and outstanding achievement in the Malaysian halal food industry. Details of the process are discussed in section 4.9.

Once the survey instrument was refined through the expert panels, conducting pilot study may be beneficial (Clark & Watson 1995). In the pilot study, the primary purpose was to ensure that the scales demonstrated the appropriate level of reliability and to assess any further difficulties that the respondents might experience in completing the questionnaire. The accepted level of reliability was determined based on the objective of the study (Moore & Benbasat 1991). For this study, the target level of minimum reliability was set at 0.7 or greater. The process of pilot study is clearly elaborated in section 4.10.

After the pilot study was completed, exploratory factor analysis (EFA) was performed to assess the factor structure and unidimensionality of the constructs. In this study, EFA was employed since there is no existing theory and framework regarding the existence of the dimensions or first-order constructs that define HFSC implementation as a higher-order construct. This analysis use to identify the underlying dimensions or first-order constructs of HFSC implementation, as assessed by a measuring instrument. Thus, this study represents initial empirical work on proposing the dimensions of HFSC implementation. As a result, the subsequent factors derived from EFA were revised before the main survey was conducted. A detailed explanation of the EFA is presented in section 4.11.

#### **4.5 Questionnaire**

The questionnaire is one of the most widely used data collection techniques within the survey strategy, as well as for large samples (McClland 1994). The questionnaire can be defined as ‘a preformulated written set of questions to which respondents record their answer usually, within rather closely defined alternatives’ (Sekaran & Bougie 2009, p.197). This method is not particularly good for exploratory research that requires large numbers of open-ended questions; however, it works best with standardised questions (Saunders, Lewis & Thornhill 2009). This study employed questionnaires as an instrument for gathering data. The questionnaire has been recognised as an effective means of gathering data from large samples.

The questionnaire for this study consists of three parts. The first two parts comprise the first-order constructs or dimensions that defining the HFSC implementation as a second-order construct and performance, construct while the last part lists questions

concerning the participants' demographic profile. It was estimated that the respondents would require approximately 30 minutes completing the questionnaire. Respondents were instructed to circle their answers with items based on a seven-point Likert-scale. The point '1' on the scale indicated 'Strongly Disagree', while '7' represented 'Strongly Agree' in response to the statements. Part three (the demographic profile of respondents) asks respondents to indicate their responses by crossing in the boxes provided. The following is a detailed discussion of each section.

#### 4.5.1 Section A

This section includes 49 questions asking the respondents to assess the critical dimensions that defined HFSC implementation as a second-order construct. These questions must reflect the 11 dimensions of HFSC implementation.

#### 4.5.2 Section B

In this section, the researcher attempted to test the relationship between HFSC implementation and organisation performance. Ten questions measuring the performance constructs, particularly, marketing performance and financial performance were given to be answered by the respondents.

#### 4.5.3 Section C

This section contains 16 questions asking the respondents questions regarding their demographic and organisation background (e.g., position in the organisation, education level, years of managerial experience in the organisation, as well as in halal food industry, type of organisation and number of operation years).

A cover letter containing the ethics approval, purpose of the study and researcher's contact information was included on the front page of the instrument. Attached together with the questionnaire is the participant information and consent form (PICF) which highlight the importance of their participation in this research and assurance of anonymity.

Since the study was performed in Malaysia and the samples consist of non-English speakers, the final version of the questionnaire was translated into Bahasa Malaysia, the Malaysian native language to expedite responses and ensure clear communication to the respondents. Then, the questionnaire was back translated into English to ensure translation uniformity (Brislin 1970; Eng 2016). The translation was performed by a certified linguistic specialist. A properly translated questionnaire may also reduce any possible discrepancy due to cultural and linguistic differences (Kim & Han 2004). The final version of the questionnaire is presented in Appendix 2 (English version).

#### **4.6 Population and Sampling Design**

This section specifically discusses the target population and sampling procedures. Population refers to the entire group of people, events, or things of interest that the researcher wishes to investigate (Sekaran & Bougie 2010). The target population chosen for this study are halal certified organisations in Malaysia that published in Malaysia JAKIM Halal Portal, the official website developed by Department of Islamic Development Malaysia (JAKIM) only for the halal industry. To be specific, the population also was selected only from food and beverage industry sector. This industry was selected as it is the highest sector contributing to Malaysia halal export for three years in a row; 2012 to 2014 (HDC 2014).

#### **4.6.1 Sampling Frame**

As of January 2014, the Department of Islamic Development Malaysia (JAKIM) and Halal Industry Development Corporation (HDC), two authorised government agencies which are responsible for handling activities related to halal matters, listed 1729 halal certified organisations of varying sizes, including micro, small, medium, large and multinationals operating in the food and beverage industry sector in Malaysia. In addition, the sampling frame for this study was drawn from the official Malaysia JAKIM Halal Portal which listed the directory for the halal certified organisations in Malaysia. This directory includes the name, contact number and email address, company product list, postal address, website, and owner of the business.

This study is limited to a single country setting. This will help to facilitate the control of plausible outcomes arising from heterogeneous environments (Zikmund 2003). Malaysia was selected because its government is planning for the country to become a global halal hub by 2020. As for today, the Malaysian government has established the Halal Industry Development Corporation (HDC) and Halal Industry Master Plan (HDC 2011).

#### **4.6.2 Sampling Technique**

This study employed the probability sampling design known as simple random sampling. The rationale of employing simple random sampling is that it reduces bias by giving an equal and independent chance to every member of the population (Kumar 2011; Lohr 2009). Simple random sampling was applied to select the respondents based on the directory records. Three states and one federal territory were selected from 16 states and federal territories in Malaysia. These states are Selangor, Johor, Penang and

Kuala Lumpur Territory because more than 60% of halal certified companies are in these areas. Therefore, the decision to choose them is legitimised. For this study, 600 halal certified organisations were selected to receive the questionnaires. The aim was to obtain a minimum sample size of approximately 200 respondents, considered to be appropriate for running structural equation modelling (Hair et al. 2010).

### **4.6.3 Sample Size**

Sample size can be defined as the actual number of subjects chosen as a sample to represent the population (Sekaran 2003). In a statistical analysis, sample size is critically important since it has a bearing on the sampling error. The sample size must be properly determined to make an inference about the population for any study activity. Some researchers recommend that the appropriate sample size for most research should be larger than 30 and less than 500, whereas in multivariate research, the suitable sample size should be several times (preferably 10-fold) larger than the number of variables in the study (Roscoe 1975; Sekaran 2003).

In SEM, it has been noted that a larger sample size is required to ensure that power, parameter estimates and errors are stable (Schumacker & Lomax 2010). According to Tabachnick and Fidell (2007), a smaller sample size may cause the covariance and correlations in SEM to become unstable. Prior literature does not specify an explicit sample size for SEM. Many researchers have argued about the absolute number in a sample size when using SEM. Hu, Bentler and Kano (1992) claimed that, in some cases, more than 5000 respondents are required, whereas Boomsma (1982) recommended that 400 should be adequate for SEM. Hair et al. (1998) recommended that 100 is the minimum sample size to ensure the appropriate use of maximum likelihood estimation



in SEM. On the other hand, Anderson and Gerbing (1988) recommended that a minimum of 150 – 200 respondents will ensure the credibility of the findings. However, Chou and Bentler (1995) claimed that a minimum of 200 respondents is reasonable and practical for SEM. Bentler and Chou (1987) suggest that a ratio of five subjects per variable is sufficient depending on the normal and elliptical distribution, whereas Hair et al. (2010) proposed five observations per variable as the rule of thumb for sample size. Since scholars do not agree about the definite sample size, a sample size of 240 in this study is considered to be large enough and appropriate for executing SEM analysis.

Another method of obtaining a sample size is by using the application of the G\* power analysis developed by Faul et al. (2009). This application provides a different experience of calculating the sample size based on effect size, standard error, power and number of predictors. The result of the sample size calculated using the G\* power software application is 77. The power of approximately 80% is used and considered sufficient for this study. Therefore, the sample size of 240 is more than the minimum requirement suggested by G\* power analysis. Therefore, the sample size is acceptable.

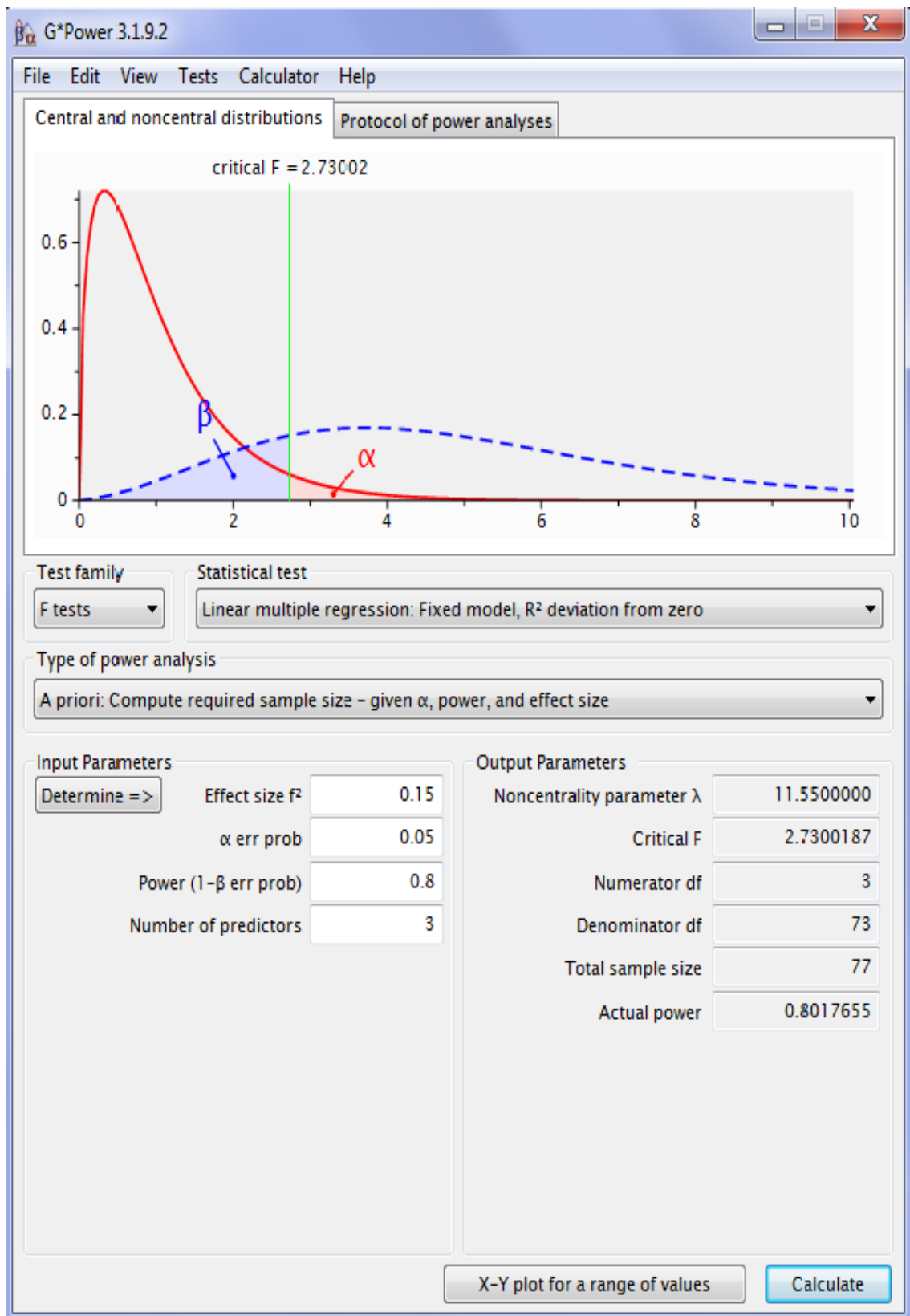


Figure 4-4: Determination of the sample size based on the G\*Power Analysis

#### **4.7 Unit of Analysis**

A unit of analysis can be defined as ‘the person who answers an interviewer’s questions or provides answers to written questions in a self-administered survey’ (Zikmund 2003, p.175). This study focuses on the analysis at organisational level, which was divided into halal certified foods and beverages organisations. Managers, senior managers, senior executives and directors were identified as appropriate key respondents since they were involved in the decision-making processes. This approach is intended to validate the applicability of this conceptual model in a ‘real world’ environment.

This study explored the critical dimensions of the HFSC implementation model and the relationship between the model and organisation performance in the context of the processed foods and beverages industry in Malaysia. Thus, substantial knowledge from that industry is vital to assist in this study. To answer the research questions, this study required respondents with vast experience in the HFSC to supply relevant answers, based on their significant role in making decisions for the organisation.

#### **4.8 Time Horizon**

The time horizon for research studies is classified into cross-sectional and longitudinal contexts. In contrast to the longitudinal scenario, data in cross-sectional studies are gathered only once, perhaps over a period of days, weeks or months. This approach was considered the most popular form of survey, less expensive and easy to administer (Zikmund 2003; Sekaran & Bougie 2010). Furthermore, cross-sectional studies are generally used to test the relationships between variables (Graziano & Raulin 2007), and were used in this study to test the relationship among the constructs.

#### **4.9 Pre-test**

Pre-testing is the best platform for researchers to gauge the meaning attributed to the survey questions. Failure to examine the interpretation of the questionnaire items may lead to respondents' misinterpretations, falsified answers, missing responses and possibly offending the respondent (Bowden et al. 2002). A pre-test was conducted prior to the pilot study. The rationale was to strengthen the content validity of the survey instrument by investigating the degree of relevance of each variable item and confirming the proposed items in the survey through the expert opinions of industry representatives and academics. Generally, the respondents were asked to give their feedback on the representativeness, clarity, ease of understanding and interpretation of the questions. This would permit the items to be refined, eliminated or expanded as necessary.

As mentioned previously, a seven-point Likert-scale was employed to measure the variable items. Importantly, the pre-test included those from industry, as well as academia. Four industrial experts, three from leading halal food organisation, one from a leading halal beverage organisation respectively and two academic experts were selected for the pre-test phase. The organisations selected for this pre-test were located in Selangor, the state having the largest number of halal certified organisations in Malaysia. The experts were targeted from a group of individuals in management (e.g., directors, senior executives and managers). These people were chosen based on their vast experience in the halal industry, specifically in food and beverages, and they are important decision makers. The participated organisations have been operating more than 25 years and their products have been certified halal for more than 10 years. These academic experts have extensive knowledge in the scaling procedures or halal studies

and supply chain management. With this background, these managers were considered qualified to be expert assessors for this study's instrument.

Table 4-4: Industry experts for the pre-test

<b>Expert</b>	<b>Background</b>	<b>Company Operating Years</b>	<b>Organisation Certifications</b>
Expert #1	Business development and operation manager; 15 years of experience working in halal food industry sector. Current role is to look after the operation of halal biscuits and crackers and managing strategic relationships with suppliers. Involved in halal training programmes more than 10 times throughout her career.	> 30	HALAL, HACCP, GMP, OHSAS 18001, ISO 9001:2008
Expert #2	Holding a director position in beverage company, 20 years of experience in halal certified fruit juice manufacturing. Currently working on improving the efficiency of halal product manufacturing and expanding the halal product line to more countries globally.	> 30	HALAL, ISO 22000:2005
Expert #3	Operations manager with 10 years of experience in halal frozen food manufacturing. Currently responsible with monitoring the halal frozen food production including processed seafood and pastry product, devising strategy on improving the authenticity of halal food products and ensure the final products are safe to be consumed especially Muslim consumers.	> 25	HALAL, HACCP, Certified Sustainable Seafood MSC
Expert #4	Halal executive officer; six years of experience dealing and monitoring the products manufacturing process, to ensure it conform to halal standard. Furthermore, the current role also need to ensure the materials used and production process need to be segregated with from non-halal one.	> 30	HALAL, ISO 9001:2008

The expert panels were invited through emails and were followed-up on the phone to obtain their agreement to participate. They were identified from the Malaysian External Trade Division Corporation (MATRADE) directory, the Malaysian national trade promotion agency. After approaching ten potential experts from the halal food industry

sector, four confirmed for interviews (see Table 4-4). They agreed to assess and provide feedback on items used for the survey questionnaire. Appointments were made according to their schedule and a number of meetings were organised at the experts' office. The same process goes to academic expert panels. All the panel of experts were briefed on the purpose of the study and the tasks that needed to be done. A copy of the survey questionnaire was given to each of the experts who agreed to complete and provide feedback within a week. On the collection day, the researcher met the experts and discussed their feedback about the questionnaire before collecting it.

Feedback was obtained from experts and a meeting was arranged with the senior thesis supervisor to discuss the feedback and suggestions. Some adjustments and refinements were made to the items based on the senior supervisor's suggestions. Items which did not clearly measure the actual context of the HFSC implementation were advised to be deleted from the questionnaires.

Items S3 and ID2 were advised to be deleted since they were not clearly measuring the actual context of the research (Table 4-5). In addition, the experts also recommended that some of the items needed to be re-phrased for clarity. The length of time required to complete the survey also needed to be re-considered, to ensure that completion is not too time consuming. Based on the experts' feedback, six items needed to be rephrased. The items are S2, ID4, PL3, SR4, MP3, and MP5. Details of the item refinement are shown in Table 4-6.

Table 4-5: Items deleted based on the pre-test results

Item label	Original item	Item deleted
S3	Our organisation believes that the higher the quality, the safer the halal product would be.	Deleted
ID2	Our organisation believes that Islamic dietary laws prohibit the consumption of alcohol, pork, blood, dead meat, and meat which has not been slaughtered according to Islamic rulings.	Deleted

#### 4.10 Pilot Study

A pilot study was administered to identify and estimate the inter-item internal consistency and reliability of the measured items, as well as examine comprehensibility, degree of difficulty, clarity and reasonable time allocation for respondents to answer the questionnaire. Responding to the experts' comments at the pre-test stage, the questionnaire was revised and modified. For the pilot study, the questionnaires were distributed during the Penang International Halal Expo and Conference 2015 (PIHEC 2015) Malaysia. This conference, which was held in conjunction, with the exhibition is a one stop centre for sellers and consumers from all over Malaysia involving halal consumable and non-consumable products, including food and drink, foodservices, logistics, Islamic finance and tourism. Thus, this conference has become a significant location for pilot study.

The respondents were randomly selected from the conference directory. They were approached face-to-face and a copy of survey questionnaire was given to those who agreed to complete and provide feedback. The completed questionnaires were collected the next day at the agreed time. A total of 120 questionnaires were distributed at that event and 100 completed questionnaires were collected personally from the identified respondents who are willing to participate in the survey. Following the suggestion made

by Malhotra (2008), 100 samples for pilot study is adequate, since the pilot study sample is usually small and could range from 15 to 30 respondents.

For this study, reliability estimates of the items were measured using the Cronbach alpha coefficient. Nunnally 1978 and Hair et al. 2010 suggest that the alpha level should be 0.7 or greater, which means that an  $\alpha$  value exceeding 0.7 indicates that the variables are internally consistent and suitable measures for the study. The results of the pilot varied between 0.730 and 0.902 ( $\alpha$ : C = 0.895; S = 0.757; ID = 0.822; PS = 0.870; MH = 0.730; ST = 0.882; PL = 0.753; EP = 0.783; TP = 0.838; SR = 0.902; IC = 0.778; MP = 0.838; and FP = 0.764). Since all the values were greater than 0.7, they are within the acceptable threshold, suggesting reliability.

Responding to the participants' comments, the questionnaire was slightly modified and refined. The time taken to complete the survey questionnaire was approximately 30 minutes, which is within the allocated time. Minor modifications were also applied on the layout of the questionnaires to enhance readability before the main survey was carried out. Other statements were retained.



Table 4-6: The initial and modified measurement items based on the pre-test and pilot study

Construct	Initial Items	Refined Items
Cleanliness (C)	<p>C1: Our organisation believes that cleanliness is prerequisite in the halal food manufacturing.</p> <p>C2: Our food products are manufactured in a clean working premise.</p> <p>C3: Our food products are manufactured using clean devices, utensils, machine and processing aids.</p> <p>C4: Our suppliers able to supply materials which are clean from any non-halal elements.</p> <p>C5: Our organisation produced purely clean food to our consumers.</p>	<p>C1: Our organisation believes that cleanliness is a prerequisite in the halal food manufacturing.</p> <p>C2: Our food products are manufactured in a clean working premise.</p> <p>C3: Our food products are manufactured using clean devices, utensils, machine and processing aids.</p> <p>C4: Our suppliers able to supply materials which are clean from any non-halal elements.</p> <p>C5: Our organisation produced purely clean food to our consumers.</p>
Safety (S)	<p>S1: Our organisation believes that safety is prerequisite in the halal food manufacturing.</p> <p><b>S2: Our food products are not hazardous to health.</b></p> <p><b>S3: Our organisation believes that the higher the quality, the safer the halal product would be.</b></p> <p>S4: Our organisation obtains materials from suppliers that are of higher quality.</p> <p>S5: Our organisation will ensure the food products are conformance to food safety standard before sells it to consumers.</p>	<p>S1: Our organisation believes that safety is a prerequisite in the halal food manufacturing.</p> <p>S2: Our food products are not hazardous to people's health.</p> <p>S3: Our organisation obtains materials from suppliers that are of higher quality.</p> <p>S4: Our organisation will ensure the food products conform to food safety standard before selling them to consumers.</p>
Islamic Dietary Law (ID)	<p>ID1: Our organisation uses Islamic dietary law as a source for our food production.</p> <p><b>ID2: Our organisation believes that Islamic dietary laws prohibit the consumption of alcohol, pork, blood, dead meat, and meat which has not been slaughtered according to Islamic rulings.</b></p>	<p>ID1: Our organisation uses Islamic dietary law as a source for how to produce halal food.</p> <p>ID2: Our organisation follows the halal guideline of food processing in a way to increase the consumers' confidence in our products.</p> <p>ID3: Our organisation ensures that our suppliers comply with</p>

	<p>ID3: Our organisation follows the halal guideline of food processing in a way to increase the consumers' confidence toward our products.</p> <p>ID4: Our organisation ensures that our suppliers comply with Islamic dietary law.</p> <p><b><i>ID5: Our organisation will conduct ritual cleansing on the processing line if it is contaminated by najis al-mughallazah.</i></b></p>	<p>Islamic dietary law.</p> <p>ID4: Our organisation will conduct ritual cleansing (samak) on the processing line if it is contaminated by najis al-mughallazah (prohibited Najis).</p>
Physical Segregation (PS)	<p>PS1: Our organisation has separate processing lines for halal food production.</p> <p>PS2: Our organisation stored materials and ingredients for halal food production using separate warehouse.</p> <p>PS3: Our organisation uses separate bonded trucks to transfer halal food products.</p> <p>PS4: Our organisation uses separate area to do the packaging activity for halal food products.</p> <p>PS5: Our suppliers segregated the materials based on halal and non-halal before sent to us.</p> <p>PS6: Our organisation uses dedicated machinery and equipment for halal food production</p>	<p>PS1: Our organisation has separate processing lines for halal food production.</p> <p>PS2: Our organisation store materials and ingredients for halal food production using separate warehouse.</p> <p>PS3: Our organisation uses separate bonded trucks to transfer halal food products.</p> <p>PS4: Our organisation uses separate areas for packaging activities of halal food products.</p> <p>PS5: Our suppliers segregate the materials based on halal and non-halal before sending them to us.</p> <p>PS6: Our organisation uses dedicated machinery and equipment for halal food production.</p>
Material Handlings (MH)	<p>MH1: Our organisation inspects, sort raw materials, ingredients and packaging material before processing.</p> <p>MH2: Our organisation uses detection and screening devices during processing of halal food product.</p> <p>MH3: Our suppliers always sort raw materials appropriately before sent to us.</p>	<p>MH1: Our organisation inspects, sort raw materials, ingredients and packaging material before processing.</p> <p>MH2: Our organisation uses detection and screening devices during processing of halal food product.</p> <p>MH3: Our suppliers always sort raw materials appropriately before sending them to us.</p>
Storage and Transport (ST)	<p>ST1: Our organisation provides dedicated warehouse for storage of our halal food products</p>	<p>ST1: Our organisation provides dedicated warehouse for storage of our halal food products.</p>

	<p>ST2: Our organisation always makes sure that the transports are appropriate to the type of the halal food</p> <p>ST3: Our suppliers were transferred materials to us using dedicated transport.</p> <p>ST4: Our organisation uses dedicated transport to transfer halal food products from our place to wholesaler, retailer or customer</p>	<p>ST2: Our organisation always makes sure that the transports are appropriate to the type of the halal food</p> <p>ST3: Our suppliers transfer materials to us using dedicated transport.</p> <p>ST4: Our organisation uses dedicated transport to transfer halal food products from our place to wholesaler, retailer or customer</p>
Packaging and Labelling (PL)	<p>PL1: Our organisation only used packaging materials which does not have any toxic effect on the product.</p> <p>PL2: Our food product packaging is providing consumers with complete ingredients information.</p> <p><b><i>PL3: Our advertisement does not display any indecent elements which are against Shariah law.</i></b></p>	<p>PL1: Our organisation only uses packaging materials which do not have any toxic effect on the product.</p> <p>PL2: Our food product packaging is providing to consumers with information on all ingredients.</p> <p>PL3: Our labels do not display anything that is contrary to Shariah law.</p>
Ethical Practices (EP)	<p>EP1: Our organisation recycles or reduces food waste when possible.</p> <p>EP2: Our organisation participates in the design of products for recycling or reuse.</p> <p>EP3: Our organisation uses halal certified and safe chemicals.</p> <p>EP4: Our organisation store harmful chemical substances away from food products.</p> <p>EP5: Our organisation practices negotiation with suppliers.</p>	<p>EP1: Our organisation recycles or reduces food waste when possible.</p> <p>EP2: Our organisation participates in the design of products for recycling or reuse.</p> <p>EP3: Our organisation uses halal certified and safe chemicals.</p> <p>EP4: Our organisation store harmful chemical substances away from food products.</p> <p>EP5: Our organisation practices negotiation with suppliers.</p>
Training and Personnel (TP)	<p>TP1: Our organisation has a group of halal trained workers to handle the halal food production.</p> <p>TP2: Our employees are trained on the importance and the right way of producing halal food products.</p> <p>TP3: Our organisation gives extensive halal training to</p>	<p>TP1: Our organisation has a group of halal trained workers to handle the halal food production.</p> <p>TP2: Our employees are trained to understand the importance and correct way of producing halal food products.</p> <p>TP3: Our organisation gives extensive halal training to</p>

	<p>distributors and retailers if needed</p> <p>TP4: Our organisation invited Halal local authority (e.g.: HDC and JAKIM) to give training to the workers.</p> <p>TP5: Our organisation guiding suppliers to establish their own halal programs.</p>	<p>distributors and retailers if and when needed</p> <p>TP4: Our organisation invites halal local authority (e.g.: HDC and JAKIM) to give training to our workers.</p> <p>TP5: Our organisation guides suppliers to establish their own halal programs.</p>
Resource Availability (RA)	<p>SR1: We believe that organisation needs to be financially stable to involve in halal food supply chain.</p> <p>SR2: We believe that organisation should have an effective transportation system in order to involve in halal food supply chain.</p> <p>SR3: We believe that organisation should be able to provide a dedicated warehouse for storage to involve in halal food supply chain.</p> <p><b><i>SR4: We believe that organisation should have capable people to handle the halal food production.</i></b></p>	<p>SR1: We believe that organisations need to be financially stable to involve in halal food supply chain.</p> <p>SR2: We believe that organisation should have an effective transportation system to involve in halal food supply chain.</p> <p>SR3: We believe that organisation should be able to provide a dedicated warehouse for storage to involve in halal food supply chain.</p> <p>SR4: We believe that organisation should employ people who can handle the halal food production.</p>
Innovative Capability (IC)	<p>IC1: Our management team is actively seeking innovative ideas on halal matters.</p> <p>IC2: Our organisation has the capacity to develop new product design to satisfy customer needs.</p> <p>IC3: Our organisation has the capacity to develop halal traceability and tracking systems as to protect the authenticity of halal food products.</p> <p>IC4: Our organisation encourages our suppliers to become more innovative on halal matters.</p>	<p>IC1: Our management team is actively exploring innovative ideas on halal matters.</p> <p>IC2: Our organisation has the capacity to develop new product design to satisfy customers' needs.</p> <p>IC3: Our organisation has the capacity to develop halal traceability and tracking systems as to protect the authenticity of halal food products.</p> <p>IC4: Our organisation encourages our suppliers to become more innovative on halal matters.</p>
Marketing Performance (MP)	<p>MP1: Implementation of halal food supply chain will increase the market share even faster.</p> <p>MP2: Implementation of halal food supply chain will expand the market coverage of the product.</p>	<p>MP1: Implementation of halal food supply chain will increase market share even faster.</p> <p>MP2: Implementation of halal food supply chain will expand market coverage of the product.</p>

	<p><b>MP3: Implementation of halal food supply chain will ease the positioning of brand image among the consumers.</b></p> <p>MP4: Implementation of halal food supply chain will improve our quality of products.</p> <p><b>MP5: There is an increase in marketing cost in our firm because of delivering our halal product information in order to counter the customer pressures.</b></p>	<p>MP3: Implementation of halal food supply chain will improve the brand's image for consumers.</p> <p>MP4: Implementation of halal food supply chain will improve our quality of our products.</p> <p>MP5: Marketing costs in our organization are increasing because we must deliver halal product information in order to mitigate the customers' concerns.</p>
Financial performance (FP)	<p>FP1: Implementation of halal food supply chain will increase in terms of profitability.</p> <p>FP2: Implementation of halal food supply chain will increase in terms of sales growth.</p> <p>FP3: There is an increase of budget allocation for halal-related activities.</p> <p>FP4: There is an increase in operational cost in our firm because of monitoring and enforcement of halal activities on suppliers.</p> <p>FP5: There is a decrease in fines due to our organisation's compliance on halal regulations.</p>	<p>FP1: Implementation of halal food supply chain will increase in profitability.</p> <p>FP2: Implementation of halal food supply chain will increase sales growth.</p> <p>FP3: There is an increase of budget allocation for halal-related activities.</p> <p>FP4: There is an increase in operational cost in our organization due to monitoring and enforcement suppliers' halal activities.</p> <p>FP5: There is a decrease in fines due to our organisation's compliance on halal regulations.</p>

\* Items in bold need to be deleted (S3 and ID2) and refined (S2, ID4, PL3, SR4, MP3 and MP5) based on the experts' feedbacks.

\* Halal food supply chain represents both food and drink

#### **4.11 Assessment of Dimensionality and Factor Structure through Exploratory Factor Analysis (EFA)**

Exploratory factor analysis (EFA) is a widely applied statistical technique used in the social sciences (Osborne & Fitzpatrick 2012; Osborne, Costello & Kellow 2008). Methodologically, EFA is conducted when the study does not have a strong theoretical model but only a tentative theory to structure the measurement of constructs (e.g., how many factors the study should have and which factors are loaded on which constructs (Ferguson & Cox 1993). Similarly, EFA was employed in this study since there is no existing theory and framework regarding the existence of dimensions or first-order constructs that define the HFSC implementation as a higher-order construct. Thus, this study represents the initial empirical work on proposing the dimensions of HFSC implementation.

As identified by Conway and Huffcutt (2003), the main focus of EFA is to take a large set of variables and reduce them into a smaller group with a more manageable number while retaining as much of the original factors as possible. Furthermore, EFA is also used to describe and summarise data by grouping variables together that are correlated and to determine the sub-factors that underline a set of items measuring each theoretical construct and dimensions of a nomological network suited to the research context (Kline 2010). This analysis is used to identify the unidimensionality of a theoretical construct (Holmes-Smith 2010). In assessing unidimensionality, EFA is suggested as the appropriate tool when new scales are being developed (Anderson & Gerbing 1988; Byrne 2010; Hair et al. 2010). Referring to prior studies (Pett, Lackey & Sullivan 2003; Thompson 2005), the objectives of exploratory factor analysis (EFA) in this study are: (i) to determine the structure between the constructs; (ii) to detect and assess the

unidimensionality of the theoretical constructs; and (iii) to reduce the number of variables.

EFA was performed using principal component analysis as the extraction method, with a varimax rotation method to determine the underlying factors. The pilot test ( $n = 100$ ) data were used as the chosen data set to perform this analysis. To check the suitability of the data for factor analysis, the results are based on the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of sphericity (BTOS). A KMO value above 0.60 (Kaiser 1974) and a Bartlett's test of sphericity p-value less than 0.05 (Bartlett 1950) were used as indicators. The KMO index ranges from 0 to 1 and 0.60 as is suggested to be the minimum value for a good factor analysis (Pallant 2016; Tabachnick & Fidell 2007). According to Hair et al. (2010), three guidelines must be employed to identify the factors of: an eigenvalue greater than 1, factor loading greater than 0.50 which is considered necessary for practical significance, and no item cross-loading greater than 0.50. Furthermore, the sample size should satisfy the case-to-variable ratio of 10:1 or a minimum of 5:1 (Hair et al. 2010). Although the pilot sample in this study is small, it is nevertheless, larger than the samples used in other prior studies that employed EFA using a pilot data set (Shah & Ward 2007; Koufteros, Vonderembse & Doll 1998; Nahm, Vonderembse & Koufteros 2003).

The results showed a 12<sup>th</sup> factor solution with eigenvalues greater than 1.0 and the total variance explained was 70.5% of the total variance, which needs to be at least 60% or higher based on Hair et al. (2010). The KMO measure of sampling adequacy was 0.892 indicating sufficient inter-correlations, in which the factors and constructs of this study have met the conditions for the test of factors analysis and the Bartlett's Test of

Sphericity was found to be significant (Chi square = 9424.188,  $p < 0.01$ ). This supports running the EFA. Based on the results of the factor loadings in Table 4-7, it was confirmed that each of the constructs is unidimensional and factorially distinct.

A new design of measurement factors after EFA was applied. Based on the EFA results, two measurement items of material handlings (MH) were deleted due to low factor loadings, and one measurement item was identified to measure physical segregation (PS) factors. For that reason, the MH factor was deleted. Thus, the number of measurement items for the PS factor increased to seven items. As shown in Table 4-7, the new Cronbach alpha ( $\alpha$ ) for all factors and constructs are above 0.7, which indicates that these measures possess sufficient reliability. Nunnally (1978, p.245) suggested that instruments used in basic research should have a reliability of about 0.70 or better. Table 4-8 summaries the final EFA output. Overall, the EFA procedure dropped five items (S1, MH1, MH3, MP5 and FP4) that did not meet the factor extraction criteria, returning 52 items grouped into ten first-order constructs and two endogenous constructs. Next, the questionnaire was revised and structured according to the EFA results. The items that are suggested for deletion were removed from the questionnaire. Thus, the resultant factors from the EFA are proceeding for the main survey. The revised questionnaire for main survey is attached in Appendix B.



Table 4-7: The EFA Output

Construct	Item	1	2	3	4	5	6	7	8	9	10	11	12
Physical segregation (PS)	PS1	.818	.030	-.065	.014	-.048	-.007	.022	-.023	.009	-.012	-.006	.126
	PS2	.890	-.045	-.106	.071	-.010	-.067	-.009	.016	-.050	.034	.049	.010
	PS3	.771	.105	.030	.141	-.163	-.119	.057	-.157	.012	.031	.102	-.091
	PS4	.815	.141	-.062	.136	-.066	-.026	-.011	-.060	-.113	-.042	.162	.009
	PS5	.776	-.017	-.076	-.065	.010	.021	-.036	.171	-.022	-.128	-.016	.105
	PS6	.741	-.173	.041	-.059	.124	.064	.040	.065	.071	-.013	-.060	-.047
	MH2	.708	-.068	.071	-.123	-.046	.027	-.033	-.017	.124	.121	-.041	-.003
Ethical practices (EP)	EP1	.180	.634	.064	-.063	.145	.001	.011	-.065	.011	.072	-.212	.041
	EP2	.067	.565	.081	.001	.054	.129	-.003	-.084	-.046	.127	-.172	.085
	EP3	-.086	.961	-.102	-.020	-.041	.019	-.031	.083	-.001	-.059	.099	-.056
	EP4	-.045	.796	-.013	-.103	-.020	-.031	-.004	.055	.131	-.130	.186	-.016
	EP5	-.001	.601	.052	-.014	.082	.002	.059	-.062	.060	.078	.002	.001
Marketing performance (MP)	MP1	-.153	.004	.819	.128	-.109	.047	.029	.113	-.133	.023	.112	-.047
	MP2	.043	-.027	.863	-.035	-.050	.058	-.097	-.006	.079	-.057	.086	.069
	MP3	-.041	.047	.742	.012	.042	-.039	.129	-.001	-.087	-.007	-.138	.041
	MP4	.086	-.046	.828	-.018	-.005	.031	.006	-.084	.071	.008	-.016	-.008
Cleanliness (C)	C1	-.047	-.089	.183	.560	-.020	-.056	.021	.027	.126	.038	.113	-.070
	C2	-.018	-.047	-.113	.801	.142	.005	.029	-.021	-.054	-.058	.039	.046
	C3	.121	-.069	.005	.731	-.005	.035	-.033	-.163	.056	.173	-.048	-.060
	C4	-.067	.124	.119	.511	.176	-.163	-.145	.154	.091	.015	-.096	-.086
	C5	.161	-.071	.002	.804	.065	.133	-.084	-.024	-.034	-.150	.032	-.041
Training and personnel (TP)	TP1	-.007	.048	-.018	.047	.846	-.005	.007	-.042	-.022	.028	-.076	.040
	TP2	-.108	.036	-.035	.120	.871	-.109	.048	-.003	-.141	.115	.007	-.023
	TP3	.058	.069	-.055	-.007	.668	.008	.031	.009	.074	-.054	.004	-.058
	TP4	.141	.015	.129	-.050	.581	.116	-.178	-.055	.147	-.038	.041	.016
	TP5	-.113	-.057	-.046	.103	.644	.084	.093	.058	-.084	-.090	.090	.126
Resource availability (RA)	SR1	-.160	.016	-.002	-.026	.098	.713	.079	.042	-.062	.122	.024	-.029
	SR2	-.068	-.029	-.097	.000	.034	.873	.070	.061	-.020	-.012	.018	-.021
	SR3	.115	.087	.079	-.028	-.060	.887	-.061	-.088	.041	-.034	-.008	-.017
	SR4	.010	.015	.085	.076	-.071	.831	-.016	-.033	-.038	-.001	-.066	-.021

Financial performance (FP)	FP1	-.056	.049	.102	.058	-.013	-.053	.825	-.073	-.063	-.103	-.013	.134
	FP2	.012	-.073	.110	-.048	.013	.026	.836	-.053	.112	-.131	.031	.179
	FP3	.083	.024	.131	-.109	.040	-.064	.624	.065	.052	.159	-.055	-.184
	FP4	.056	-.109	-.125	-.023	.120	.120	.505	-.042	.205	.150	.104	-.220
Islamic dietary law (ID)	ID1	-.111	.015	.107	-.032	.067	-.106	.065	.643	-.029	.140	.039	-.041
	ID2	.180	.106	-.086	.112	-.137	.091	.025	.574	-.089	.102	-.163	.070
	ID3	.053	-.004	.081	.066	-.007	.037	-.147	.749	.065	.052	.135	-.111
	ID4	.058	-.050	-.102	-.083	.008	-.002	.016	.730	.076	-.097	.080	-.007
Safety (S)	S2	.121	.096	.011	.089	-.067	-.065	.059	.065	.703	-.049	-.073	-.152
	S3	-.047	.145	-.062	.146	-.039	-.061	.016	-.035	.674	.035	.008	.145
	S4	-.043	-.080	-.029	-.006	.005	.053	-.054	.019	.743	.119	-.006	.167
Innovative capability (IC)	IC1	-.017	-.039	-.072	-.061	-.024	.058	.051	.154	-.037	.818	.011	.101
	IC2	.109	-.046	.006	-.064	.108	-.041	-.042	.031	.082	.730	.020	.005
	IC3	.026	.116	-.064	.097	-.088	.023	.070	-.138	.138	.663	.178	-.078
	IC4	-.081	.052	.053	.124	-.034	.023	.000	.004	-.088	.524	.066	.282
Storage and transport (ST)	ST1	.232	.035	.033	.049	-.016	.027	-.044	-.015	-.137	.119	.691	.128
	ST2	.175	-.016	.060	-.085	-.008	-.091	-.018	.084	-.026	.070	.734	.167
	ST3	.199	.079	-.012	-.022	.031	.024	.096	.043	.189	-.002	.513	.010
	ST4	.243	-.022	-.013	.071	.045	.074	.113	.037	-.001	-.013	.563	.050
Packaging and labelling (PL)	PL1	.148	.082	.037	.055	.011	.007	.089	.074	.012	-.108	.115	.534
	PL2	.128	-.017	-.019	-.064	-.008	-.110	-.056	-.110	-.018	.175	.209	.748
	PL3	.030	-.047	-.032	-.076	.103	.102	-.093	.002	.257	.030	.001	.534
Eigenvalues		16.013	4.680	4.002	2.918	2.187	2.106	1.845	1.542	1.434	1.288	1.098	1.064
Reliability coefficient ( $\alpha$ )		0.917	0.854	0.889	0.817	0.861	0.883	0.796	0.807	0.788	0.845	0.913	0.804
Number of test measures		7	5	4	5	5	4	4	4	3	4	4	3

Table 4-8: Summary of the EFA Output

Construct	Items before EFA	Dropped Items	Reason to drop	No of items drop	Items after EFA	Remark
PS	6	-	-	-	7	<ul style="list-style-type: none"> <li>Item MH2 is added to PS</li> </ul>
EP	5	-	-	-	5	
MP	5	MP5	Factor loading < 0.5	1	4	
C	5	-	-	-	5	
TP	5	-	-	-	5	
RA	4	-	-	-	4	
FP	5	FP4	Factor loading < 0.5	1	4	
ID	4	-	-	-	4	
S	4	S1	Factor loading < 0.5	1	3	
IC	4	-	-	-	4	
ST	4	-	-	-	4	
PL	3	-	-	-	3	
MH	3	MH1 MH3	Factor loading < 0.5	2	0	<ul style="list-style-type: none"> <li>ItemMH2 is grouped under PS</li> <li>Factor MH is deleted</li> </ul>
<b>Total</b>	<b>57</b>			<b>5</b>	<b>52</b>	

#### 4.12 Main Survey

A survey method was employed for this study since it has been frequently employed in organisational studies. Here, a survey method was the most appropriate tool because it is cost-effective for large samples and can reach a geographically dispersed sample (Zikmund 2003; Sekaran & Bougie 2010). A survey also offers an accurate means of assessing the sample information and enables the researcher to draw conclusions about generalising findings to a larger population (Creswell 2009). The main survey was carried out between February 2015 and June 2015. Low response rate is a common issue for the researchers who are collecting data in Malaysia. Malaysian manufacturers

cannot not be easily convinced and persuaded to participate in surveys. Several possible data collection methods were considered to obtain an adequate response rate in the Malaysian context. Thus, selecting the correct survey method is critical.

