

QUALITY MANAGEMENT PRACTICES OF FOOD MANUFACTURERS: A
COMPARATIVE STUDY BETWEEN SMALL, MEDIUM AND LARGE
COMPANIES IN MALAYSIA

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For my beloved father and mother

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ABSTRACT

The objective of this study is to identify the extent of quality management (QM) practices implemented by the food manufacturing companies in Malaysia. Second, is to identify the level of QM practices implemented by the small, medium, and large food manufacturing companies in Malaysia. In addition, this study aimed to investigate the relationship between quality management practices with the operational performance and market performance of the food manufacturing companies in Malaysia. This study utilized quantitative approach by constructing a survey questionnaire. Data collected were analyzed statistically using SPSS version 22.0. Food manufacturing companies were discovered implementing all the quality management practices components measured. In terms of the types of QM practices, GMP, HACCP, ISO 9001 and TQM were implemented. The implementation level in terms of the components and types of QM practices was found highest in large companies, followed by medium companies and small companies. Statistical different was observed in the implementation level between small companies with medium and large companies. However, no significant difference discovered between medium companies and large companies. It was found that quality management practices were significantly related with the operational performance and market performance of the food manufacturing companies in Malaysia. This study carries an important message in terms of the managerial economics in which a specific company performance can be improved individually by implementing the identified QM practices. This is particularly important to the small sized and medium sized enterprises for effective resources control. This study served as the framework for food manufacturing industries to understand their current position in implementing the QM practices. At the same time, promote continuous improvement in the current practices via benchmarking process.

ABSTRAK

Objektif kajian ini bertujuan untuk mengenalpasti tahap amalan pengurusan kualiti (QM) yang dilaksanakan oleh industri pembuatan makanan di Malaysia. Kedua, adalah untuk mengenalpasti sejauh mana amalan ini dilaksanakan dalam kalangan industri pembuatan makanan bersaiz kecil, sederhana, dan besar. Sementara itu, kajian ini bertujuan untuk mengkaji hubungan antara amalan pengurusan kualiti dengan prestasi operasi dan prestasi pasaran industri pembuatan makanan di Malaysia. Kajian ini menggunakan kaedah kuantitatif dengan cara soal selidik. Data yang diperolehi dianalisis secara statistik dengan menggunakan perisian SPSS versi 22.0. Industri pembuatan makanan didapati melaksanakan semua komponen amalan pengurusan kualiti tercatat. Dari segi jenis amalan, GMP, HACCP, ISO 9001 dan TQM telah dilaksanakan. Tahap pelaksanaan dari segi komponen dan jenis amalan QM adalah tertinggi di industri bersaiz besar, diikuti oleh industri bersaiz sederhana dan industri bersaiz kecil. Perbezaan statistik dalam tahap pelaksanaan diperhatikan antara industri bersaiz kecil dengan industri bersaiz sederhana dan industri bersaiz besar. Walau bagaimanapun, tiada perbezaan signifikan didapati antara industri bersaiz sederhana dan industri bersaiz besar. Kajian ini mendapati bahawa amalan QM mempunyai hubungan signifikan dengan prestasi operasi dan prestasi pasaran industri pembuatan makanan di Malaysia. Kajian ini membawa mesej penting di mana prestasi tertentu dapat dipertingkatkan secara individu dengan melaksanakan amalan QM tertentu yang dikenalpasti dalam kajian ini. Ini adalah penting terhadap industri bersaiz kecil dan sederhana untuk kawalan sumber yang berkesan. Kajian ini boleh dijadikan sebagai rangka kerja bagi industri pembuatan makanan untuk memahami kedudukan semasa dalam melaksanakan amalan QM. Pada masa yang sama, untuk meningkatkan lagi amalan ini dengan cara merujuk.

CONTENTS

TITLE	i
DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
ABSTRAK	vi
CONTENTS	vii
LIST OF TABLES	xi
LIST OF FIGURES	xiii
LIST OF ABBREVIATIONS	xiv
LIST OF APPENDICES	xv
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Background of research	1
1.3 Problem statement	4
1.4 Research questions	8
1.5 Research objectives	8
1.6 Research scope	9
1.7 Significance of study	10
1.8 Thesis organization	11
1.9 Definition of key terms	12
1.10 Summary	13
CHAPTER 2 LITERATURE REVIEW	14
2.1 Introduction	14
2.2 Introduction to food quality	14
2.3 Introduction to quality management (QM)	17
2.4 Scope of quality management	18
2.5 Quality management in food manufacturing industry	19
2.5.1 Quality control program	21
2.5.2 Quality assurance program	21