A drop-and-collect method was applied in this study, involving the distribution of self-administered questionnaires to identified respondents. According to Brown (1993), by combining the strengths and avoiding weaknesses of face-to-face and postal surveys, drop-and-collect provides a fast, cheap and reliable research tool. This method involves the hand-delivery of survey questionnaires to the respondents. Then, the completed surveys are collected by the researcher based on the allocated time (Hair, Bush & Ortinau 2003; Zikmund 2003). This procedure allows respondents to complete the questionnaire in their own time and at their own convenience. This survey was administered purely for academic purposes and the respondents were clearly explained this objective. Furthermore, a drop-and-collect method may reduce the risk of bias arising from non-participation, interviewer's influence and social desirability effects due to face-to-face recruitment and follow-up (MacLennan, Langley & Kypri 2011). The analysis of the collected data is presented in Chapter 6.

#### **4.13 Ethical Consideration**

All research conducted at RMIT College of Business involving humans as subjects must go through the ethical review process and must obtain written approval (see Appendix A) from the Business College Human Ethics Advisory Network (CHEAN) or RMIT Human Resource Ethics Committee (HREC) prior to commencement. The objectives were to ensure that questions were designed according to the standard requirements of the ethics committee, and to simultaneously confirm that no belittling questions were

asked. The researcher was prepared, organised and considerate of participants' confidentiality in this study. Confidentiality of the information provided by the respondents based on the questionnaire items was assured through ethics approval procedures.

For the pre-test, the respondents were approached through electronic mail (e-mail). If they are agreed, a letter of invitation was sent to them. Appointments were made according to their schedule and a number of meetings were organised at the experts' office. Pilot study and main survey were approached also through e-mail. If they agreed to participate in this study, a cover letter, which was attached to the questionnaire, was physically delivered to them. In the cover letter, the respondents were advised that participation consent in this study was given once they completed the questionnaire. One week was given to complete the questionnaire, which takes approximately 30 minutes to complete. The researcher will personally come and collect the completed questionnaire from the selected respondents. The respondents were informed that all the collected data is strictly confidential and will not be identified in the thesis report or any related publication. Data can only be accessed by the researcher and her supervisor and will be kept securely at RMIT University for a period of five years.

#### **4.14 Summary**

This chapter justifies the need to employ a positivist paradigm in gathering answers to the research objectives with the aim of and testing the hypotheses in the model. In addition, this chapter has detailed the methods used in this research, including the research design, constructing and administrating the instruments, pre-test, the pilot study and assessment of dimensionality and factor structure using EFA. The following

chapter will discuss the primary analytical method used in this study, which is SEM.

Data analysis and the results will be discussed in Chapter 6.

## **CHAPTER 5**

### **RESEARCH METHODOLOGY: ANALYTICAL METHOD AND PROCEDURE**

#### **5.1 Introduction**

Once the data collection was completed, the next task is to analyse the collected data by selecting a suitable analytical method. Hence, structural equation modelling (SEM) analysis was employed for this study. This chapter explains the primary analytical method employed in this study. The focus is to elaborate the analytical procedures during the process of data analysis from the measurement model using confirmatory factor analysis (CFA) to confirming model by SEM. The actual process and results will be discussed in Chapter 6.

This chapter begins with the introduction in section 5.1. Following this section is an overview of SEM as an analytical method employed in this study. Section 5.2 discusses the details of SEM, including the two-stage approach of SEM. Assessment of model fit and an evaluation of reliability and validity are discussed from section 5.3 to section 5.4. Finally, the concluding remarks of the chapter are provided in section 5.5.

#### **5.2 Structural Equation Modelling (SEM)**

Over the past three decades, the use of SEM in social sciences research as an analytical tool has been widely applied, including food supply chain management research (Chin, Peterson & Brown 2008; Hair, Gabriel & Patel 2014). SEM has been accepted as an important tool for analysis in academic research (Anderson & Gerbing 1988; Kline 2005; Hair et al. 2010). SEM is a statistical technique that simultaneously analyses the relationships among all measures, of the measures to the proposed constructs and those

among the proposed constructs (Gerbing, Hamilton & Freeman 1994). Despite the ability to test both the measurement and structural model, SEM can assess the model fit through an array of fit-indices.

The SEM technique is confirmatory rather than exploratory, in which the aim is to confirm the hypothesised relationships between factors (latent constructs/variables), as well as the relationships between factors and their underlying measures (Byrne 2010). As a confirmatory approach, SEM provides a comprehensive means of assessing and modifying the measurement models, as well as the structural model (Awang 2012). In addition, it is a statistical methodology that takes a confirmatory approach to the analysis of a structural theory related to some phenomenon (Byrne 2010).

SEM comprises two sub-models: (i) a ‘Measurement Model’ that allows the user to assess how well the observed (or indicator) variables represent the latent, unobservable variable (often referred to as a construct) that they are hypothesised to measure; and (ii) a ‘Structural Model’ that allows the user to estimate the strength of interrelationships amongst those unobservable or latent constructs” (Gallagher, Ting & Palmer 2008, p. 256). By using confirmatory factor analysis (CFA), the analysis can assess the measurement model of the study and the issues of validity and reliability of a measurement model are addressed. More importantly, SEM provides an overall test evaluating the fitness of a model and individual parameter estimate tests simultaneously (Hair et al. 2010). Prior literature confirms that SEM methods (particularly the covariance-based approach discussed in the next sub-section) are the pre-eminent method of multivariate data analysis (Hershberger 2003).



In this study, the dataset of this research was initially analysed using IBM SPSS Statistics version 22. Then, the dataset was tested using covariance-based software called, Analysis of Moment Structure (AMOS), to test a set of relationships between one or more independent variables and one or more dependant variables. AMOS is a powerful SEM software that can analyse and test complex relationships, examine the theoretical framework directly, find models that best fit the data at hand and explore the “how and why” in one’s data (Awang 2012). SEM analysis involves two techniques which consist of covariance-based SEM (CB-SEM) and partial least squares based SEM (PLS-SEM). These two techniques have a different emphasis, and the generic assumption held by researchers pertaining to SEM, is which type of SEM-based techniques should be employed. These two SEM-based techniques are discussed further in the next two sub-sections.

### **5.2.1 The Covariance-based SEM (CB-SEM) Approach**

The CB-SEM approach was introduced by Karl G. Jöreskog as a second-generation statistical method to analyse the covariance structure of the measures that underline the latent constructs (Jöreskog 1970). This method provides some benefits which are not possible to be conducted by the first-generation statistical method. For example, by using CB-SEM, it will assist the operationalisation of the hypothesised latent constructs and associated indicators of theory development and confirmation. CB-SEM was found to be helpful in scale development, exploratory and confirmatory analyses, and the evaluation of causal relationships (Babin, Hair & Boles 2008; Byrne 2010; Hair et al. 2010). More importantly, CB-SEM has certain superior benefits over the PLS-SEM approach (explanation provided later). CB-SEM can be performed using several software packages, such as LISREL, EQS, AMOS, SEPA-TH, RAMONA, MX and

CALIS (Chin 1998). LISREL is said to be the first-choice software to be used; however, AMOS is more user-friendly, especially for beginners (Gallagher, Ting & Palmer 2008).

CB-SEM has several advantages over PLS-SEM. One of the advantages of CB-SEM occurs when the theoretical model is complex. This method facilitates the assessment of a theoretical model with second or even third order constructs. “First-order measurement model is one in which covariance between the constructs are explained by a single layer constructs, whereas a second-order measurement model contains two layer of latent constructs” (Hair, Gabriel & Patel 2014, p. 46). Theoretically, the second-order construct should show causes to the first-order construct, which in turn cause the observed variables (Hair et al. 2010). Otherwise, it should not be used if the proposed second-order construct does not reflect the theory. The analysis will allow for the execution of the model where the error terms are modelled for each indicator and generate the loadings of the individual indicators (Hair, Gabriel & Patel 2014). The indicators with large error terms and low factor loadings will be deleted to obtain a model with acceptable fit.

The other advantage of applying CB-SEM is it allows for the assessment of reliability and validity. Through the CFA process, it allows all latent constructs to be assessed in terms of reliability and validity. Each of the constructs will be assessed both for convergent and discriminant validity (Bagozzi & Yi 2012). The measurement model which was found to be valid and reliable can continue with the structural model analysis for testing of the hypothesised relationship.

Another important advantage in CB-SEM compared to PLS-SEM is the high accuracy of the estimated structural regression coefficients which contribute to more accurate results. It can only be achieved if the study has a sufficiently large sample size to estimate covariance (Kline 2011; Bollen 1989). Further, CB-SEM is dependent on parametric assumptions,<sup>1</sup> in which the data is normally distributed, and the independence of the observations.

Finally, CB-SEM is superior to PLS-SEM when it able to assess the overall model fit. The fit measures are related to the ability of the model to account for the sample covariances. Therefore, the fit model refers to how well the parameter estimates are able to match the sample covariances (Hair, Gabriel & Patel 2014). The SEM algorithms help to identify the best fitting parameter estimates. For example, to match the data variances and covariances, error terms for measures need to be increased. Therefore, models with a low R-square and low factor loading can still generate a good model fit. Unfortunately, this procedure is not able to be analysed using PLS-SEM. For this reason, PLS-SEM is said to be less rigorous in the context of evaluating the overall model fit.

### **5.2.2 The Partial Least Square SEM (PLS-SEM) Approach**

The second approach of SEM is PLS-SEM, a nonparametric approach<sup>2</sup> introduced by a Swedish professor named Herman Wold around 1975 (Wold, Sjöström & Eriksson 2001). The PLS-SEM approach is mainly applied to develop theories in exploratory research by focusing on the explaining the variance in the endogenous variables (Hair et

---

<sup>1</sup> Statistical procedures that use interval-scaled or ratio-scaled data and assume populations or sampling distributions with normal distributions (Zikmund 2003).

<sup>2</sup> Statistical procedures that use nominal- or ordinal-scaled data and make no assumptions about the distribution of the population (or sampling distribution) (Zikmund 2003).

al. 2014a). Although PLS-SEM is an approach that can be applied with no assumptions about the data distribution (Vinzi et al. 2010), it is not appropriate for all kinds of statistical analysis (Wong 2013). Researchers need to be aware of some weaknesses of PLS-SEM.

The PLS-SEM method is considered for smaller sample sizes; however, high-valued structural path coefficients are needed, otherwise the estimates of structural regression coefficients become less accurate (Wong 2013; Hair, Gabriel & Patel 2014). Thus, to have consistency and accuracy estimates on the hypothesised relationships with the use of a small sample size, a large number of measures for each of the construct are required.

Unlike CB-SEM, there is no evaluation for the overall model fit (i.e., goodness of fit measure) in PLS-SEM to examine to what extent the proposed theoretical model of the study fits the observed data (Hair, Gabriel & Patel 2014). Due to the inability to provide goodness of fit measures, most of the research articles using this method are rejected and it is considered to be a less rigorous approach (Chin 1998). Despite these weaknesses, PLS-SEM becomes a method of choice when the following situations are encountered (Wong 2013; Hsu, Chen & Hsieh 2006): (i) having small sample size and the data do not meet the parametric assumptions; (ii) the research is prediction oriented; (iii) the property of consistency is large; (iv) theory testing is not the primary focus of the study; and (v) consists of the formative constructs in the model.

For this study, the data set was found to be normally distributed and met the parametric assumptions. Furthermore, the theoretical model does not contain formative constructs

and theory testing is the primary focus of the study. Taking these aspects into consideration, the PLS-SEM approach was discarded and the CB-SEM approach became the method of choice.

### **5.2.3 Two-Stage Approach of SEM**

SEM can be performed using two approaches, one-stage and two-stage. A one-stage approach, or also a single-stage approach, is when the process refers to the simultaneous estimation of the both measurement and structural models in a single analysis. However, this approach can cause some problems, including interpretational confounding and misspecification (Gallagher, Ting & Palmer 2008; Bollen et al. 2007). Moreover, the two-stage approach is when the analyses are conducted for the measurement model first, then fixed until the measurement model is acceptably fit before the structural model can be estimated. As recommended by Anderson and Gerbing (1988), this thesis adapted the two-stage approach to conduct the analysis. The advantage of employing the two-step approach is when problems of interpretational confounding and misspecification can be detected, to allow adequate independent assessment of the convergent and discriminant validities of the measured constructs and a separate assessment validity of the structural models (Dow, Samson & Ford 1999). This two-step approach of SEM is now well accepted, is used in many academic studies and has become the foundation of other extended methods (Gallagher, Ting & Palmer 2008).

As illustrated in Figure 5-1, stage one begins with an analysis of the measurement model by using confirmatory factor analysis. The analysis was conducted to specify the causal relationships between the observed variables (items) and the underlying

constructs (latent variables/first-order constructs). At this stage, one of the purposes is to verify unidimensionality. Unidimensionality is defined as “an assumption underlying the calculation of reliability and is demonstrated when the indicators of a construct have acceptable fit on a single-factor (one dimensional) model” (Hair et al. 1995, p. 641). It means that one underlying construct can only be defined by a set of measured variables (indicators). Unidimensional models are achieved if all factor loadings of all measuring items are within an acceptable range. Furthermore, Kline (2015) suggested that unidimensional models provide more accurate tests of convergent and discriminant validity. An assessment of unidimensionality must be performed prior to the evaluation of the validity and reliability of the measurement model.

In assessing unidimensionality, CFA is considered powerful and flexible technique compared to EFA (Anderson & Gerbing 1988; Dunn, Seaker & Waller 1994; Hair et al. 2010). Through CFA, the measurement model is considered unidimensional if all items result in factor loading of 0.50 and above (Hair et al. 2010). Once the measurement model is unidimensional, the reliability and validity of the constructs are evaluated. This evaluation was conducted prior to evaluating hypotheses regarding relationships between constructs. After the assessment of the reliability and validity of the constructs is satisfactorily obtained and cross-validated, structural models can be developed to test the research hypotheses (stage-two). The overall SEM procedure employed in this study is illustrated in Figure 5-1. Further details of the two-stage approach of SEM analysis are discussed in Chapter 6.

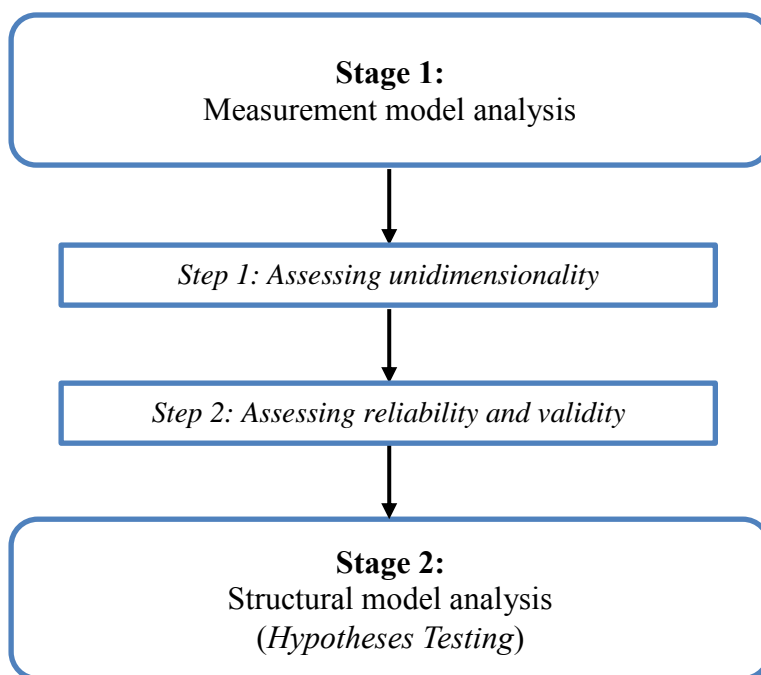


Figure 5-1: Two-stage approach of the structural model used in this thesis

#### 5.2.4 SEM Assumptions

To apply SEM as an analytical tool, several assumptions need to be met. One of the most important assumptions is the sample size. SEM requires the sample size to be adequate to ensure that covariance and correlations are more stable (Tabachnick & Fidell 2007). Some authors argue that the minimum sample size that can be used for SEM is as small as 50 (Anderson and Gerbing 1984); however, others suggest that the accepted minimum sample size should be 100 to ensure the appropriate use of maximum likelihood estimation (MLE) (Hair et al 2010). Boomsma and Hoogland (2001) suggest that the estimation of SEM using maximum likelihood methods can only be used when the sample size is at least 200. A sample size that is too large sample is 400 and over, and is considered undesirable because the methods can become too sensitive and lead to poor model fit (Carmines & McIver 1981; Tanaka 1987; Hair et al 2010).

Notwithstanding, Bentler (1995) suggests that it is advisable to consider how many subjects per estimated parameter rather than the number of participants per measured variable. It is suggested that fewer than ten subjects per estimated parameter may be adequate if the estimated size of effect is large and all the items are normally distributed (Tabachnick & Fidell 2007). Although scholars do not agree about the definite number of sample size, Hair et al (2010) considered the number 200 to be ideal. For this thesis, the sample size is 240, and therefore, considered to be appropriate for conducting SEM. The details of the appropriate sample size for SEM have been discussed in section 4.8.3. Other equally important assumptions for using SEM, include the normality of data, independent observations, random sampling of respondents and the effect of missing data and outliers. Missing data, assessment of outliers and normality will be discussed in Chapter 6 under Data Screening (Section 6.2).

### **5.2.5 Path Diagram**

By using SEM, the hypothesised relationships can be illustrated in the form of a path diagram. For this study, the SEM diagram is conceptualised at higher-order or second-order modelling, which consists of first-order constructs (latent constructs), second-order construct, endogenous construct, measurement error and arrows representing relationships between the constructs (see Figure 5-2). At the first-order level, the constructs include cleanliness, safety, Islamic dietary law, physical segregation, material handlings, storage and transport, packaging and labelling, ethical practices, training and personnel, innovative capability and resource availability. HFSC implementation is posited as a second-order construct. Furthermore, the endogenous constructs in this study consist of marketing performance and financial performance.



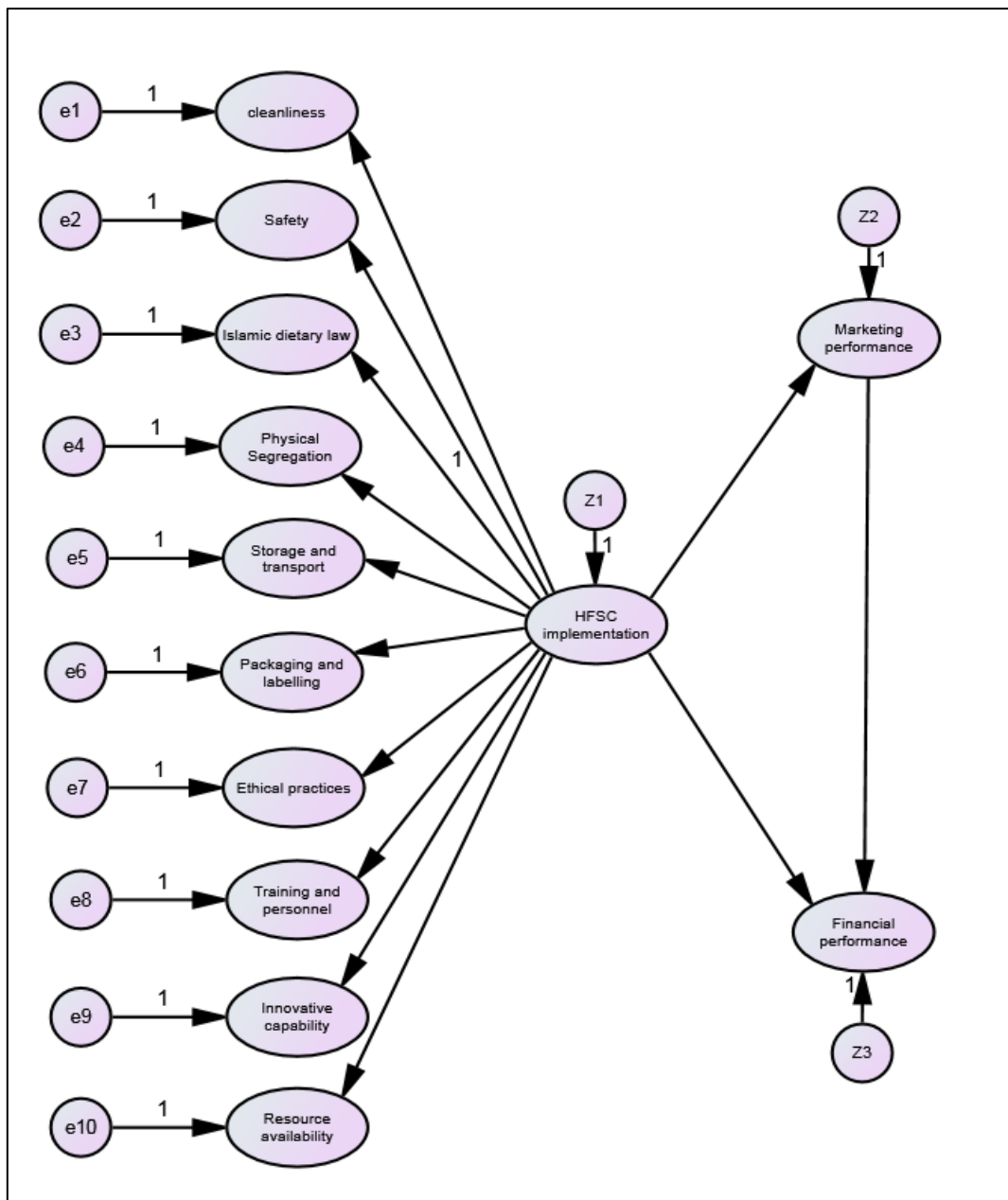


Figure 5-2: The path diagram for this thesis

The single-headed pointed in arrows in the diagram represent the causal relationships, in which one construct is dependent on another. For example, the arrow connecting HFSC implementation with marketing performance represents a direct relationship that is hypothesised between these two constructs. The single-headed arrows pointing outwards link the first-order constructs and second-order construct, which implies that first-order constructs are the dimension or facets of the second-order construct. In

addition, a second-order construct can be posited as explanatory construct to endogenous constructs. As demonstrated in the SEM diagram, the measurement error has been represented as (e) enclosed in small circles, whereas residual errors have been represented as (z) in small circles.

### **5.3 Assessment of the Measurement Model**

Based on the earlier discussion, the validating procedure of the measurement model can be performed through confirmatory factor analysis (CFA). CFA enables the access of unidimensionality, reliability and validity of a latent construct (Awang 2012). Once unidimensionality has been established, the assessment of reliability and validity can be conducted on the constructs of the study (Anderson & Gerbing 1988; Hair et al. 2010). Assessing the reliability and validity of the constructs is extremely important to ensure the quality of the findings and conclusions of the study. The measurement model must have a satisfactory level of validity and reliability prior to testing a significant relationship in the structural model (Fornell & Larcker 1981). Therefore, the assessments of unidimensionality, content validity, construct validity, convergent validity and discriminant validity are discussed in the following sub-sections.

#### **5.3.1 Unidimensionality**

Unidimensionality must be assessed prior to the evaluation of reliability and validity. The unidimensionality conditions can be based on the traditional common factor model, in which a set of indicators share only a single underlying factor (Segars 1997). It is suggested for the measurement model to examine the unidimensionality to confirm a set of measured variables which can be explained by only one underlying construct (Hair et al. 2010). An assessment of unidimensionality is achieved through EFA to determine

the factors that underline a set of items measuring each construct that suits the research context (Kline 2010). However, unidimensionality can also be measured through CFA to assess the internal and external consistency of a construct and to analyse the measurement model for first-order constructs (Anderson & Gerbing 1988).

In fact, unidimensionality is only achieved when all measuring items have acceptable factor loadings for the latent constructs. It is possible that some measurement items need to be deleted to achieve unidimensionality. According to Awang (2012), for newly developed items, the acceptable factor loadings should be 0.5 and above, whereas for established items, the factor loadings need to be 0.6 or higher. In this study, the pooled-CFA was performed to assess the measurement model, including the unidimensionality.

### **5.3.2 Reliability**

Reliability refers to ‘the extent to which your data collection techniques or analysis procedures will yield consistent findings’ (Saunders, Lewis & Thornhill 2009, p.156). The main objective of running a reliability test is to minimize the errors and biases in research (Yin 2013). Furthermore, reliability reflects “the quality of the used scales, in that it quantifies the extent to which scores are affected by the ubiquitous measurement error” (Raykov 2009, p. 223). Cronbach’s alpha ( $\alpha$ ) is the most common method used to assess reliability, including the reliability of a measurement scale or internal reliability (Nunnally & Bernstein 1994; Sekaran & Bougie 2010). Different levels of acceptance have been suggested in the literature. Nunnally (1978) suggests that the alpha should exceed 0.70 to indicate good internal consistency. On the other hand, Carmines & Zeller (1979) suggest a level of acceptance of 0.80 for internal consistency. Moreover, other researchers suggest that a level of 0.60 is considered acceptable (Nunnally & Bernstein

1994). Despite the different views on the acceptance level, it is generally agreed that an alpha of 0.70 and higher is acceptable to indicate internal consistency. Therefore, this research uses 0.70 as the minimum level to indicate the internal consistency of the constructs.

Through CFA, the assessment for reliability could be made based on internal reliability, composite reliability and average variance extracted (AVE). The objective of reliability remains the same, which is to check the reliability of the developed measurement model in measuring the latent constructs. For composite reliability, a value of 0.6 or higher is required to achieve the composite reliability for a construct. On the other hand, an AVE must be 0.5 or higher to ensure that the average percentage of variation is explained by the measured items (Awang 2012). If all the three criteria (internal consistency, composite reliability and average variance extracted) are met, then the reliability of the measurement model is achieved.

### **5.3.3 Validity**

Validity is defined as ‘the ability of a scale to measure what intended to be measured’ (Zikmund 2003, p.331). A valid construct should have three important aspects as suggested by Nunnally and Bernstein (1994). First, the construct should be a good representation of the domain of observable related to the construct. Second, the construct should represent the alternative measures adequately. Finally, the construct should be closely related to other constructs of interest. Based on the discussion above, content validity, construct validity including convergent and discriminant validity were examined in this thesis.

### **5.3.3.1 Content Validity**

Content validity is the assessment of the extent that the content of a scale measures a construct (Malhotra, Agarwal & Peterson 1996). Therefore, content validity is a function of how well the dimensions and elements of a concept have been explained (Sekaran 2003). In addition, Haynes, Richard and Kubany (1995) define content validity as the degree to which items are representative of the construct of interest. To obtain content validity, careful attention was given in the process of developing the questionnaires. Only validated measurements are used in this study. Furthermore, the questionnaires were given to experts (practitioners in the industry and academics) during the pre-test for their opinion on the wording of the items. Words or sentences were corrected based on their comments. The final questionnaire incorporated minor changes to remove a few ambiguities as discussed in Section 4.9.

### **5.3.3.2 Construct Validity**

Through an extensive literature review, the constructs of the study have been developed and obtained. The constructs were adapted to develop a theoretical framework of the study and to gain an understanding among the constructs. This only can be achieved if the construct validity is confirmed. Construct validity is the extent to which a set of measured items reflects the latent construct (Hair et al. 2010). In other words, construct validity is concerned with what the instrument is measuring (Churchill & Iacobucci 2006). The importance of achieving the validity of constructs has been discussed by several authors, with the objective of addressing the issues of weak validation experienced by many prior researchers (Churchill & Iacobucci 2006; Malhotra 2008; Gallagher, Ting & Palmer 2008; Hair et al. 2010).

Construct validity is assessed through convergent and discriminant validity. In addition to the assessment of convergent and discriminant validity, construct validity is also achieved by assuring that the model goodness-of-fit results obtained from CFA fit the data adequately. The goodness-of-fit results indicate how fit is the items in measuring their identified latent constructs. Details of convergent validity and discriminant validity are discussed in following sub-sections.

#### **5.3.3.3 Convergent Validity**

Convergent validity is achieved when all factor loadings are statistically significant and the standardised loading estimate is 0.50 or higher (Hair et al. 2010). According to Sekaran (2003), convergent validity examines whether the measures of the same construct are highly correlated. AVE is used as an indicator for supporting convergent validity (Fornell & Larcker 1981). In addition, by computing the AVE for each construct, it can verify the convergent validity. To verify the convergent validity, the AVE value must be greater than or equal to 0.50 to achieve an adequate level (Fornell & Larcker 1981; Hair et al. 2010). Retaining the low factor loadings in a model could lead to convergent validity failure (Awang 2012). Lastly, the convergence was also reflected by the measure of composite reliability (CR), which is greater than 0.6 and higher than the construct's AVE value.

#### **5.3.3.4 Discriminant Validity**

Discriminant validity is the degree to which a concept differs from other concepts (Hair et al. 2010). Moreover, it determines if the measures of a construct have been correlated too highly with other constructs, meaning that the construct is free from redundant items. The observation of discriminant validity in this study was employed by checking

the estimated correlations between the factors, which should not be greater than 0.85 (Kline 2005); if the two factors were found to be highly correlated (greater than 0.85), redundant items that show lack of discriminant validity were deleted. Furthermore, discriminant validity was assessed by comparing the square root of AVE with correlations shared between each indicator and the other indicator of the model (Fornell & Larcker 1981; Vázquez-Carrasco & Foxall 2006). If the square root of AVE for each of the factors is greater than its shared variance with any of the other factors, then discriminant validity is achieved.

Another method to assess discriminant validity is by using AMOS. This software helps to identify the item redundancy in the model through a discrepancy measure called Modification Indices (MI). A high value of MI indicates that the items are redundant and one of the identified items need to be deleted (Awang 2012). Another requirement for discriminant validity is that the redundant pair can be controlled as a “free parameter estimate”. By achieving this validity, it indicates that the measurement model of a construct is free from redundant items.

#### **5.4 Assessment of Overall Model Fit**

In SEM, there are series of goodness-of-fit (GOF) indices to determine the fit of the model. GOF specifies how well the model reproduces the observed covariance matrix among the indicators or first-order items (Hair et al. 2010). Based on the literature, there are between four to six fit indices that can assess the model fit (Kline 2005; Medsker, Williams & Holahan 1994). Currently, there is no agreement among scholars as to which fitness indices should be reported. Hair et al. (2010) and Holmes-Smith, Coote and Cunningham (2006) recommend the use of at least three fit indices by including at

least one index in each category: absolute fit, incremental fit and parsimonious fit. The selection of indices used in the study and the acceptable cut-off values reported in the study may vary depending on which study is referred. For this study, the model fit category used, selected indices and level of acceptance are presented in Figure 5-1. In the next sub-sections, each category of the GOF measures is discussed.

#### **5.4.1 Absolute Fit Indices**

An absolute fit index includes the chi-square ( $\chi^2$ ), goodness-of-fit (GFI), root mean square error (RMSEA) and standardised root mean square residual (SRMR). Absolute fit indices measure how well a priori model fits the sample data and determine which of the proposed model has the most superior fit (McDonald & Ho 2002). These indices measure how well the proposed theory fits the data (Hooper, Coughlan & Mullen 2008). The chi-square ( $\chi^2$ ) is used to test whether the matrix of implied variance and covariance ( $\Sigma$ ) is significantly different to the matrix of empirical sample variance and covariance (S). The purpose is to determine the magnitude discrepancy between  $\Sigma$  and S. A good model fit will generate an insignificant result at the threshold of 0.05 (Barrett 2007). However, this type of statistical index has been criticised for being too sensitive to the sample size, especially in cases in which the sample size is over 200 (Fornell & Larcker 1981; Bagozzi & Yi 2012; Hair et al. 2010). Chi-square statistics are often considered as either a “badness of fit” or a “lack of fit” (Kline 2010; Mulaik et al. 1989). Hence, most researchers do not solely use this value to reject or accept their models, but use it in conjunction with other indices to evaluate the overall fit.

The second measure of absolute fit index used in this study is the GFI. The GFI measures the relative amount of both variance and covariance explained by the model



(Byrne 2010). The GFI statistic was created by Jöreskog and Sörbom (1982) as an alternative to the chi-square test. The GFI value is calculated by comparing the discrepancy value for the model under testing to the discrepancy value for a saturated version of the model, which is considered to represent a 100% fit or 1.0. However, this measure is not adjusted for degrees of freedom (Hair et al. 2010) which ranges from 0 (indicating a poor fit) to 1 (indicating a perfect fit), for which a recommended acceptance level is 0.90 (Hair et al. 2010; Byrne 2010; Kline 2010). Furthermore, it was found that the GFI increases as the number of parameters increases (MacCallum & Hong 1997), and has an upward bias with larger samples (Shevlin & Miles 1998). It is recommended that this index should not be used independently due to its sensitivity (Sharma et al. 2005; Hooper, Coughlan & Mullen 2008).

Root Mean Square Error of Approximation (RMSEA) is the third measure of absolute fit index used within this study. This measure helps to correct the tendency of the chi-square to reject specified models and considers error approximation in the population. The RMSEA also reveals how well the model with the chosen parameter estimates fit the population covariance matrix (Byrne 2010). Moreover, it has been regarded as “one of the most informative fit indices” (Diamantopoulos & Siguaw 2000, p. 85). Browne and Cudeck (1992) as reported in Bollen and Long (1993) recommended that an absolute RMSEA value of less than 0.05 indicates a close fit, and less than 0.08 suggests a reasonable fit. Holmes-Smith, Coote and Cunningham (2006) recommended that the RMSEA should be less than 0.05; however, a cut-off value ranging from 0.05 to 0.08 was found to be commonly acceptable (Hair et. al 2010).

Table 5-1: Summary of goodness-of-fit (GOF) indices

Category	Name of Index	Level of Acceptance	Comments
Absolute fit	Chi-square ( $\chi^2$ )	$p > 0.05$	Indicates exact fit of the model. A non-significant p-value indicates an adequate representation of the data. This measure is sensitive to large sample size.
	Goodness-of-Fit (GFI)	$\geq 0.90$	Value close to 0 indicates a poor fit, while value close to 1 indicates a perfect fit.
	Root Mean Square Error of Approximation (RMSEA)	$\leq 0.08$	Values less than 0.05 are generally considered a 'good' fit. Values between 0.05 and 0.08 are considered 'adequate' fit. Values up to 0.10 are considered acceptable and represent the lower bound of fit.
	Standardised Root Mean Square Residual (SRMR)	$< 0.08$	Smaller, the better; 0 indicates perfect fit
Incremental fit	Adjusted Goodness-of-Fit (AGFI)	$> 0.80$	
	Tucker-Lewis Index (TLI)	$\geq 0.90$	Value close to 0 indicates a poor fit,
	Comparative Fit Index (CFI)	$\geq 0.90$	While value close to 1 indicates a perfect fit.
Parsimonious fit	Normed Chi-square ( $\chi^2/df$ )	$1.0 \leq \chi^2/df \leq 5.0$	Lower limit is 1.0, upper limit is 3.0 or as high as 5.0

*Source: Adapted from Hair et al. (2010), Kline (2010), Chau & Hu (2001), Tabachnick & Fidell (2007), Hu & Bentler (1999), Hooper, Coughlan & Mullen (2008)*

The root mean square residual (RMR) and standardised root mean square residual (SRMR) are the square root of the difference between the residuals of the sample covariance matrix and the hypothesised covariance model (Hooper, Coughlan & Mullen 2008). RMR is calculated based on the scales of each indicator; hence, if the questionnaire consists of a varying scale range, the RMR becomes difficult to interpret (Kline 2010). To overcome this problem, the SRMR has been introduced (Bentler

1995). A rule of thumb is that SRMR should be less than 0.05 for a good fit (Hu & Bentler 1999), whereas values as high as 0.08 are deemed acceptable. It should be noted that the SRMR will be lower when the models are based on larger sample sizes.

#### **5.4.2 Incremental Fit Indices**

The second category is incremental fit indices, which include the Adjusted Goodness-of-Fit Index (AGFI), Normed Fit Index (NFI), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI). Incremental fit indices compare how well the proposed model fits the data in relation to a baseline model that assumes independence among all the variables (Bentler 1990). Related to the GFI is the Adjusted Goodness-of-Fit Index (AGFI) which adjusts the GFI based upon degrees of freedom, with more saturated models reducing fit (Tabachnick & Fidell, 2007). Thus, more parsimonious models are preferred, yet are also penalised for complicated models. In addition, AGFI tends to increase with the sample size. Similar to the GFI, values for the AGFI also range between 0 and 1, and it is generally accepted that values of 0.80 or greater indicate well-fit models (Chau & Hu, 2001). Given the often-detrimental effect of the sample size on these two fit indices, they are not relied on as a stand-alone index; however, given their historical importance, they are often reported in covariance structure analyses (Hooper, Coughlan & Mullen 2008).