2.6	Quality management system in food manufacturing industry	22
2.6.1	Good Manufacturing Practices (GMP) for Food	23
2.6.2	Hazard Analysis Critical Control Point (HACCP) system	26
2.6.3	Quality Management System - ISO 9001	30
2.6.4	Total Quality Management (TQM) program	35
2.7	Current quality management practices in the food manufacturing Industry	38
2.8	Performance measure of the company	39
2.9	Relationship between QM practices with company performance	41
2.10	Previous study on food quality management practices	43
2.11	Research framework	48
2.12	Research hypothesis	49
2.13	Summary	49
CHAPTER 3 METHODOLOGY		50
3.1	Introduction	50
3.2	Applied theory	50
3.3	Research design	51
3.4	Sample design	52
3.4.1	Population and sample	52
3.4.2	Sampling method	53
3.5	Variables and measures	54
3.5.1	Variables	54
3.5.2	Measures	54
3.6	Research instrument	55
3.6.1	Questionnaire design	55
3.6.2	Survey questionnaire	58
3.7	Pilot test	59
3.8	Data collection	59
3.8.1	Phase 1: base data collection	59
3.8.2	Phase 2: main data collection	60
3.9	Statistical Techniques	60
3.9.1	Factor analysis	60
3.9.2	Reliability analysis	61
3.9.3	Descriptive analysis	61

3.9.4	T-test	61
3.9.5	Pearson correlation analysis	62
3.9.6	Regression analysis	62
3.10	Summary	63
CHAPTER 4 DATA ANALYSIS AND RESULTS		64
4.1	Introduction	64
4.2	Response rate	64
4.3	Scale validity and reliability	65
4.3.1	Validity analysis	65
4.3.2	Reliability analysis	68
4.4	Demographic characteristics	68
4.4.1	Background of the company	68
4.4.2	Background of the respondents	71
4.5	Descriptive analysis	72
4.5.1	The extent of QM practices implementation	72
4.5.2	The level of QM practices implementation	76
4.5.2.1	Level of implementation based on components of QM practices	76
4.5.2.2	Level of implementation based on types of QM practices	80
4.6	Central limit theorem	81
4.7	T-Test	81
4.7.1	T-Test based on components of QM practices	82
4.7.1.1	T-test between small and medium companies	82
4.7.1.2	T-test between small and large companies	83
4.7.1.3	T-test between medium and large companies	84
4.7.2	T-test based on types of QM practices	85
4.7.2.1	T-test between small and medium companies	85
4.7.2.2	T-test between small and large companies	86
4.7.2.3	T-test between medium and large companies	87
4.8	Pearson correlation analysis	88
4.8.1	Assumption for Pearson correlation analysis	88
4.8.2	Correlation based on components of QM practices with company performance	89
4.8.3	Correlation based on types of QM practices with company performance	91

4.9	Linear regression	93
4.9.1	Assumption for linear regression	93
4.9.2	Overall regression model between components of quality management practices with company performance	95
4.10	Summary	97
CHAPTER 5 DISCUSSION, CONCLUSION AND RECOMMENDATIONS		98
5.1	Introduction	98
5.2	Discussion on findings	98
5.2.1	First objective	99
5.2.2	Second objective	101
5.2.3	Third objective	103
5.3	Hypothesis formulated	105
5.4	Limitation of the study	105
5.5	Recommendations	106
5.5.1	Recommendation for future research	106
5.5.2	Recommendation for food manufacturing industry	107
5.6	Summary	108
REFERENCES		109
APPENDICES		123
Vita		129

LIST OF TABLES

1.1	Main processed food exported from Malaysia in year 2015	2
1.2	ISO 9001 and ISO 22000 certified companies in Malaysia	3
1.3	Food product exporting value to world and to top five countries exported	4
1.4	Summarization of different types of food manufacturing companies	12
1.5	Company categorization	13
2.1	Definition of quality according to quality gurus	14
2.2	Comparison between quality assurance and quality control	21
2.3	Summary on Malaysia standard Good Manufacturing Practices of Food	25
2.4	Seven principles of the HACCP system	27
2.5	Quality management principles	30
2.6	Summary of previous study on quality management practices	44
3.1	Examples of quality management practices used by previous studies	51
3.2	Determination of sample size from a given population	53
3.3	Summarization of literature for the identification of quality management practices components and items	56
3.4	Summarization of literature for the identification of components and items of operational performance and market performance	57
3.5	Guidelines for alpha coefficient	61
4.1	Response rate analysis	65
4.2	Factor analysis	66
4.3	Reliability analysis	68
4.4	Company profile	69
4.5	Quality management practices implementation and certification	

status	70
4.6 Profile of respondents	71
4.7 Mean value of seven components of quality management practices and their respective items	73
4.8 Mean value of seven components of QM practices and their respective items categorized based on company sizes	77
4.9 Mean value based on types of quality management practices	80
4.10 Independent T-test for components of quality management practices between small companies and medium companies	82
4.11 Independent T-test for components of quality management practices between small companies and large companies	83
4.12 Independent T-test for components of quality management practices between medium companies and large companies	84
4.13 Independent T-test for types of quality management practices between small companies and medium companies	85
4.14 Independent T-test for types of quality management practices between small companies and large companies	86
4.15 Independent T-test for types of quality management practices between medium companies and large companies	87
4.16 Skewness value	89
4.17 Overall correlation matrix between components of quality management practices and company performance	90
4.18 Overall correlation matrix between types of quality management practices and company performance	92
4.19 Skewness value	93
4.20 One-sample Kolmogorov-Smirnov Test	94
4.21 Regression model between quality management practices with operational performance and market performance	96
5.1 Summary of hypothesis results	105

LIST OF FIGURES

2.1	The intrinsic and extrinsic quality attributes	16
2.2	Relationship between food safety and quality management system	17
2.3	The scope of food quality management	18
2.4	Different entities of quality system in food manufacturing industry	19
2.5	Relationship between different quality management systems in food manufacturing industry	20
2.6	CCP decision tree for critical control points identification	28
2.7	Process based quality management system	31
2.8	Research framework	48
3.1	Equation to determine the frequency interval	53
4.1	Scatter plot of QM practices and operational performance	88
4.2	Scatter plot of standardized predicted value and standardized residual	94
5.1	The implementation level for different types of quality management practices in different size of company	102

LIST OF SYMBOLS AND ABBREVIATIONS

DOSM	Department Of Statistics Malaysia
EU	European Union
FQMS	Food Quality Management System
FSMS	Food Safety Management System
GMP	Good Manufacturing Practices for Food
HACCP	Hazard Analysis Critical Control Points
HAS	Halal Assurance System
ISO	International Standard of Organization
MIDA	Malaysian Investment Development Authority
SME	Small and Medium Enterprise
TQM	Total Quality Management
WTO	World Trade Organization

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Survey questionnaire	123

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter describes about the research background by introducing the food manufacturing industry in Malaysia. Problem statement was identified based on extensive review of previous literature. In addition, research questions and objectives were developed to fill up the research gap identified. In this chapter, research scope was presented and the significance of the study was described in details. Key terms used in this study were defined and the structure of the thesis was summarized.

1.2 Background of research

Food manufacturing industry experiences substantial growth, globally for the past few decades. In the United States of America, the shipment value of the manufacturing sector accounted for USD 538 billion in year 2006 and with more than 10% of the total shipment value recorded by the food manufacturing industry (International Trade Administration, 2008). It was identified that this industry dominated the whole manufacturing sector in the United States with 28,000 companies involved in the manufacturing of food in year 2006 (International Trade Administration, 2008). In the case of Canada, food manufacturing industry catch the limelight, positioned as the second largest of the Canadian manufacturing sector and accounting more than \$ 88 billion revenue in year 2011 (Canadian Agri-Food Policy Institute, 2014). The same phenomenon was observed in Malaysia where positive growth was discovered in the Malaysia processed food market.

Malaysia is a member of World Trade Organization (WTO) who strategically ranked as the second trading partner within the Asean and the 23rd largest trading partner with the European Union (EU) (EC, 2014). As the third largest poultry meat producer in Asia Pacific region, the largest cocoa processor in Asia and the sixth largest exporter in the world for pepper and its related products, the food manufacturing industry strategically showing significant contribution to Malaysia economic (MIDA, 2016; DE, 2015; USDA FAS, 2014). The five main processed foods exported from Malaysia were summarized in Table 1.1. The Malaysian Investment Development Authority (MIDA) reported that around RM 18 billion was contributed by total processed food in year 2015 with the food products distributed to over 200 countries, including North America (MIDA, 2016). Major countries cover Singapore, Indonesia, United State of America, Thailand and Republic of China (MIDA, 2016; Food Export - Midwest, 2011).

Table 1.1: Main processed food exported from Malaysia in year 2015

Processed Food Exported	Exporting Value (RM)
Edible products and preparation	5.6 billion
Cocoa and cocoa preparations	4.1 billion
Cereal and cereal preparation	2.8 billion
Dairy products	1.4 billion
Margarine and shortening	1.1 billion

(Source: MIDA, 2016)

The food manufacturing industry in Malaysia comprises of about 6,000 companies, accounted nearly 10% of the total manufacturing output (Food Export – Midwest, 2011). Industrial players consist of both the domestic and multinational companies such as Nestle, Unilever and Campbell Soup (Food Export – Midwest, 2011). However, this industry is still predominated by the small and medium size companies, accounting for 14.4% of the total SME manufacturing establishments (MIDA, 2015; DOSM, 2011). Major subsectors of the food manufacturing companies include (i) fish and fish products, (ii) livestock and livestock products, (iii) confectionary, (iv) canned fruits and vegetables, (v) dairy products, (vi) noodles, bread and other bakery products (MIDA, 2016; DE, 2015).

The global market of food manufacturing industry is rather competitive and challenging. Considering the current situation, food manufacturing industry in Malaysia shall remain strong enough to stay competitively in this market. One of the

alternatives is by implementing the quality management practices. These practices provide confidence to the consumer with high quality, safety and reliable product (ISO, 2012b). At the same time, improve customer satisfaction and company competitiveness in the market (ISO, 2012b).