In addition to AGFI, the Normed Fit Index (NFI) is one of the most popular incremental measures (Hair et al. 2010; Byrne, 2010). The NFI reflects the proportion to which the researchers' model fits compared to the null model. For example,  $NFI = 0.50$  means the researcher's model improves the fitness by 50%. However, this index does not control the degrees of freedom (Bollen, 1989). A major drawback to this index is that it is

sensitive to the sample size, underestimating fitness for samples less than 200 (Mulaik et al., 1989; Bentler, 1990). Thus, it is not recommended to solely rely on the NFI (Kline, 2010).

This problem was rectified using the Non-Normed Fit Index (NNFI), also known as the Tucker-Lewis Index (TLI), which prefers simpler models. To overcome the NFI's shortcomings, Bentler (1990) used it with the Comparative Fit Index (CFI). The CFI compares the covariance matrix predicted by the model to the observed covariance matrix. However, only TLI and CFI are reported in this thesis. They ranged from 0 (poor fit) to 1 (perfect fit), having commonly recommended a level of 0.90 or greater (Hair et al. 2010).

#### **5.4.3 Parsimonious Fit Indices**

Lastly, parsimonious fit indices can be measured by normed chi-square ( $\chi^2/df$ ). These indices test the parsimony of the proposed model by assessing the fitness of the model to the number of estimated coefficient required to achieve the level of fit. The normed chi-square ( $\chi^2/df$ ), also known as CMIN, is the most popular index used in this category to evaluate the model. In this measure, a range of acceptable values for the  $\chi^2/df$  ratio have been suggested, ranging from less than 2.0 (Hair et al. 2010; Tabachnick & Fidell 2007), to less than 3.0 (Carmines & McIver 1981) and more liberal limits of less than 5.0 (Wheaton 1987). Thus, this thesis has used this measure as an indicator of the overall fit (in conjunction with other measures), not as a basis for rejecting or accepting the model.

This study adopts the indices which had most commonly been used in previous research regarding supply chain management. The purpose is to evaluate the models in which the three categories are reflected. Table 5-1 outlines the SEM model fit indices reported in this study. As outlined in the table, the absolute fit indices include the chi-square ( $\chi^2$ ), GFI, RMSEA and SRMR; the incremental fit indices include AGFI, CFI, TLI; and the parsimonious fit index includes the normed chi-square ( $\chi^2/df$ ).

## **5.5 Summary**

This chapter discussed the use of CB-SEM to justify the data analysis and as a major reference to the development of Chapter 6. The focus of this chapter emphasises the issues of SEM and its applicability to this study, particularly the two-stage approach of measurement model and structural model. In the beginning, the chapter pointed out the difference between CB-SEM and PLS-SEM and why this study has used CB-SEM. It also justified the use of some procedures and the steps of the chosen analysis. Then, this chapter discussed elements that should be considered while assessing the measurement model. The issues related to unidimensionality, reliability and validity have been addressed. Furthermore, the issues of evaluating the goodness-of-fit model which covered absolute, incremental and parsimonious goodness-of-fit indices have also been presented. The following chapter will focus on the data analysis and findings, initiating with the preliminary data analysis, assessing the measurement model using CFA and confirming the structural model.

## **CHAPTER 6**

### **DATA ANALYSIS AND FINDINGS**

#### **6.1 Introduction**

This chapter describes the data analysis and results for this study. First, the chapter explains the data preparation and screening, which includes assessing the missing data, screening for outliers, and checking the normality of the data. Second, the section explains the response rate and non-response bias. The third section presents a brief descriptive data analysis of the respondents' demographic profiles. Following this section, is an assessment of the measurement models and structural model analysis. Finally, the last section provides the summary of the chapter.

#### **6.2 Data Screening**

The main reason for screening the data is to check whether the data have been correctly entered, that there are no missing values, it is free of outliers and to confirm that the distribution of the variables is normal. The data cleaning process requires careful consideration as it will significantly affect the final statistical results. The process demands consistency checks and treatment of missing data (if required). The overarching objective of handling of all screening activities is to avoid failure of the model estimation and crashing of fitting programs (Kline 2005). Hence, the details of the process are discussed in this section.

##### **6.2.1 Assessment of Missing Data**

Missing data commonly occurs in research studies when respondents fail to answer one or more items in the survey. According to Cohen and Cohen (1983), up to 10% missing data may not cause any serious problem in the interpretation of the findings. However,

prior studies have suggested that missing data requires appropriate treatment and must be based on the patterns of missing values. One of the solutions recommended by Tabachnick & Fidell (2007) is removing the missing values. For this study, the survey resulted in 240 completed questionnaires with no missing data for the measured variables. The reason for this is that this study applied the drop-and-collect method which allows the researcher to drop and collect the completed questionnaires personally. Thus, the researcher was able to double-check the completed questionnaires and if any questions remained unanswered, in person with the participants. Furthermore, to confirm the accuracy in the data entry process, another procedure was performed using IBM SPSS Statistics 22 software. The data were verified case-by-case and further checking was conducted by using descriptive statistics, including frequency distribution, maximum and minimum values, the mean and standard deviation. The results yielded no missing values in the data entry process and ensured that the data were 100% accurate.

### **6.2.2 Assessment of Outliers**

Checking for outliers is important, as outliers can affect the normality of the data which could then distort the statistical results (Hair et al. 2010; Tabachnick & Fidell 2007). Detecting outliers can be performed from a univariate, bivariate and multivariate perspective. Since this research uses SEM, a multivariate test for outliers was adopted to investigate if there were any extreme scores for two or more variables. Mahalanobis  $D^2$  distances are generated for each case using SPSS Regression. Tabachnick & Fidell (2007) recommended that cases with values larger than 1 are a potential problem. To determine if cases are multivariate outliers, the researcher identifies the critical chi-square value using the number of independent variables as the degrees of freedom.  $D^2$

assesses the extent of the dissimilarity of each case across a set of constructs. Furthermore, a  $D^2$  value larger than the critical chi-square value indicates the presence of multivariate outliers. Examination of  $D^2$  values indicates that the maximum  $D^2$  value is 42.91, which far exceeds the critical value of 29.59. Table 6-1 depicts a list of critical values for evaluating  $D^2$ .

Table 6-1: Critical values for evaluating Mahalanobis Distance

Number of independent variables (df)	Critical value of $\chi^2$
1	10.83
2	13.82
3	16.27
4	18.47
5	20.52
6	22.46
7	24.32
8	26.13
9	27.88
10	29.59

*Source: Pearson & Hartley (1972), Tabachnick & Fidell (2007)*

Further analysis was performed using Cook's Distance to check whether this outlier has an undue influence on the results. Referring to Tabachnick & Fidell (2007), cases with values larger than 1 are a potential problem. Based on the results in Table 6-2, the maximum of Cook's Distance value is 0.136, suggesting that no cases indicated the presence of an outlier, and all 240 cases were retained for further analysis.

Table 6-2: Multivariate outliers and Cook's Distance test results

Case	$D^2$	Cook's Distance
49	42.91	0.136
73	16.75	0.001
158	16.85	0.002
117	18.13	0.010



### **6.2.3 Assessment of Normality**

Checking normality is an important early step in almost every multivariate analysis. Normality can be examined at both the univariate and multivariate level. As mentioned by Hair et al. (2010), normality measures the data that is normally distributed across the population sample and that there are no excessively high or low scores from a few respondents which can then skew the overall result. Lack of normality will adversely affect the suitability indices and standard errors (Baumgartner & Homburg 1996). Two components values used to assess data normality are, skewness and kurtosis. Skewness judges the symmetry of the distribution, whereas kurtosis assesses the peakedness of a distribution. A positive skew represents a distribution that is shifted or skewed to the left and a negative skew reflects a distribution skewed to the right. A negative kurtosis value denotes a flatter distribution, whereas a positive kurtosis value reveals a peaked or taller distribution (Tabachnick & Fidell 2007). Data distribution with either a highly skewed nature or with high kurtosis indicates non-normality, which has random effects on specification or estimation (Hall & Wang 2005).

Hair et al. (2014b) suggested that all skewness values should fall within an acceptable range of -1 to +1. Although an absolute value of skewness 1.0 or lower indicates that the data is normally distributed, if the sample size is greater than 200, the absolute skewness could increase to 1.5 (Awang 2015). On the other hand, the value of the standardised kurtosis index should be within the range of -3 to +3 (Kline 2005). The absolute values of kurtosis index from about 8.0 to over 20.0 have been described as indicating “extreme” kurtosis or may suggest a problem (DeCarlo 1977). For this study, the normality test result is presented in Table 6-3. The results demonstrate that all values for the items fall within the acceptable range of skewness +1 to -1 and meet a

lenient +3 to -3 range of kurtosis. Therefore, the empirical measures of skewness and kurtosis for all constructs from the questionnaires confirm no issues of multivariate non-normality in the data set.

Table 6-3: Results of the normality distribution test

<b>First-order construct</b>	<b><i>n</i></b>	<b>Skewness</b>	<b>Kurtosis</b>
Cleanliness	240	-.738	.219
Safety	240	-.405	.647
Islamic dietary law	240	-.580	.405
Physical Segregation	240	-.663	.430
Storage and Transport	240	-.218	-.584
Packaging and Labelling	240	-.687	.616
Ethical Practices	240	-.631	.112
Innovative Capability	240	-.635	-.082
Training and Personnel	240	-.216	-.637
Resource Availability	240	-.722	-.627
<b>Endogenous construct</b>	<b><i>n</i></b>	<b>Skewness</b>	<b>Kurtosis</b>
Marketing Performance	240	-.806	.538
Financial Performance	240	-.552	-.205

Further testing was conducted to check the multivariate normality via a residuals test. The residuals plots appear normal in the regression when no significant deviations from normality occur for the present data (Pallant 2011). Details of the results are discussed in sub-section 6.2.4.

#### **6.2.4 Residuals Test**

In the normality assessment, it is important to check the normality of residuals. The other test to assess the multivariate normality is via a residuals test. This can be performed by regressing each variable in the model on all other variables in the model and checking whether all residuals of the variables are normally distributed (Garson 2012). The normal probability plots were used to see if there are deviations from normality. Some of the deviations reflect the presence of outliers, mixtures in the data or truncation in the data (D'Agostino, Belanger & D'Agostino Jr 1990). In the normal probability plot, the points are the observed residuals and the line represents the normal

distribution. In this study, the plots appear to be close to normal. As shown in Figure 6-1 and Figure 6-2, all dots were situated straight along the line, indicating that the residuals had been perfectly normally distributed. Thus, it is assumed that the distribution of data was normal.

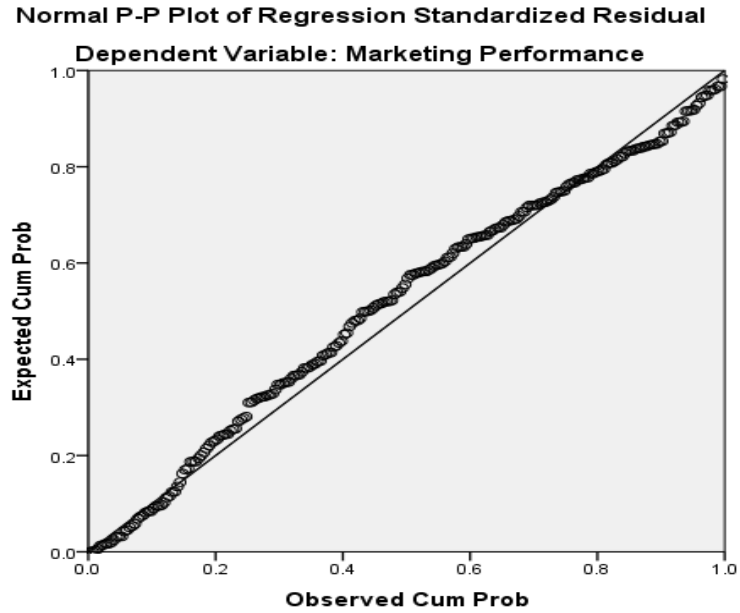


Figure 6-1: Normal P-P plot of HFSC implementation and marketing performance

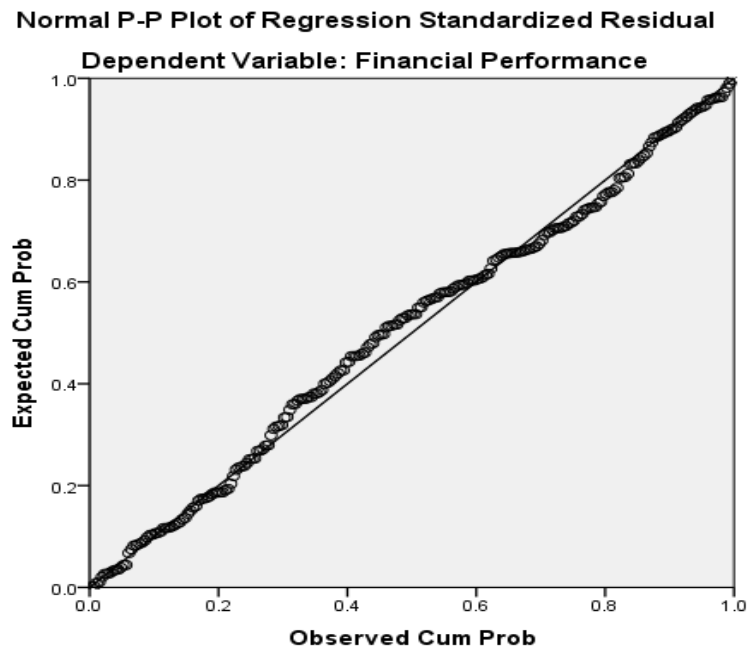


Figure 6-2: Normal P-P plot of HFSC implementation and financial performance

### **6.2.5 Assessment of Multicollinearity**

The next assumption is the multicollinearity problem. Multicollinearity can be defined as the extent to which any variable's influence can be explained by other variables in the analysis (Hair et al. 2010). The ability to specify and further define any variable's effect will become more difficult as multicollinearity increases. With multicollinearity, the variables are identified as having a very high correlation, with a value of 0.90 and above (Tabachnick & Fidell 2007). The variables probably are redundant or one of the variables is a combination of two or more of the other variables. High multicollinearity can cause both logical and statistical problems (Kline 2005; Tabachnik & Fidell 2007).

Assumptions for multicollinearity are tested via correlation matrices and co-linearity diagnostics. For this study, correlation values were calculated for cleanliness (C); safety (S); Islamic dietary law (ID); physical segregation (PS); storage and transport (ST); packaging and labelling (PL); ethical practices (EP); training and personnel (TP); resource availability (RA); innovative capability (IC); marketing performance (MP); and financial performance (FP). Overall, the correlation values between constructs fall into low to middling values, ranging from 0.154 to 0.713 as shown in Table 6-4. In this study, no items were found to be highly correlated that were above 0.9, indicating that the data has no multicollinearity problem.

Collinearity diagnostics can also be determined by noting tolerance values (1-squared multiple correlation) and variance inflation factors (VIF). Low-tolerance values (those approaching zero) indicate that multiple correlations with other variables is high, suggesting the possibility of multicollinearity. The results of the analysis indicate that the tolerance values for all items range from 0.349 to 0.724, which are above 0.20 as

suggested by Hair et al. (2014a). These results confirmed that the assumption has not been violated. The other value given is VIF, which is the inverse of the tolerance value. VIF values above 5 would be a concern, indicating multicollinearity. VIF values for this analysis are range from 1.382 to 2.867, indicating no possibility of multicollinearity. Hence, this data set is free from multicollinearity.

Table 6-4: Inter-constructs correlation matrix

	C	S	ID	PS	ST	PL	EP	TP	RA	IC	MP	FP
C	1											
S	.367	1										
ID	.345	.244	1									
PS	.287	.427	.400	1								
ST	.264	.491	.336	.713	1							
PL	.275	.495	.258	.544	.648	1						
EP	.350	.360	.338	.476	.487	.392	1					
TP	.201	.298	.206	.344	.411	.401	.273	1				
RA	.201	.313	.190	.296	.393	.404	.154	.492	1			
IC	.390	.342	.461	.554	.564	.436	.523	.285	.278	1		
MP	.276	.162	.315	.169	.216	.311	.184	.332	.426	.224	1	
FP	.157	.058	.401	.209	.262	.198	.344	.201	.254	.464	.428	1

### 6.3 Response Rate

To obtain a reasonable response rate, the survey was conducted in two phases. In Phase 1, 600 questionnaires were distributed to the identified respondents from February 2015 to April 2015. A total of 130 completed questionnaires were collected. A follow-up survey was conducted with the second wave of data collection from May 2015 to June 2015, which generated another 110 responses. Overall, the total number of completed questionnaires received for this study was 240 respondents, yielding a response rate of 40%.

Malaysian manufacturers are not easily convinced and persuaded to participate in surveys. Therefore, the response rate was low, yet satisfactory. However, the response rate is also considered to be adequate when compared to other similar studies in the literature. For instance, Manzouri et al. (2013) conducted a survey on halal certified food companies in Malaysia, which yielded a 20.3% response rate. Similarly, Tieman & van Nistelrooy (2014) conducted their cross-sectional survey among halal certified manufacturers in Malaysia and achieved a low response rate of 16%. By using this drop-and-collect method, respondents were identified and contacted personally, prior to dropping-off the questionnaires. Respondents were given five days to complete the questionnaires, and the completed questionnaires were personally collected by the researcher. Table 6-5 presents the breakdown of the respondents for Phase 1 and Phase 2.

Table 6-5: Breakdown of respondents based on timing of the data collection

Phase 1 (Feb 2015 – April 2015)	Phase 2 (May 2015 - June 2015)	Total	Response Rate (%)
130	110	240	40%

Table 6-6 below lists the locations and respondents for the study. Three states and one federal territory were selected to represent the population. This was primarily because most halal certified companies are located in these areas.

Table 6-6: Locations of the respondents

No	Location	No. of Respondents	Frequency (%)
1	Selangor	83	34.6
2	Johor	58	24.2
3	Penang	53	22.1
4	Kuala Lumpur (Federal Territory)	46	19.2
<b>Total</b>		<b>240</b>	<b>100%</b>

#### 6.4 Verification of Non-response Bias

Non-response bias refers to the bias that exists when respondents to a survey differ from those who did not respond in terms of demographic or attitudinal variables (Sax, Gilmartin & Bryant 2003). A wave analysis method was conducted to find potential non-response bias by comparing the early and late participants (Rogelberg & Stanton 2007). Each completed questionnaire was recorded with the date it was collected. The early respondents were those whose questionnaires were collected during Phase 1 (February 2015 – April 2015), while the late respondents were those whose questionnaires were collected during Phase 2 (May 2015 – June 2015). If the late respondents differ from the early respondents, it most likely indicates that some level of bias exists (Harris-Kojetin 2009). Differences in the distribution between the response waves were analysed by cross-tabulation. Statistical significance was estimated by chi-squared tests. A  $p$ -value  $\leq 0.05$  was considered to be significant. The key demographic variables adopted in the analysis consisted of the number of operating years, number of employees, managerial experience in halal business and manufacturing product category. Table 6-7 reveals the demographic profiles of the early and late responses. The results indicate that a significant  $p$ -value of more than 0.05 exists in all variables. Thus, it may be concluded that there is no significant demographic difference between the early and late respondents, and non-response bias was not an influence in this research.

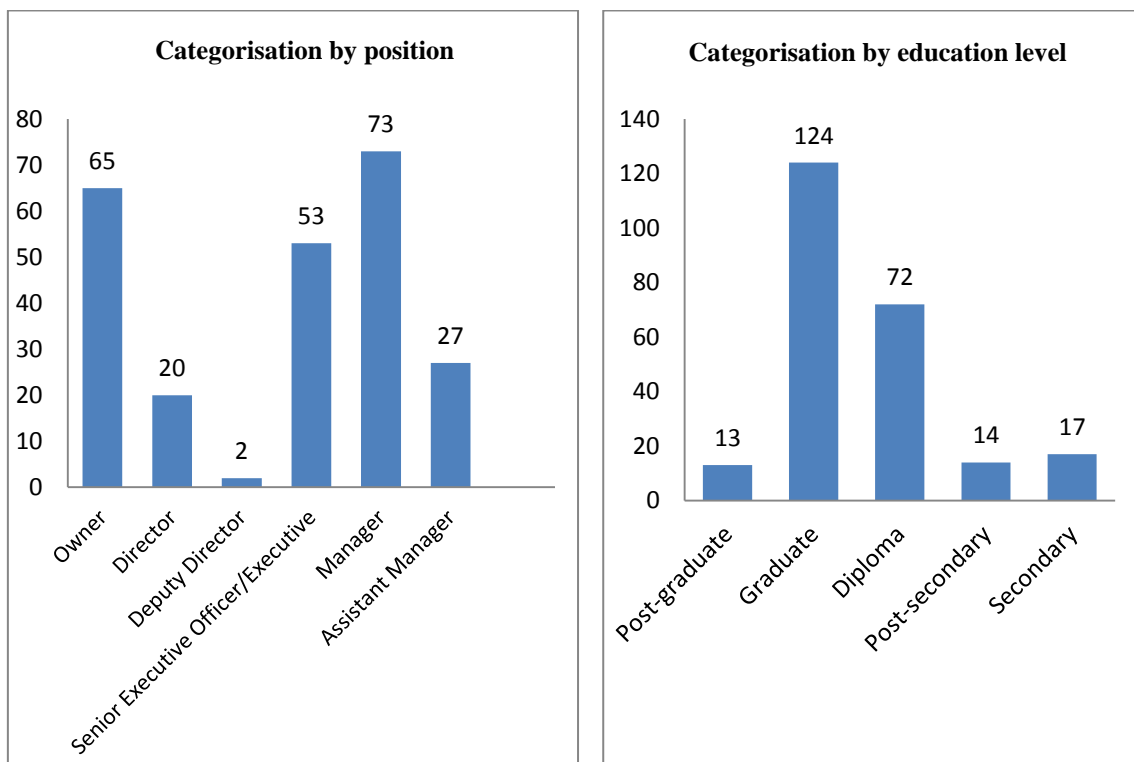
Table 6-7: Chi-square test for non-response bias

Variable	$\chi^2$	Sig.
Number of operating years	6.648	0.156
Number of employees	4.689	0.455
Managerial experience in halal business	2.694	0.610
Manufacturing product category	1.493	0.474

*Note:  $p < 0.05$*

## 6.5 Profile of Respondents

Figure 6-3 presents a profile of the respondents. In total, the sample consists of 240 respondents. The position, level of education, and employment of people working in the halal food and beverage industry sector varied. Most respondents are managers (n = 73; 30.4%) and most have completed graduate degrees (n = 124; 51.7%). The other 48.3% have postgraduate, diploma, post-secondary and secondary degrees. Approximately 32% indicated that they had been working in the organisation between 6 to 10 years, followed by 30% having worked as managers for five years or less. Of the 240 respondents, most (40%) had between six to ten years of managerial experience in the halal food and beverage industry. It is evident that the majority of respondents have previous experience in the halal food and beverage industry.





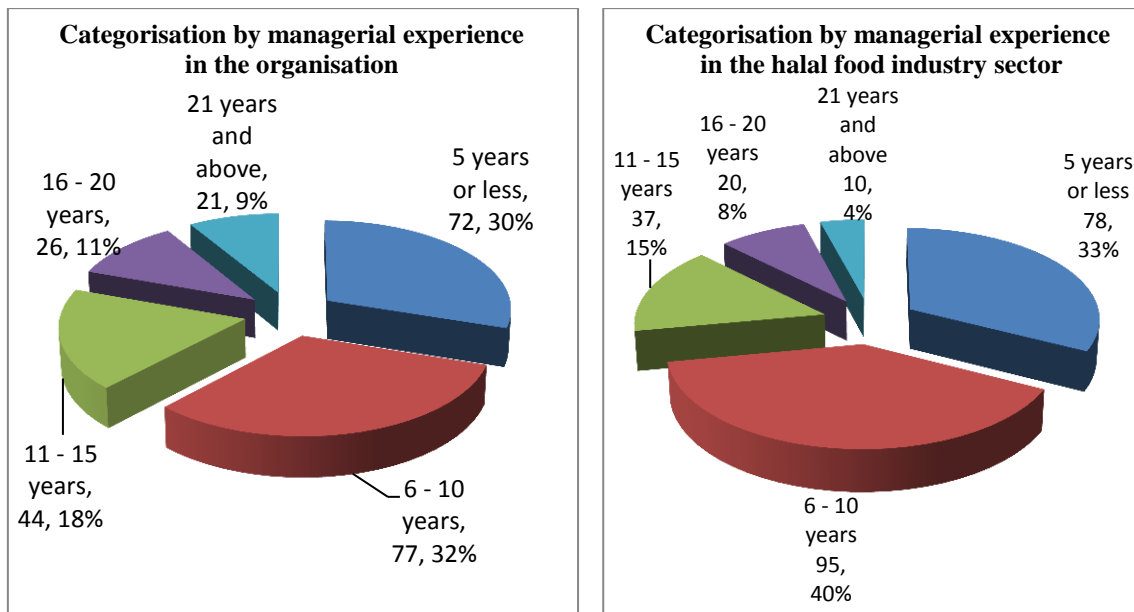


Figure 6-3: Characteristics of the respondents

Figure 6-4 summarizes the profiles of the participating organisations. The majority of the companies are medium-sized enterprises (n = 123; 51.2%) with a workforce of 75 to 200 people, followed by small-sized enterprises (n = 83; 34.6%) with 5 to 74 employees. Only 40 organisations have been in operation for more than 25 years; most (35.8%) having been established for 6 to 15 years. Of the 240 responding companies, 185 are involved in processed foods, 24 in beverage products and 31 in manufacturing of both processed foods and beverages. The description of the organisations' profiles disclosed that the survey was participated by organisations of which the majority are experienced halal manufacturers in Malaysia.

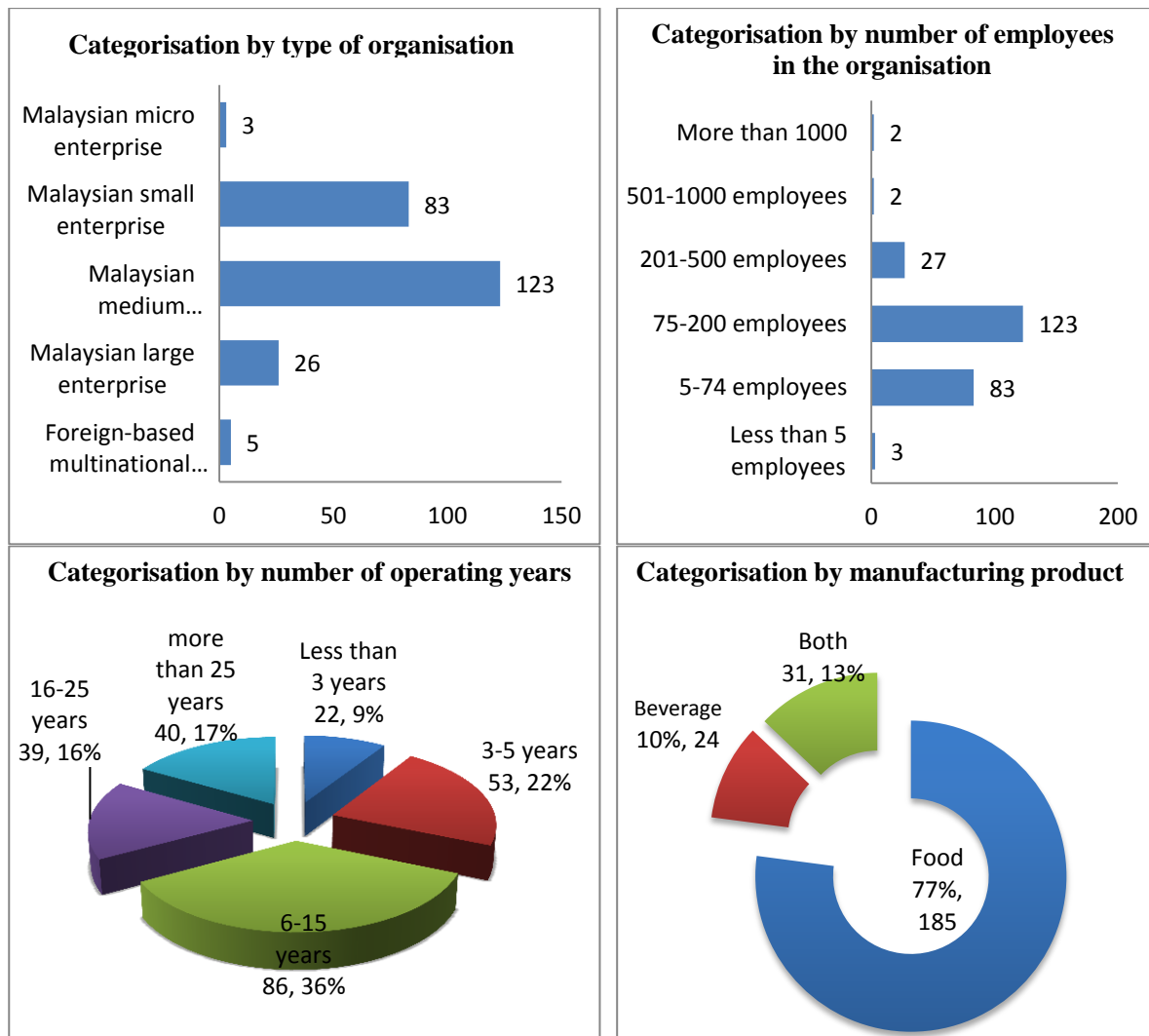


Figure 6-4: Characteristics of organisations

## 6.6 Descriptive Analysis

Table 6-8 shows the mean and standard deviations of all measured items, as well as the Cronbach's alpha of each factor. A seven-point Likert scale was used to assess the degree of agreement on the measurement items. The scale ranges from 1 (Strongly Disagree) to 7 (Strongly Agree). For the reliability analysis, it is vital to apply to ensure the stability and consistency of measurements across time and the various items in the instrument (Sekaran & Bougie 2010). This involves finding measures that reflect the 'true scores' for the surveyed items examining the phenomenon of interest (Straub, Boudreau & Gefen 2004). A benchmark greater than 0.70 (Nunnally 1978) was applied

to all the factors, and the Cronbach's alpha values should be above the cut-off point of 0.70. The results of all factors reveal that the Cronbach's alpha coefficient scores ranged from 0.727 to 0.913 across all factors. Thus, the results demonstrate a good level of internal consistency.

Table 6-8: Descriptive statistics of the constructs

Construct	No of Items	Mean	SD	Cronbach's Alpha ( $\alpha$ )
Cleanliness (C)	5	6.557	0.447	0.817
Safety (S)	3	6.313	0.590	0.755
Islamic Dietary Law (ID)	4	6.471	0.585	0.807
Physical Segregation (PS)	7	5.707	0.929	0.909
Storage and Transport (ST)	4	5.845	0.843	0.913
Packaging and Labelling (PL)	3	6.242	0.695	0.804
Ethical Practices (EP)	5	5.325	1.124	0.824
Innovative Capability (IC)	4	5.656	0.967	0.832
Training and Personnel (TP)	5	6.246	0.573	0.883
Resource Availability (RA)	4	6.095	0.768	0.845
Marketing Performance (MP)	4	6.345	0.619	0.834
Financial Performance (FP)	4	6.070	0.742	0.727

The mean values of the first-order constructs used to measure the HFSC implementation ranged from 5.325 for Ethical Practices (EP) to 6.557 for Cleanliness (C). The standard deviation ranges between 0.447 for Cleanliness (C) and 1.124 for Ethical Practices (EP). It could be interpreted that majority of the industry players agreed on cleanliness as the most important dimension of HFSC implementation. Ethical practices are considered as the least important dimension measuring HFSC implementation, since it was indicated by the lowest mean of 5.325. For the endogenous constructs, the mean value ranged between 6.070 for financial performance (FPerf) and 6.345 for marketing performance (MPerf), with the standard deviation (s) range between 0.619 for marketing performance and 0.742 for financial performance. Both marketing and financial

performance had mean values greater than 6.0, indicating that the respondents agreed that improved performance was due to HFSC implementation.

### **6.7 Assessment of Common Method Variance and Social Desirability Bias**

Common method variance and social desirability bias have become important issues to ensure the quality of data derived from surveys. Common method variance can be defined as ‘variance that is attributable to the measurement method rather than to the constructs the measure represent’ (Podsakoff et al. 2003, p.879) whereas social desirability bias refers to the tendency of research subjects to choose responses they believe are more socially desirable rather than choosing responses that are reflective of their own thoughts (Grimm 2010).

The use of surveys can sometimes become prone to certain problems, such as common method variance, which may lead to erroneous conclusions about relationships between variables by inflating or deflating findings (Craighead et al. 2011). This method of variance is considered to be a problem since it constitutes one of the major causes of measurement error. This issue is compounded when both the dependent and independent constructs are perpetual measures and derived from same respondents (Chang, van Witteloostuijn & Eden 2010). Social desirability bias may exist when data is collected through the presence of the researcher to the respondents and the respondents try to “please” the researcher by giving the acceptable answers (Grimm 2010).

Referring to the guidelines offered by Conway and Lance (2010), to overcome the problem of common method variance and social desirability bias, i) the questions are

limited to the questions that must be asked and are relevant to the respondents' background to ensure validity; and ii) both the researchers and the respondents must sit at a fair distance to give respondents space to fill in the questionnaire. Thus, following the guideline could minimise both of these issues.

For this study, other additional measures were employed to assess common method variance, which is the use of the Harman single-factor test (Podsakoff et al. 2003) with the aim of identifying and measuring variables that reflect the observed constructs. The basic assumption of this test is that if a substantial amount of common method variance is present, a factor analysis of all the data will result in a single factor accounting for the majority of covariance in the independent and dependent variables. Exploratory factor analysis was used where all variables are loaded into a single factor, with no rotation. Referring to the extraction sums of square loadings in Table 6-9, the results of the Harman's Single Factor Solution reveal that 28.767% of variance is attributed to the measured items. The value is well below the threshold value of 50% (Podsakoff & Organ 1986), which indicates that there was no possibility of common method variance problems associated with the data.

Table 6-9: Results of the Harman's single factor solution

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
<i>1</i>	<i>14.959</i>	<i>28.767</i>	<i>28.767</i>	<i>14.959</i>	<i>28.767</i>	<i>28.767</i>
2	4.470	8.596	37.363			
3	3.830	7.366	44.729			

## **6.8 Structural Equation Modelling (SEM)**

For this thesis, SEM was used to test the proposed hypotheses. A two-stage approach, recommended by Anderson and Gerbing (1988), was employed to perform the SEM analysis. First, an assessment of the measurement model was conducted to specify the causal relationships between the observed variables (items) and to confirm the measurement model fit. To achieve this, confirmatory factor analysis (CFA) was performed. Second, the structural model was tested to see the causal relationships between the underlying exogenous and endogenous constructs.

For this study, the exogenous constructs divided into two groups, consisting of the first-order constructs and second-order construct. The first-order constructs are cleanliness (C), safety (S), Islamic dietary law (ID), physical segregation (PS), storage and transport (ST), packaging and labelling (PL), ethical practices (EP), training and personnel (TP), resource availability (RA), and innovative capability (IC), whereas the second-order construct is HFSC implementation. The endogenous constructs include marketing and financial performance. Both analysis and results are discussed further in the next section.

## **6.9 Stage One: Confirmatory Factor Analysis (CFA)**

Confirmatory factor analysis (CFA) is a statistical technique used to verify the factor structure of a set of observed variables (Suhr 2006). By using CFA, the researcher can specify the structure of the model being tested prior to the analysis (Byrne 2010). It is employed to test whether the measures of a construct are consistent with the researcher's understanding of the nature of that construct (Awang 2012). Through the process of CFA, the issues of scale reliability (Cronbach's alpha), internal consistency

(construct reliability), distinct validity (variance extracted), convergent and discriminant validity were examined.

This study employs the Pooled-CFA to measure the constructs. As suggested by Awang (2012), by using a Pooled-CFA, there is no problem of Model Identification although some constructs might have less than four items since the combined constructs able to increase the degrees of freedom for the model. Furthermore, Pooled-CFA runs all the latent constructs simultaneously, thus saving time (Chong, Nazim & Ahmad 2014). By using this method, the unidimensionality, validity and reliability of the constructs can be assessed together. In addition, the analysis also explained the goodness of fit statistics for each of the measurement models to ensure that the measurement model is fit enough before it can be continued to a structural model. The results of the initial and final measurement models are reported in the next section.

#### **6.9.1 Full Measurement Model–First-order Constructs of HFSC Implementation**

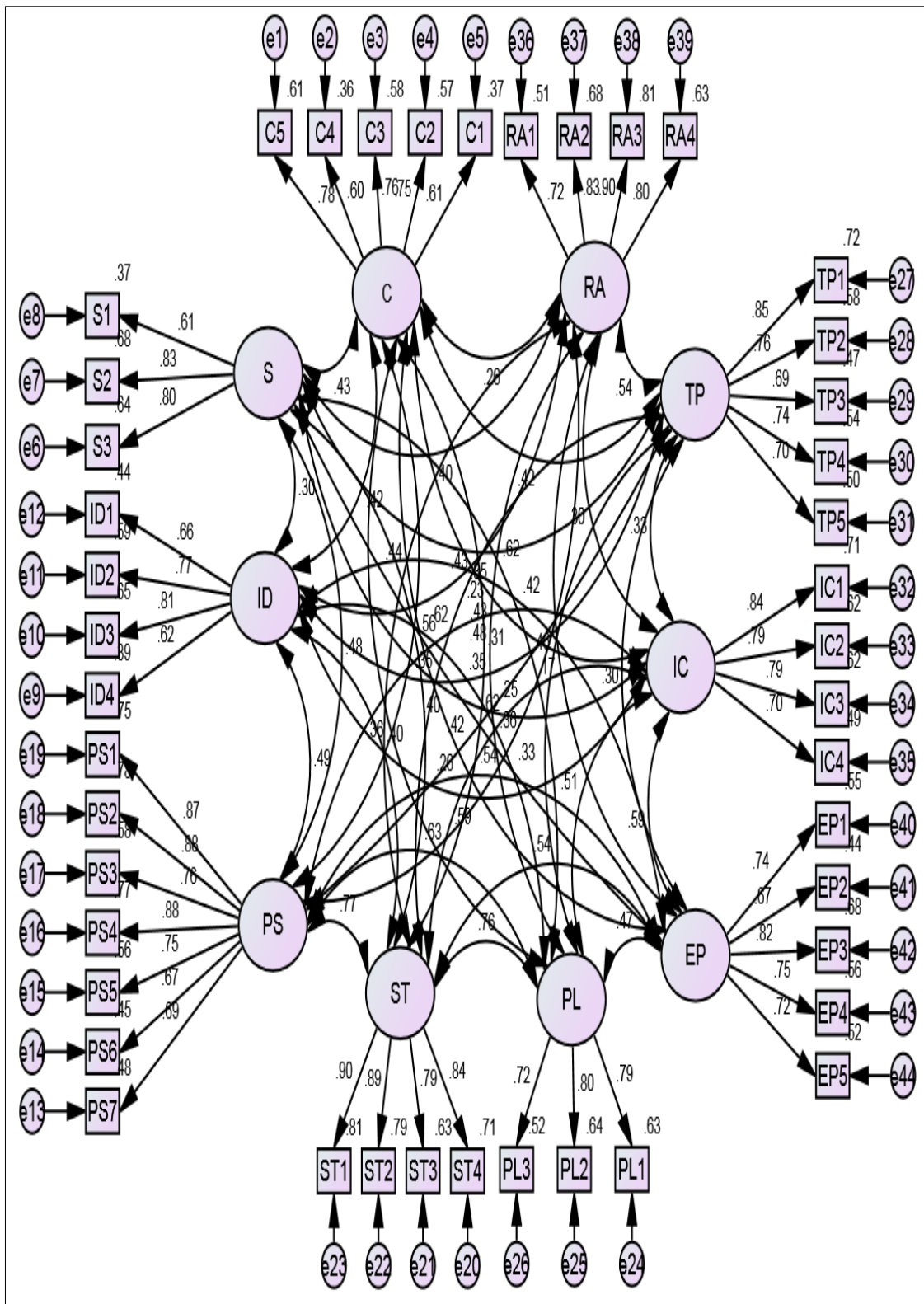
The measurement model of HFSC implementation is analysed using ten proposed first-order constructs (C, S, ID, PS, ST, PL, EP, TP, IC and RA). In the first-order model, C, S, ID, PS, ST, PL, EP, TP, IC and RA are correlated measurement constructs for HFSC implementation. Then, HFSC implementation may be operationalised as a second-order model, in which the ten first-order constructs are governed by a higher-order factor. At the first-order level, 44 items were used to measure all the ten constructs subjected to a CFA.

The results of the model estimation are shown in Figure 6-5. Initial standardised estimations of the hypothesised model show that all the parameters were significant ( $p <$

0.001); however, the results of initial model indices were less favourable. The results for the initial model indices indicate that this measurement model does not adequately fit the data. Table 6-10 presents the list of Goodness-of-Fit (GoF) indices for the initial full measurement model. The chi-square ( $\chi^2$ ) was 1699.40, with degrees of freedom (df) of 857. A normed chi-square for this initial model was 1.98. A normed chi-square between 2 to 5 is acceptable, with 2 or lower preferred. The GFI = 0.75, AGFI = 0.71, TLI = 0.86, CFI = 0.87, RMSEA = 0.07 and SRMR = 0.07. GFI; CFI and TLI should exceed 0.90 or better, and RMSEA and SRMR should be less than 0.08 (different sources recommend varying guidelines, but values ranging from 0.05 to 0.08 were found to be commonly acceptable (Hair et. al 2010). RMSEA and SRMR meet the recommended guidelines. However, CFI, TLI, GFI and AGFI are not within the recommended levels. Thus, the results were considered unacceptable for further work.

Given that majority of the goodness-of-fit indices are not within the recommended level (i.e., CFI, TLI, GFI and AGFI), further detailed assessment was performed to obtain a better fit and parsimonious model. Nevertheless, the pursuit of higher GoF needs to be balanced to maintain content validity, particularly the important items





Notes: C-cleanliness, S-safety, ID-Islamic dietary law, PS-physical segregation, ST-storage and transport, PL-packaging and labelling, EP-ethical practices, TP-training and personnel, IC-innovation capability, RA- resource availability

Figure 6-5: CFA first-order measurement model of HFSC implementation – Initial model

Table 6-10: Summary of goodness-of-fit indices – Initial model

GoF measure	Statistic measure	Index value ( <i>n</i> = 240)	Recommended value
Absolute	Root mean square error of approximation (RMSEA)	0.07	≤0.08
	Goodness of fit (GFI)	0.75	≥0.90
	Standardised root mean square residual (SRMR)	0.07	<0.08
Incremental	Adjusted goodness of fit (AGFI)	0.71	>0.80
	Tucker-Lewis Index (TLI)	0.86	≥0.90
	Comparative fit index (CFI)	0.87	≥0.90
Parsimonious	Normed $\chi^2$ ( $\chi^2$ /df)	1.98	≤3.00

that measure the constructs. The assessment involved checking the standardised residuals covariance and modification indices (MI). The assessment of the measurement model started with the examination of standardised residuals covariance. There were few items had residual values greater than the threshold of 2.58 (Hair et al. 2010) and needed to be deleted. At the same times, modification indices also showed that similar items had large values. Regardless of factor loadings above 0.6, modification indices (MI) need to be examined, particularly in the case where the fitness indices do not achieve the required level (Awang 2012). In MI, it shows the correlated error among the items where two or more items are redundant to each other. The relevant items were removed iteratively until the most significant fit model is achieved.

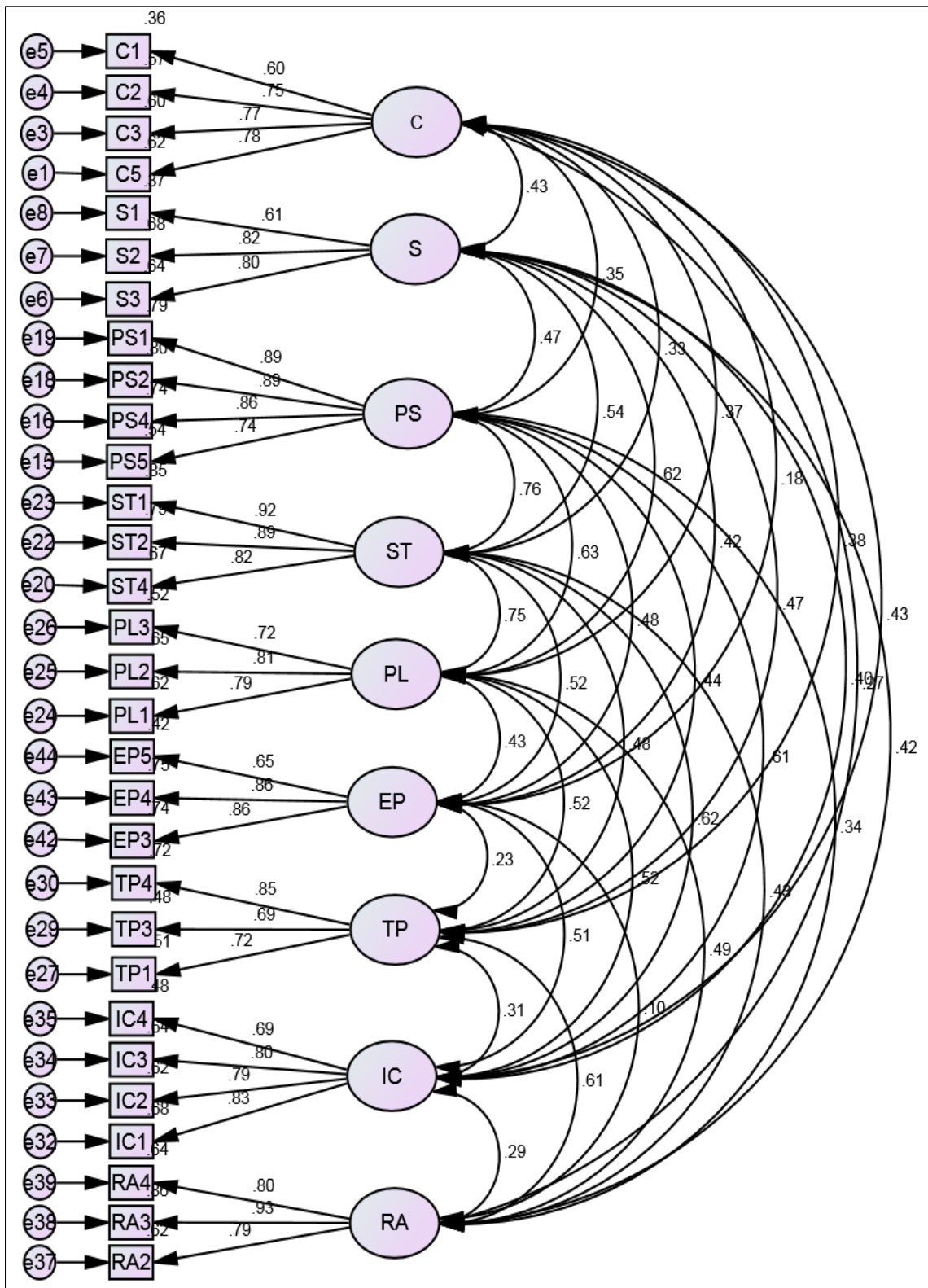
The process resulted in deleting one factor (ID – Islamic Dietary Law) from the measurement model due to high MI and model fit problem. Finally, fourteen items (EP1, EP2, C4, PS6, PS3, PS7, TP2, TP5, SR1, ST3, ID1, ID2, ID3 and ID4) were removed for further analysis. These deletions do not change the content of halal food supply chain (HFSC) implementation. The remaining constructs and items are still significant in measuring the first-order measurement model of HFSC implementation.

The modified first-order model for testing the HFSC implementation construct indicates C, S, PS, ST, PL, EP, TP, IC and SR are correlated. The modified measurement model as shown in Figure 6-6, was found to be acceptably fit the data and represented with thirty items. The chi-square ( $\chi^2$ ) was 608.27 with degrees of freedom (df) of 369. A normed chi-square for this final measurement model was 1.65. The GFI = 0.86, AGFI = 0.83, TLI = 0.93, CFI = 0.94, RMSEA = 0.05 and SRMR = 0.05.

In this study, all the values are in the recommended range for indices for the measurement model. Table 6-11 summarise the result of the final model of full measurement model. The value of AGFI (0.83) exceeds the threshold level of 0.80, indicating acceptable fit. The TLI and CFI are within the recommended value of 0.90, RMSEA and SRMR which had the value of 0.05 respectively is within the acceptable threshold values, suggesting reasonable fit (Chau & Hu 2001). The correlations between underlying constructs were less than 0.85. The standardised factor loadings are all above 0.60 and no large standardised residuals covariance. Therefore, the results acceptably support the first-order measurement model of HFSC implementation.

Table 6-11: Summary of goodness-of-fit indices – Final model

GoF measure	Statistic measure	Index value (n = 240)	Recommended value
Absolute	Root mean square error of approximation (RMSEA)	0.05	≤0.08
	Goodness of fit (GFI)	0.90	≥0.90
	Standardised root mean square residual (SRMR)	0.05	<0.08
Incremental	Adjusted goodness of fit (AGFI)	0.83	>0.80
	Tucker-Lewis Index (TLI)	0.94	≥0.90
	Comparative fit index (CFI)	0.93	≥0.90
Parsimonious	Normed $\chi^2$ ( $\chi^2$ /df)	1.65	≤3.00



Notes: C-cleanliness, S-safety, PS-physical segregation, ST-storage and transport, PL-packaging and labelling, EP-ethical practices, TP-training and personnel, IC-innovation capability, RA- resource availability

Figure 6-6: CFA first-order measurement model of HFSC implementation – Final model

## 6.9.2 Construct Validity and Reliability of the Full Measurement Model

Having an acceptable overall model fit, the next phase of CFA is to assess the psychometric properties of measures regarding reliability properties, construct validity, convergent validity and discriminant validity.

Reliability refers to the internal consistency of items that comprise a latent construct (Hair et al. 2010). The scale purification or reliability of the measures in this study was first assessed using Cronbach's coefficient alpha, and then continued with CFA. Based on Table 6-12, the internal reliability of the constructs is correspondingly in the comfortable range as the Cronbach's alpha value of all the constructs exceeds the suggested level of 0.70 (Nunnally 1978). Reliability was also measured using CFA. In investigating the reliability of the constructs, the assessment of construct/composite reliability (CR) and average variance extracted (AVE) of each construct was employed. Theoretically, CR represents the shared variance among a set of observed variables that measure an underlying construct (Fornell & Larcker 1981), while AVE is the mean variance extracted for the items loading on a construct (Hair et al. 2010). CR and AVE were calculated from the model estimates using the CR formula and AVE formula provided by Fornell and Larcker (1981). The formulas are as described below:

$$CR \quad \rho_{\eta} = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \epsilon_i}$$

Where  $\lambda_i$  is the standardised loading for each observed variable,  $\epsilon_i$  is the error variance associated with each observed variable, and  $\rho_{\eta}$  is the measure of construct reliability.

$$AVE \quad \rho_{vc(\eta)} = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum \epsilon_i}$$

Where  $\lambda_i$  is the standardised loading for each observed variable,  $\epsilon_i$  is the error variance associated with each observed variable.

The recommended threshold of CR should be equal to or greater than 0.60, and AVE should be equal to or greater than 0.50 (Bagozzi and Yi 1988). Based on the results, the value of CR and AVE are above the threshold levels of 0.60 and 0.50, respectively (see Table 6-12). It can be concluded that the measures used within this thesis were within acceptable levels to support the reliability of the constructs.

Construct validity exists when a set of measured items reflects the latent construct the researcher intends to measure. Construct validity is the most important objective when evaluating a research measure. Bagozzi, Yi and Phillips (1991) argued that construct validity is a prerequisite for theory testing. In this thesis, all fitness indices for the models were within the acceptable level. In addition, convergent validity and discriminant validity for the full measurement model are confirmed (will be explained later in next paragraph). Therefore, it was confirmed that construct validity was achieved (Awang 2012; Hsieh & Hiang 2004).

Table 6-12: Measurement model evaluation – results summary

Construct	Item	Standardised Loading	Cronbach's Alpha ( $\alpha$ )	AVE	CR
Cleanliness (C)			0.82	0.53	0.82
	C1	0.60			
	C2	0.75			
	C3	0.77			
	C5	0.78			
Safety (S)			0.80	0.56	0.79
	S1	0.61			
	S2	0.82			
	S3	0.80			
Physical Segregation (PS)			0.91	0.72	0.91
	PS1	0.89			
	PS2	0.89			
	PS4	0.86			
	PS5	0.74			
Storage and Transport (ST)			0.90	0.77	0.91
	ST1	0.92			
	ST2	0.89			
	ST4	0.82			

Packaging and Labelling (PL)			0.80	0.60	0.82
	PL1	0.79			
	PL2	0.81			
	PL3	0.72			
Ethical Practices (EP)			0.83	0.63	0.84
	EP3	0.86			
	EP4	0.86			
	EP5	0.65			
Training and Personnel (TP)			0.80	0.57	0.80
	TP1	0.72			
	TP3	0.69			
	TP4	0.85			
Innovation Capability (IC)			0.85	0.61	0.86
	IC1	0.83			
	IC2	0.79			
	IC3	0.80			
	IC4	0.69			
Resource Availability (RA)			0.88	0.71	0.88
	SR2	0.79			
	SR3	0.93			
	SR4	0.80			

*Notes: CR=composite reliability; AVE=average variance extracted*

Convergent validity evaluates the extent to which indicators of a construct “converge”, indicating a high proportion of variance in common (Gallagher, Ting and Palmer 2008). It is assessed based on factor loadings and AVE. Convergent validity is reflected when standardised factor loadings exceed 0.50 with statistical significance and the AVE is equal to or greater than 0.50 (Awang 2012; Hair et al. 2010; Anderson & Gerbing 1988). As an evidence of convergent validity, all factor loadings range from 0.60 to 0.93 were relatively high exceeding the critical value of 0.5 and statistically significant ( $p < 0.001$ ). The results of AVE which range from 0.53 to 0.77 also provide additional support for convergent validity. Therefore, the measures display adequate convergent validity.

The final step is to assess discriminant validity. Discriminant validity is demonstrated when each hypothesised construct is distinct from others and is not measuring the same

thing (Gallagher, Ting and Palmer 2008; Hair et al. 2010). This was verified using two methods. First, as recommended by Kline (2015), the estimated correlations between latent constructs should not be higher than 0.85. As shown in Table 6-13, the results of inter-construct correlations were not excessively high (all are below 0.85), which demonstrates that each construct shares larger variance with its own measures than with other measures. Second, discriminant validity was also assessed by ensuring that the square root of AVE for each latent construct is greater than the levels of inter-construct correlations (Fornell & Larcker 1981). The results indicate that all square roots of AVE are greater than the correlations between the latent constructs. Based on the given findings, discriminant validity is generally supported for all the constructs in the measurement model.

Having analysed the measurement model for goodness-of-fit, reliability, construct validity, convergent validity and discriminant validity, the next section is to perform the analysis of the structural model, test the hypotheses suggested by the proposed theoretical model and present the main findings generated from path model analysis.

Table 6-13: Discriminant validity summary for first-order constructs of HFSC implementation

	C	S	PS	ST	PL	EP	TP	RA	IC
C	<b>0.729</b>								
S	0.428	<b>0.750</b>							
PS	0.354	0.472	<b>0.847</b>						
ST	0.326	0.536	0.765	<b>0.877</b>					
PL	0.366	0.619	0.631	0.753	<b>0.775</b>				
EP	0.177	0.416	0.483	0.519	0.430	<b>0.796</b>			
TP	0.375	0.473	0.443	0.480	0.519	0.233	<b>0.756</b>		
RA	0.270	0.420	0.337	0.434	0.490	0.105	0.609	<b>0.843</b>	
IC	0.432	0.401	0.607	0.621	0.516	0.511	0.307	0.288	<b>0.779</b>

Notes: The number in bold in the diagonal row are square root of the AVE



## **6.10 Stage Two: Structural Model**

Once the basic measurement model (in stage one) has been validated and a satisfactory fit achieved, a structural model based on a path analysis is then estimated. Essentially, this is the final stage of the SEM process and a researcher can only move into this stage when the validity and reliability of a CFA full measurement model is achieved (Anderson & Gerbing 1988; Kline 2015). The structural model can be defined as “the portion of the model that specifies how the latent variables are related to each other” (Arbuckle 2005, p.90).

The structural model is developed to test the underlying hypotheses to answer the research questions outlined in Chapter 1. Table 6-14 list four initial hypotheses for this study (H1, H2, H3 and H4). At the beginning of the study, 11 first-order constructs or dimensions were proposed and hypothesised to define HFSC implementation as a second-order construct. However, after going through the process of dimensionality and factor structure using EFA and an assessment of the measurement model using CFA, two of the first-order constructs or dimensions were deleted. The remaining nine first-order constructs were hypothesised to define the HFSC implementation model. Furthermore, hypotheses two, three and four (H2, H3 and H4) were developed to determine the relationship between the constructs under consideration.

Table 6-14: The underlying hypotheses in the thesis

Hypotheses	Hypothesised relationships
H <sub>1a-k</sub>	Halal food supply chain implementation is positively defined by (a) cleanliness, (b) safety, (c) Islamic dietary law, (d) physical segregation, (e) material handlings, (f) storage and transport, (g) packaging and labelling, (h) ethical practices, (i) training and personnel, (j) innovative capability, and (k) resource availability.
H <sub>2</sub>	Halal food supply chain implementation is positively related to organisation's marketing performance.
H <sub>3</sub>	Halal food supply chain implementation is positively related to organisation's financial performance.
H <sub>4</sub>	Organisation's marketing performance is positively related to organisation's financial performance.

In the proposed theoretical model, the underlying constructs were categorised into two categories: 1) exogenous constructs (ten first-order constructs and the HFSC implementation construct); and 2) endogenous constructs (marketing performance and financial performance). The GoF indices were examined as part of evaluating the structural model. The purpose of doing this is to assess if the hypothesised structural model fits the data. If the results of model fitting are not satisfactory, then the model need to be re-specified to improve model fit and its correspondence to the underlying theory (Hair et al. 2010; Tabachnick & Fidell 2007).

In addition, the path coefficient estimates were examined along with the overall model fit indices to test hypotheses H1 to H4. Parameter estimates are important to SEM analysis because they are used to generate the estimated population covariance matrix for the model (Tabachnick & Fidell 2007). In this section, the process starts with assessing the HFSC implementation as a second-order construct. Next, the hypothesised relationships are assessed and confirm the structural model of the study. The details of the structural model evaluation of this thesis are discussed below.

### **6.10.1 HFSC Implementation as a Second-order Construct**

The test is further assessed on the second-order model to confirm the constructs in defining HFSC implementation. Initially, based on prior literature, 11 first-order constructs were proposed to define HFSC implementation as a second-order construct. However, after going through the whole process of unidimensional and measurement model assessment, the first-order constructs or dimensions were reduced to nine. Thus, the structure of the proposed second-order construct that related to nine first-order constructs is presented in Figure 6-7 and a summary of the results for HFSC implementation as a second-order model is shown in Table 6-15. According to the results, the model-fit indices exceed the common acceptance levels. The normed chi-square for the model is  $1.57 \leq 3.0$ , suggesting that the model is fitted to the sample data well. The value for GFI is 0.90 and the AGFI value (0.84) is slightly higher than the first-order measurement model. The second-order model produces the value for CFI (0.95) and TLI (0.94) over the 0.90 benchmark and the values for RMSEA and SRMR are slightly increase at 0.06 and 0.07 respectively, suggesting an acceptable fit.

Prior literature argues for a model that includes a second-order model structure can never produce a model fit that is “better” (in terms of fit indices) than a model that specifies only first-order correlated factors (Marsh & Hocevar 1985; Arnau & Thompson 2000; Koufteros, Babbar & Kaighobadi 2009). In contrast, the results for the second-order model in this study show a moderate increase on the overall model fit. Therefore, the second-order model demonstrates a better fit than the first-order model.

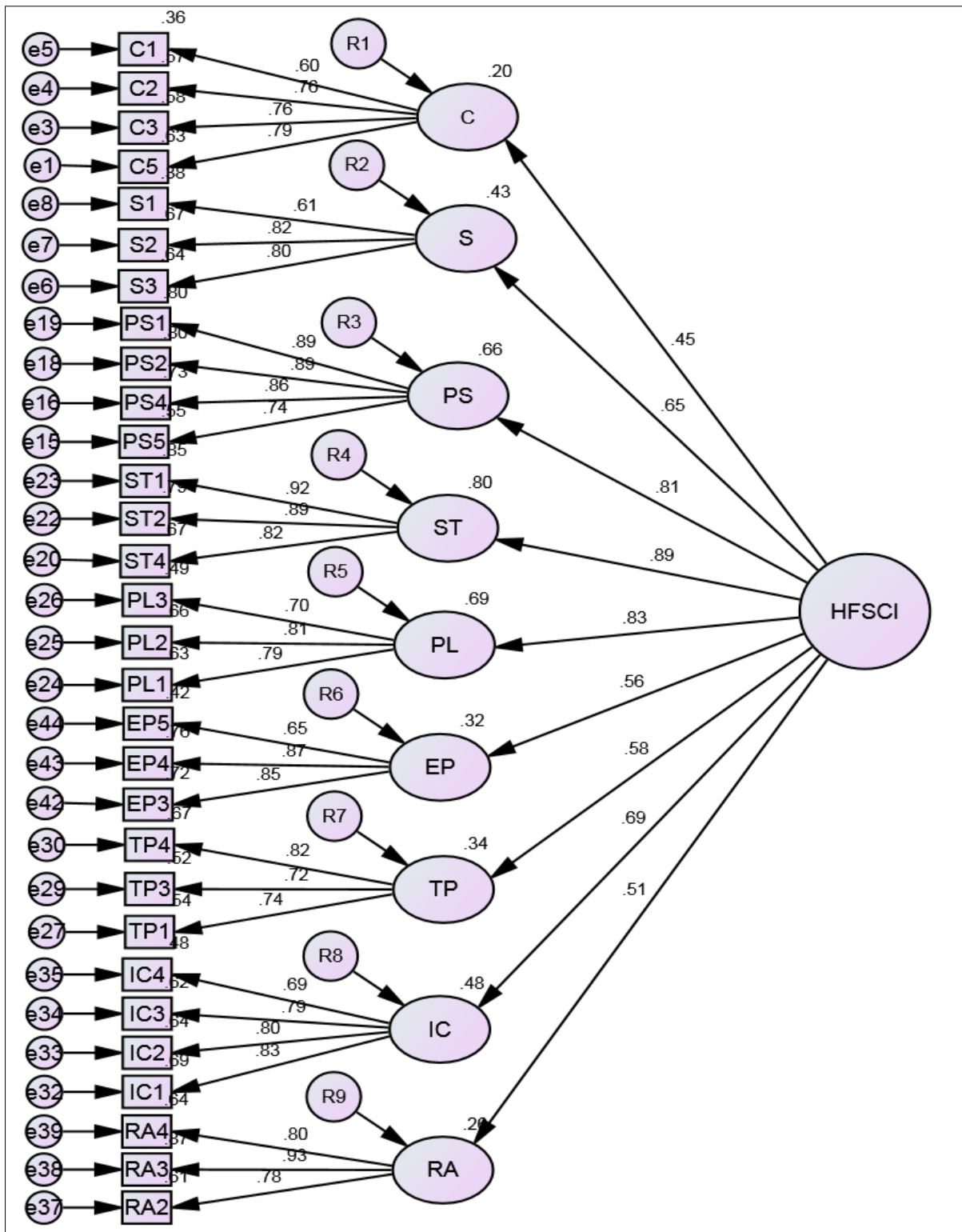
An examination of the second-order model of the HFSC implementation indicates that the findings reveal that all paths are statistically significant ( $p < 0.01$ ). The paths between HFSC implementation and its underlying first-order constructs or dimensions

were 0.45 for C, 0.65 for S, 0.81 for PS, 0.89 for ST, 0.83 for PL, 0.56 for EP, 0.58 for TP, 0.69 for IC and 0.51 for RA. As illustrated in Table 6-15, the standardised estimates of all nine underlying first-order constructs or dimensions of HFSC implementation are found to be supported. HFSC implementation can then be acceptably conceptualised as a second-order unidimensional construct comprising of C, S, PS, ST, PL, EP, TP, IC and RA. The analyses confirm that HFSC implementation as a second-order construct can be modelled. Therefore, Hypothesis  $H_{1a}$  to  $H_{1j}$  is accepted.

Table 6-15: Summary results of hypotheses testing for HFSC implementation as a second-order construct

Hypothesised Path	Standardised Estimate ( $\beta$ )	t-value	p-value	Result
$H_{1a}$ : HFSCI $\longrightarrow$ C	0.45	6.12	***	Supported
$H_{1b}$ : HFSCI $\longrightarrow$ S	0.65	8.70	***	Supported
$H_{1c}$ : HFSCI $\longrightarrow$ PS	0.81	10.74	***	Supported
$H_{1d}$ : HFSCI $\longrightarrow$ ST	0.89	13.10	***	Supported
$H_{1e}$ : HFSCI $\longrightarrow$ PL	0.83	11.22	***	Supported
$H_{1f}$ : HFSCI $\longrightarrow$ EP	0.56	7.85	***	Supported
$H_{1g}$ : HFSCI $\longrightarrow$ TP	0.58	7.34	***	Supported
$H_{1h}$ : HFSCI $\longrightarrow$ IC	0.69	9.75	***	Supported
$H_{1i}$ : HFSCI $\longrightarrow$ RA	0.51	7.00	***	Supported

Note: \*\*\*significant at  $p < 0.05$



Notes: C-cleanliness, S-safety, PS-physical segregation, ST-storage and transport, PL-packaging and labelling, EP-ethical practices, TP-training and personnel, IC-innovation capability, and RA- resource availability

Figure 6-7: HFSC implementation as a second-order construct

### 6.10.2 Construct Validity and Reliability of Full Model

Earlier in sub-section 6.9.2, construct validity and reliability of the exogenous constructs representing HFSC implementation were examined. In this section, the construct validity of the two endogenous constructs relative to the HFSC implementation as a second-order construct was examined. This validity includes the CFA model and the correlation with the two endogenous constructs of marketing and financial performance. Table 6-16 provides the summary of inter-construct correlations, reliability and validity of the constructs.

Table 6-16: Validity and reliability summary for full model

	HFSCI	MP	FP
<b>AVE</b>	0.500	0.669	0.541
<b>CR</b>	0.882	0.890	0.820
<b><math>\alpha</math></b>	0.847	0.889	0.796
<i>Inter-construct Correlations and Square Root of AVE</i>			
<b>HFSCI</b>	<b>0.707</b>		
<b>MP</b>	0.351	<b>0.817</b>	
<b>FP</b>	0.370	0.542	<b>0.735</b>

*Notes: AVE-average variance extracted and CR-composite reliability. The number in bold in the diagonal row are square root of the AVE.*

In this thesis, all GOF indices for the model were within the acceptable level. The chi-square ( $\chi^2$ ) was 1281.78 with 653 degrees of freedom (df). A normed chi-square for this final model was 1.96, RMSEA was 0.06 and SRMR was 0.07 which are consistent with the recommended guidelines (Hair et al. 2010). The value of AGFI and GFI exceeds the threshold level of 0.80 and 0.90, respectively, indicating an acceptable fit. The TLI and CFI are within the recommended value of 0.90, suggesting a reasonable fit (Chau & Hu 2001). Further, the correlations between underlying constructs were less than 0.85.

In addition, most of the item loadings and reliability for marketing performance and financial performance constructs are above the recommended levels which exceed 0.50, with statistical significance (Awang 2012; Hair et al. 2010; Anderson & Gerbing 1988). The composite reliability of the HFSC implementation was 0.882 indicates high internal consistency and the AVE of 50% confirms convergent validity. The composite reliability and AVE for marketing performance at 0.890 and 0.669, respectively indicate that the construct is reliable and convergent validity is achieved. Furthermore, financial performance exhibits the composite reliability of 0.820, and AVE of 0.541 indicates the construct is highly reliable and convergent validity is confirmed.

The analysis indicates that all the three constructs achieved discriminant validity. This was verified using two methods. First, as recommended by Kline (2015), the estimated correlations of inter-constructs should not be higher than 0.85. As shown in Table 6-16, the results of inter-construct correlations ranged from 0.351 to 0.542 (all are below 0.85). Second, discriminant validity also was assessed by ensuring that the square root of AVE for each construct was greater than the levels of inter-construct correlations (Fornell & Larcker 1981). The results indicate that all the square roots of AVE are greater than the correlations between the constructs. It has been shown that convergent validity and discriminant validity for the full model is confirmed. Therefore, it confirms that construct validity is achieved.

### **6.10.3 Initial Hypothesised Structural Model**

The analyses of the hypothesised structural model were performed by testing the hypotheses that includes one definition of a second-order construct and three causal relationships. The constructs operationalised in the model are adopted from the results

of the measurement model using CFA as explained in Section 6.9. The full initial hypothesised structural model in this thesis is presented in Figure 6-8. As shown in the figure, there were nine dimensions or first-order constructs that defined HFSC implementation as a second-order construct. The dimensions are cleanliness, safety, physical segregation, storage and transport, packaging and labelling, ethical practices, training and personnel, innovation capability and resource availability. HFSC implementation was hypothesised to significantly affect the marketing and financial performance at the organisational level. Furthermore, marketing performance was hypothesised to significantly affect financial performance.

Table 6-17: Results of hypotheses testing for the initial structural model

Hypothesised Path	Standardised Estimate ( $\beta$ )	t-value	p-value	Result
$H_2$ : HFSCI $\longrightarrow$ MP	0.35	4.85	***	Supported
$H_3$ : HFSCI $\longrightarrow$ FP	0.21	2.94	.003	Supported
$H_4$ : MP $\longrightarrow$ FP	0.47	6.28	***	Supported

Note: \*\*\*significant at  $p < 0.05$

The fit measures of this model are shown in Table 6-17. A t-value (also known as “critical ratios” or “wold statistics”) was used to determine the relationships between the exogenous and endogenous constructs in the structural model. This value was formed by dividing a parameter estimate with the standard error (Hox & Bechger 1998; Koufteros, Babbar & Kaighobadi 2009). The threshold for t-value is above 1.96, which indicates a significant path (Byrne 2010; Schumacker & Lomax 2004).

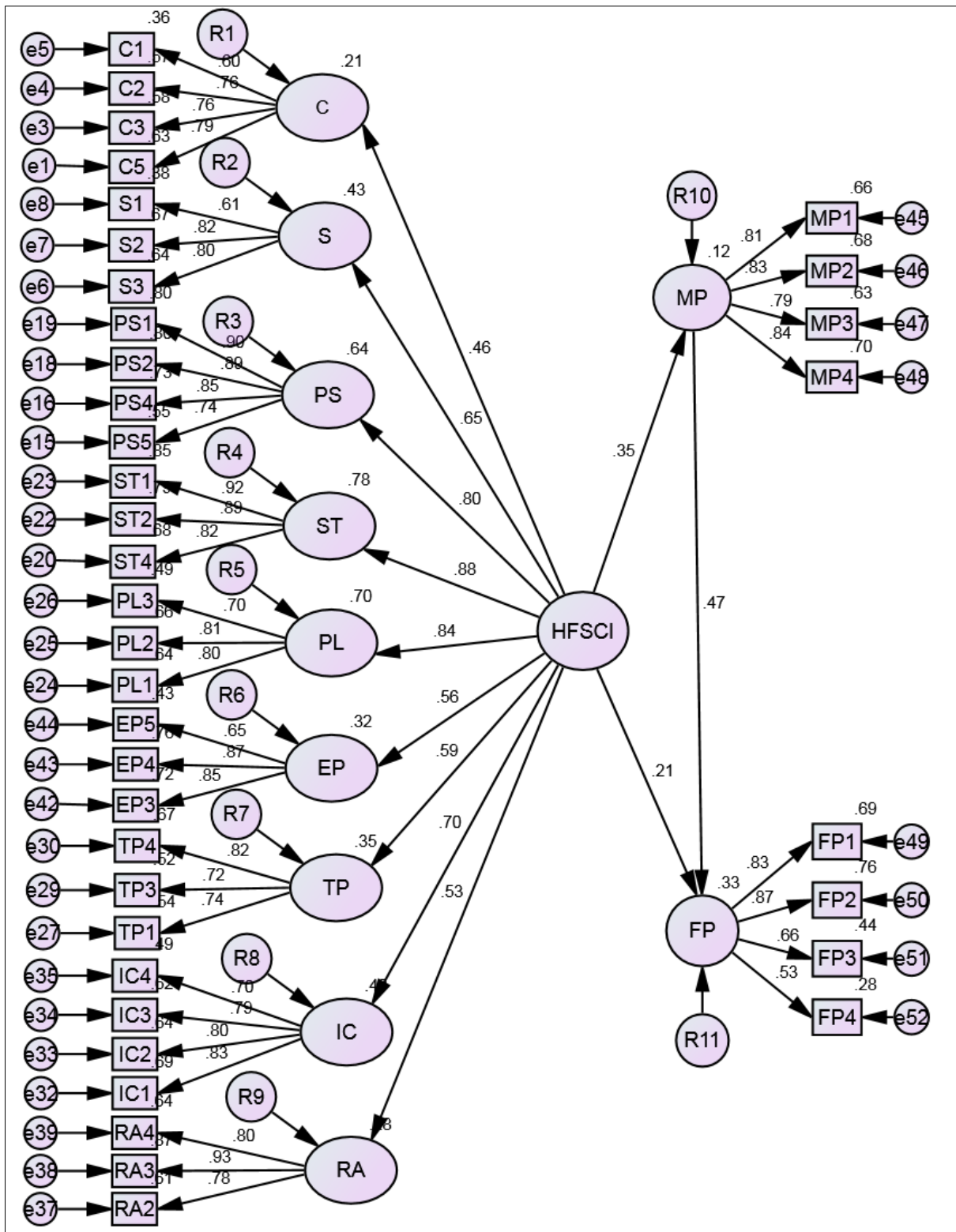
The initial hypothesised structural model demonstrates that all three paths ( $H_2$ ,  $H_3$  and  $H_4$ ) are statistically significant ( $p < 0.05$ ); however, the initial structural model indicates



a low model fit. As displayed in Table 6-18, the results were found to be Chi-Square/df = 1.91, GFI = 0.79, AGFI = 0.76, TLI = 0.89, CFI = 0.90, RMSEA = 0.06 and SRMR = 0.08 and noncompliant with the GoF indices, which required the structural model to be re-specified. Thus, it is reasonable to conclude that the initial model does not fit well and it is therefore, rejected. Re-specification is needed to obtain a good model fit.

Table 6-18: Summary of goodness-of-fit indices – Initial structural model

GoF measure	Statistic measure	Index value ( <i>n</i> = 240)	Recommended value
Absolute	Root mean square error of approximation (RMSEA)	0.06	≤0.08
	Goodness of fit (GFI)	0.79	≥0.90
	Standardised root mean square residual (SRMR)	0.08	<0.08
Incremental	Adjusted goodness of fit (AGFI)	0.76	>0.80
	Tucker-Lewis Index (TLI)	0.89	≥0.90
	Comparative fit index (CFI)	0.90	≥0.90
Parsimonious	Normed $\chi^2$ ( $\chi^2$ /df)	1.91	≤3.00



Notes: C-cleanliness, S-safety, PS-physical segregation, ST-storage and transport, PL-packaging and labelling, EP-ethical practices, TP-training and personnel, IC-innovation capability, RA-resource availability, MP-marketing performance, and FP-financial performance

Figure 6-8: The initial structural model

#### 6.10.4 Final Hypothesised Structural Model

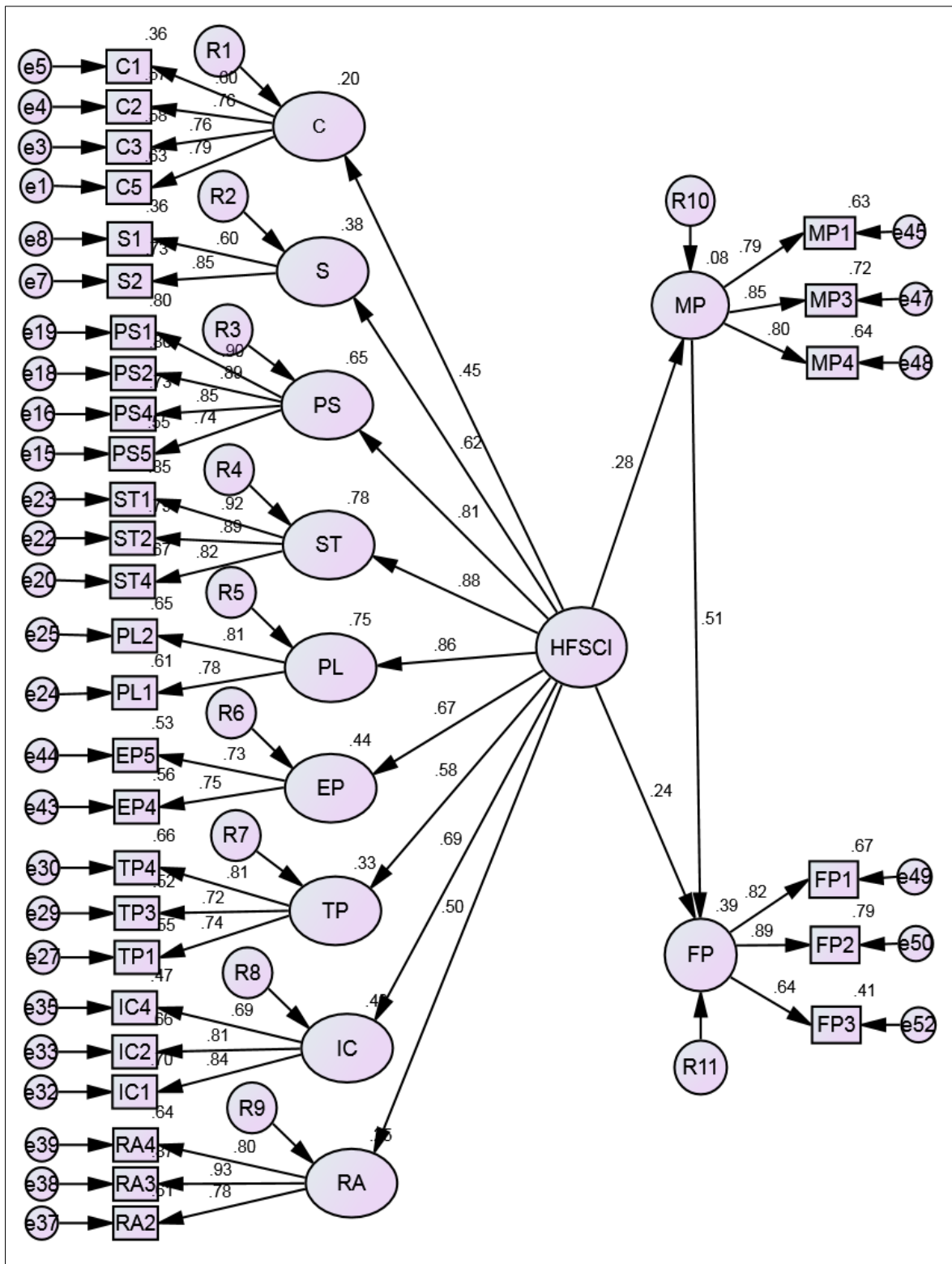
The initial hypothesised structural model has been re-specified to achieve the model fit. High standardised covariance residual values of the model greater than 2.58 are observed, since those items can cause model fit incompliance. As part of the procedure, modification indices (MI) were referred to as guidance for model improvement. The results obtained from the re-specification of structural model indicates that six items (MP2, FP4, S3, PL3, EP3 and IC3) needed to be deleted. As suggested by Holmes-Smith, Coote and Cunningham (2006), dropping one item or path at a time could change the modification indices and structural coefficients and their significance.