Quality management practices can be extracted from the quality systems such as the Good Manufacturing Practices (GMP) for food, the Good Hygiene Practices (GHP), Hazard Analysis Critical Control Points (HACCP) system, ISO 9001 and the Total Quality Management (TQM) program (Psomas & Fotopoulos, 2010; Milios et al., 2013; Manning, 2013; Kafetzopoulos et al., 2013). For example, the ISO 9001 system emphasized on customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making, and mutually beneficial of supplier relationship (ISO, 2012a). All these systems had been practiced and implemented worldwide (Psomas & Fotopoulos, 2010; Milios et al., 2013; Manning, 2013; Kafetzopoulos et al., 2013).

In Malaysia, quality systems were first launched in year 1987 with ISO standard as the earliest introduced system (Idris et al., 2011). Up until year 2014, there were total 11487 companies in Malaysia with ISO 9001 standard certification and 311 companies certified with ISO 22000 system (ISO, 2014). Table 1.2 summarized the number of ISO 9001 and ISO 22000 certified companies in Malaysia. Instead of the ISO system alone, other quality systems, such as, the HACCP, GMP, and Halal Assurance System (HAS) are widely implemented by the food manufacturing companies in Malaysia (Idris et al., 2011).

Table 1.2: ISO 9001 and ISO 22000 certified companies in Malaysia

Year	ISO 9001	ISO 22000
2006	6786	-
2007	7838	45
2008	6267	85
2009	6463	102
2010	8614	239
2011	10757	183
2012	11746	206
2013	12002	389
2014	11487	311

(Source: ISO, 2014)

Different size of company is believed to implement the quality management practices in a distinctive manner. Small companies and medium companies had limitation compared to the large companies in terms of capital and resources in implementing the quality management practices effectively and efficiently. Consequently, the small, medium, and large companies are expected to implement the quality management practices in a different manner. In addition, quality management practices not only important to assure for the product quality; instead enhance the performance of an organization.

1.3 Problem statement

Food which served as a basic needs had been given strong emphasis by the Malaysian government as one of the main industries who contributed for the economic advancement. This industry had been targeted among one of the 12 industries under the Third Industrial Master Plan (IMP 3) 2006 – 2020 for further advancement and development (IMP, 2006). Table 1.3 shows the value of food product exported to the world and to the top five exported countries. The food product exporting value indicated USD 5.4 million in year 2011, increased in a stable manner and achieved highest exporting value of USD 6.6 million in year 2014. However, the exporting value dropped to USD 6.0 million in year 2015. This industry seems facing some obstacles for further advancement and had achieved the threshold of development.

Table1.3: Food product exporting value to world and to top five countries exported

	Food Product Exporting Value in USD				
	2011	2012	2013	2014	2015
World	5,420,946.44	5,780,697.08	6,075,463.30	6,649,913.41	6,035,864.75
Singapore	863,787.30	974,711.43	1,028,806.54	1,242,348.37	1,127,805.30
Indonesia	597,037.58	652,421.06	611,136.12	610,609.11	455,337.54
Thailand	373,180.18	458,347.81	455,237.84	413,777.73	372,994.41
United states	356,695.88	269,043.45	234,306.94	267,670.84	247,173.51
China	261,193.27	322,647.43	413,820.17	410,421.11	459,240.33

One of the possible reason for this issue is the frequent changes in the localized food law and regulation within the exported countries. In general, these countries setting a much stringent control over the food product imported as an alternative in controlling the outbreak of foodborne disease. This disease is a challenging issue

experienced not only by the developing countries (Sharifa Ezat et al., 2013), as well as the developed countries (CDC, 2013, Kirk et al., 2008, Lee et al., 2001). The Centres for Disease Control and Prevention (CDC, 2013) estimated that there were 48 million Americans suffered from foodborne disease in the United States. In Malaysia, the high incident rate of 56.25 reported in the Malaysia Health Facts (2012) indicated that the issue of foodborne disease is a rather serious issue. As such, to ensure that the Malaysian food products are always accepted by these countries, food manufacturers shall come out a solution to rest assure that the localized food law and regulation are always met regardless how frequent is the changes. One of the ways is by implementing the quality management (QM) practices.

These practices were adapted from the international recognized standard such as the Total Quality Management Program, ISO 9001:2008, HACCP system, the GMP system and etc. These systems were periodically updated to keep the food manufacturers always meeting up the requirements. The quality management practices is useful in managing the product quality. It assures that the food products manufactured are of standard and fulfill the pre-set specification. A good quality product met the customers' requirement, received minimal complaint issue, subsequently achieve higher customer satisfaction, generate sales and improve the company revenue. Therefore, it is a needs to identify whether or not the above performance mentioned can be achieved, so that to attract more food manufacturers in implementing the quality management practices.