The items were deleted due to two reasons: 1) having high modification indices which reflect the covariance between each pair of items in the model; and 2) low model fit or goodness-of-fit does not achieve the required level. Therefore, the items were deleted one at a time and the model was re-run until the acceptable model fit is achieved. The final modified model is presented in Figure 6-9.

Table 6-19: Results of hypotheses testing for the final structural model

Hypothesised Path	Standardised Estimate ( $\beta$ )	t-value	p-value	Result
$H_2$ : HFSCI $\longrightarrow$ MP	0.28	3.80	***	Supported
$H_3$ : HFSCI $\longrightarrow$ FP	0.24	3.61	***	Supported
$H_4$ : MP $\longrightarrow$ FP	0.51	6.81	***	Supported

Note: \*\*\*significant at  $p < 0.05$



Notes: C-cleanliness, S-safety, PS-physical segregation, ST-storage and transport, PL-packaging and labelling, EP-ethical practices, TP-training and personnel, IC-innovation capability, RA-resource availability, MP-marketing performance, and FP-financial performance

Figure 6-9: The final structural model

The results presented in Table 6-19 indicate that hypotheses H2, H3 and H4 were accepted, because they are statistically significant ( $p < 0.05$ ). The standardised estimate for these hypotheses are all significant ( $\beta = 0.28$  for H2, 0.24 for H3 and 0.51 for H4). Hence, these hypotheses are supported. The GoF indices show that this model adequately fits the data. The chi-square ( $\chi^2$ ) was 771.16, with 452 degrees of freedom (df). A normed chi-square for this final model was improved from 1.91 to 1.71, well below the threshold value of 3. The GFI = 0.84, AGFI = 0.81, TLI = 0.92, CFI = 0.93, RMSEA = 0.05 and SRMR = 0.06. In this study, the value of GFI was less than 0.90 but was still at an acceptable level and close to the preferred value. Zikmund (2003) claimed that value of GFI less than 0.90 does not necessarily indicate that the model has a poor fit (see Table 6-20).

Table 6-20: Summary of goodness-of-fit indices – Final structural model

GoF measure	Statistic measure	Index value ( $n = 240$ )	Recommended value
Absolute	Root mean square error of approximation (RMSEA)	0.05	$\leq 0.08$
	Goodness of fit (GFI)	0.84	$\geq 0.90$
	Standardised root mean square residual (SRMR)	0.06	$< 0.08$
Incremental	Adjusted goodness of fit (AGFI)	0.81	$> 0.80$
	Tucker-Lewis Index (TLI)	0.92	$\geq 0.90$
	Comparative fit index (CFI)	0.93	$\geq 0.90$
Parsimonious	Normed $\chi^2$ ( $\chi^2$ /df)	1.71	$\leq 3.00$

These results show that the final structural model is a better fit for the data than the initial structural model. On a theoretical basis, the final model is consistent with the previous literature on the halal food supply chain, which only investigated the dimensions without looking at the organisation performance aspect. The comparison of goodness-of-fit indices for both structural models is presented in Table 6-21. Both

tested hypothesised structural models resulted in different fit indices. Comparing these fit indices, the results clearly reveal that the final structural model provides the best parsimonious model. Therefore, the final structural model is the best fit of the data and accepted as the structural model for this study.

Table 6-21: Comparison model fit indices

Indices	Initial Structural Model	Final Structural Model
Chi-Square/df	1.91	1.71
RMSEA	0.06	0.05
SRMR	0.08	0.06
AGFI	0.76	0.81
GFI	0.79	0.84
CFI	0.90	0.93
TLI	0.89	0.92

*Source: Recommended value for GFI-Goodness of Fit Index, RMSEA-Root Mean Square of Error Approximation, SRMR-Standardised Root Mean Square Residual (SRMR), AGFI-Adjusted Goodness of Fit, CFI-Comparative Fit Index, TLI-Tucker-Lewis Index, Chi-Square/df- Chi Square/Degrees of Freedom was adapted from Hair et al. (2010); Kline (2010); Chau and Hu (2001); Hu & Bentler (1999); and, Tabachnick and Fidell (2007).*

### 6.11 Summary of Hypotheses Testing

In sum, all four hypothesised relationships were tested in this thesis. The results were found to support all four hypotheses.  $H_{1a}$  to  $H_{1i}$  which represents nine dimensions were tested to define halal supply chain implementation as a second-order construct. All nine out of eleven dimensions were found to be significant and positively define HFSC implementation. In addition,  $H_2$ ,  $H_3$  and  $H_4$  were hypothesised for causal relationships between HFSC implementation and organisation performance, particularly marketing and financial performance. The results demonstrated that focusing on marketing performance can drive better financial performance of the organisation since marketing performance is positively related and correlated with financial performance. Table 6-22 summarises the results. The results are discussed further in Chapter 7.

Table 6-22: Summary of all results of hypotheses testing

Hypothesised Path	Hypotheses	Result
$H_{1a}$ : HFSCI $\longrightarrow$ C	Halal food supply chain implementation is defined as a second-order construct which represents (a) cleanliness, (b) safety, (c) physical segregation, (d) storage and transport, (e) packaging and labelling, (f) ethical practices, (g) training and personnel, (h) innovation capability, and (i) resource availability.	Supported
$H_{1b}$ : HFSCI $\longrightarrow$ S		
$H_{1c}$ : HFSCI $\longrightarrow$ PS		
$H_{1d}$ : HFSCI $\longrightarrow$ ST		
$H_{1e}$ : HFSCI $\longrightarrow$ PL		
$H_{1f}$ : HFSCI $\longrightarrow$ EP		
$H_{1g}$ : HFSCI $\longrightarrow$ TP		
$H_{1h}$ : HFSCI $\longrightarrow$ IC		
$H_{1i}$ : HFSCI $\longrightarrow$ RA		
$H_2$ : HFSCI $\longrightarrow$ MP	Halal food supply chain implementation is positively related to organisation's marketing performance.	Supported
$H_3$ : HFSCI $\longrightarrow$ FP	Halal food supply chain implementation is positively related to organisation's financial performance.	Supported
$H_4$ : MP $\longrightarrow$ FP	Organisation's marketing performance is positively related to organisation's financial performance.	Supported

## 6.12 Summary

This chapter starts with editing of the data from the collected questionnaire. Data screening was performed prior to conducting SEM and the preliminary data analysis, including the descriptive analysis, and sample characteristics were discussed. Following this, 240 respondents were analysed and the demographic characteristics of this sample were described.

In the second part of the data analysis, SEM was conducted in two stages, the measurement and the structural model. The first stage deals with assessing the GoF of the measurement model using a CFA. At this stage, the assessment of the measurement

model was made regarding the following pattern of results: 1) indicators specified to measure a proposed underlying dimension/factor all have relatively high standardised factor loadings (i.e.,  $> 0.60$ ) on the factor; 2) estimated correlations between the factors were not  $> 0.85$ ; 3) and the overall model fit indices suggest acceptance of the model. The initial results indicated that the measurement model was not consistent with the variance and covariance in the dataset. The model needed to be re-specified and some items were removed in an attempt to achieve a reasonable and significant model before continuing to the next stage of the structural model. As a result, the modified measurement model provided adequate fit to the data.

Each factor was then assessed to confirm the reliability, construct validity, convergent validity and discriminant validity. Based on the findings, the factors were found to be valid and adequate to continue for the next stage, which is the analysis of the structural model. The second stage of SEM is the structural model analysis, and was continued once the measurement model was achieved. The hypothesised structural model includes one defining a second-order construct and three paths representing the hypotheses of ( $H_1$ ,  $H_2$ ,  $H_3$  and  $H_4$ ).  $H_1$  was tested as a second-order construct and other hypotheses were tested for causal relationship. The initial structural model was re-specified according to the modification indices and normalised residual. After some of the items were removed, the final structural model with the overall fit indices was achieved. All four hypotheses ( $H_1$ ,  $H_2$ ,  $H_3$  and  $H_4$ ) were found to be statistically significant.



## **CHAPTER 7**

### **DISCUSSION OF FINDINGS**

#### **7.1 Introduction**

This chapter highlights the findings derived from Chapter 6. The findings are discussed to provide an overview of how the HFSC implementation model has been developed, and to report the results of hypotheses-testing. The discussion in this chapter is divided into seven sections. Following this section, an overview of the thesis focusing on developing the HFSC implementation model is summarised in section 7.2. Section 7.3 discusses the valid dimensions of HFSC implementation model. Section 7.4 to Section 7.6 discusses the relationships among the constructs and the results of underlying hypotheses involved in this thesis. The discussions at each section start with a revisit and review the hypotheses, present the findings and interprets the finalised structural model. Finally, the chapter summary is presented in Section 7.7.

#### **7.2 Overview of the Thesis**

The HFSC is quite recent and has become a new research domain within the broader context of food supply chain management. Discussion on the prior halal literature stated that research in halal is emerging and focusing mainly on marketing, consumer studies and certification. Limited studies are dealing with halal supply chain issues. Recently, there has been increasing issues in halal food related to authenticity, adulteration, cross-contamination and the use of a fraudulent halal logo. The issues have been a highly controversial and much disputed subject within the field of the halal food industry (Tieman, van der Vorst and Che Ghazali 2012; Bonne and Verbeke 2008; Fadzlillah et al. 2011). As such, the HFSC implementation model is proposed as a guideline for the

halal-certified food manufacturers and partners, so that trust and credibility can be delivered to the relevant consumers.

In the context of academic research, halal food management has attained the attention of researchers and practitioners for the past decade. However, Wan Omar, Rahman and Jie (2015) highlights that research focusing on HFSC implementation is lacking in the theoretical foundation and is relatively under-researched. Despite the level of research that has been done in different aspects of halal food management, developing a comprehensive model of HFSC implementation in Malaysia has yet to be achieved. Recent halal food management literature suggests that halal requires a supply chain approach and standard model as to remain competitive in the market (Lada, Tanakinjal & Amin 2009; Ibrahim & Mokhtarudin 2010; Wilson & Liu 2010; Tieman 2011). In addition, academic research needs a rigorous validated instrument to support future research in halal food management in general, and HFSC implementation.

Based on the argument and issues above, the main objective of this study was to develop a model for HFSC implementation and to assess the relationships between HFSC implementation and organisation performances. Underpinned by the Conventions Theory (CT) and Resource-based View (RBV) and based on an extensive literature review, the constructs were developed and conceptual model was proposed in Chapter 3. The measurements of the constructs were then validated. The conceptual model was used as a framework to test four hypotheses in attempt to answer the following research questions:

- a) What are the dimensions of halal food supply chain implementation?
- b) What are the critical dimensions of the halal food supply chain implementation?
- c) Does the halal food supply chain implementation have an impact on an organisation's marketing performance?
- d) Does the halal food supply chain implementation have an impact on an organisation's financial performance?
- e) Does the organisation's marketing performance impact on an organisation's financial performance?

All the research questions will be discussed thoroughly in Section 8.2. Then, the proposed hypotheses were tested using covariance-based structural equation modelling (CB-SEM), as described in Chapter 6. All the hypotheses and results are depicted in Table 7-1. These hypotheses will be revisited with further discussions in the next sections.

Table 7-1: The hypotheses and summary of the results

Hypotheses	Description	Result
H <sub>1a-i</sub>	Halal food supply chain implementation is defined as a second-order construct which represents (a) cleanliness, (b) safety, (c) physical segregation, (d) storage and transport, (e) packaging and labelling, (f) ethical practices, (g) training and personnel, (h) innovation capability, and (i) resource availability.	Supported
H <sub>2</sub>	Halal food supply chain implementation is positively related to an organisation's marketing performance.	Supported
H <sub>3</sub>	Halal food supply chain implementation is positively related to an organisation's financial performance.	Supported
H <sub>4</sub>	Organisation's marketing performance is positively related to an organisation's financial performance.	Supported

### 7.3 Discussion of the Dimensions of HFSC Implementation

Through an extensive review of literature, the HFSC implementation model is suggested to be composed of 11 dimensions or first-order constructs. The main focus is to identify the dimensions of HFSC implementation. Therefore, this study attempts to confirm whether the identified dimensions can define HFSC implementation as a model. In the proposed model, it was hypothesised that HFSC implementation is positively defined by all 11 dimensions. All seven dimensions were posited in hypothesis 1. Therefore, the first hypothesis was proposed as:

*H<sub>1a-k</sub>: Halal food supply chain implementation is positively defined by (a) cleanliness, (b) safety, (c) Islamic dietary law, (d) physical segregation, (e) material handlings, (f) storage and transport, (g) packaging and labelling, (h) ethical practices, (i) training and personnel, (j) resource availability and (k) innovative capability.*

The results are analysed based on statistical measures of standardised coefficient pathways and parameter estimates by IBM SPSS Amos version 22. After going through the purification process using EFA and assessment of measurement model using CFA, two of the dimensions of the HFSC implementation model were deleted. Details of the processes have been explained in Section 4.11 and Section 6.9. The final analysis presented in Table 7-1 indicates that hypotheses H<sub>1a</sub> to H<sub>1i</sub> are supported.

The findings reveal that only nine dimensions; cleanliness, safety, physical segregation, storage and transport, packaging and labelling, ethical practices, training and personnel, innovative capability and resource availability are positively defined HFSC implementation model. Of the nine dimensions, the findings show that storage and

transport was found to be the most critical dimension with the highest  $\beta$  value of 0.89, and p-value of 0.00. Furthermore, cleanliness was found to be the least important dimension with the lowest  $\beta$  value of 0.45 and a p-value of 0.00. It is suggested that the organisations that manufacture halal certified processed food and beverages should focus on all nine dimensions while implementing a HFSC process. Most importantly, storage and transport, packaging and labelling, as well as physical segregation are among the critical dimensions that also need to be concentrated by the organisations in the halal food industry.

The extensive review of literature revealed that the findings are in line with the identified dimensions of the HFSC implementation model. The first dimension that should be taken into consideration is cleanliness. In the HFSC, it is always stressed that cleanliness must be applied from farm to fork and based on Islamic teachings. In fact, cleanliness is concerned not only in terms of clothing, building and its surrounding area (Abdul Rahim 2005), but also in food (Riaz & Chaudry 2004). Although it was found that cleanliness is the least important, it remains significant and important.

It was found in this study, that among the respondents that to agreed develop an HFSC implementation model, cleanliness is a prerequisite in the Malaysian halal processed food and beverage manufacturing. This finding clearly states that cleanliness must be comprised of working premise, all devices, utensils, machine, processing aids and the condition of the food that is delivered to consumers. This finding is supported by Standards Malaysia (2009), which stated that the organisations in the halal food industry need to use food grade cleaning chemicals for cleaning and dispose of contaminated prepared food based on local disposal regulations and Shariah requirements. In the

context of the Malaysia halal food industry, this aspect needs to be focused by the manufacturers, as well as all the partners involved throughout the supply chain. By focusing on this dimension, the issues regarding cleanliness in some of the areas of halal processed food production and distribution can be minimised.

Safety was found to be a significant dimension of the HFSC implementation model, which is measured by two items. The result of SEM analysis suggested that safety is an important dimension for HFSC implementation model, and consequently may affect the organisational performance. To compete in the halal food industry, halal manufacturers should constantly include element safety in their products, particularly food and beverage products. Focus is not only on Islamic processing techniques, but both on the safety and quality. This is supported by Badrie et al. (2006), who mentioned that in the halal food industry, food safety is of prime importance to both consumers and professionals.

Food safety is the primary responsibility of food producers to avoid any foodborne illnesses. It is suggested that by obeying halal standards and implementing a proper implementation model, distrust in the safety of halal food can be avoided (Marzuki 2012). In general, food safety is perceived as an important dimension and consumers are willing to pay a higher price to buy safer food. Despite halal-certified food materials and ingredients, the products also need to be safe for consumption. Otherwise, failure to secure the food will lead to food spoilage, which considered wasteful, costly and can affect trade and consumer confidence (Aung & Chang 2014). The result is supported by Muhammad, Isa and Kifli (2009) who stated that halal is being acknowledged as a new standard for safety, hygiene and quality assurance.

The analysis revealed that physical segregation is the third most critical dimension of the HFSC implementation model. This finding agrees with Riaz and Chaudry (2004), who suggest that in the manufacture of halal products, it is imperative that all possible sources of contamination are segregated throughout the entire production chain, particularly during the processing stage. In this study, physical segregation is measured using four validated items. Based on the findings, the manufacturers of halal processed food strongly agreed that for halal food production, the processing line needs to be separated. Furthermore, stored materials and ingredients need to have separate warehouses for halal food products. In fact, packaging activities for halal food products needs to be conducted in separate areas from non-halal food products. The respondents also agreed that suppliers should do the segregation process of halal and non-halal materials before sending the food to the manufacturers. More importantly, this finding is supported by several studies (Tieman 2011; Talib, Ali & Jamaludin 2008; Lodhi 2009) which focus on the need to physically segregate halal products to prevent any intentionally or unintentionally, direct contact with elements that can defect the halal status. By implementing this practice, the issues of cross-contamination in Malaysian halal food industry can be reduced.

The finding from the structural model revealed that storage and transport is the most critical dimension of the HFSC implementation model. Three items are used to measure this dimension. The respondents agreed that halal food manufacturers should provide a dedicated warehouse and appropriate transport for the handling the halal food products. It is recommended that appropriate transport be used when sending food products either to wholesalers, retailers or customers. Similarly, it is suggested that halal products should have a dedicated storage zone or racks and no mixing of halal and non-halal

products should occur in the same cold room (Tieman, van der Vorst & Che Ghazali 2012). The finding is also supported by Ngah and Zainuddin (2012), who stated that it becomes a major concern that halal and non-halal products should be kept separately in storage and transportation, especially during distribution, to avoid contamination.

The main reason for having a dedicated warehouse and transportation is to minimise cross-contamination with non-halal food materials or products throughout the supply chain, and to ensure the authenticity of the halal food products on the market. Delivering the right product to the right customer with the correct halal status is the key to survival for halal food organisations. Hence, this dimension should be a concern of all members in the supply chain process, including manufacturers, suppliers and distributors.

Based on these findings, packaging and labelling was the second significant dimension of the HFSC implementation model. Packaging and labelling also plays an important role in implementing the HFSC. In this study, two items are used to measure packaging and labelling as a dimension. It was found that the packaging materials used for halal food products need to be free of toxins. Furthermore, the respondents also agreed that packaging should provide consumers with information related to the ingredients. In the case of halal food in industry, the halal logo acts as mode of communication, particularly to Muslim consumers that the food complies with their religious dietary law. Hence, halal certified food should have proper labelling with the halal logo stated on it. In fact, having this halal logo marked on the label provides a competitive advantage over non-certified halal food.



These findings appear to be supported by Ab Talib and Johan (2012), who stated that the process of packaging and labelling products must also be considered to create a genuine and wholesome halal product. Soong (2007) suggests that food packaging must not be made from non-halal substances, and if it made from the raw material of animal origin, then it requires proper halal certification. Furthermore, disguising any facts on food labels, such as sources of the ingredients is prohibited in Islamic jurisprudence (Lodhi 2009).

The result of SEM specifies that ethical practices are a significant dimension in defining the HFSC implementation model. The ethical practices are when an organisation applies ethical features in the development of the halal products. This study used two items to measure this dimension. It was found that halal food manufacturers and members in the supply chain should store all harmful chemical substances away from the food products. In addition, it is suggested that suppliers should commit to waste reduction goals. Apparently, this suggestion has a strong relationship with the correct practices in halal food production, indicating if this model is applied, cross-contamination can be minimised and the waste of contaminated food can be reduced.

In the literature, researchers identify ethical features as being environmentally friendly, considering animals' welfare, having an organic character, respectful of Islamic financing and fair trade attributes (Mohamad & Hassan 2012). This is supported by Sungkar (2010) whose study highlights that having ethical producers who are practically involved in fair trade and are socially responsible within the production chain constitute a major concern in the halal food industry. Al-Qaradawi (2007) also emphasised that human actions and behaviours are part of the principle of

permissibility, not limited to only the things and objects being used. Hence, ethical practices are important to ensure that the integrity is been applied throughout the HFSC implementation.

To develop a sustainable pool of knowledgeable workers and professionals in the halal industry, training is essential, and management should be able to ensure everyone is appropriately trained (Ali et al. 2014; Tieman, van der Vorst & Che Ghazali 2012). This is in line with the finding indicating that training and personnel is a significant dimension of the HFSC implementation model. Three validated items are used to measure this dimension. The respondents agreed that workers need to be trained before they can handle halal food production. Halal food organisations should invite local authorities to give training to their workers. Furthermore, they also are required to give extensive halal training to the supply chain members if needed, especially suppliers and distributors. By considering all these aspects, the issues of integrity and the probabilities of human error in the halal food production can be reduced in the halal food industry.

The results also indicate that halal certified organisations need to be innovative. From the results of this study, innovative capability is a significant dimension in defining the HFSC implementation model. This dimension is measured using three items. It was found that majority of the respondents agreed that halal food organisations are required to explore new innovative ideas related to halal matters, such as venturing in the development of halal traceability and tracking system management. At the same time, the organisations need to encourage the suppliers to be innovative too when it comes to halal products. Furthermore, organisations must also be able to develop new product designs, in order to compete in the competitive halal market. The finding is supported

by Zailani et al. (2010), who believe that being innovative can improve halal transparency in the production and throughout the entire supply chain. In addition, a highly innovative organisation tends to be more competent.

Finally, resource availability was found to be a significant dimension in defining HFSC implementation as a model. Resource availability was measured using three measurement items. The majority of halal food manufacturers strongly agree that to be involved in the HFSC, they must be able to provide an effective transportation system, a dedicated warehouse and group of workers who can handle halal food production line. This is in agreement with Standards Malaysia (2009), which stated that in the halal food industry, management needs to ensure the availability of resources, such as manpower, infrastructure, machinery and equipment and financial capital before halal production is fully operational. This is important to ensure that the business runs smoothly. Thus, organisations need to focus on availability of resources related to the halal business.

In conclusion, this study developed a comprehensive model of HFSC implementation and validated scales for nine dimensions or first-order constructs. The most important are nine out of eleven dimensions which are integral to measure the HFSC implementation model as a second-order construct. These nine dimensions need to be fully concentrated by the manufacturers and all supply chain members to ensure the organisational performance can be achieved.

#### **7.4 The Relationship between HFSC Implementation and Marketing Performance**

This section discusses the results of hypothesis testing related to the relationship between HFSC implementation and an organisation's marketing performance. The

proposed model was hypothesised that by implementing a comprehensive model of e HFSC with the concentration on the nine dimensions may improve the organisation's marketing performance. Thus, it can be hypothesised as:

*H<sub>2</sub>: Halal food supply chain implementation is positively related to an organisation's marketing performance*

This thesis aimed to examine the positive effect of the HFSC implementation model and an organisation's marketing performance. The results indicate that by implementing the HFSC implementation model in the organisations improves the organisation's marketing performance. These findings agree with the argument made by Ou et al. (2010) that a successful and comprehensive model of supply chain management implementation can enhance the relationship among supply chain partners, increase marketing performance, particularly customer satisfaction, and promote organisational performance.

The primary long-term objectives of most organisations are to increase market share and profits. Several prior studies have measured organisation performance using both financial and market criteria, including market share, the growth of sales, ROI and profitability. In this thesis, the measures of marketing performance consist of market share, brand image and the quality of the products. The findings suggest that by accomplishing all the validated measurement items of all dimensions of HFSC implementation, it may improve marketing performance in the supply chain, which is measured by market share, brand image and product quality. Within the context of halal processed food and beverages, the results indicate that by implementing a HFSC model, the brand image of the organisation increases with the highest standardised loading

compared to other measures. The results imply that halal processed food and beverage organisations should significantly consider brand image, market share and product quality when attempting to improve the marketing performance of the organisation. Successive promotional activities through mass media appear to vastly prevail in the competitive markets (Kim & Kim 2005), such as the halal food market. Consequently, this thesis has confirmed that this relationship is better captured when all the nine dimensions are concentrated in the implementation of the HFSC, which will lead to an increase in the organisation's marketing performance.

### **7.5 The Relationship between HFSC Implementation and Financial Performance**

This section explains the results of hypothesis testing related to the relationships between HFSC implementation and an organisation's financial performance. The proposed model hypothesised that by implementing a comprehensive model of the HFSC with a concentration on nine dimensions, the organisation's financial performance may be improved. Therefore, the third hypothesis was proposed as:

*H<sub>3</sub>: Halal food supply chain implementation is positively related to an organisation's financial performance*

The structural model indicates that the relationship between HFSC implementation is positively significant with respect to an organisation's financial performance. It can be concluded that implementing a proper comprehensive model of the HFSC improves the financial performance of the organisation. The results also indicate that nine significant dimensions defined HFSC implementation as a comprehensive model that needs to be adopted by halal processed food and beverages manufacturers. Certainly, these nine

dimensions are a dominant indication of the effect of the HFSC implementation model on an organisation's financial performance. In essence, the HFSC implementation model directly predicts financial outcomes.

Numerous studies have suggested that SCM is a key driver of organisational performance (Kannan & Tan 2005; Ou et al. 2010). It was proven that the effects of SCM on improving the organisation performance in manufacturing industries has been extensively documented (Li et al. 2006) and is widely considered to be an effective management tool to maintain the business stability, growth and prosperity. According to Yamin, Gunasekaran and Mavondo (1999), organisational performance refers to how well an organisation achieves its market-oriented and financial goals. It is suggested that financial metrics should serve as a tool for comparing organisations and evaluating an organisation's behaviour over time (Holmberg 2000). Most prior literature have measured organisational performance using typical indicators, such as sales growth, the growth of market share, profitability, return on investment (ROI) and so forth (Li et al. 2006; Green & Inman\* 2005; Wu et al. 2006; Yamin, Gunasekaran & Mavondo 1999; Shi & Yu 2013). This study has used profitability, sales growth and operational cost to measure the organisation's financial performance.

The findings of this study support the view that implementing a comprehensive model of the HFSC has an impact on organisational financial outcomes. Financial performances are improved for halal processed food organisations that are clean in production, produce safe products, emphasise physical segregation in manufacturing and distribution, provide dedicated storage and transport, have reliable packaging and labelling, participate in ethical business practices, provide sufficient training to workers,

are innovative and have sufficient resources. For example, in this study, the operational cost of the organisation is increased due to its involvement in halal-related activities. However, by applying a HFSC implementation model, the cost can be covered since the profitability and sales growth of the organisations are also increased.

In summary, the relationship between HFSC implementation and financial performance can be improved by focusing on the validated scales of first-order constructs. All the dimensions or the first-order constructs need to be implemented by the organisation and coordinated throughout the supply chain, which in turn, drives financial performance. Therefore, the aim to increase the profitability and sales growth of an organisation can be achieved by implementing a comprehensive model of HFSC implementation.

#### **7.6 The Relationship between Marketing Performance and Financial Performance**

This section elaborates on the results of the hypothesis testing related to the linkage between an organisation's marketing performance and its financial performance. The proposed model hypothesised that increased an organisation's marketing performance improves the organisation's financial performance. Therefore, the fourth hypothesis was proposed as:

*H4: An organisation's marketing performance is positively related to organisation's financial performance*

The results of the analyses indicated that there was a significant relationship between an organisation's marketing performance and its financial performance. Generally, the findings support hypothesis four (H<sub>4</sub>), and therefore, it was concluded that increases in an organisation's marketing performance improves the organisation's financial

performance. This is supported by Anderson, Fornell and Lehmann (1994), who found that marketing performance positively impacts financial performance.

Four validated measurement items of marketing performance could explain a significant portion of the variance in the financial performance. Certainly, the test was successful as it could prove that marketing performance directly predicts the financial performance of the organisation. Based on an extensive review of relevant literature, it was found that there is a lack of knowledge about this relationship. In this thesis, it is assumed that this relationship would provide us with a deeper understanding of the important marketing initiatives in relation to financial outcomes.

The importance of non-financial and financial performance measures has been realised by many organisations. Nevertheless, many still lack an understanding of how to balance these measures. Most of the organisations tend to concentrate more on the financial performance measures; however, such inequality does not necessarily lead to an improvement in organisation performance, including halal food organisations. It is suggested that for a balanced approach, organisations should understand that financial performance measurements are important for strategic decisions and external reporting, while day-to-day manufacturing and marketing activities is better handled with non-financial measures (Maskell 1991).

This study managed to examine the relationship between marketing measures and financial performance for organisations which implement a HFSC model. This is supported by Kosan (2014), who suggests that marketing may influence changes in the market share and sales which can positively lead to increased profits. In addition,



marketing capabilities help an organisation create a strong brand image that allows the organisation to achieve superior firm performance (Ruiz-Ortega & García-Villaverde 2008). Improving among these marketing performance measures, such as market share, customer satisfaction, brand equity, product differentiation and innovation have an impact on financial performance (Kosan 2014). Based on these findings, it was proven that improves the brand image, as one of the measures in marketing performance will improve the financial performance. The same thing applies to the improvement of product quality which will influence the financial performance of the organisation. Thus, in the halal food industry, manufacturers should think about how to improve the organisation's marketing performance, since it will impact the organisation's financial performance.

In conclusion, the analyses of SEM revealed that all four hypotheses are supported and detailed as follows:

1. Halal food supply chain implementation is positively defined by (a) cleanliness, (b) safety, (c) Islamic dietary law, (d) physical segregation, (e) material handlings, (f) storage and transport, (g) packaging and labelling, (h) ethical practices, (i) training and personnel, (j) resource availability and (k) innovative capability ( $H_{1a-k}$ )
2. Halal food supply chain implementation is positively related to an organisation's marketing performance ( $H_2$ )
3. Halal food supply chain implementation is positively related to an organisation's financial performance ( $H_3$ )
4. Organisation's marketing performance is positively related to an organisation's financial performance ( $H_4$ )

Table 7-2: Summary of finalised measurement items based on findings

<b>Construct</b>	<b>Measurement Item</b>
Cleanliness	<ul style="list-style-type: none"> <li>• Cleanliness is a prerequisite in the halal food manufacturing</li> <li>• Manufactured in clean working premise</li> <li>• Manufactured using clean devices, utensils, machine and processing aids</li> <li>• Manufactured purely clean food to consumers</li> </ul>
Safety	<ul style="list-style-type: none"> <li>• Not hazardous to people's health</li> <li>• Obtains materials from suppliers that are of higher quality</li> </ul>
Physical segregation	<ul style="list-style-type: none"> <li>• Separate processing lines for halal food production</li> <li>• Storing materials and ingredients using separate warehouse for halal food products</li> <li>• Separate areas for packaging activities of halal food products</li> <li>• Suppliers segregate the materials according to halal and non-halal before sending to us</li> </ul>
Storage and transport	<ul style="list-style-type: none"> <li>• Provides dedicated warehouse for storage of halal food products</li> <li>• Transport are appropriate to the type of the halal food products</li> <li>• Use dedicated transport to transfer halal food products to wholesaler, retailer and consumers</li> </ul>
Packaging and labelling	<ul style="list-style-type: none"> <li>• Use packaging materials that have no toxic effect on product</li> <li>• Packaging provides consumers with information on all ingredients</li> </ul>
Ethical practices	<ul style="list-style-type: none"> <li>• Store harmful chemical substances away from food products</li> <li>• Asks suppliers to commit to waste reduction goals</li> </ul>
Training and personnel	<ul style="list-style-type: none"> <li>• Workers are trained to handle halal food production</li> <li>• Gives extensive halal training to distributors and retailers if needed</li> <li>• Invites halal local authority to give training to the workers</li> </ul>
Innovative capability	<ul style="list-style-type: none"> <li>• Actively exploring innovative ideas on halal matters</li> <li>• Able to develop new product design to satisfy consumers' needs</li> <li>• Encourage suppliers to be innovative on halal matters</li> </ul>
Resource availability	<ul style="list-style-type: none"> <li>• Have an effective transportation system to involve in halal food supply chain</li> <li>• Able to provide a dedicated warehouse for storage in order to involve in halal food supply chain</li> <li>• Should employ people who can handle halal food production</li> </ul>
Marketing Performance	<ul style="list-style-type: none"> <li>• Implementation of HFSC will increase market share even faster</li> <li>• Implementation of HFSC will improve the brand's image</li> <li>• Implementation of HFSC will improve quality of the products</li> </ul>
Financial Performance	<ul style="list-style-type: none"> <li>• Implementation of HFSC will increase profitability</li> <li>• Implementation of HFSC will increase sales growth</li> <li>• There is an increase of operational cost for halal-related activities</li> </ul>

## 7.7 Summary

This chapter presented the hypothesised structural model and reported the results of the underlying hypotheses. The hypothesised model was tested using Covariance-based SEM, which includes four proposed hypotheses (H<sub>1</sub> to H<sub>4</sub>). Using SEM, it is possible to explore relationships among a set of constructs and test hypothesised models with sample data (Breckler 1990; Kline 2015). As hypothesised, it was found that nine dimensions or first-order constructs represent HFSC implementation as a second-order construct. Moreover, it confirms that a HFSC implementation construct can be modelled. Given the findings of the relationships, HFSC implementation was found to be positively correlated with the marketing and financial performance of the organisation. This study also aims to discover the impact of marketing performance on financial performance. Therefore, improving marketing performance should also improve the organisation's financial performance.

The next chapter will discuss the significant contribution of the study and research implications are identified based on the research findings. The next chapter also will point out the limitations in this study, suggest directions for future research and describe the concluding remarks.

## **CHAPTER 8**

### **CONCLUSIONS AND IMPLICATIONS**

#### **8.1 Introduction**

This study attempts to develop a model for HFSC implementation in the processed food and beverage industry in Malaysia, and investigate whether this model can relatively impact organisational performance. Based on Conventions Theory (CT) and Resource-based View (RBV) as theoretical foundations and through the extensive literature review process, a unified theoretical framework was developed in Chapter 3 which incorporates various constructs. Furthermore, the framework was developed to test the relationship between the HFSC implementation construct and both financial and marketing performance. This final chapter is divided into six sections. Following this section, the research questions are readdressed based on the findings derived in Chapter 6. The contributions of the study, including theoretical, methodological and managerial are discussed in Section 8.3. Limitations of the study are presented in Section 8.4, and directions for future research are detailed in Section 8.5. Finally, a brief conclusion is described in Section 8.6. A summary of this chapter will be highlighted in Section 8.7.

#### **8.2 Readdressing the Research Questions**

The present study was designed since the development of a quality and robust model of HFSC implementation has not yet been achieved. Academic research on halal food management and the HFSC is relatively under-researched and less extensive. Drawing from the purpose and rationale of this study, a theoretical model was developed with some testable hypotheses.

Returning to the overarching objective posed at the beginning of this study, several specific research questions were established. This section will answer with what was suggested in Chapter 1. Based on an extensive literature review, the overarching research objective was developed. The overarching objective as stated in Chapter 1 is:

*To develop a model for halal food supply chain implementation and assess the relationship between halal food supply chain implementation and organisational performance.*

To achieve the main purpose of the study, a number of research questions were formulated. These research questions will be elaborated separately in sections 8.2.1 to 8.2.5.

### **8.2.1 Research Question 1**

*What are the dimensions of halal food supply chain implementation?*

In reviewing the literature on halal food management, it was found that developing a comprehensive model of HFSC implementation is yet to be conducted. To achieve this objective, the first research question was designed. Research question 1 was created to identify the dimensions of the HFSC implementation model. Eleven dimensions are proposed in the model and these dimensions were identified based on Conventions Theory (CT) as the theoretical foundation through an extensive review of the literature discussed in Chapter 3. The proposed dimensions of the HFSC implementation model are represented by cleanliness, safety, Islamic dietary law, physical segregation,

material handlings, storage and transport, packaging and labelling, ethical practices, training and personnel, innovative capability and resource availability. Aligned with the CT perspective, quality and successful implementation in the food supply chain process may require organisations to concentrate on these important dimensions. The measurement items were adapted from prior studies and were rationalised according to the interest of the current study. Next, the measurement model was validated and the structural model was finalised using covariance-based structural equation modelling (CB-SEM), which was further discussed in Chapter 5.

In this study, the model is proposed with 11 hypothesised dimensions (H1a to H1k) to answer the question of whether HFSC implementation as a second-order construct can be defined by these dimensions. Based on the results of hypothesis testing, it was concluded that nine dimensions: cleanliness, safety, physical segregation, storage and transport, packaging and labelling, ethical practices, training and personnel, innovative capability and resource availability significantly and positively defined HFSC implementation as a second-order construct. These results also indicate that storage and transport has the strongest significant value for defining the HFSC implementation model, which considered this dimension to be the important compared to the other dimensions.

This finding agrees with Riaz and Chaudry's (2004) findings which showed that transportation, storage and distribution activities are the most crucial components in maintaining halal food integrity in the supply chain process. Similarly, the finding is also further supported by Omar, Jaafar and Osman (2013) in their study, with the idea that proper storage could preserve the quality of halal food products. The results of this

study confirm that the use of all nine dimensions is important in HFSC implementation. Consequently, it is suggested that organisations may need to emphasise on these important dimensions if they wish to have a quality and workable implementation of the HFSC.

### **8.2.2 Research Question 2**

*Which are the critical dimensions of the halal food supply chain implementation?*

The present study was designed to determine the critical dimensions of the HFSC implementation in the processed foods and beverages industry. Thus, research question 2 was formulated. After all the hypotheses were tested using the rigorous analytical tool, CB-SEM, the results of this investigation show that three of the dimensions were ranked as critical due to a higher beta value of standardised estimate towards the HFSC implementation model. The most critical dimension is storage, and transport has the highest standardised estimate value in defining the HFSC implementation model, followed by packaging and labelling and physical segregation.

Based on the empirical findings, storage and transport, packaging and labelling and physical segregation, should be more focused while implementing the HFSC. The findings of this study suggest that organisations should have a dedicated storage and transportation system solely for halal products to avoid from cross-contamination with non-halal items. This is supported by literature, such as Tieman, van der Vorst and Che Ghazali (2012), who suggested that halal products should have a dedicated storage zone or racks, and there should be no mixing of halal and non-halal products in the same cold room and carrier. Furthermore, organisations should also be concerned with the aspects

of packaging and labelling for halal food products, such as the material used in halal food packaging and the accurate and complete information of ingredients provided on the product label.

The other aspect that needs to be highly considered by organisations is physical segregation. Physical segregation means that halal food products should not be in direct contact with other non-halal products or elements during the supply chain process to preserve its halal status. This finding further supports the idea of Lodhi (2009), who suggested the need to physically segregate halal products to prevent any intentional or unintentional direct contact with elements that can affect the halal status. As such, based on this finding and supported by the literature, it appears that these three dimensions: storage and transport, packaging and labelling, and physical segregation are the most critical dimensions of HFSC implementation model.

### **8.2.3 Research Question 3**

*Does the halal food supply chain implementation have an impact on an organisation's marketing performance?*

Research question 3 was addressed by hypothesis H2 which proposes that there is a positive relationship between HFSC implementation and an organisation's marketing performance. The findings found that HFSC implementation has a significant positive relationship with marketing performance. As a result, it validates and strengthens the proposed importance of having a comprehensive model of HFSC implementation on organisation performance, particularly marketing performance.



The current findings can be concluded in that by implementing a comprehensive model of a HFSC with the concentration on nine dimensions may improve the organisation's marketing performance. Ultimately, this finding indicates that by focusing on all significant dimensions, such as the ability to manufacture in a clean premise; ensuring that the product is safe to be consumed by the customer; can physically segregate the production of halal and non-halal products; able to provide a dedicated warehouse and transportation; aware of the material used for the packaging of halal food; being ethical in business practices; the ability to train employees on how to facilitate halal food production; have the capacity to innovate for halal production; and are able to provide sufficient resources throughout the implementation of the HFSC, may have an impact on the marketing performance of the organisation.