Over the years, extensive studies had been conducted to correlate the relationship between quality management practices with the company performance. However, the results were very inconsistent as some researchers reported for a positive effect (Singh et al., 2006), some with no effect (Singels et al., 2001), while other researchers reported for a negative effect (Sroufe & Curkovic, 2008). Talib and co-workers (2014) studied about the model for quality management practices in the food manufacturing companies in Malaysia. Their study focused on the small and medium size company with practices extracted from TQM program only. There were 8 dimensions identified for assessing the quality management practices. These include: (i) quality assurance; (ii) leadership; (iii) information management; (iv) customer focus; (v) human resource management; (vi) process management; (vii) supplier focus; and (viii) corporate planning. However, Talib and co-workers (2014) suggested that

further research is required to identify the quality management practices with the organization performance.

Sohail and Teo (2003) studied about the effect of TQM practices with the organizational performances of the Malaysian SMEs. They compared between the ISO 9000 certified companies with the non-certified companies based on the six criteria identified: (i) employee training and development; (ii) process management; (iii) quality measurement and benchmarking; (iv) top management commitment; (v) customer involvement and satisfaction; and (vi) strategy and planning. This study discovered that there is significant relationship between TQM practices with the organizational performance of company. However, this study was not specifically designed for the food manufacturing industries, instead diverted into various industries. This is because the respondents were randomly drawn from the SMEs membership list, without considering the types of industries. Another limitation is that Sohail and Teo (2003) focused on the small medium companies in Malaysia only, whereby the large companies were not included.

Anuar and Yusuff (2011) demonstrated the best manufacturing practices among the small medium enterprises (SMEs) in Malaysia. The eight areas of manufacturing best practices consist of (i) customer focus, (ii) supply chain management, (iii) production process, (iv) quality, (v) marketing strategy, (vi) technology and product innovation, (vii) human resource development, and (viii) management. Their study was limited to the ISO 9000 certified company with focus attended to the manufacturing practices. The relationship with the company performance was not included.

Abusa and Gibson (2013a) studied about the implementation extent of Total Quality Management (TQM) program, at the same time, evaluating the effect of ISO 9001 over the implementation status of the Libyan manufacturing companies. The population size focused on small medium and large companies from various industries. This included food, minerals, electronics and engineering, chemical, textiles and furniture, and cement and building materials. Libyan companies were found struggling for effective TQM implementation. No statistical difference found in the extent of TQM implementation between the small medium and large companies. This study, however, covered various industry types and the findings were limited to the Libyan companies and thus, does not reveal the actual situation in the Malaysia context.

Study was conducted among the manufacturing companies in Libyan (Abusa & Gibson, 2013b) to identify the TQM implementation level and its effect on the organizational performance of the companies. The TQM elements were found to be significantly correlated with the organizational performance; with the exception observed in the supplier quality management. No significant difference discovered between the ISO certified and non-certified companies. This study experiences the same limitation as found in previous study in which the industrial type was large and findings were limited to the Libyan situation.

Over the years, extensive studies had been conducted on the quality assurance and quality management models of the SMEs and large companies. However, there are very limited studies reported in the food related field, particularly in the Malaysia context. The quality management practices studied usually adapted from only one of the quality management systems. Limited study was identified for the QM practices adapted from HACCP and GMP. Previous literature did not emphasized specifically to the food manufacturing industry; instead focused mainly on a general and large population, such as the manufacturing industry (Abusa & Gibson, 2013a; Vladimirov, 2011). Therefore, there is a need to study the current implementation extent of the quality management practices in Malaysia. Also, to compare the implementation level between different company scales as the large companies are of systematic with automation technology; whereas, the small and medium enterprises are rely strongly to labour owing to the low technology. By investigating the implementation between different sizes of company, the food manufacturers are able to realize their current position of QM implementation among the same company size; and subsequently to further improve the implementation by benchmarking the QM implementation of the medium or large company size. Study was also needed for the relationship between quality management practices with company performance which still remained at the grey area.

1.4 Research questions

This research attempts to answer the following questions:

- i. What are the extent of quality management practices implemented by food manufacturing companies in Malaysia?
- ii. To what level have the small, medium, and large food manufacturing companies in Malaysia implemented the quality management practices?
- iii. Are there any relationship between quality management practices with the operational performance and market performance of food manufacturing companies in Malaysia?

1.5 Research objectives

The objectives of this study are formulated as below:

- i. To determine the extent of quality management practices implemented by the food manufacturing companies in Malaysia.
- ii. To identify the level of quality management practices implemented by the small, medium, and large food manufacturing companies in Malaysia.
- iii. To investigate the relationship between quality management practices with the operational performance and market performance of the food manufacturing companies in Malaysia.

1.6 Research scope

This research covered Malaysian food manufacturing companies regardless of their certification status of the quality management system in which companies with or without certified with the quality management system were included in this study. This concept shall not interfere with the end result of this study. The reason is that companies with no quality management system certified do not imply that the quality management practices are not being implemented. This is supported by Abusa and Gibson (2013b) who conducted the study over the company with formalized and non-formalized TQM program. Same theory was postulated by Prajogo and Brown (2004) who identified that companies who certified with the quality management system or by simply adopting the quality management practices serve no significant differences between them (Prajogo and Brown, 2004). At the same time, population of this study is not limited by the company's sizes. Different sizes of companies, including small, medium and large companies are covered.

In terms of the quality management practices, this study consists of the practices extracted from Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Point (HACCP) system, ISO 9001, and Total Quality Management (TQM) program only. However, the quality management practices components shall involve components that are commonly used in previous literature. The same principle applied to the operational performance and market performance of the company. Performance indicators covered both financial and non-financial indicator, but were limited to certain performance measured as adapted via extensive reviewing process of previous literature.

1.7 Significant of study

This study highlights the current quality management practices implemented by the food manufacturing companies in Malaysia. It fills the gap by establishing a comprehensive study in revealing the implementation level among the small, medium and large companies. It served as a framework for the food manufacturers to understand their current position in implementing the quality management practices and subsequently facilitates the food manufacturers to benchmark themselves with other food manufacturers of the same company size or with the larger company size which promote continuous improvement. In addition, this relationship identified between the quality management practices with the operational performance and market performance facilitated the food manufacturers for resources management in which the food manufacturers can focus more specifically in a particular performance that they wish to improve of via the implementation of that particular quality management practices. This would be extremely useful particularly to the small companies who had very limited resources.

This study is believed as the first to describe in a reliable manner a framework consisting of the major dimension measured of the internationally recognized quality management systems covered GMP, HACCP, ISO 9001 and TQM. It also further enhance the literature of the relationship between quality management practices with the operational performance and market performance of the food manufacturing companies.

1.8 Thesis organization

This thesis consists of five chapters. In Chapter 1, an introduction over the research study was discussed. It describes the study background, problem statement and characterized with the research questions and objectives. In this chapter, the research scope and significance of study were identified. Key terms used in this study were defined at the end of this chapter.

Chapter 2 discussed about the literature review in which comprehensive review was conducted on previous literature to generate the precursor information which is important to this study. It discussed about food quality, quality management and the scope of quality management. Different types of quality management systems were presented and the relationship between QM practices with company performance was reviewed. A research framework was structured and the research hypothesis were postulated.

Chapter 3 describes about the methodology applied in this research. The theory was highlighted. Research design and sample design were discussed; variables and measures were identified. Research instrument used were described and pilot test was conducted. Data collection and analyzing method were elaborated at the end of the chapter.

Chapter 4 defined the data analyzing process and results of the study based on collected data. The data collected was analyzed with validity and reliability analysis to test for the reliability. Descriptive analysis, T-test, Pearson correlation analysis and regression analysis were conducted over the collected data.

In Chapter 5, the discussion, conclusion and recommendation of the study were discussed. It involved the research methodology, findings, and hypothesis of this study. The research limitation was defined and the implication of the study was presented. At the end of the chapter, recommendation for future research and food manufacturing industry was discussed.

1.9 Definition of key terms

The definition of the main terms used in this study are as below:

Quality management: It is defined as the management of product quality and product safety, consisted the obligatory systems and voluntary systems (Whitehead, 1998; Sikora & Strada, 2006). Example of these systems are Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), Hazard Analysis Critical Control Points (HACCP), and ISO 9001 (Sikora & Strada, 2006).

Quality management practices: It refers to any practices applied in managing the product quality and product safety. In the context of this study, these practices are adapted from the GMP system, HACCP system, ISO 9001 management system, and TQM program.

Processed food: It refers to food products which undergoes any additional processing steps. The processing method can be of minor, such as the canned fruits; to a more complex form, such as snack food.

Processed food companies or food manufacturing companies: The classification of processed food companies or the food manufacturing companies were based on the classification published by the United Nations Statistics Divisions as adapted by the Federation of Malaysian Manufacturers (FMM). Table 1.4 showed the summarization of different types of food manufacturing companies based on the International Standard Industrial Classification of All Economic Activities (ISIC).

Table 1.4: Summarization of different types of food manufacturing companies

No.	Types of food manufacturing companies
1	Processing and preserving of meat, fish, and fruits
2	Manufacture of bakery products
3	Manufacture of cocoa, chocolate and sugar confectionery
4	Manufacture of dairy products
5	Manufacture of grain mill products, starches and starch products
6	Manufacture of macaroni, noodles, couscous and similar farinaceous products
7	Manufacture of sugar
8	Manufacture of vegetable and animal oils and fats
9	Manufacture of other food products

(Source: Department of Economic and Social Affairs Statistics Division, 2008)

Small, medium, and large companies: This study covered only the small, medium, and large companies sized. The definition of small companies and medium companies are taken from the officially published guideline by the Small Medium Enterprises (SME) Corporation Malaysia based on the company sales turnover and the number of full time employees. Table 1.5 shows the company categorization based on the definition published by the SME Corporation Malaysia.