In this study, marketing performance is measured by increasing the market share, market coverage, brand image, quality of products and marketing cost. Based on the results, it is evident that this study has made progress towards enhancing the understanding of manufacturers on how this model could help them to make wise and strategic decisions related to marketing aspects, such as increasing the market share, ease the positioning of brand image among consumers and to improve the quality of the products.

#### **8.2.4 Research Question 4**

*Does the halal food supply chain implementation have an impact on an organisation's financial performance?*

Research question 4 was designed to investigate the impact of HFSC implementation on the organisation's financial performance. Based on the finalised structural model, findings emerging from this study indicate that HFSC implementation does significantly impact an organisation's financial performance. In this case, this thesis confirms that by applying this holistic model of HFSC implementation comprised of nine dimensions in the relationship, may improve the organisation's financial performance. Furthermore, financial performance is measured by profitability, sales growth, budget allocation, operational cost and fines. More importantly, this current finding provides a complete understanding to the manufacturers regarding the significant relationships between the HFSC implementation model and organisation performance, particularly financial performance. As such, by taking into consideration all nine dimensions, this model will become a major reference to manufacturers in the halal food industry to formulate the right strategies for achieving higher profit and sales growth.

#### **8.2.5 Research Question 5**

*Does the organisation's marketing performance impact an organisation's financial performance?*

Research for question 5 intends to empirically examine the impact of an organisation's marketing performance on financial performance. In the context of halal processed foods and beverages, the findings revealed that an organisation's marketing performance has a significant impact on the organisation's financial performance. This study confirms that an organisation's marketing performance is an important construct in predicting the improvement of organisation's financial performance. Furthermore, this finding agrees with the argument made by Kosan (2014), that improving marketing

performance measures, such as market share, customer satisfaction, brand equity, product differentiation and innovation have an impact on financial performance. Although there are multiple measures for marketing performance, in this study, focusing on increasing the market share, improving the product quality and a good branding positioning will increase the organisation's financial performance.

Finally, the overarching objective of the study was successfully achieved. As mentioned earlier, the objective was achieved when the findings generated in Chapter 5 answered all the research questions (RQ1 to RQ5). Having answered all the research questions and achieved the main objective, this comprehensive model of HFSC implementation has become an important construct for organisation performance.

### **8.3 Contributions of the Study**

This study provided an in-depth understanding of the concept of HFSC management. This section discusses some significant contributions of this study regarding theoretical, methodological and managerial aspects.

#### **8.3.1 Theoretical Contributions**

The most significant original contribution the study makes to the area of halal supply chain management is that the study attempted to develop a holistic model of HFSC implementation which is underpinned by CT and Resource-based View (RBV). Although numerous studies regarding HFSC and halal food management are emerging in the literature, only one study (Bonne & Verbeke 2008) has examined the use of CT in the context of halal studies. This study is the first attempt of a theoretical foundation in the halal supply chain research domain. Furthermore, this study proposes additional

knowledge to the theory by demonstrating that most the dimensions that have been selected to define HFSC implementation as a construct can be appropriately explained using this theory. In this study, CT is used to facilitate in defining the dimensions or parameters of HFSC implementation, whereas RBV is used to ascertain how the HFSC implementation as a second-order construct can affect the organisational performance. As a result, a new theoretical of the HFSC implementation model was developed and tested. By combining both the theory in the area of the halal food supply chain, this study has extended the prior knowledge and made a strong contribution for other researchers.

As highlighted at the beginning of the thesis, research into halal food management and the HFSC is relatively new (Wan Omar, Rahman & Jie 2015). Despite the number of studies that have been performed on the different aspects of halal food management, the development of a comprehensive model of HFSC implementation has not yet been discussed. Prior studies have focused primarily on marketing studies, such as consumer awareness, consumer intention, purchasing behaviour, product adoption and branding (Alam & Sayuti 2011; Hanzaee & Ramezani 2011; Wan Omar, Muhammad & Omar 2008; Wilson & Liu 2010). Furthermore, there were many issues related to halal food authenticity, halal food adulteration and use of the fraudulent halal logo reported globally, including Malaysia (Ali et al. 2014; Bonne & Verbeke 2008). Hence, this study has attempted to provide a proper HSFC implementation model that can be used effectively for securing the HFSC process. Therefore, the findings of this study identified that only nine dimensions defined HFSC implementation as a construct. In addition, the findings also demonstrate that proper implementation is positively related to the organisational performance, particularly finance and marketing performance. This

becomes a new theoretical model in this research domain. For this reason, this study furthers the halal supply chain literature by developing a holistic model for HFSC implementation and investigating the relationship with organisational performance.

Although many halal studies were conducted in Malaysia as a research setting, there are few studies that have investigated the area of the HFSC. As previously suggested, Tieman, van der Vorst and Che Ghazali (2012), initiated the model to address the halal supply chain principles, and the research mainly investigated general halal products. Furthermore, the research did not investigate the impact of HFSC implementation on the organisational performance. Omar and Jaafar (2011) emphasised the identification of factors that lead to an effective halal supply chain and focused on the poultry industry; however, this study also failed to investigate the impact on the organisational performance. Finally, Ab Rahman, Manzouri and Zain (2013) focused on implementing green practices in the HFSC. Ultimately, the development of a HFSC implementation model is new, since it has not been widely acknowledged, particularly within the scope of the processed food and beverage industry.

### **8.3.2 Methodological Contributions**

This study used a quantitative-based research methodology. Data analysis for this study ranged from basic to advanced statistical techniques to solve the research problems. In halal food management, research that has employed rigorous statistical methods is limited. Prior HFSC studies have predominantly been case studies (Ali et al. 2014; Zulfakar, Jie & Chan 2013; Tieman, van der Vorst & Che Ghazali 2012). Even in the context of the quantitative method category, the vast majority of research on the HFSC has primarily applied either descriptive statistics or regression analyses (Wan Omar,

Rahman & Jie 2015). This research is among very few halal studies which have utilised covariance-based structural equation modelling (CB-SEM) (Aziz & Chok 2013). By using CB-SEM, this study was able to demonstrate the impact of HFSC implementation on organisational performance as an observed variable. In addition, CB-SEM provides holistic test to evaluate the fitness of the model and individual parameter estimate tests simultaneously (Hair et al. 2010). This makes testing a hypothesis easier and more precise than conventional statistical techniques. Thus, this study contributes as a reference for future research in terms of rigorous statistical analysis by employing the analytical power of CB-SEM.

Another significant contribution made by the study is the development and validation of the instrument. This study is the first attempt to develop and validate the measurement scale both at the first and higher orders for HFSC implementation construct. The process of development and validation is adopted as a comprehensive multi-step approach suggested by Shah and Ward (2007), of which the detailed explanations can be found in Chapter 4. Essentially, a pooled CFA was applied to assess the validation and model fit of a measurement model. In this study, a pooled CFA was used on a first order measurement model, in which all nine dimensions were run together simultaneously, which could not possibly have been conducted using conventional statistical techniques. Similarly, the process is run to confirm HFSC implementation as a higher order construct. This assessment considered to entail more extensive modelling of multivariate interrelations and allowing the output to be analysed in more precise manner. Hence, these findings provide new insights to the body of knowledge. Moreover, the validated scale provides an opportunity to other researchers, either academic or practitioner, to assess HFSC studies using a different theoretical domain.

### **8.3.3 Managerial Contributions**

From a managerial perspective, the findings from this study will benefit the organisations who are involved in the halal food industry, in both Muslim and non-Muslim countries. The findings of the study indicate that nine dimensions are important to define HFSC implementation as a higher order construct. In particular, the organisations should consider the importance of all nine dimensions since the model tested in this study indicate that all are significant for defining the HFSC implementation construct. In addition, three dimensions considered to be critical dimensions are storage and transportation, packaging and labelling and physical segregation, need to be further emphasised by the organisations throughout the supply chain. In fact, organisations should take into consideration a set of critical dimensions if they wish to produce high quality attributes of halal food products. Thus, by developing this model, it may assist managers in identifying areas for improvement and formulating appropriate strategies in the halal food industry.

The findings reported here also provide empirical evidence for management to incorporate into their decision making. Thus far, many organisations implement the HFSC based on competitive pressure, customer pressure and executive judgement. The action will only make the organisations focusing to certain aspects which could possibly not be so important, whilst some other important aspects could be ignored. By having this validated framework, it may be used as a comprehensive reference to guide future managers to have an improved knowledge and understanding of HFSC implementation, and therefore, the HFSC will be more efficient.

This study attempted to investigate on the effect of marketing performance on financial performance. Interestingly, the results reveal that the relationship between marketing performance and financial performance was significant. Marketing performance measures in this study were found to contribute to the improvement of financial performance. These results reinforce the importance of a balanced approach to managing supply chain activities. Therefore, this study highlights the need to emphasize marketing activities, such as marketing strategies, initiatives and plans rather than aiming solely at reducing cost. This will provide useful insights to managers, as it could be a new focus for making the organisation competitive and profitable in the market.

#### **8.4 Limitations of the Study**

Although this study made some contributions to the literature pertaining to the HFSC, a number of limitations must be considered. Firstly, the sample selected in this study focuses on one single industry in Malaysia. The potential issues of limited external validity and generalisability of the findings might be occurred; constraining the study to a single industry may eliminate problems associated with the effects of different industries (Hartline & Ferrell 1996). Nevertheless, the results may not be generalizable to other industry sectors or countries. For this reason, future research should disclose whether the findings are applicable to be applied to other research settings.

Secondly, the current study was limited by a medium sample size, which may affect the stability of the parameter estimates. As such, caution must be applied when interpreting the empirical findings. Regarding the rigorous analytical technique CB-SEM, it has been noted that a larger sample size is required to ensure that power, parameter estimates and errors remain stable (Schumacker & Lomax 2010). Although the sample



size for this study is considered acceptable and appropriate, these findings may not be sufficiently credible.

Thirdly, this study was conducted using a cross-sectional survey utilizing structured questionnaires. In the context of the research design, the cross-sectional nature of the data implies that true causal relationships that exist between the research constructs cannot be inferred. Causality can be established more definitely with longitudinal data. Therefore, a longitudinal setting is recommended to be applied in investigating the relationship between HFSC implementation and organisational performance.

Finally, the samples for this study were obtained from the official Halal Portal directory of Department of Islamic Development Malaysia (JAKIM), and therefore, excluded companies that were not listed in the directory. Thus, generalisations from the findings of this study cannot be applied to all halal manufacturing companies in Malaysia.

## **8.5 Directions for Future Research**

Despite some limitations, this study serves as a baseline to guide future research in the following areas:

- a) Future research should be highlighted in the context of collaboration and integration of the HFSC. Although few studies have discussed halal integrity, they have failed to address the importance of collaboration with various partners within both domestic and global halal food supply chains. Collaboration and integration amongst the supply chain members is critical to ensure the integrity of halal products and performance of HFSC.

- b) Further investigation can be performed regarding transparency of the HFSC. Being transparent among the supply chain partners will reduce the product integrity risk. Future researchers should explore the current efforts regarding transparency and how it can increase the sustainability of the HFSC.
- c) The current study does not consider the moderating effect that may exist between the hypothesised causal relationships. Moderating factors could entail certain factors, such as customer pressure, competitive pressure and organisation size. Thus, future research may explore identification of potential moderating factors and their effect on the hypothesised relationships.
- d) Future researchers are suggested to extend this model to other non-Muslim countries which may have a different culture background and halal food production regulations. The purpose of applying cross-boundary research, specifically in non-Muslim countries, is to observe whether halal food manufacturers consider the same dimensions, or perhaps there are some additional dimensions that are more important to consider while implementing a HFSC. Countries, such as Australia, New Zealand, the United States, Japan and the United Kingdom could be potential non-Muslim countries to explore and compare with the data obtained in the current study.
- e) From an industrial perspective, future studies could reconsider applying the HFSC framework into other industry contexts, such as cosmetics and personal care, healthcare and pharmaceuticals. As previously discussed in Chapter 3, the current study is investigated on single industry, which is processed food and beverages in

Malaysia. Therefore, the findings and implications of the present study might be different because the identified dimensions are tested in the halal food industry.

## **8.6 Concluding Remarks**

Growing demand drives the halal food market to continue its momentum across the global food supply chain. Without any doubt, the halal food market continues to struggle to overcome certain issues and challenges. This study was motivated by the growing issues of authenticity and adulteration in the global halal food industry. Several issues have created confusion and uncertainty among consumers about whether the products offered are truly halal (Talib, Ali & Jamaludin 2008). Additionally, a lack of empirical research and robust framework in halal food chain management was another rationale for this study to be investigated. Although numerous halal studies have concentrated on the topic of the HFSC, a limited number of studies have developed a holistic model of HFSC implementation.

The discussion in Chapters 1, 2 and 3 clearly points to the need to design, develop and manage an HFSC implementation model so that credibility can be delivered to the consumers. The setting of this study was restricted to a single industry in Malaysia, which is halal processed food and beverages. Furthermore, the current study was undertaken in Malaysia as a research setting due to its leadership in the global halal food space and continues to lead in the context of halal standards, regulations and management process, including supply chain process (Reuters 2015).

Theoretically, this study has made a significant contribution by developing and validating the measurement instruments in two ways: 1) to assess the dimensions of the

HFSC implementation model as higher-order construct; and 2) to the organisational performance constructs. CB-SEM was applied to assess the validation of the measurement model and to test the relationship between the constructs. This assessment is an extensive multivariate analysis and allows the output to be analysed in a more precise manner.

The findings of this study confirm that the final HFSC implementation model was defined by nine underlying dimensions, since the results were found to be statistically significant. Moreover, it also demonstrated that the HFSC implementation model has a positive effect on organisational performance, particularly on marketing and financial performance when all dimensions were considered. Another important finding was that three underlying dimensions; storage and transport, packaging and labelling and physical segregation were found to be critical due to the higher standardised estimates value. Thus, this served as a critical set of dimensions that defined the HFSC implementation model.

This research has emphasised the important dimensions in the implementation of the HFSC model within the context of the processed food and beverage industry. It is hoped that the scales developed together with the discussed research implications may be helpful for further in-depth studies and applications. Finally, the findings of this study provide a profound knowledge base on the supply chain management in the halal food market, and could offer useful insights for both industry and academic applications.

## **8.7 Summary**

This chapter concluded and discussed the outcomes of the study. A transparent picture and understanding from the findings on the development of the HFSC implementation, theoretical implications, methodological implications and managerial implications were discussed. On the other hand, the research questions were readdressed by comparing the assumptions with the findings generated in Chapter 6. Nevertheless, this study acknowledges some limitations that provide potential opportunities for future research. Finally, this chapter ended with concluding remarks and the chapter summary.

## REFERENCES

- Aaker, DA 1996, 'Measuring brand equity across products and markets', *California Management Review*, vol. 38, no. 3, pp. 102-20.
- Ab Rahman, MN, Manzouri, M & Zain, CRCM 2013, 'Environmental concern in managing halal food supply chain', *American Journal of Environmental Sciences*, vol. 9, no. 3, p. 240.
- Ab Talib, MS, Hamid, ABA, Zulfakar, MH & Jeeva, AS 2014, 'Halal logistics PEST analysis: the Malaysia perspectives', *Asian Social Science*, vol. 10, no. 14, p. 119.
- Ab Talib, MS & Mohd Johan, MR 2012, 'Issues in Halal Packaging: A Conceptual Paper', *International Business and Management*, vol. 5, no. 2, pp. 91-5.
- Abdul Latif, M (2006). 'Training on halal procedures and standards', Agricultural and Food for Asia Marketing Association and the Pacific (AFMAASIA), viewed 3 January 2015, <[http://www.afmaasia.org/malaysia\\_2006/Annex-4.pdf](http://www.afmaasia.org/malaysia_2006/Annex-4.pdf)>.
- Abdul, M, Ismail, H, Hashim, H & Johari, J 2009, 'Consumer decision making process in shopping for halal food in Malaysia', *China-USA Business Review*, vol. 8, no. 9, pp. 40-47.
- Abdul, M, Ismail, H & Mustapha, M 2013, 'Halal food certification: Case of Malaysian SME entrepreneurs', *China-USA Business Review*, vol. 12, no. 2, pp. 163-73.
- Abdul Rahim, A 2005, 'A concept of clean toilet from the Islamic perspective', *Journal of Islamic Built Environment*, vol. 1, no. 1, pp. 71-84.
- Abu Bakar, A, Othman, ZA, Nazri, A, Zakree, M, Hamdan, AR, Sarim, HM, Badari, KA, Hanan, A & Natasyah, F 2013, 'Classification of Halal Status for Food Product Using Data Mining Approach', *Advances in Information Sciences & Service Sciences*, vol. 5, no. 15.
- Ahmed, A 2008, 'Marketing of halal meat in the United Kingdom: Supermarkets versus local shops', *British Food Journal*, vol. 110, no. 7, pp. 655-70.
- Ahmed, A, Ahmed, N & Salman, A 2005, 'Critical issues in packaged food business', *British Food Journal*, vol. 107, no. 10, pp. 760-80.
- Aida, A, Man, YC, Wong, C, Raha, A & Son, R 2005, 'Analysis of raw meats and fats of pigs using polymerase chain reaction for Halal authentication', *Meat Sci*, vol. 69, no. 1, pp. 47-52.
- Aiking, H & De Boer, J 2004, 'Food sustainability: Diverging interpretations', *British Food Journal*, vol. 106, no. 5, pp. 359-65.

- Alam, SS & Sayuti, NM 2011, 'Applying the Theory of Planned Behavior (TPB) in halal food purchasing', *International Journal of Commerce and Management*, vol. 21, no. 1, pp. 8-20.
- Alavifar, A, Karimimalayer, M & Anuar, MK 2012, 'Structural equation modeling VS multiple regression', *Engineering Science and Technology: An International Journal*, vol. 2, no. 2, pp. 326-329.
- Albakir, SNWSM & Mohd-Mokhtar, R 2011, 'A conceptual design of genuine Halal logo detector', paper presented to 2011 IEEE International Conference on Imaging Systems and Techniques.
- Ali, AJ 1992, 'The Islamic work ethic in Arabia', *The Journal of psychology*, vol. 126, no. 5, pp. 507-19.
- Ali, AJ & Al-Owaihian, A 2008, 'Islamic work ethic: a critical review', *Cross cultural management: An international Journal*, vol. 15, no. 1, pp. 5-19.
- Ali, MH, Tan, KH & Makhbul, ZM 2013, 'Mitigating halal food integrity risk through supply chain integration', paper presented to Asia Pacific Industrial Engineering and Management System, Cebu, Philippines.
- Ali, MH, Tan, KH & Pawar, K 2013, 'Enhancing halal food integrity through supply chain integration', paper presented to European Operations Management Association, Dublin, Ireland.
- Ali, MH, Tan, KH, Pawar, K & Makhbul, ZM 2014, 'Extenuating Food Integrity Risk through Supply Chain Integration: The Case of Halal Food', *Industrial Engineering & Management Systems*, vol. 13, no. 2, pp. 154-62.
- Al-Qaradawi, Y 2007, *The Lawful and the Prohibited in Islam*, Islamic Book Trust, Kuala Lumpur.
- Al Halaseh, L & Sundarakani, B 2012, 'Study on Quality Attributes of Halal Food Supply Chain', *International Journal Logistics Economics and Globalisation*, vol. 4, no. 1/2.
- Al-Harran, S & Low, K 2008, 'Marketing of halal products: the way forward', *The Halal Journal*, March 2008, pp. 44-6.
- Al-Jallad, N 2008, 'The concepts of al-halal and al-haram in the Arab-Muslim culture: a translational and lexicographical study', *Language Design: Journal of Theoretical and Experimental Linguistics*, vol. 10, pp. 77-86.
- Alserhan, BA 2010, 'Islamic Branding: A conceptualization of related terms', *Brand Management*, vol. 18, no.1, pp. 34-49.
- APFI 2016, 'Global Halal Market on The Rise', Asia Pacific Food Industry, viewed 19 January 2017, <<http://www.apfoodonline.com/index.php/bnf/item/829-global-halal-market-on-the-rise>>.

- Amabile, TM, Conti, R, Coon, H, Lazenby, J & Herron, M 1996, 'Assessing the work environment for creativity', *Academy of management journal*, vol. 39, no. 5, pp. 1154-84.
- Amaratunga, D, Baldry, D, Sarshar, M & Newton, R 2002, 'Quantitative and qualitative research in the built environment: application of “mixed” research approach', *Work study*, vol. 51, no. 1, pp. 17-31.
- Ambali, AR & Bakar, AN 2013, 'Halāl food and products in Malaysia: People’s awareness and policy implications', *Intellectual Discourse*, vol. 21, no. 1.
- Amjadi, K & Hussain, K 2005, 'Integrating food hygiene into quantity food production systems', *Nutrition & Food Science*, vol. 35, no. 3, pp. 169-83.
- Anderson, JC & Gerbing, DW 1984, 'The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis', *Psychometrika*, vol. 49, no. 2, pp. 155-73.
- Anderson JC & Gerbing, DW 1988, 'Structural equation modeling in practice: A review and recommended two-step approach', *Psychological bulletin*, vol. 103, no. 3, p. 411.
- Arbuckle, J 2005, '*Amos 6.0 update to the amos user’s guide*', SPSS, Inc, Chicago.
- Arnau, RC & Thompson, B 2000, 'Second order confirmatory factor analysis of the WAIS-III', *Assessment*, vol. 7, no. 3, pp. 237-46.
- Aung, MM & Chang, YS 2014, 'Traceability in a food supply chain: Safety and quality perspectives', *Food Control*, vol. 39, pp. 172-84.
- Awang, Z 2012, *Structural equation modeling using AMOS graphic*, Penerbit Universiti Teknologi MARA.
- Awang, Z 2015, *SEM made simple: A gentle approach to learning Structural Equation Modeling*, MPWS Rich Publication, 9671109985.
- Aziz, YA & Chok, NV 2013, 'The role of Halal awareness, Halal certification, and marketing components in determining Halal purchase intention among non-Muslims in Malaysia: a structural equation modeling approach', *Journal of International Food & Agribusiness Marketing*, vol. 25, no. 1, pp. 1-23.
- Azman, NHN & Marson, T 2012, 'Halal Development and Malaysian Exports', paper presented to 3rd International Conference on Business and Economic Research, Bandung, Indonesia.
- Babin, BJ, Hair, JF & Boles, JS 2008, 'Publishing research in marketing journals using structural equation modeling', *Journal of marketing theory and practice*, vol. 16, no. 4, pp. 279-86.



- Badrie, N, Gobin, A, Dookeran, S & Duncan, R 2006, 'Consumer awareness and perception to food safety hazards in Trinidad', *Food Control*, vol.17, pp. 370-377.
- Bagozzi, RP 1980, 'Performance and satisfaction in an industrial sales force: An examination of their antecedents and simultaneity', *the Journal of Marketing*, pp. 65-77.
- Bagozzi, RP & Yi, Y 1988, 'On the evaluation of structural equation models', *Journal of the Academy of Marketing Science*, vol. 16, no. 1, pp. 74-94.
- Bagozzi, RP & Yi, Y 2012, 'Specification, evaluation, and interpretation of structural equation models', *Journal of the Academy of Marketing Science*, vol. 40, no. 1, pp. 8-34.
- Bagozzi, RP, Yi, Y and Phillips, LW 1991, 'Assessing construct validity in organizational research', *Administrative Science Quarterly*, vol.36, no.3, pp: 421-458.
- Bahrudin, SSM, Illyas, MI & Desa, MI 2011, 'Tracking and tracing technology for Halal product integrity over the supply chain', paper presented to 2011 International Conference on Electrical Engineering and Infomatics, Bandung, Indonesia, 17-19 July, 2011.
- Barrett, P 2007, 'Structural equation modelling: Adjudging model fit', *Personality and Individual differences*, vol. 42, no. 5, pp. 815-24.
- Barney, J 1991, 'Firm resources and sustained competitive advantage', *Journal of Management*, vol. 17, no. 1, pp. 99-120.
- Barney, JB 1995, 'Looking inside for competitive advantage', *The Academy of Management Executive*, vol. 9, no. 4, pp. 49-61.
- Bartlett, MS 1950, 'Tests of significance in factor analysis', *British Journal of Mathematical and Statistical Psychology*, vol. 3, no. 2, pp. 77-85.
- Batrawy, A 2014, 'Demand grows for halal food as industry evolves', *Yahoo News*, viewed 15 April 2015, <<https://www.yahoo.com/news/demand-grows-halal-food-industry-evolves-155147413--finance.html?ref=gs>>.
- Baumgartner, H & Homburg, C 1996, 'Applications of structural equation modeling in marketing and consumer research: A review', *International journal of Research in Marketing*, vol. 13, no. 2, pp. 139-61.
- Beer, E 2014, 'Global halal market to hit \$1.6tn by 2018', *Food Navigator.com*, viewed 25 May 2015, <<http://www.foodnavigator.com/Regions/Middle-East/Global-Halal-market-to-hit-1.6tn-by-2018>>.
- Bentler, PM 1990, 'Comparative fit indexes in structural models', *Psychological bulletin*, vol. 107, no. 2, p. 238.

- Bentler, PM 1995, *EQS structural equations program manual*, Multivariate Software, Encino, CA.
- Bentler, PM & Chou, C-P 1987, 'Practical Issues in Structural Modeling', *Sociological Methods & Research*, vol. 16, no. 1, pp. 78-117.
- Bernamea 2011, 'Pure Creamery Butter-Golden Churn tidak halal-JAKIM', *Utusan Online*, 15 August, viewed 3 March 2016, <[http://ww1.utusan.com.my/utusan/info.asp?y=2011&dt=0815&pub=Utusan\\_Malaysia&sec=Terkini&pg=bt\\_09.htm](http://ww1.utusan.com.my/utusan/info.asp?y=2011&dt=0815&pub=Utusan_Malaysia&sec=Terkini&pg=bt_09.htm)>.
- Bernamea 2014, 'Kilang Bebola Ikan di Juru Guna Logo Halal Tidak Diiktiraf Diserbu', *Bernamea.com*, 5 February, viewed 3 March 2016, <[http://www.bernama.com/bernama/state\\_news/bm/news.php?id=1012210&cat=ut](http://www.bernama.com/bernama/state_news/bm/news.php?id=1012210&cat=ut)>.
- Beulens, AJ, Broens, D-F, Folstar, P & Hofstede, GJ 2005, 'Food safety and transparency in food chains and networks Relationships and challenges', *Food Control*, vol. 16, no. 6, pp. 481-6.
- Bohari, AM, Hin, CW & Fuad, N 2013, 'The competitiveness of halal food industry in Malaysia: A SWOT -ICT analysis', *GEOGRAFIA OnlineTM Malaysia Journal of Society and Space*, vol. 9, no. 1, pp. 1-9.
- Bollen, KA 1989, 'A new incremental fit index for general structural equation models', *Sociological Methods & Research*, vol. 17, no. 3, pp. 303-16.
- Bollen, KA, Kirby, JB, Curran, PJ, Paxton, PM & Chen, F 2007, 'Latent variable models under misspecification: two-stage least squares (2SLS) and maximum likelihood (ML) estimators', *Sociological Methods & Research*, vol. 36, no. 1, pp. 48-86.
- Bollen, KA & Long, JS 1993, *Testing structural equation models*, vol. 154, Sage.
- Bon, M & Hussain, M 2010, 'Halal food and tourism: prospects and challenges', *Tourism in the Muslim World: Bridging tourism theory and practice*, vol. 2, pp. 47-59.
- Bonne, K & Verbeke, W 2008, 'Religious values informing halal meat production and the control and delivery of halal credence quality', *Agriculture and Human Values*, vol. 25, no. 1, pp. 35-47.
- Bonne, K, Vermeir, I, Bergeaud-Blackler, F & Verbeke, W 2007, 'Determinants of halal meat consumption in France', *British Food Journal*, vol. 109, no. 5, pp. 367-86.
- Boomsma, A 1982, 'The robustness of LISREL against small sample sizes in factor analysis models', *Systems under indirect observation: Causality, structure, prediction*, vol. 1, pp. 149-73.

- Boomsma, A & Hoogland, JJ 2001, 'The robustness of LISREL modeling revisited', *Structural equation models: Present and future. A Festschrift in honor of Karl Jöreskog*, vol. 2, no. 3, pp. 139-68.
- Borzooei, M & Asgari, M 2013, 'Establishing a Global Halal Hub: In-Depth Interviews', *International Journal of Academic Research in Business and Social Sciences*, vol. 3, no. 10.
- Bowden, A, Fox-Rushby, J, Nyandieka, L & Wanjau, J 2002, 'Methods for pre-testing and piloting survey questions: illustrations from the KENQOL survey of health-related quality of life', *Health policy and planning*, vol. 17, no. 3, pp. 322-30.
- Bowling A 1997, *Research Methods in Health*. Open University Press, Buckingham.
- Breckler, SJ 1990, 'Applications of covariance structure modeling in psychology: Cause for concern?', *Psychological bulletin*, vol. 107, no. 2, p. 260.
- Brewer, MS, Sprouls, GK & Russon, C 1994, 'Consumer attitudes toward food safety issues', *Journal of food safety*, vol. 14, no. 1, pp. 63-76.
- Brislin, RW 1970, 'Back-translation for cross-cultural research', *Journal of cross-cultural psychology*, vol. 1, no. 3, pp. 185-216.
- Brown, S 1993, 'Drop and Collect Surveys: A Neglected Research Technique?', *Marketing Intelligence & Planning*, vol. 5, no. 1, pp. 19-23.
- Browne, MW & Cudeck, R 1992, 'Alternative ways of assessing model fit', *Sociological Methods & Research*, vol. 21, no. 2, pp. 230-58.
- Bruil, R 2010, 'Halal logistics and the impact of consumer perceptions', Master thesis, University of Twente.
- Bryman, A & Bell, E 2007, *Business Research Methods*, Oxford University Press, New York.
- Burrell, G & Morgan, G 1979, *Sociological paradigms and organisational analysis*, vol. 248, London: Heinemann.
- Byrne, BM 2001, *Structural Equation Modeling with Amos: Basic Concepts, Applications, and Programming*, Lawrence Erlbaum Associates: London.
- Byrne, BM 2010, *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming*, 2<sup>nd</sup> edn, Routledge: New York.
- CAC 2003, Risk Analysis Policies of the Codex Alimentarius Commission, 26th Session July 2003.
- Carmines, EG & Zeller, RA 1979, *Reliability and validity assessment*, vol. 17, Sage publications.

- Carmines, EG & McIver, JP 1981, 'Analyzing models with unobserved variables: Analysis of covariance structures', *Social measurement: Current issues*, pp. 65-115.
- Cavana, RY, Delahaye, BL & Sekaran, U 2001, *Applied business research: Qualitative and quantitative methods*, John Wiley & Sons Australia.
- Ceranić, S & Božinović, N 2009, 'Possibilities and Significance of HAS Implementation (Halal Assurance System) in Existing Quality System in Food Industry', *Biotechnology in Animal Husbandry*, vol. 25, no. 3-4, pp. 261-6.
- Chang, S-J, Van Witteloostuijn, A & Eden, L 2010, 'From the editors: Common method variance in international business research', *Journal of International Business Studies*, vol. 41, no. 2, pp. 178-84.
- Chau, PY & Hu, PJH 2001, 'Information technology acceptance by individual professionals: A model comparison approach', *Decision sciences*, vol. 32, no. 4, pp. 699-719.
- Chawk, A & Ayan, A 2006, 'Population Dynamics, Security and Supply of Halal Food', in Sheikh Mohd Saifuddeen Shaikh Mohd Salleh and Azrina Sobrian (eds.) *Food and Technological Progress. An Islamic Perspective*, MPH Publishing, Petaling Jaya.
- Che Man, Y, Bojei, J, Sazili, A & Abdullah, A 2007, 'Malaysia halal hub opportunities', paper presented to 4th Asian Livestock & Feed Industry Conference.
- Chen, IJ & Paulraj, A 2004, 'Understanding supply chain management: critical research and a theoretical framework', *International Journal of Production Research*, vol. 42, no. 1, pp. 131-63.
- Chin, WW 1998, 'The partial least squares approach to structural equation modeling', *Modern methods for business research*, vol. 295, no. 2, pp. 295-336.
- Chin, WW, Peterson, RA & Brown, SP 2008, 'Structural equation modeling in marketing: Some practical reminders', *Journal of marketing theory and practice*, vol. 16, no. 4, pp. 287-98.
- Chong, EE, Nazim, A & Ahmad, SB 2014, 'A comparison between individual confirmatory factor analysis and pooled confirmatory factor analysis: An analysis of library service quality, a case study at a public university in Terengganu', *International Journal of Engineering Science and Innovative Technology*, vol. 3, no. 1, pp. 110-6.
- Chou, C-P & Bentler, PM 1995, 'Estimates and tests in structural equation modeling', in RH, Hoyle (ed.) *Structural equation modeling: Concepts, issues and applications*, Thousand Oaks, CA: Sage, pp. 37-55.
- Churchill Jr, GA 1979, 'A paradigm for developing better measures of marketing constructs', *Journal of marketing research*, pp. 64-73.

- Churchill, GA & Iacobucci, D 2006, '*Marketing research: methodological foundations*', Dryden Press, New York.
- Cidell, JL & Alberts, HC 2006, 'Constructing quality: the multinational histories of chocolate', *Geoforum*, vol. 37, no. 6, pp. 999-1007.
- Clark, LA & Watson, D 1995, 'Constructing validity: Basic issues in objective scale development', *Psychological assessment*, vol. 7, no. 3, p. 309.
- Clarke, S 1999, 'Perceptions of organizational safety: implications for the development of safety culture', *Journal of organizational Behavior*, pp. 185-98.
- Clason, DL & Dormody, TJ 1994, 'Analyzing data measured by individual Likert-type items', *Journal of Agricultural Education*, vol. 35, p. 4.
- Cohen, J & Cohen, P 1983, *Applied multiple regression/correlation analysis for the behavioral sciences*. 2nd edn, Hillsdale, Erlbaum New Jersey.
- Conner, KR 1991, 'A historical comparison of resource-based theory and five schools of thought within industrial organization economics: do we have a new theory of the firm?', *Journal of Management*, vol. 17, no. 1, pp. 121-54.
- Conway, JM & Huffcutt, AI 2003, 'A review and evaluation of exploratory factor analysis practices in organisational research', *Organisational Research Methods*, vol. 6, no. 2, pp. 147-68.
- Conway, JM & Lance, CE 2010, 'What reviewers should expect from authors regarding common method bias in organizational research', *Journal of Business and Psychology*, vol. 25, no. 3, pp. 325-34.
- Cooper, D & Schindler, P 2008, *International Edition: Business Research Methods*, New Delhi.
- Craighead, CW, Ketchen, DJ, Dunn, KS & Hult, GTM 2011, 'Addressing common method variance: guidelines for survey research on information technology, operations, and supply chain management', *IEEE Transactions on Engineering Management*, vol. 58, no. 3, pp. 578-88.
- Creswell, JW 2009, *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, 3<sup>rd</sup> edn, Sage Publications, Inc, California, USA.
- Creswell, JW 2013, *Research design: qualitative, quantitative and mixed methods approaches*, 4th edn, Sage, Thousand Oaks, CA.
- Croom, S, Romano, P & Giannakis, Mihalis 2000, 'Supply chain management: an analytical framework for critical literature review', *European Journal of Purchasing & Supply Management*, vol.6, pp.67-83.
- Crossan, F 2003, 'Research philosophy: towards an understanding', *Nurse researcher*, vol. 11, no. 1, pp. 46-55.

- Crotty, M 1998, *The foundations of social research: Meaning and perspective in the research process*, Sage.
- D'agostino, RB, Belanger, A & D'Agostino Jr, RB 1990, 'A suggestion for using powerful and informative tests of normality', *The American Statistician*, vol. 44, no. 4, pp. 316-21.
- Daft, R 2012, *Organization theory and design*, Cengage Learning, Ohio, USA.
- Dali, N, Nooh, MNB, Nawai, NB, Mohammad, HB, Nilai, BB & Sembilan, N 2009, 'Is halal products are more expensive as perceived by the consumers? Muslimpreneurs challenges and opportunities in establishing a blue ocean playing field', *Journal of Management & Muamalah*, vol. 2, pp. 39-62.
- Danesh, MMS, Chavosh, A & Nahavandi, M 2010, 'Comparative analysis of the Muslims' and non-Muslims' satisfaction with Halal products', paper presented to Advanced Management Science (ICAMS), 2010 IEEE International Conference on.
- Daud, S, Din, RC, Bakar, S, Kadir, MR & Sapuan, NM 2011, 'Implementation of MS1500: 2009: A Gap Analysis', *Communications of the IBIMA*, vol. 2011.
- Daud, NM, Aziz, HA, Baharudin, NH & Shamsudin, SF 2012, 'Identifying the Determinant Attributes of Halal Cosmetics Product That Influence Its Positioning Strategy in Malaysian Market', *Journal of Applied Sciences Research*, vol. 8, no. 1.
- Day, GS 1994, 'The capabilities of market-driven organizations', *the Journal of Marketing*, pp. 37-52.
- De Jonge, J, Van Trijp, J, van der Lans, IA, Renes, RJ & Frewer, LJ 2008, 'How trust in institutions and organizations builds general consumer confidence in the safety of food: A decomposition of effects', *Appetite*, vol. 51, no. 2, pp. 311-7.
- DeCarlo, LT 1997, 'On the meaning and use of kurtosis', *Psychological methods*, vol. 2, no. 3, p. 292.
- Dennis, MJ 1998, 'Recent developments in food authentication [dagger]', *Analyst*, vol. 123, no. 9, pp. 151-56.
- Diamantopoulos, A, & Siguaw, JA 2000, *Introducing LISREL: A guide for the uninitiated*, Sage.
- Di Foggia, G, Ferrari, S, Lazzarotti, V & Pizzurno, E 2011, 'Innovation Process for halal product development: An empirical analysis of Italian firms', *Management Research and Practice*, vol. 3, no. 1, pp. 27-47.
- Dittmann, JP 2012, *Supply chain transformation: Building and executing an integrated supply chain strategy*, McGraw Hill Professional.

- Dollah, A, Yusoff, MYZM & Ibrahim, NJ 2012, 'Halal concept according to Abu Mansur Al-Maturidi: A thematic study', paper presented to International Halal Conference (INHAC 2012), Kuala Lumpur, Malaysia, 4-5 September 2012.
- Dow, D, Samson, D & Ford, S 1999, 'Exploding the myth: do all quality management practices contribute to superior quality performance?', *Production and operations management*, vol. 8, no. 1, pp. 1-27.
- Dunn, SC, Seaker, RF & Waller, MA 1994, 'Latent variables in business logistics research: scale development and validation', *Journal of Business Logistics*, vol. 15, no. 2, p. 145.
- Eng, T-Y 2016, 'An empirical study of Chinese SME grocery retailers' distribution capabilities', *Supply Chain Management: An International Journal*, vol. 21, no. 1, pp. 63-77.
- Esfahani, AN & Shahnazari, A 2013, 'Designing Halal and Pure Food Model by Emphasizing Consumer Behavior Management', *Journal of Basic and Applied Scientific Research*, vol. 3, no. 2, pp. 574-8.
- Fadzilillah, NA, Man, YBC, Jamaludin, MA, Rahman, SA & Al-Kahtani, HA 2011, 'Halal food issues from Islamic and modern science perspectives', paper presented to International Conference on Humanities, Historical and Social Sciences. IACSIT Press, Singapore.
- Faul, F, Erdfelder, E, Buchner, A & Lang, A-G 2009, 'Statistical power analyses using G\* Power 3.1: Tests for correlation and regression analyses', *Behavior research methods*, vol. 41, no. 4, pp. 1149-60.
- Ferguson, E & Cox, T 1993, 'Exploratory factor analysis: A users' guide', *International Journal of Selection and Assessment*, vol. 1, no. 2, pp. 84-94.
- Finn, A & Louviere, JJ 1992, 'Determining the appropriate response to evidence of public concern: the case of food safety', *Journal of Public Policy & Marketing*, pp. 12-25.
- Fischer, J 2011, 'The halal frontier', in *The Halal Frontier*, Springer, pp. 1-30.
- Flynn, BB, Huo, B & Zhao, X 2010, 'The impact of supply chain integration on performance: A contingency and configuration approach', *Journal of Operations Management*, vol. 28, no. 1, pp. 58-71.
- Fornell, C & Larcker, DF 1981, 'Structural equation models with unobservable variables and measurement error: Algebra and statistics', *Journal of marketing research*, pp. 382-8.
- Frazer, L & Lawley, M 2000, *Questionnaire administration and design: A practical guide*, Brisbane, Australia: John Wiley & Sons.