Table 1.5: Company categorization

Category	Definition
Micro	<ul style="list-style-type: none"> ▪ Sales turnover of less than RM 300,000 or ▪ Full time employees less than 5.
Small	<ul style="list-style-type: none"> ▪ Sales turnover from RM 300,000 to less than RM 15 million or ▪ Full time employees from 5 to less than 75.
Medium	<ul style="list-style-type: none"> ▪ Sales turnover from RM 15 million to not exceeding RM 50 million or ▪ Full time employees from 75 to not exceeding 200.

(Source: SME Corp, 2013)

This guideline provides only the information about micro companies, small companies, and the medium sized companies. For the purpose of this study, sales turnover of more than RM 50 million or with the full time employees more than 200 are considered as large companies as the definition of large companies is not being included in the published guidelines.

Operational performance and market performance: Operational performance measured at the operational level such as the product quality, manufacturing, inventory management and R&D performance. Market performance measured about the growth of sales, profit, market share and etc.

1.10 Summary

Showing the importance of food manufacturing industries to the Malaysia economy, implementation of the quality management practices becomes one significant step in ensuring the sustainability and competency of this sector. Consequently, this research is to identify the extent of QM practices implemented by the food manufacturers in Malaysia. Second, is to identify the implementation level among different size of company and to study on the relationship with the operational and market performance.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of quality, quality management, and the different types of quality management systems in the food manufacturing industry. It discussed about the current quality management practices implemented among different sizes of companies and the performance measures. The relationship between quality management practices with the company performance was reviewed. In this chapter, previous studies about the quality management practices were summarized. Research framework and hypothesis were also formulated.

2.2 Introduction to food quality

The quality gurus, Philip B Crosby (1979), W. Edwards Deming (2000) and Joseph M. Juran (1999) had greatly influenced and contributed to the development of quality concept and quality management (Ngee Goh, 2014). Table 2.1 summarized the interpretation of quality according to the quality gurus.

Table 2.1: Definition of quality according to quality gurus

Quality Gurus	Definition of Quality
Philip B. Crosby (1979)	Conformance to requirements
W. Edwards Deming (2000)	Conformance to consumer' needs
Joseph M. Juran (1999)	Fitness for use

Over the years, practitioners and academicians translated the terms quality into different meaning (Ng, 2012). It was defined as the product features and characteristics, particularly in satisfying the intended requirements (DSM, 2009b). In the context of food product, quality can be grouped into two major categories: (i) the intrinsic quality attributes and (ii) the extrinsic quality attributes as shown in Figure 2.1.

The intrinsic attributes refer to the measurable product properties (Veale & Quester, 2009; Fandos & Flavian, 2006). It covers the product safety and reliability (Luning et al., 2002; Krissoff et al., 2002), the nutritional properties and wholesomeness (Luning et al., 2002; Krissoff et al., 2002), the sensory properties (taste, texture, aroma, and appearance) (Alli, 2004; Luning et al., 2002; Szczeniak, 2002; Iop et al., 2006; Krissoff et al., 2002), shelf life (Nicoli, 2012; Luning et al., 2002), and the degree of convenient (Luning et al., 2002). In contrast, the extrinsic attributes refer to the alterable product properties (Veale & Quester, 2009; Fandos & Flavian, 2006). It is the image variables, the brand name, product price, certification, the country of origin and etc. (Veale & Quester, 2009; Fandos & Flavián, 2006; Espejel et al., 2007; Iop et al., 2006).

Different quality attributes responsible for the different aspects of a food product. Food safety, as an intrinsic property responsible for the safety of a product. Failure in food safety shall result in the foodborne disease. Foodborne disease is a challenging issue not only faced by the developing countries (Sharifa Ezat et al., 2013), instead the developed countries (CDC, 2013, Kirk et al., 2008, Lee et al., 2001) as well. The Centres for Disease Control and Prevention (CDC, 2013) estimated that there were 48 million Americans suffered from foodborne disease in the United States. The high incident rate of 56.25 reported in the Malaysia Health Facts (2012) indicated that the issue of foodborne disease is a challenging issue in Malaysia. The outbreak of this disease starts to draw public concern about the food safety properties. Nowadays, it is a norm that food safety was considered as the main attribute during food purchasing (Alvarez, 2010; Grunert, 2005).

With this concept in mind, quality management practices or the quality management systems were practiced worldwide to assure for the food quality and food safety (Milios et al., 2013; Kafetzopoulos et al., 2013; Spadoni et al., 2013).