- Gallagher, D, Ting, L & Palmer, A 2008, 'A journey into the unknown; taking the fear out of structural equation modeling with AMOS for the first-time user', *The Marketing Review*, vol. 8, no. 3, pp. 255-75.
- Garson, GD 2012, 'Testing statistical assumptions', *Statistical Associates Publishing, Asheboro, NC*.
- Gerbing, DW, Hamilton, JG & Freeman, EB 1994, 'A large-scale second-order structural equation model of the influence of management participation on organizational planning benefits', *Journal of Management*, vol. 20, no. 4, pp. 859-85.
- GIFR 2013, *Global Islamic Finance Report 2013*, Edbiz Consulting <[http://www.gifr.net/gifr\\_2013.htm](http://www.gifr.net/gifr_2013.htm)>.
- Golnaz, R, Zainalabidin, M, Mad Nasir, S & Eddie Chew, FC 2010, 'Non-Muslims' awareness of Halal principles and related food product in Malaysia', *International Food Research Journal*, vol.17, pp. 667-674.
- Gowen Iii, CR & Tallon, WJ 2003, 'Enhancing supply chain practices through human resource management', *Journal of Management Development*, vol. 22, no. 1, pp. 32-44.
- Grant, RM 1991, 'The resource-based theory of competitive advantage: implications for strategy formulation', *California management review*, vol. 33, no. 3, pp. 114-35.
- Graziano, AM & Raulin, ML 2007, *Research Methods: A Process of Inquiry*, Pearson Education, Inc, Boston.
- Green, K & Inman\*, R 2005, 'Using a just-in-time selling strategy to strengthen supply chain linkages', *International Journal of Production Research*, vol. 43, no. 16, pp. 3437-53.
- Grimm, P 2010, 'Social desirability bias', *Wiley International Encyclopedia of Marketing*.
- Guan, J & Ma, N 2003, 'Innovative capability and export performance of Chinese firms', *Technovation*, vol. 23, no. 9, pp. 737-47.
- Guba, EG 1990, *The paradigm dialog*, Sage Publications.
- Guba, EG & Lincoln, YS 1994, 'Competing paradigms in qualitative research', *Handbook of qualitative research*, vol. 2, no. 163-194.
- Hair, JF, Anderson, RE, Tatham, RL & William, C 1995, 'Black (1995), Multivariate data analysis with readings', *New Jersey: Prentice Hall*.
- Hair, JFJ, Anderson, RE, Tatham, RL & William, C 1998, *Black (1998), Multivariate data analysis*, Upper Saddle River, NJ: Prentice Hall.



- Hair, JFJ, Bush, R & Ortinau, D 2003, *Marketing Research*, McGraw.
- Hair, JFJ, Black, WC, Babin, BJ & Anderson, RE 2010, *Multivariate Data Analysis*, 7<sup>th</sup> edn, Prentice Hall, New Jersey.
- Hair, JFJ, Gabriel, M & Patel, V 2014, 'AMOS covariance-based structural equation modeling (CB-SEM): guidelines on its application as a marketing research tool', *Brazilian Journal of Marketing*, vol. 13, no. 2.
- Hair, JFJ, Sarstedt, M, Hopkins, L & Kuppelwieser, VG 2014a, 'Partial least squares structural equation modeling (PLS-SEM)', *European Business Review*, vol. 26, no. 2, p. 106.
- Hair, JFJ, Hult, GTM, Ringle, C & Sarstedt, M 2014b, *A primer on partial least squares structural equation modeling (PLS-SEM)*, Sage Publications.
- Halal Food Information Center 2016, Thailand, viewed 17 February 2017, < <http://www.thaihalalfoods.com/EN/industry.php?id=17> >.
- Halim, MAA & Salleh, MMM 2012, 'The Possibility of Uniformity on Halal Standards in Organization of Islamic Countries (OIC) Country', *World Applied Sciences Journal*, vol. 17.
- Hall, DB & Wang, L 2005, 'Two-Component Mixtures of Generalized Linear Mixed Effects Models for Cluster Correlated Data', *Statistical Modelling*, vol. 5, no. 1, pp. 21-37.
- Hampden-Turner, C & Trompenaars, F 1997, 'Response to Geert Hofstede', *International Journal of Intercultural Relations*, vol. 21, no. 1, pp. 149-59.
- Hanzaee, KH & Ramezani, MR 2011, 'Intention to Halal Products in The World Markets', *Interdisciplinary Journal of Research in Business*, vol. 1, no. 5, pp. 01-07.
- Harris-Kojetin, B 2009, 'When Should Agencies Conduct Nonresponse Bias Analyses?', paper presented to Federal Committee on Statistical Methodology Workshop, Washington, D.C.
- Hartline, MD & Ferrell, OC 1996, 'The management of customer-contact service employees: an empirical investigation', *the Journal of Marketing*, pp. 52-70.
- Hashimi, D & Salleh, SMSSM 2010, 'A Background on Halal Industry and Principles', paper presented to International Workshop for Islamic Scholars on Agribiotechnology: Shariah Compliance, Penang, Malaysia.
- Hay, C 2002, *Political analysis: a critical introduction*, Palgrave Macmillan.
- Haynes, SN, Richard, D & Kubany, ES 1995, 'Content validity in psychological assessment: A functional approach to concepts and methods', *Psychological assessment*, vol. 7, no. 3, p. 238.

- Healy, M & Perry, C 2000, 'Comprehensive Criteria to Judge Validity and Reliability of Qualitative Research within the Realism Paradigm', *Qualitative Market Research: An International Journal*, vol. 3, no. 3, pp. 118-26.
- Hershberger, SL 2003, 'The growth of structural equation modeling: 1994-2001', *Structural Equation Modeling*, vol. 10, no. 1, pp. 35-46.
- HDC 2011, *Awreenss on The Halal Industry*, Halal Industry Development Corporation, viewed 20 January 2014, <<http://www.hdcglobal.com>>.
- HDC 2012, *Business Opportunities in Halal Industry*, Halal Industry Development Corporation, viewed 20 January 2014, <<http://www.hdcglobal.com>>.
- HDC 2014, *Opportunities in Halal Economy*, Halal Industry Development Corporation, viewed 2 May 2014, <<http://www.hdcglobal.com>>.
- Hirschheim, R 1985, 'Information systems epistemology: An historical perspective', *Research methods in information systems*, pp. 13-35.
- Holmberg, S 2000, 'A systems perspective on supply chain measurements', *International Journal of Physical Distribution & Logistics Management*, vol. 30, no. 10, pp. 847-68.
- Holmes-Smith, P, Coote, L & Cunningham, E 2006, 'Structural equation modeling: From the fundamentals to advanced topics', *SREAMS, Melbourne*.
- Holmes-Smith, P 2010, 'An applied introductory course in structural equation modelling using AMOS', IN SREAM.
- Hooley, GJ, Greenley, GE, Cadogan, JW & Fahy, J 2005, 'The performance impact of marketing resources', *Journal of Business Research*, vol. 58, no. 1, pp. 18-27.
- Hooper, D, Coughlan, J & Mullen, M 2008, 'Structural equation modelling: Guidelines for determining model fit', *Articles*, p. 2.
- Hox, JJ & Bechger, TM 1998, 'An introduction to structural equation modeling', *Family Science Review*, vol. 11, pp. 354-73.
- Hsieh, Y-C & Hiang, S-T 2004, 'A study of the impacts of service quality on relationship quality in search-experience-credence services', *Total Quality Management & Business Excellence*, vol. 15, no. 1, pp. 43-58.
- Hsu, C-C, Tan, KC, Laosirihongthong, T & Leong, GK 2011, 'Entrepreneurial SCM competence and performance of manufacturing SMEs', *International Journal of Production Research*, vol. 49, no. 22, pp. 6629-49.
- Hsu, S-H, Chen, W-H & Hsieh, M-J 2006, 'Robustness testing of PLS, LISREL, EQS and ANN-based SEM for measuring customer satisfaction', *Total Quality Management & Business Excellence*, vol. 17, no. 3, pp. 355-72.

- Hu, L-t, Bentler, PM & Kano, Y 1992, 'Can test statistics in covariance structure analysis be trusted?', *Psychological bulletin*, vol. 112, no. 2, p. 351.
- Hu, Lt & Bentler, PM 1999, 'Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives', *Structural equation modeling: a multidisciplinary journal*, vol. 6, no. 1, pp. 1-55.
- Huo, B, Qi, Y, Wang, Z & Zhao, X 2014, 'The impact of supply chain integration on firm performance: The moderating role of competitive strategy', *Supply Chain Management: An International Journal*, vol. 19, no. 4, pp. 369-84.
- Ibrahim, HR & Mokhtarudin, MZH 2010, 'Fraudulent quality labelling: Case of Halal labelling', *China-USA Business Review*, vol. 9, no. 9, pp. 41-47.
- ICCI-IHI Alliance Halal Standard 2010, *Food Services (First Edition)*, IHIAS 0200:2010, International Halal Integrity Alliance, Malaysia.
- Ireland, J & Rajabzadeh, SA 2011, 'UAE consumer concerns about Halal products', *Journal of Islamic Marketing*, vol. 2, no. 3, pp. 274-83.
- ITC 2015, *From Niche to Mainstream – Halal Goes Global*, International Trade Centre, viewed 20 May 2015, <<http://www.intracen.org>>.
- Jaafar, HS, Endut, IR, Faisol, N & Omar, EN 2011, 'Innovation in logistics services–halal logistics', paper presented to 16<sup>th</sup> International Symposium on Logistics (ISL), Berlin, 10 – 13 July.
- Jalil, F & Musa, N 2012, 'Halal Products - Malaysian Constitution Perspective', paper presented to International Halal Conference (INHAC 2012), Kuala Lumpur, Malaysia.
- Jaques, T 2015, 'Cadbury and pig DNA: when issue management intersects with religion', *Corporate Communications: An International Journal*, vol. 20, no. 4, pp.468-82.
- Jie, F 2008, 'Supply chain analysis of the Australian beef industry', PhD thesis, University of Sydney.
- Joni, F 2015, 'Hati-hati beli bebola ikan-JAKIM', *Utusan Online*, 12 February, viewed 3 March 2016, <<https://www.utusan.com.my/berita/nasional/hati-hati-beli-bebola-ikan-jakim-1.58764>>.
- Jöreskog, KG 1970, 'A general method for analysis of covariance structures', *Biometrika*, pp. 239-51.
- Jöreskog, KG & Sörbom, D 1982, 'Recent developments in structural equation modeling', *Journal of marketing research*, pp. 404-16.
- Junaini, SN & Abdullah, J 2008, 'MyMobiHalal 2.0: Malaysian mobile halal product verification using camera phone barcode scanning and MMS', paper presented to

- Computer and Communication Engineering, 2008. ICCCE 2008. International Conference on IEEE.
- Kabir, S 2014, 'Does Australia overlook a potential trade opportunity?', paper presented to Australian Conference of Econometrics, 1- 4 July.
- Kaiser, HF 1974, 'An index of factorial simplicity', *Psychometrika*, vol. 39, no. 1, pp. 31-6.
- Kamali, MH 2010, 'The Halal industry from a shari'ah perspective', *Islam and Civilisational Renewal*, vol.1, no. 4.
- Kannan, VR & Tan, KC 2005, 'Just in time, total quality management, and supply chain management: understanding their linkages and impact on business performance', *Omega*, vol. 33, pp. 153-62.
- Kassam, Z & Robinson, SE 2013, 'Islam and Food', *Encyclopedia of Food and Agricultural Ethics*, pp. 1-11.
- Khan, N 2009, *Special report: Halal logistics*, viewed 3 March 2015, <<http://www.arabiansupplychain.com/article-385-special-report-halal-logistics/>>.
- Khattak, JZK, Mir, A, Anwar, Z, Wahedi, HM, Abbas, G, Khattak, HZK & Ismatullah, H 2011, 'Concept of Halal Food and Biotechnology', *Advance Journal of Food Science & Technology*, vol. 3, no. 5.
- Kim, H-b & Kim, WG 2005, 'The relationship between brand equity and firms' performance in luxury hotels and chain restaurants', *Tourism management*, vol. 26, no. 4, pp. 549-60.
- Kim, H-b, Kim, WG & An, JA 2003, 'The effect of consumer-based brand equity on firms' financial performance', *Journal of consumer marketing*, vol. 20, no. 4, pp. 335-51.
- Kim, MT & Han, HR 2004, 'Cultural considerations in research instrument development', in M. Frank- Stromborg and S. J. Olsen (eds.) *Instruments for clinical health care research*, Jones & Bartlett, Boston, pp.73-81.
- Kirwan, J 2006, 'The interpersonal world of direct marketing: Examining conventions of quality at UK farmers' markets', *Journal of Rural Studies*, vol. 22, pp. 301-312.
- Kitchenham, B & Pfleeger, SL 2002, 'Principles of survey research: part 5: populations and samples', *ACM SIGSOFT Software Engineering Notes*, vol. 27, no. 5, pp. 17-20.
- Kline, RB 1998, *Principles and Practice of Structural Equation Modeling*, Guildwood, New York.

- Kline, RB 2005, *Principles and Practice of Structural Equation Modeling*, Guilford Press, New York.
- Kline, RB 2010, *Principles and Practice of Structural Equation Modeling*, Guilford Press, New York.
- Kline, RB 2015, *Principles and practice of structural equation modeling*, Guilford publications, New York.
- Kline, RB 2011, 'Convergence of structural equation modeling and multilevel modeling', in M. Williams (ed.), *Handbook of methodological innovation*, Thousand Oaks, CA: Sage.
- Kordnaeij, A, Askaripoor, H & Bakhshizadeh, A 2013, 'Studying affecting factors on customers' attitude toward products with Halal brand (case study: Kuala Lumpur, Malaysia)', *International Research Journal of Applied and Basic Sciences*, vol. 4, no. 10, pp. 3138-45.
- Kosan, L 2014, 'Accounting for Marketing: Marketing Performance Through Financial Results', *International Review of Management and Marketing*, vol. 4, no. 4, p. 276.
- Koufteros, XA, Vonderembse, MA & Doll, WJ 1998, 'Developing measures of time-based manufacturing', *Journal of Operations Management*, vol. 16, no. 1, pp. 21-41.
- Koufteros, X, Babbar, S & Kaighobadi, M 2009, 'A paradigm for examining second-order factor models employing structural equation modeling', *International Journal of Production Economics*, vol. 120, no. 2, pp. 633-52.
- Kuhn, TS 1970, *The structure of scientific revolutions*, 2nd edn, University of Chicago Press Chicago.
- Kumar, R 2011, *Research Methodology: A Step-by-Step Guide for Beginners*, 3<sup>rd</sup> edn, SAGE, London.
- Kurokawa, K 2011, 'Challenge of the Halal Food Certificate for Food Marketing: Implications from the Local Branding Strategy of Thailand', *Studies in Regional Science*, vol. 41, no. 4, pp. 1045-54.
- Lada, S, Tanakinjal, GH & Amin, H 2009, 'Predicting intention to choose Halal products using theory of reasoned action', *International Journal of Islamic and Middle Eastern Finance and Management*, vol. 2, no. 1, pp. 66-76.
- Lai, K-h & Wong, CW 2012, 'Green logistics management and performance: Some empirical evidence from Chinese manufacturing exporters', *Omega*, vol. 40, no. 3, pp. 267-82.

- Lam, Y & Alhashmi, SM 2008, 'Simulation of halal food supply chain with certification system: a multi-agent system approach', in *Intelligent Agents and Multi-Agent Systems*, Springer, pp. 259-66
- Lever, J & Miele, M 2012, 'The growth of halal meat markets in Europe: An exploration of the supply side theory of religion', *Journal of Rural Studies*, vol. 28, no. 4, pp. 528-37.
- Li, S, Nathan, BR, Nathan, T.S.R & Rao, S.S 2006, 'The impact of supply chain management practices on competitive advantage and organizational performance', *The International Journal of Management Science*, vol.34, pp.107-124.
- Lindkvist, KB & Sánchez, JL 2008, 'Conventions and innovation: a comparison of two localized natural resource-based industries', *Regional Studies*, vol. 42, no. 3, pp. 343-54.
- Lodhi, A-u-H 2009, *Understanding Halal Food Supply Chain*, HFRC UK Ltd, London.
- Lodhi, A-u-H 2010, *Understanding Halal Food Supply Chain* (second), HFRC UK Ltd, London.
- Lohr, S 2009, *Sampling: design and analysis*, Cengage Learning.
- MacCallum, RC & Hong, S 1997, 'Power analysis in covariance structure modeling using GFI and AGFI', *Multivariate Behavioral Research*, vol. 32, no. 2, pp. 193-210.
- Machfud, AK, Dahlan, ARA, Khatib, J & Haji-Ahmed, AA 2011, 'Collaboration, Wealth And Value Creation, SMEs'halal Products Communities, And Information Systems', *International Journal of New Computer Architectures and their Applications (IJNCAA)*, vol. 1, no. 2, pp. 510-8.
- MacLennan, B, Langley, J & Kypri, K 2011, 'Distributing surveys: Postal versus drop-and-collect', *Epidemiology*, vol. 22, no. 3, pp. 443-4.
- Makadok, R 2001, 'Toward a synthesis of the resource-based and dynamic-capability views of rent creation', *Strategic management journal*, vol. 22, no. 5, pp. 387-401.
- Malboobi, MT & Malboobi, MA 2012, 'Halal concept and products derived from modern biotechnology', paper presented to International workshop for Islamic scholars on agribiotechnology: Shariah compliance, Penang, Malaysia.
- Malhotra, NK 2008, *Marketing research: An applied orientation*, 5/e, Pearson Education India.
- Malhotra, NK, Agarwal, J & Peterson, M 1996, 'Methodological issues in cross-cultural marketing research: A state-of-the-art review', *International Marketing Review*, vol. 13, no. 5, pp. 7-43.

- Maloni, MJ & Brown, ME 2006, 'Corporate social responsibility in the supply chain: an application in the food industry', *Journal of business ethics*, vol. 68, no. 1, pp. 35-52.
- Man, YC, Bojei, J, Sazili, AQ & Abdullah, AN 2007, 'Malaysia Halal Hub Opportunities', paper presented to 4<sup>th</sup> Asian Livestock & Feed Industry Conference.
- Manzini, R & Accorsi, R 2013, 'The new conceptual framework for food supply chain assessment', *Journal of food engineering*, vol. 115, no. 2, pp. 251-63.
- Manzouri, M & Rahman, MNA 2013, 'Adaptation of theories of supply chain management to the lean supply chain management', *International Journal of Logistics Systems and Management*, vol. 14, no. 1, pp. 38-54.
- Manzouri, M, Ab Rahman, MN, Saibani, N & Zain, CRCM 2013, 'Lean supply chain practices in the Halal food', *International Journal of Lean Six Sigma*, vol. 4, no. 4, pp. 389-408.
- Marranci, G 2012, 'Defensive or offensive dining? Halal dining practices among Malay Muslim Singaporeans and their effects on integration', *The Australian Journal of Anthropology*, vol. 23, no. 1, pp. 84-100.
- Marsh, HW & Hocevar, D 1985, 'Application of confirmatory factor analysis to the study of self-concept: First-and higher order factor models and their invariance across groups', *Psychological bulletin*, vol. 97, no. 3, p. 562.
- Martin, G & Ronan, G 2000, *Managing the cold chain for quality and safety*, Europe, viewed 15 May 2015, <[http://www.teagasc.ie/ashtown/research/preparedfoods/managing\\_the\\_cold\\_chain.pdf](http://www.teagasc.ie/ashtown/research/preparedfoods/managing_the_cold_chain.pdf)>
- Maruchek, A, Greis, N, Mena, C & Cai, L 2011, 'Product safety and security in the global supply chain: Issues, challenges and research opportunities', *Journal of Operations Management*, vol. 29, no. 7, pp. 707-20.
- Marzuki, SZS, Hall, CM & Ballantine, PW 2012, 'Restaurant managers' perspectives on< IT> halal</IT> certification', *Journal of Islamic Marketing*, vol. 3, no. 1, pp. 47-58.
- Maskell, BH 1991, '*Performance measurement for world class manufacturing: a model for American companies*', CRC press.
- Mathews, JA 2006, 'Resource and activities are two sides of the same coin: duality of the activities and resource-based views of strategic management', paper presented to Conference on Strategic Management, Copenhagen.
- McCelland, S 1994, 'Training needs assessment data-gathering methods: Part 4, survey questionnaire', *Journal of European Industrial Training*, vol.18, no.5, pp. 22-26.

- McColl, E, Jacoby, A, Thomas, L, Soutter, J, Bamford, C, Steen, N, Thomas, R, Harvey, E, Garratt, A & Bond, J 2001, *Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients*, Core Research.
- McDonald, RP & Ho, M-HR 2002, 'Principles and practice in reporting structural equation analyses', *Psychological methods*, vol. 7, no. 1, p. 64.
- McKeown, M 2008, *The truth about innovation*, Pearson Education, India.
- Md Nor, A-Z & Ooi, SK 2014, 'Tapping into the Lucrative Halal Market: Malaysian SMEs Perspective', *International Journal of Business and Innovation*, vol. 1, no. 6, pp. 12-22.
- Meadows, C 2003, 'Formal methods for cryptographic protocol analysis: Emerging issues and trends', *Selected Areas in Communications, IEEE Journal on*, vol. 21, no. 1, pp. 44-54.
- Medsker, GJ, Williams, LJ & Holahan, PJ 1994, 'A review of current practices for evaluating causal models in organizational behavior and human resources management research', *Journal of Management*, vol. 20, no. 2, pp. 439-64.
- Melatu Samsi, SZ, Tasnim, R & Ibrahim, O 2011, 'Stakeholders' role for an efficient traceability system in halal industry supply chain', paper presented to Annual International Conference on Enterprise Resource Planning + Supply Chain Management (ERP + SCM 2011) Penang, Malaysia, 14-15 March.
- MGCC 2011, *Market Watch 2012 The Malaysian Food Industry*, Malaysian-German Chamber of Commerce and Industry, viewed 20 May 2015, <[www.malaysia.ahk.de/fileadmin/ahk.../Market.../The Malaysian Food Industry.pdf](http://www.malaysia.ahk.de/fileadmin/ahk.../Market.../The_Malaysian_Food_Industry.pdf)>
- Miller, JG 1999, 'Cultural psychology: Implications for basic psychological theory', *Psychological Science*, vol.10, pp. 85-91.
- Mitra, S & Datta, PP 2014, 'Adoption of green supply chain management practices and their impact on performance: an exploratory study of Indian manufacturing firms', *International Journal of Production Research*, vol. 52, no. 7, pp. 2085-107.
- Mohamad, AB & Hassan, H 2011, 'The Influences of Halal Integrity on Product Adaptation Strategy for Global Trade', *International Business Management*, vol. 5, no. 6, pp. 421-426.
- Mohamed, M 2016, *Status of the halal industry 2016*, Malaysia Ministry of International Trade and Industry, viewed 2 February 2016 <<http://www.miti.gov.my/index.php/pages/view/3195>>.
- Mohamed, YH, Rahim, ARA, Ma'ram, AB & Ghazli, M 2016, 'Halal Traceability in Enhancing Halal Integrity for Food Industry in Malaysia—A Review',



*International Research Journal of Engineering and Technology*, vol. 03, no. 03, pp.68-74.

Mohammed, JA 2013, 'Business Precepts of Islam: The Lawful and Unlawful Business Transactions According to Shariah', in *Handbook of the Philosophical Foundations of Business Ethics*, Springer, pp. 883-97

Mohd Yusoff, H 2004, 'Halal certification scheme', *Standard & Quality News*, vol. 11, pp. 4-5.

Mondy, RW & Mondy, JB 2012, '*Human Resource Management*', Pearson Education, Edinburgh.

Moore, GC & Benbasat, I 1991, 'Development of an instrument to measure the perceptions of adopting an information technology innovation', *Information systems research*, vol. 2, no. 3, pp. 192-222.

Muhammad, NMN, Isa, FM & Kifli, BC 2009, 'Positioning Malaysia as halal-hub: integration role of supply chain strategy and halal assurance system', *Asian Social Science*, vol. 5, no. 7, p. 44.

Mukhtar, A & Butt, MM 2012, 'Intention to choose Halal products: the role of religiosity', *Journal of Islamic Marketing*, vol. 3, no. 2, pp. 108-20.

Mulaik, SA, James, LR, Van Alstine, J, Bennett, N, Lind, S & Stilwell, CD 1989, 'Evaluation of goodness-of-fit indices for structural equation models', *Psychological bulletin*, vol. 105, no. 3, p. 430.

Murdoch, J, Marsden, T & Banks, J 2000, 'Quality, nature, and embeddedness: Some theoretical considerations in the context of the food sector', *Economic geography*, vol. 76, no. 2, pp. 107-25.

Mursyidi, A 2013, 'The Role of Chemical Analysis in the Halal Authentication of Food and Pharmaceutical Products', *Journal of Food and Pharmaceutical Sciences*, vol. 1, no. 1.

Nakyinsige, K, Man, YC & Sazili, AQ 2012, 'Halal authenticity issues in meat and meat products', *Meat Sci*, vol. 91, no. 3, pp. 207-14.

Nakyinsige, K, Man, YC, Sazili, AQ, Zulkifli, I & Abu Bakar, F 2012, 'Halal meat: A niche product in the food market', paper presented to 2012 2<sup>nd</sup> International Conference on Economics, Trade and Development, Singapore.

Nasir, K & Pereira, A 2008, 'Defensive dining: notes on the public dining experiences in Singapore', *Contemporary Islam*, vol. 2, no. 1, pp. 61-73.

Neuman, WL 2011, *Social Research Methods: Qualitative and Quantitative Approaches*, 7 edn, Allyn & Bacon, Boston.

- Ngah, AH & Zainuddin, Y 2012, 'Barriers to supply chain adoption among Malaysian halal manufacturers with general barriers as a moderating factor', paper presented to International Halal Conference 2012, Kuala Lumpur, Malaysia, 4<sup>th</sup>-5<sup>th</sup> September 2012.
- Nooh, M, Nawai, N, Dali, N, Mohammad, H & Nilai, BB 2007, 'Halal branding: An exploratory research among consumers in Malaysia', paper presented to 3rd UNITEN International Business Management Conference Human Capital Optimization Strategies Challenges and Sustainability, Malaysia.
- Noordin, N, MD Noor, NL, Hashim, M & Samicho, Z 2009, 'Value Chain of Halal Certification System: A Case of the Malaysia Halal Industry', paper presented to European and Mediterranean Conference on Information Systems 2009, Izmir, 13<sup>th</sup>-14<sup>th</sup> July 2009.
- Nordin, N, Noor, NLM & Samicho, Z 2012, 'Applying the Work Systems Method to Investigate the Operational Efficiency of the Halal Certification System', paper presented to 19th IBIMA Conference on Innovation Vision 2020: Sustainable Growth, Entrepreneurship and Economic Development.
- Norman, AA, Md Nasir, MHN & Azmi, M 2008, 'The users perceptions and opportunities in Malaysia in introducing RFID system for Halal food tracking', *Wseas Transactions On Information Science & Applications*, vol. 5, no. 5.
- Nunnally, JC 1978, *Psychometric Theory*, 2nd edn, Mc Graw Hill: New York.
- Nunnally, JC & Bernstein, I 1994, 'The assessment of reliability', *Psychometric theory*, vol. 3, pp. 248-92.
- Nawai, N, Nooh, MN, Dali, NRS & Mohammad, H 2007, 'An Exploratory Study on Halal Branding Among Consumers in Malaysia: Factor Analysis Technique', *Journal of Muamalat and Islamic Finance Research*, vol. 4, no. 1, pp. 19-44.
- NZTE 2012, *Food and Beverage in Malaysia-Market Profile*, New Zealand Trade & Enterprise, viewed 20 May 2015, <<https://www.nzte.govt.nz/en/export/market-research/food-and-beverage/food-and-beverage-market-in-malaysia>>.
- O'Leary, Z 2004, *The essential guide to doing research*, Sage.
- Oliver, C 1997, 'Sustainable competitive advantage: Combining institutional and resource-based views', *Strategic management journal*, pp. 697-713.
- Omar, EN & Jaafar, HS 2011, 'Halal supply chain in the food industry-A conceptual model', paper presented to Business, Engineering and Industrial Applications (ISBEIA), 2011 IEEE Symposium on.
- Omar, EN, Jaafar, HS & Osman, MR 2013, 'Halalan Toyayiban Supply Chain of the Food Industry', *Journal of Emerging Economies and Islamic Research*, vol. 1, no. 3.

- Omar, EN, Jaafar, HS, Osman, MR & Faisol N 2013, 'Halalan toyyiban supply chain management the new insights in sustainable supply chain management', paper presented to *ICLT Kyoto*, Japan.
- Omar, KM, Mat, NKN, Imhemed, GA & Ali, FMA 2012, 'The direct effects of halal product actual purchase antecedents among the international Muslim consumers', *American Journal of Economics*, pp. 87-92.
- Oppenheim, AN 2000, *Questionnaire design, interviewing and attitude measurement*, Bloomsbury Publishing.
- Orlikowski, WJ & Baroudi, JJ 1991, 'Studying information technology in organizations: Research approaches and assumptions', *Information systems research*, vol. 2, no. 1, pp. 1-28.
- Osborne, JW, Costello, AB & Kellow, JT 2008, 'Exploratory factor analysis (EFA) is rightly described as both an art and a science, whereresearchers follow a series of ana-lytic steps involving judgments more reminis-cent of qualitative inquiry, an interesting irony given the mathematical sophistication underly-ing EFA models', *Best Practices in Quantitative Methods*, p. 86.
- Osborne, JW & Fitzpatrick, DC 2012, 'Replication analysis in exploratory factor analysis: what it is and why it makes your analysis better', *Practical Assessment, Research & Evaluation*, vol. 17, no. 15, p. 2.
- Othman, R, Ahmad, ZA & Zailani, S 2009, 'The Effect of Institutional Pressures in the Malaysian Halal Food industry', *International Business Management*, vol. 3, no. 4, pp. 80-4.
- Othman, P, Sungkar, I & Hussin, WSW 2009, 'Malaysia as an international Halal food hub: Competitiveness and potential of meat-based industries', *Asean Economic Bulletin*, vol. 26, no. 3, pp. 306-20.
- Ou, CS, Liu, FC, Hung, YC & Yen, DC 2010, 'A Structural Model of Supply Chain Management on Firm Performance', *International Journal of Operations & Production Management*, vol. 30, no. 5, pp. 526-45.
- Pahim, K, Jemali, S & Mohamad, S 2012, 'An empirical research on relationship between demand, people and awareness towards training needs: A case study in Malaysia Halal logistics industry', paper presented to Business Engineering and Industrial Applications Colloquium (BEIAC), 2012 IEEE.
- Pallant, J 2010, *SPSS survival manual: A step by step guide to data analysis using SPSS . Maidenhead*, Open University Press/McGraw-Hill.
- Pallant, J 2011, *SPSS survival manual: A step by step guide to data analysis using SPSS Australia*, Allen & Unwin.

- Park, CS & Srinivasan, V 1994, 'A survey-based method for measuring and understanding brand equity and its extendibility', *Journal of marketing research*, pp. 271-88.
- Patel, S, *Healthcare, Technology, Participation, Research and a PhD blog*, blog, viewed 1 December 2015, < <http://salmapatel.co.uk/academia/the-research-paradigm-methodology-epistemology-and-ontology-explained-in-simple-language>>.
- Pearson, ES & Hartley, HO 1972, *Biometrika Tables for Statisticians*, Vol. II, Cambridge University Press, Cambridge, England.
- Peter, R, Mateja, A & Mojca, J 2013, 'Food Chain Safety Management Systems: The Impact of Good Practices', in *Advances in Food Process Engineering Research and Applications*, Springer, pp. 607-25.
- Pett, MA, Lackey, NR & Sullivan, JJ 2003, *Making sense of factor analysis: The use of factor analysis for instrument development in health care research*, Sage.
- Pew Research Center 2011, *The Future of the Global Muslim Population*, viewed 12 April 2014, <<http://www.pewforum.org/2011/01/27/the-future-of-the-global-muslim-population>>.
- Pew Research Center 2015, *The Future of World Religions: Population Growth Projections 2010-2050*, viewed 15 August 2015, <<http://www.pewforum.org/2015/04/02/religious-projections-2010-2050/>>.
- Podsakoff, PM, MacKenzie, SB, Lee, J-Y & Podsakoff, NP 2003, 'Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies', *Journal of Applied Psychology*, vol. 88, no. 5, pp. 879-903.
- Podsakoff, PM & Organ, DW 1986, 'Self-Reports in Organizational Research: Problems and Prospects', *Journal of Management*, vol. 12, no. 4, pp. 531-44.
- Ponte, S 2009, 'Governing through quality: conventions and supply relations in the value chain for South African wine', *Sociologia ruralis*, vol. 49, no. 3, pp. 236-57.
- Ponte, S & Gibbon P 2005, 'Quality standards, conventions and the governance of global value chains', *Economy and Society*, vol.34, no.1, pp. 1-31.
- Prendergast, GP 1995, 'The EC directive on packaging and packaging waste: current status and logistical implications', *Logistics Information Management*, vol. 8, no. 3, pp. 10-7.
- Punch, K 2003, *Survey research: The basics*, Sage.

- Quintana-García, C & Benavides-Velasco, CA 2008, 'Innovative competence, exploration and exploitation: The influence of technological diversification', *Research Policy*, vol. 37, no. 3, pp. 492-507.
- Qureshi, S, Jamal, M, Qureshi, M, Rauf, M, Syed, B, Zulfiqar, M & Chand, N 2012, 'A Review Of Halal Food With Special Reference To Meat And Its Trade Potential', *The Journal and Plant Sciences*, vol. 2292, p. 79.
- Rahman, MA, Sadik, S, Ali, A, Ahmad, HF & Suguri, H 2008, 'Formal model of agent-based supply chain framework in a virtual enterprise for reliability', paper presented to Industrial Informatics, 2008. INDIN 2008. 6th IEEE International Conference on.
- Rahman, AAB, Ahmad, Ahmad, WIW, Mohamad, MY & Ismail, Z 2011, 'Knowledge on Halal food amongst food industry entrepreneurs in Malaysia', *Asian Social Science*, vol. 7, no. 12, pp. 216-221.
- Rarick, C, Falk, G, Barczyk, C & Feldman, L 2011, 'Is it kosher? No, it's halal: a new frontier in niche marketing', in *Allied Academies International Conference. International Academy for Case Studies Proceedings*, Jordan Whitney Enterprises, Inc. pp. 51.
- Rattray, J & Jones, MC 2007, 'Essential elements of questionnaire design and development', *Journal of clinical nursing*, vol. 16, no. 2, pp. 234-43.
- Razalli, MR, Abdullah, S & Yusoff, RZ 2012, 'Is Halal certification process “green”?', *The Asian Journal of Technology Management (AJTM)*, vol. 5, no. 1.
- Razalli, MR, Yusoff, RZ & Mohd Roslan, MW 2013, 'A framework of Halal certification practices for hotel industry', *Asian Social Science*, vol. 9, no. 11.
- Regenstein, J, Chaudry, M & Regenstein, C 2003, 'The kosher and halal food laws', *Comprehensive Reviews in Food Science and Food Safety*, vol. 2, no. 3, pp. 111-27.
- Rezai, G, Mohamed, Z & Shamsudin, MN, 2011, 'Assessment of consumers' confidence on Halal labelled manufactured food in Malaysia', *Pertanika Journal of Social Science and Humanities*, vol. 19, no. 2, pp. 33-42.
- Rezai, G, Mohamed, Z & Shamsudin, MN 2012, 'Non-Muslim consumers' understanding of Halal principles in Malaysia', *Journal of Islamic Marketing*, vol. 3, no. 1, pp. 35-46.
- Ruževičius, J 2012, 'Products quality religious-ethnic requirements and certification', *Economics and Management*, vol. 17, no. 2, pp. 761-7.
- Riaz, MN & Chaudry, MM 2004, *Halal Food Production*, CRC Press United States of America.

- Rogelberg, SG & Stanton, JM 2007, *Introduction: Understanding and dealing with organizational survey nonresponse*, Sage Publications Sage CA: Los Angeles, CA, 1094-4281.
- Roscoe, JT 1975, *Fundamental research statistics for the behavioral sciences [by] John T. Roscoe*, Holt, Rinehart and Winston, New York, NY.
- Roth, AV, Tsay, AA, Pullman, ME & Gray, JV 2008, 'Unraveling the food supply chain: strategic insights from China and the 2007 Recalls', *Journal of Supply Chain Management*, vol. 44, no. 1, pp. 22-39.
- Ruiz-Ortega, MJ & García-Villaverde, PM 2008, 'Capabilities and competitive tactics influences on performance: Implications of the moment of entry', *Journal of Business Research*, vol. 61, no. 4, pp. 332-45.
- Salman, F & Siddiqui, K 2011, 'An exploratory study for measuring consumers awareness and perceptions towards halal food in Pakistan', *Interdisciplinary Journal of Contemporary Research in Business*, vol. 3, no. 2.
- Samsi, SZM, Ibrahim, O & Tasnim, R 2012, 'Review on knowledge management as a tool for effective traceability system in Halal food industry supply chain', *Journal of Research And Innovation In Information Systems*, pp. 1.78-85.
- Sarkis, J, Zhu, Q & Lai, KH 2011, 'An organizational theoretic review of green supply chain management literature', *International Journal of Prodcustions Economics*, vol. 130, pp. 1-15.
- Saunders, M, Lewis, P & Thornhill, A 2009, '*Research Methods for Business Students*', 5<sup>th</sup> edn, Pearson Education, England.
- Satibi, Z 2012, 'Premis Campuran Makanan Halal, Tak Halal Diserbu', *Harian Metro*, 14 April, p. 17.
- Sax, LJ, Gilmartin, SK & Bryant, AN 2003, 'Assessing response rates and nonresponse bias in web and paper surveys', *Research in higher education*, vol. 44, no. 4, pp. 409-32.
- Schumacker, RE & Lomax, RG 2004, *A Beginner's Guide to Structural Equation Modeling*, Lawrence Erlbaum Associates, Mahwah, New Jersey.
- Schumacker, RE & Lomax, R 2010, *Structural equation modeling*, Routledge, Taylor & Francis Group, New York.
- Segars, AH 1997, 'Assessing the unidimensionality of measurement: A paradigm and illustration within the context of information systems research', *Omega*, vol. 25, no. 1, pp. 107-21.
- Sekaran, U 2003, *Research methods for business. Hoboken, NJ: John Wiley & Sons.*

- Sekaran, U & Bougie, R 2009, *Research Methods for business 5th ed*, John Wiley & Sons Ltd. United Kingdom.
- Sekaran, U & Bougie, R 2010, *Research Methods for Business: A Skill Building Approach*, Wiley, London.
- Shaari, JAN, Ottot, H & Kermin, MF 2013, 'Halal; Organic; and Preservative: Marketing Concept for Bread Industry', paper presented to Annual Paris Business and Social Science Research Conference, Paris, 3 – 4 July 2013.
- Shafie, S & Othman, MN 2006, 'Halal Certification: an international marketing issues and challenges', paper presented to the International IFSAM VIIIth World Congress, Berlin, Germany, 28 - 30 September 2006.
- Shafii, Z & Khadijah, WWS 2012, 'Halal Traceability Framework for Halal Food Production', *World Applied sciences Journal*, 01-05.
- Shah, R & Ward, PT 2007, 'Defining and developing measures of lean production', *Journal of Operations Management*, vol. 25, no. 4, pp. 785-805.
- Sharma, S, Mukherjee, S, Kumar, A & Dillon, WR 2005, 'A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models', *Journal of Business Research*, vol. 58, no. 7, pp. 935-43.
- Shears, P, Zollers, F, & Hurd, S 2001, 'Food for thought: What mad cows have wrought with respect to food safety regulations in the EU and UK', *British Food Journal*, vol.103, no.1, pp. 63-87.
- Shevlin, M & Miles, JN 1998, 'Effects of sample size, model specification and factor loadings on the GFI in confirmatory factor analysis', *Personality and Individual differences*, vol. 25, no. 1, pp. 85-90.
- Shi, M & Yu, W 2013, 'Supply chain management and financial performance: literature review and future directions', *International Journal of Operations & Production Management*, vol. 33, no. 10, pp. 1283-1317.
- Siaw, C-L & Rani, NSA 2012, 'A Critical Review on the Regulatory and Legislation Challenges Faced by Halal Start-up SMEs Food Manufacturers in Malaysia', *Procedia-Social and Behavioral Sciences*, vol. 57, pp. 541-8.
- Slack, N, Chambers, S & Johnston, R 2010, *Operations management*, Pearson education.
- Sobh, R & Perry, C 2006, 'Research Design and Data Analysis in Realism Research', *European Journal of Marketing*, vol. 40, no. 11/12, pp. 1194-209.
- Soesilowati, ES 2010, 'Business opportunities for halal products in the global market: Muslim consumer behaviour and halal food consumption', *Journal of Indonesian Social Science and Humanities*, vol. 3, no. 1, pp. 151-60.

- Song, M, Di Benedetto, CA & Nason, RW 2007, 'Capabilities and financial performance: The moderating effect of strategic type', *Journal of the Academy of Marketing Science*, vol. 35, no. 1, pp. 18-34.
- Soong, S. F. (2007), "Managing Halal Quality in Food Service Industry", Master Dissertation, University of Nevada, Las Vegas, USA.
- Standards Malaysia 2009, *Halal food- production, preparation, handling and storage – general guidelines (second revision)*, MS 1500:2009, Department of Standards Malaysia, Malaysia.
- Standards Malaysia 2013, *Islamic and halal principles – Definitions and interpretations on terminology*, MS 2393:2013, Department of Standards Malaysia, Malaysia.
- Standards Malaysia 2014, *Shariah-based quality management systems –Requirements with guidance (first revision)*, MS 1900:2014, Department of Standards Malaysia, Malaysia.
- Statista 2015, *Food and Beverages Malaysia*, The Statistics Portal, viewed 2 January 2016, < <https://www.statista.com/outlook/253/122/food-beverages/malaysia>>.
- Stock, JR & Boyer SL 2009, 'Developing a consensus definition of supply chain management: a qualitative study' *International Journal of Physical Distribution & Logistics Management*, vol.39, no.8, pp.690-711.
- Straete, EP 2004, 'Innovation and changing worlds of production: Case studies of Norwegian dairies', *European Urban and Regional Studies*, vol.11, no.3, pp. 227-241.
- Straub, D, Boudreau, MC, & Gefen, D 2004, 'Validation guidelines for IS positivist research', *Communications of AIS*, vol.13, pp: 380-427.
- Suhr, DD 2006, 'Exploratory or Confirmatory Factor Analysis', paper presented to SUGI 31 Conference Leaders, San Francisco, California, 26 -29 March.
- Sungkar, I 2009, 'The global halal food industry: revisited', *The Halal Journal*, May - June 2009, pp. 36-8.
- Sungkar, I 2010, 'Consumer awareness: thoughts and trends across the globe', *The Halal Journal*, vol. 2, no. 1, pp. 22-8.
- Swafford, PM, Ghosh, S & Murthy, N 2008, 'Achieving supply chain agility through IT integration and flexibility', *International Journal of Production Economics*, vol. 116, no. 2, pp. 288-97.
- Tabachnick, B & Fidell, L 2007, 'Using Multivariate Statistics. Pearson Education', Boston, MA.
- Talib, A, Ali, KAM & Jamaludin, KR 2008, 'Quality assurance in halal food manufacturing in Malaysia: A preliminary study', paper presented to



International Conference on Mechanical & Manufacturing Engineering (ICME2008), Johor Bahru, Malaysia.

- Talib, Z, Zailani, S & Zanuddin, Y 2010, 'Conceptualizations on the dimensions for halal orientation for food manufacturers: a study in the context of Malaysia', *Pakistan Journal of Social Sciences*, vol. 7, no. 2, pp. 56-61.
- Tan, K-C, Kannan, VR, Handfield, RB & Ghosh, S 1999, 'Supply chain management: an empirical study of its impact on performance', *International Journal of Operations & Production Management*, vol. 19, no. 10, pp. 1034-52.
- Tan, KC 2001, 'A framework of supply chain management literature', *European Journal of Purchasing & Supply Management*, vol. 7, no. 1, pp. 39-48.
- Tan, KC 2002, 'Supply chain management: practices, concerns, and performance issues', *Journal of Supply Chain Management*, vol. 38, no. 4, pp. 42-53.
- Tan, MII, Razali, RN & Desa, MI 2012, 'Factors influencing ICT adoption in halal transportations: A case study of Malaysian halal logistics service providers', *International Journal of Computer Science Issues*, vol. 9, no. 1, pp. 62-71.
- Tan, MII, Razali, RN & Husny, ZJ 2012, 'The Adoption of Halal Transportations Technologies for Halal Logistics Service Providers in Malaysia', paper presented to Proceedings of World Academy of Science, Engineering and Technology.
- Tanaka, JS 1987, "'How big is big enough?": Sample size and goodness of fit in structural equation models with latent variables', *Child development*, pp. 134-46.
- Thomson Reuters 2015, *State of the Global Islamic Economy Report 2015/16*, Thomson Reuters, New York.
- Thompson, JA 2005, 'Proactive personality and job performance: a social capital perspective', *Journal of Applied Psychology*, vol. 90, no. 5, p. 1011.
- Tieman, M 2008, 'Halal Storage: A Critical Success Factor of Your Halal Supply Chain', *The Halal Journal*, November-December 2008.
- Tieman, M 2009a, 'Halal Compliant Terminal: Facilitating Imports and Exports', *The Halal Journal*, March-April 2009.
- Tieman, M 2009b, 'Halal Transportation: The Building Blocks of a Halal Transportation System', *The Halal Journal*, January-February 2009.
- Tieman, M 2011, 'The Application of Halal in Supply Chain Management : in-depth interviews', *Journal of Islamic Marketing*, vol. 2, no.2, pp. 186-195.
- Tieman, M 2013, 'The Application of Halal in Supply Chain Management : Principles in the Design and Management of Halal Food Supply Chain', PhD thesis, MARA University of Technology.

- Tieman, M 2015, 'Halal clusters', *Journal of Islamic Marketing*, vol. 6, no.1, pp. 2-21.
- Tieman, M, van der Vorst, JG & Che Ghazali, M 2012, 'Principles in halal supply chain management', *Journal of Islamic Marketing*, vol. 3, no. 3, pp. 217-43.
- Tieman, M & Che Ghazali, M 2012, 'Halal control activities and assurance activities in halal food logistics', paper presented to *International Halal Conference 2012*, Putra World Trade Centre Kuala Lumpur, Malaysia, 4-5 September.
- Tieman, M & van Nistelrooy, M 2014, 'Perception of Malaysian food manufacturers toward halal logistics', *Journal of International Food & Agribusiness Marketing*, vol. 26, no. 3, pp. 218-33.
- Tomlinson, I 2013, 'Doubling food production to feed the 9 billion: a critical perspective on a key discourse of food security in the UK', *Journal of Rural Studies*, vol. 29, pp. 81-90.
- Trienekens, JH, Wognum, P, Beulens, AJ & van der Vorst, JG 2012, 'Transparency in complex dynamic food supply chains', *Advanced Engineering Informatics*, vol. 26, no. 1, pp. 55-65.
- Tsalikis, J & Lassar, W 2009, 'Measuring consumer perceptions of business ethical behavior in two Muslim countries', *Journal of business ethics*, vol. 89, no. 1, pp. 91-8.
- Tse, YK & Tan, KH 2011, 'Managing product quality risk in a multi-tier global supply chain', *International Journal of Production Research*, vol. 49, no. 1, pp. 139-58.
- van der Spiegel, M, van der Fels-Klerx, HJ, Sterrenburg, P, van Ruth, SM, Scholtens-Toma, IMJ & Kok, EJ 2012, 'Halal assurance in food supply chains: Verification of halal certificates using audits and laboratory analysis', *Trends in Food Science & Technology*, vol. 27, no. 2, pp. 109-19.
- van der Vorst, JG.A.J 2000, 'Effective Food Supply Chains Generating, Modelling and Evaluating Supply Chain Scenarios', PhD thesis, Wageningen University.
- Vannoppen, J, Van Huylenbroeck, G & Verbeke, W 2004, *Economic conventions and consumer valuation in specific food supply networks*, Shaker Verlag, Aachen, Germany.
- Vázquez-Carrasco, R & Foxall, GR 2006, 'Positive vs. negative switching barriers: The influence of service consumers' need for variety', *Journal of Consumer Behaviour*, vol. 5, no. 4, pp. 367-79.
- Veal, AJ 2005, *Business Research Methods: A Managerial Approach*, Pearson, Australia.
- Verbeke, W, Rutsaert, P, Bonne, K & Vermeir, I 2013, 'Credence quality coordination and consumers' willingness-to-pay for certified halal labelled meat', *Meat Sci*, vol. 95, no. 4, pp. 790-7.

- Vinzi, VE, Chin, WW, Henseler, J & Wang, H 2010, *Handbook of partial least squares: Concepts, methods and applications*, Springer Science & Business Media.
- Vlajic, JV, van der Vorst, JGAJ & Haijema, R 2012, 'A framework for designing robust food supply chains', *International Journal of Production Economics*, vol. 137, no. 1, pp. 176-89.
- Wan Hassan, WM & Awang, KW 2009, 'Halal food in New Zealand restaurants: an exploratory study', *International Journal of Economics and Management*, vol. 3, no. 2, pp. 385-402.
- Wan Omar, WM, Muhammad, MZ & Omar, CA 2008, 'An analysis of the Muslim consumers' attitudes towards halal food products in Kelantan', paper presented to ECER Regional Conference, UiTM Kelantan, Malaysia, 15 - 17 December 2008.
- Wan Omar, WM, Rahman, S & Jie, F 2015, 'Halal food chain management: a systematic review of literature and future research directions', paper presented to 13th ANZAM Operations, Supply Chain and Services Management Symposium, RMIT University, Melbourne, 31 May - 2 June 2015.
- Wang, CL & Ahmed, PK 2007, 'Dynamic capabilities: A review and research agenda', *International Journal of Management Reviews*, vol. 9, no. 1, pp. 31-51.
- Wheaton, B 1987, 'Assessment of fit in overidentified models with latent variables', *Sociological Methods & Research*, vol. 16, no. 1, pp. 118-54.
- Wicks, AC & Freeman, RE 1998, 'Organization studies and the new pragmatism: Positivism, anti-positivism, and the search for ethics', *Organization science*, vol. 9, no. 2, pp. 123-40.
- Wilcock, A, Pun, M, Khanona, J & Aung, M 2004, 'Consumer attitudes, knowledge and behaviour: a review of food safety issues', *Trends in Food Science & Technology*, vol. 15, no. 2, pp. 56-66.
- Wilkinson, J 1997a, 'A new paradigm for economic analysis?', *Economy and Society*, vol.26, no.6, pp. 305-339.
- Wilson, JAJ & Liu, J 2010, 'Shaping the halal into a brand?', *Journal of Islamic Marketing*, vol. 1, no. 2, pp. 107-23.
- Wold, S, Sjöström, M & Eriksson, L 2001, 'PLS-regression: a basic tool of chemometrics', *Chemometrics and intelligent laboratory systems*, vol. 58, no. 2, pp. 109-30.
- Wong, KK-K 2013, 'Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS', *Marketing Bulletin*, vol. 24, no. 1, pp. 1-32.

- Wu, F, Yenyurt, S, Kim, D & Cavusgil, ST 2006, 'The impact of information technology on supply chain capabilities and firm performance: A resource-based view', *Industrial Marketing Management*, vol. 35, no. 4, pp. 493-504.
- Yamin, S, Gunasekaran, A & Mavondo, FT 1999, 'Relationship between generic strategies, competitive advantage and organizational performance: an empirical analysis', *Technovation*, vol.19, pp.507-518.
- Yang, Y & Bao, W 2010, 'The design and implementation of halal beef wholly quality traceability system computer and computing technologies in agriculture IV', in D Li, Y Liu & Y Chen (eds), *International Conference on Computer and Computing Technologies in Agriculture*, Springer Berlin Heidelberg, pp. 464-472.
- Yang, Y & Bao, W 2011, 'The Design and Implementation of Halal Beef Wholly Quality Traceability System', in *Computer and Computing Technologies in Agriculture IV*, Springer, pp. 464-72.
- Yin, RK 2013, *Case study research: Design and methods*, Sage publications, Thousand Oaks, CA.
- Yusuf, YY, Gunasekaran, A, Adeleye, E & Sivayoganathan, K 2004, 'Agile supply chain capabilities: Determinants of competitive objectives', *European Journal of Operational Research*, vol. 159, no. 2, pp. 379-92.
- Zailani, S, Arrifin, Z, Abd Wahid, N, Othman, R & Fernando, Y 2010, 'Halal traceability and halal tracking systems in strengthening halal food supply chain for food industry in Malaysia (A Review)', *Journal of Food Technology*, vol. 8, no. 3.
- Zailani, S, Kanapathy, K, Iranmanesh, M & Tieman, M 2015, 'Drivers of halal orientation strategy among halal food firms', *British Food Journal*, vol.117, no. 8, pp. 2143-2160.
- Zainalabidin, M, Golnaz, R & Mad, N 2011, 'The Complementary Effect of Halal Principles and Sustainable Concept', *Journal of Environmental Science and Engineering*, vol. 5, no. 5, pp. 652-9.
- Zakaria, Z 2008, 'Tapping into the world Halal market: Some discussions on Malaysia laws and standards', *Shariah Journal*, vol. 16, no. Special edition, pp. 603-16.
- Zhang, C & Dhaliwal, J 2009, 'An investigation of resource-based and institutional theoretic factors in technology adoption for operations and supply chain management', *International Journal of Production Economics*, vol. 120, no. 1, pp. 252-69.
- Zhou, Y & Wang, E 2011, 'Urban consumers' attitudes towards the safety of milk powder after the melamine scandal in 2008 and the factors influencing the attitudes', *China Agricultural Economic Review*, vol. 3, no. 1, pp. 101-11.

- Zikmund, WG 2003, *Business Research Methods*, 7th edn, Thomson/South-Western, Cincinnati, OH.
- Zikmund, WG 2003, *Essentials of Marketing Research*, 2nd edn, Thomson, London.
- Zulfakar, MH, M Anuar, M & Ab Talib, MS 2012, 'Conceptual Framework on Halal Food Supply Chain Integrity Enhancement', paper presented to International Halal Conference 2012, Putra World Trade Centre Kuala Lumpur, Malaysia, 4<sup>th</sup>-5<sup>th</sup> September 2012.
- Zulfakar, MH, Anuar, MM & Ab Talib, MS 2014, 'Conceptual framework on halal food supply chain integrity enhancement', *Procedia-Social and Behavioral Sciences*, vol. 121, pp. 58-67.
- Zulfakar, MH, Jie, F & Chan, C 2012, 'Halal food supply chain integrity: from a literature review to a conceptual framework', paper presented to 10th ANZAM Operations, Supply Chain and Services Management Symposium, Melbourne, Australia, 14-15 June 2012.
- Zulfakar, M, Chan, C & Jie, F 2014, 'Factors influencing the operations of Halal meat supply chain in Australia', paper presented to ISL2014: Designing Responsible and Innovative Global Supply Chains, Ho Chi Minh City, Vietnam.
- Zulfakar, MH 2015, 'Australia's Halal Meat Supply Chain (Ahmsc) Operations: Supply Chain Structure, Influencing Factors and Issues', PhD thesis, RMIT University.

# APPENDICES

## APPENDIX 1 – Notice of Ethics Approval



Business College Human  
Ethics Advisory Network  
(BCHEAN)

Building 108, Level 11  
239 Bourke Street  
Melbourne VIC 3000

GPO Box 2476V  
Melbourne VIC 3001  
Australia

Tel. +61 3 9925 5555  
Fax +61 3 9925 5624

### Notice of Approval

Date: 21 November 2014

Project number: 18992

Project title: *Developing a model for halal food supply chain.*

Risk classification: Negligible Risk

Principal Investigator: Professor Shams Rahman  
Student Investigator: Mrs Wan Marhaini Wan Omar  
Other Investigator: Dr Ferry Jie

Project Approved: From: 21 November 2014 To: 1 September 2017

#### Terms of approval:

- 1. Responsibilities of the principal investigator**  
It is the responsibility of the principal investigator to ensure that all other investigators and staff on a project are aware of the terms of approval and to ensure that the project is conducted as approved by BCHEAN. Approval is only valid while the investigator holds a position at RMIT University.
- 2. Amendments**  
Approval must be sought from BCHEAN to amend any aspect of a project including approved documents. To apply for an amendment submit a request for amendment form to the BCHEAN secretary. This form is available on the Human Research Ethics Committee (HREC) website. Amendments must not be implemented without first gaining approval from BCHEAN.
- 3. Adverse events**  
You should notify BCHEAN immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
- 4. Participant Information and Consent Form (PICF)**  
The PICF must be distributed to all research participants, where relevant, and the consent form is to be retained and stored by the investigator. The PICF must contain the RMIT University logo and a complaints clause including the above project number.
- 5. Annual reports**  
Continued approval of this project is dependent on the submission of an annual report.
- 6. Final report**  
A final report must be provided at the conclusion of the project. BCHEAN must be notified if the project is discontinued before the expected date of completion.
- 7. Monitoring**  
Projects may be subject to an audit or any other form of monitoring by BCHEAN at any time.
- 8. Retention and storage of data**  
The investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

Regards,



Professor Roslyn Russell  
Chairperson  
RMIT BCHEAN

## APPENDIX 2 – Participation Information



### INVITATION TO PARTICIPATE IN A RESEARCH PROJECT

#### PARTICIPANT INFORMATION

**Project Title:**

**Developing a Model for Halal Food Supply Chain Implementation**

**Investigators:**

PhD Candidate

Wan Marhaini Wan Omar, RMIT University, [wanmarhaini.wanomar@rmit.edu.au](mailto:wanmarhaini.wanomar@rmit.edu.au), [marhainiomar@yahoo.com](mailto:marhainiomar@yahoo.com), (+613) 9925 5452

Senior Supervisor

Prof Shams Rahman, RMIT University, [shams.rahman@rmit.edu.au](mailto:shams.rahman@rmit.edu.au), (+613) 9925 5530

Associate Supervisor

Dr Ferry Jie, RMIT University, [ferry.jie@rmit.edu.au](mailto:ferry.jie@rmit.edu.au), (+613) 9925 5812

*Dear Potential Participant,*

*You are invited to participate in a research project conducted by RMIT University (Australia). This information sheet describes the project. Please read this sheet carefully and be confident that you understand its contents before deciding whether to participate. If you have any questions about the project, please contact one of the investigators identified above.*

**Who is involved in this research project? Why is it being conducted?**

The researcher of this project, Wan Marhaini Wan Omar, is a student from RMIT University in Australia, supervised by Professor Shams Rahman and Dr. Ferry Jie from the School of Business IT and Logistics at RMIT University. This research is being conducted as part of a doctoral degree and has been approved by the RMIT Human Research Ethics Committee.

**Why have you been approached?**

Your company has been invited to participate in the survey because your company is one of the Halal certified food companies in Malaysian Halal food industry. Your company has been randomly chosen from one of the following Halal company directories: Malaysia External Trade Development Corporation (MATRADE) Halal Products & Services Directory, Halal Pages, Department of Islamic Development Malaysia (JAKIM) and The International Halal Showcase (MIHAS) 2014 Directory. For that reason, you have been approached to give information in the survey based on your expertise and role as senior executives or managers in the company. Participation in this research is voluntary and therefore you may withdraw any unprocessed information at any time.

### **What is the project about? What are the questions being addressed?**

The purpose of this study is to develop a comprehensive model for Halal food supply chain (HFSC) and investigate the relationship between HFSC determinants and firm performance. In order to address the main objective above, the following specific research questions are formulated:

- i. What are the determinants of the Halal food supply chain (HFSC)?
- ii. What are the critical dimensions of HFSC model?
- iii. Does HFSC have impact on market share, product sales volume and market development of firms?
- iv. Does HFSC impact profitability and return-on-investment (ROI) of firms?
- v. Does the institutional pressure such as the competition moderate the relationships between HFSC and firm performances?

The researcher expects that 600 participants will participate in the study.

### **If I agree to participate, what will I be required to do?**

If you agree to take part in this research, which is entirely your personal choice, a survey question will be physically delivered to you and the questionnaire will take approximately 50 minutes to complete. One week will be given to complete the questionnaire. Once you have completed the questionnaire, the researcher will come and collect the completed questionnaire. As you are not being identified in any way, your views will remain anonymous. Information generated in the survey will be kept securely and analysed by the researcher.

### **What are the possible risks or disadvantages?**

The topic will focus on the concept of the Halal food supply chain. No sensitive questions (e.g. company identity, revenue, profit) will be asked in the survey and you will have the right to not answer any question you deem inappropriate. Your name and your company will not be mentioned within the research. The obtained information will be handled discreetly. If you are unduly concerned about your answer to any questions or if you find participation in the project distressing, please inform researcher of this project, Wan Marhaini Wan Omar at (+613) 9925 5452, [wanmarhaini.wanomar@rmit.edu.au](mailto:wanmarhaini.wanomar@rmit.edu.au), or her supervisor Professor Shams Rahman (+613) 9925 5530, [shams.rahman@rmit.edu.au](mailto:shams.rahman@rmit.edu.au), Dr. Ferry Jie (+61 3) 9925 5812, [ferry.jie@rmit.edu.au](mailto:ferry.jie@rmit.edu.au) as soon as convenient. We will discuss your concerns with you confidentially and suggest appropriate follow up, if necessary.

### **What will happen to the information I provide?**

The result of the study will be disseminated in the PhD thesis. The research paper will be subjected for publication or presentation at conferences. The research data will be securely kept at RMIT University for a period of five (5) years after publication before being destroyed. The thesis will be kept in RMIT research repository. Research data are required to be retained for longer or indefinite periods. All hard data will be kept in a locked filing cabinet and soft data in a password protected computer in the office of the investigator in the School of Business IT and Logistics RMIT University. Data will be saved on the University Network System where practicable (as the system provides a high level of manageable security and data integrity, can provide secure remote access, and is backed up on a regular basis). Only the researcher/s will have access to the data. To ensure the security of the collected data, the data will be destroyed (physically and electronically) after the five years. Upon request, summary of the research can be made and send to you after the completion of the research.

### **What are my rights as a participant?**

If you choose to participate in this research you have the right to:

- Withdraw your participation at any time.
- Have any unprocessed data withdrawn and destroyed, provided it can be reliably identified and doing so induce any risks for the participant.
- Have any question answered at any time.



**Whom should I contact if I have any questions?**

If you have any questions, please contact the researcher of this project, Wan Marhaini Wan Omar at (+613) 9925 5452, [wanmarhaini.wanomar@rmit.edu.au](mailto:wanmarhaini.wanomar@rmit.edu.au), or her supervisor Professor Shams Rahman (+613) 9925 5530, [shams.rahman@rmit.edu.au](mailto:shams.rahman@rmit.edu.au), Dr. Ferry Jie (+61 3) 9925 5812, [ferry.jie@rmit.edu.au](mailto:ferry.jie@rmit.edu.au).

**What other issues should I be aware of before deciding whether to participate?**

There are no other issues you need to be aware of.

Thank you very much for your contribution to this research.

Yours sincerely

---

**Wan Marhaini Wan Omar,**

PhD Candidate,  
School of Business IT and Logistics, College of Business,  
Royal Melbourne Institute of Technology University, Australia,  
Building 80 Level 8, 445 Swanston Street, Melbourne 3000,  
Victoria, Australia.

---

**Professor Shams Rahman**

Senior Supervisor,  
MSc (MEngg), ME (IndEngg), PhD(OR)  
School of Business IT and Logistics, College of Business,  
Royal Melbourne Institute of Technology University, Australia,  
Building 80 Level 8, 445 Swanston Street, Melbourne 3000,  
Victoria, Australia.

---

**Dr Ferry Jie**

Associate Supervisor,  
BSIE, MSIE, PhD (Supply Chain Management)  
School of Business IT and Logistics, College of Business,  
Royal Melbourne Institute of Technology University, Australia,  
Building 80 Level 9, 445 Swanston Street, Melbourne 3000,  
Victoria, Australia.

*If you have any concerns about your participation in this project, which you do not wish to discuss with the researchers, then you can contact the Ethics Officer, Research Integrity, Governance and Systems, RMIT University, GPO Box 2476V VIC 3001. Tel: (03) 9925 2251 or email [human.ethics@rmit.edu.au](mailto:human.ethics@rmit.edu.au)*

## APPENDIX 3 – Consent Form

### CONSENT FORM

1. I have had the project explained to me, and I have read the information sheet
2. I agree to participate in the research project as described
3. I agree:
  - to complete a questionnaire
4. I acknowledge that:
  - (a) I understand that my participation is voluntary and that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied (unless follow-up is needed for safety).
  - (b) The project is for the purpose of research. It may not be of direct benefit to me.
  - (c) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.
  - (d) The security of the research data will be protected during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided to me if requested (if so please provide details). Any information which will identify me will not be used.

Participant: \_\_\_\_\_ Date: \_\_\_\_\_  
(Signature)

**\*Participants should be given a photocopy of this PICF after it has been signed.**

## APPENDIX 4 – Questionnaire for Main Survey (English Version)



### DEVELOPING A MODEL FOR HALAL FOOD SUPPLY CHAIN IMPLEMENTATION

The objective of a study is to develop a model on Halal processed food and beverage industry in Malaysia. The global demand for Halal food product is growing with the increase and spread of Muslim population globally. To fulfill the global demand with efficient distribution system, the focus of Halal food management has shifted from the organization-centered perspective to supply chain perspective. Therefore, the model building will help the Halal food manufacturer to implement Halal food supply chain in a right and efficient manner. Furthermore, the model also can be applied by other manufacturers in other countries with minor modification.

#### ALL INFORMATION WILL REMAIN STRICTLY CONFIDENTIAL

The instructions below will assist you in completing the questionnaire:

- Below is the example how to complete the questionnaire

		Strongly Disagree				Strongly Agree		
C1	Our organization believes that cleanliness is prerequisite in Halal food manufacturing.	1	2	3	4	5	6	7

By circling 6, your response is more towards strongly agree

- It is important that you **PLEASE ANSWER ALL QUESTIONS** to the best of your knowledge, even if some may appear to be similar. Your answers to all sections of this questionnaire are vital to the success of this study. Unfortunately partly answered surveys are not useable. Therefore, please do not leave questions unanswered.
- There is no right or wrong answers.
- If you wish to comment on any of the questions, please use the space provided at the end of the questionnaire.
- The findings of this study will be reported in aggregated form, so no organization, department or individual respondent can be identified.
- If you have any questions, please contact the researcher of this project, Wan Marhaini Wan Omar at (+613) 9925 5452, [wanmarhaini.wanomar@rmit.edu.au](mailto:wanmarhaini.wanomar@rmit.edu.au), or his supervisor Professor Shams Rahman (+613) 9925 5530, [shams.rahman@rmit.edu.au](mailto:shams.rahman@rmit.edu.au).

*We appreciate highly your time and effort to participate in this research project. If you would like a copy of the findings sent to you, please phone or send your business card separately to the questionnaire. The answers to the survey will be kept in strict confidence. The names of participating ministries, departments and statutory bodies, government-owned companies and individuals will not be released.*

Regards,  
 Wan Marhaini Wan Omar  
 PhD Student  
 School of Business IT and Logistics  
 College of Business, Building 80 Level 8,  
 RMIT University, 445 Swanston Street, Melbourne 3000, Australia

## SECTION A: HALAL FOOD SUPPLY CHAIN IMPLEMENTATION

The following questions refer to the dimensions of halal food supply chain (HFSC) implementation model. Please indicate your response by circling on the following statements.

### C – Cleanliness

		Strongly Disagree					Strongly Agree	
		1	2	3	4	5	6	7
C1	Our organisation believes that cleanliness is a prerequisite in the halal food manufacturing	1	2	3	4	5	6	7
C2	Our food products are manufactured in a clean working premise	1	2	3	4	5	6	7
C3	Our food products are manufactured using clean devices, utensils, machine and processing aids	1	2	3	4	5	6	7
C4	Our suppliers able to supply materials which are clean from any non-halal elements	1	2	3	4	5	6	7
C5	Our organisation produced purely clean food to our consumers	1	2	3	4	5	6	7

### S – Safety

		Strongly Disagree					Strongly Agree	
		1	2	3	4	5	6	7
S1	Our food products are not hazardous to people's health	1	2	3	4	5	6	7
S2	Our organisation obtains materials from suppliers that are of higher quality	1	2	3	4	5	6	7
S3	Our organisation will ensure the food products conform to food safety standard before selling them to consumers.	1	2	3	4	5	6	7

### ID – Islamic Dietary Law

		Strongly Disagree					Strongly Agree	
		1	2	3	4	5	6	7
ID1	Our organisation uses Islamic dietary law as a source for how to produce halal food	1	2	3	4	5	6	7
ID2	Our organisation follows the halal guideline of food processing in a way to increase the consumers' confidence in our products.	1	2	3	4	5	6	7
ID3	Our organisation ensures that our suppliers comply with Islamic dietary law.	1	2	3	4	5	6	7
ID4	Our organisation will conduct ritual cleansing (samak) on the processing line if it is contaminated by najis al-mughallazah (prohibited najis).	1	2	3	4	5	6	7

### PS – Physical Segregation

		Strongly Disagree					Strongly Agree	
		1	2	3	4	5	6	7
PS1	Our organisation has separate processing lines for halal food production.	1	2	3	4	5	6	7
PS2	Our organisation store materials and ingredients for halal food production using separate warehouse.	1	2	3	4	5	6	7
PS3	Our organisation uses separate bonded trucks to transfer halal food products.	1	2	3	4	5	6	7
PS4	Our organisation uses separate areas for packaging activities of halal food products.	1	2	3	4	5	6	7
PS5	Our suppliers segregate the materials based on halal and non-halal before sending them to us.	1	2	3	4	5	6	7
PS6	Our organisation uses dedicated machinery and equipment for halal food production	1	2	3	4	5	6	7
PS7	Our organisation uses detection and screening devices during processing of halal food product.	1	2	3	4	5	6	7

**ST – Storage and Transport**

		Strongly Disagree					Strongly Agree	
ST1	Our organisation provides dedicated warehouse for storage of our halal food products	1	2	3	4	5	6	7
ST2	Our organisation always makes sure that the transports are appropriate to the type of the halal food.	1	2	3	4	5	6	7
ST3	Our suppliers transfer materials to us using dedicated transport.	1	2	3	4	5	6	7
ST4	Our organisation uses dedicated transport to transfer halal food products from our place to wholesaler, retailer or customer	1	2	3	4	5	6	7

**PL – Packaging and Labelling**

		Strongly Disagree					Strongly Agree	
PL1	Our organisation only uses packaging materials which do not have any toxic effect on the product.	1	2	3	4	5	6	7
PL2	Our food product packaging is providing to consumers with information in ingredients.	1	2	3	4	5	6	7
PL3	Our label does not display anything that is contrary to Shariah law.	1	2	3	4	5	6	7

**EP – Ethical Practices**

		Strongly Disagree					Strongly Agree	
EP1	Our organisation recycles or reduces food waste when possible.	1	2	3	4	5	6	7
EP2	Our organisation participates in the design of products for recycling or reuse.	1	2	3	4	5	6	7
EP3	Our organization uses halal-certified and safe chemicals.	1	2	3	4	5	6	7
EP4	Our organisation store harmful chemical substances away from food products.	1	2	3	4	5	6	7
EP5	Our organisation practices negotiation with suppliers.	1	2	3	4	5	6	7

**TP – Training and Personnel**

		Strongly Disagree					Strongly Agree	
TP1	Our organisation has a group of halal trained workers to handle the halal food production.	1	2	3	4	5	6	7
TP2	Our employees are trained to understand the importance and correct way of producing halal food products.	1	2	3	4	5	6	7
TP3	Our organisation gives extensive halal training to distributors and retailers if and when needed	1	2	3	4	5	6	7
TP4	Our organisation invites halal local authority (e.g: HDC and JAKIM) to give training to our workers.	1	2	3	4	5	6	7
TP5	Our organisation guides suppliers to establish their own halal programs.	1	2	3	4	5	6	7

**RA – Resource Availability**

		Strongly Disagree					Strongly Agree	
RA1	We believe that organisation needs to be financially stable in order to involve in halal food supply chain.	1	2	3	4	5	6	7
RA2	We believe that organisation should have an effective transportation system in order to involve in halal food supply chain.	1	2	3	4	5	6	7
RA3	We believe that organisation should be able to provide a dedicated warehouse for storage in order to involve in halal food supply chain.	1	2	3	4	5	6	7

RA4	We believe that organisation should employ people who handle the halal food production.	1	2	3	4	5	6	7
-----	---	---	---	---	---	---	---	---

### IC – Innovative Capability

		Strongly Disagree				Strongly Agree		
IC1	Our management team is actively exploring innovative ideas on halal matters.	1	2	3	4	5	6	7
IC2	Our organisation has the capacity to develop new product design to satisfy customers' needs.	1	2	3	4	5	6	7
IC3	Our organisation has the capacity to develop halal traceability and tracking systems as in order to protect the authenticity of halal food products.	1	2	3	4	5	6	7
IC4	Our organisation encourages our suppliers to become more innovative on halal matters.	1	2	3	4	5	6	7

## SECTION B: ORGANISATIONAL PERFORMANCE

The following questions refer to organisational performance. Please indicate your response by circling on the following statements.

### MP – Marketing Performance

		Strongly Disagree				Strongly Agree		
MP1	Implementation of halal food supply chain will increase the market share even faster.	1	2	3	4	5	6	7
MP2	Implementation of halal food supply chain will expand the market coverage of the product.	1	2	3	4	5	6	7
MP3	Implementation of halal food supply chain will improve the brand's image for the consumers.	1	2	3	4	5	6	7
MP4	Implementation of halal food supply chain will improve quality of our products.	1	2	3	4	5	6	7

### FP – Financial Performance

		Strongly Disagree				Strongly Agree		
FP1	Implementation of halal food supply chain will increase in terms of profitability.	1	2	3	4	5	6	7
FP2	Implementation of halal food supply chain will increase in terms of sales growth.	1	2	3	4	5	6	7
FP3	There is an increase of budget allocation for halal-related activities	1	2	3	4	5	6	7
FP4	There is an increase in operational cost in our firm because of monitoring and enforcement of halal activities on suppliers.	1	2	3	4	5	6	7

## SECTION C: RESPONDENT PROFILE

The following information requires details of the respondents. Please indicate your answer by crossing **X** in the box provided.

**1. Position in the organization:**

- Owner
- Director
- Deputy Director
- Senior Executive Officer / Executive Officer
- Manager
- Assistant Manager

**2. Education level:**

- Post-graduate       Graduate       Diploma       Post-secondary       Secondary

**3. How many years of managerial experience you have in the organization?**

- |  |   |
|--|---|
| <input type="checkbox"/> 5 years or less | <input type="checkbox"/> 16 – 20 years      |
| <input type="checkbox"/> 6 – 10 years    | <input type="checkbox"/> 21 years and above |
| <input type="checkbox"/> 11 – 15 years   |   |

**4. How many years of managerial experience you have in Halal food industry?**

- |  |   |
|--|---|
| <input type="checkbox"/> 5 years or less | <input type="checkbox"/> 16 – 20 years      |
| <input type="checkbox"/> 6 – 10 years    | <input type="checkbox"/> 21 years and above |
| <input type="checkbox"/> 11 – 15 years   |   |

**5. Type of organization (based on sales turnover and number of full-time employees):**

- Foreign-based Multinational Company (please specify country of origin: \_\_\_\_\_)
- Malaysian owned Multinational Company
- Malaysian Large Enterprise
- Malaysian Medium Enterprise
- Malaysian Small Enterprise
- Malaysian Micro Enterprise

**6. Level of Involvement in the market:**

- Domestic market
- Multinational market
- Regional market
- All markets

**7. Number of employees (approximately) in your organization:**

- Less than 5
- 5 - 74
- 75 – 200
- 201 – 500
- 501 - 1000
- More than 1000

**8. Number of years that your organization has been operating?**

- Less than 3 years
- 3 – 5 years
- 6 – 15 years
- 16 – 25 years
- More than 25 years

**9. Location of business operation:**

- Selangor
- Johor
- Penang
- Kuala Lumpur (Federal Territory)
- Other states (please specify : \_\_\_\_\_)

**10. Company Belongs to:**

- Muslim Manufacturer
- Non-Muslim Manufacturer

**11. Is your company and your product is Halal certified?**

- Yes
- No

**12. Types of certification your organization registered to:** (You may cross **X** more than one)

- |   |  |
|---|--|
| <input type="checkbox"/> Halal Certificate (JAKIM)            | <input type="checkbox"/> Sanitation Standard Operating Procedures (SSOP)     |
| <input type="checkbox"/> Health Certificate (MeSTI)           | <input type="checkbox"/> Quality Management System (ISO 9001)                |
| <input type="checkbox"/> Good Manufacturing Practice (GMP)    | <input type="checkbox"/> Food Safety Management System (ISO 22000)           |
| <input type="checkbox"/> Good Hygiene Practice (GHP)          | <input type="checkbox"/> Supply Chain Security Management System (ISO 28000) |
| <input type="checkbox"/> Islamic Manufacturing Practice (IMP) | <input type="checkbox"/> Other (please specify: _____)                       |

**13. Type of product category produced:**

- Food
- Beverage
- Both

**14. Type of food and beverage produced:** (You may cross **X** more than one)

- Processing and preserving of meat (e.g: chicken, beef, turkey, lamb, goat)
- Processing and preserving of fish, crustaceans and molluscs (e.g: fish, shrimps, crabs, oysters, mussels)
- Processing and preserving of fruit and vegetables (e.g: fruits based - cocktails, pineapples, corn, mushrooms)
- Manufacture of vegetable and animal oils and fats (e.g: spinach, carrots, pepper, cooking oil, margarine, shortenings)
- Manufacture of dairy products (e.g: milk, yogurt, cheese, chocolates, ice-cream)
- Manufacture of grain mill products, starches and starch products (e.g: cake, candy, flour)
- Manufacture of cereals (e.g: rice, wheat, pastas, barley)
- Manufacture of spices (e.g: curry powder, chilli powder, herbs, soup)
- Manufacture of prepared animal feeds (e.g: pallet)
- Manufacture of beverages (e.g: tea, coffee, juices, soft drinks, cordial)
- Manufacture of other food products (Please specify: \_\_\_\_\_)

**15. Halal course or training attended:**

- 1 to 3 times
- 4 to 6 times
- 7 to 9 times
- More than 10 times
- Never attended

**16. Do you think that a standard model of Halal food supply chain is needed in Malaysia Halal food industry?**

- Yes
- No

**\*\*\*Thank you very much for your assistance and co-operation to participate in this research\*\*\***