Intrinsic Quality Attributes	Extrinsic Quality Indicators
<p>Food safety attributes</p> <ul style="list-style-type: none"> ▪ Foodborne pathogens ▪ Heavy metals and toxins ▪ Pesticide or drug residues ▪ Soil and water contaminants ▪ Food additives, preservatives ▪ Physical hazards ▪ Spoilage and botulism ▪ Irradiation and fumigation ▪ Other <p>Nutrition attributes</p> <ul style="list-style-type: none"> ▪ Calories ▪ Fat and cholesterol content ▪ Sodium and minerals ▪ Carbohydrates and fiber content ▪ Protein ▪ Vitamins ▪ Other <p>Sensory/ organoleptic attributes</p> <ul style="list-style-type: none"> ▪ Taste and tenderness ▪ Colour ▪ Appearance/ blemishes ▪ Freshness ▪ Softness ▪ Smell/ aroma ▪ Other <p>Value/ function attributes</p> <ul style="list-style-type: none"> ▪ Compositional integrity ▪ Size ▪ Style ▪ Preparation/ convenience ▪ Package materials ▪ Keep ability ▪ Other <p>Process attributes</p> <ul style="list-style-type: none"> ▪ Animal welfare ▪ Authenticity of process/ place of origin ▪ Traceability ▪ Biotechnology/ biochemistry ▪ Environmental impact ▪ Worker safety other 	<p>Test/ measurement indicators</p> <ul style="list-style-type: none"> ▪ Quality management systems ▪ Certification ▪ Records ▪ Labeling ▪ Minimum quality standards ▪ Occupational licensing ▪ Other <p>Cues</p> <ul style="list-style-type: none"> ▪ Price ▪ Brand name ▪ Manufacturer name ▪ Store name ▪ Packaging ▪ Advertising ▪ Country of origin ▪ Distribution outlet ▪ Warranty ▪ Reputation ▪ Past purchase experience ▪ Other information provided

Figure 2.1: The intrinsic and extrinsic quality attributes (Caswell et al., 2002)

2.3 Introduction to quality management (QM)

The Codex Alimentarius Commission (CAC) was established in year 1963 via collaboration effort between the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) (Godefroy, 2014). The noble purpose was to protect public health, to ensure for the food safety and suitability for human consumption (CAC, 2015a; Godefroy, 2014). Align with this mission, CAC aimed at facilitating the international food trade process and to serve for the World Trade Organization's Agreement on Sanitary and Phytosanitary measures (SPS agreement) as the reference point (CAC, 2015a; Godefroy, 2014). The Codex Alimentarius Commission had been protecting the human health for more than 50 years. Along their effort in protecting the public health, CAC had published more than 300 publications covering the international food standards, guidelines and codes of practices (CAC, 2015b). These publications served as framework for assuring the food safety, at the same time, served as the precursor guideline for the establishment of quality management system and practices in the food manufacturing industry.

Quality management is essential in assuring the product quality and product safety (Whitehead, 1998). It can be classified into the obligatory system and voluntary system (Sikora & Strada, 2006). The obligatory system such as Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), and Hazard Analysis Critical Control Points (HACCP) emphasized on food safety (Sikora & Strada, 2006). On the other hand, the voluntary system focused on food quality (Sikora & Strada, 2006). The example of voluntary system includes the ISO 9001 system (Sikora & Strada, 2006).

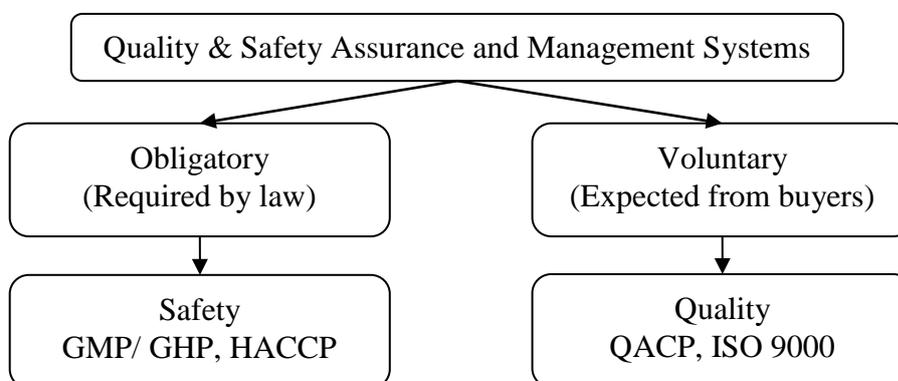


Figure 2.2: Relationship between food safety and quality management system (Sikora & Strada, 2006)

2.4 Scope of quality management

According to the FDA (2013), food is defined as any edible substances intended for human consumption purpose, which may exist in the unprocessed, semi processed or processed form (Alli, 2004). It covers any ingredients and substances incorporated into food and in contact with food during the processing stage (Alli, 2004). Consequently, the core principle of quality management emphasized on the food itself, from farm to fork, the raw materials used for processing, the surfaces which come into contact with food, the packaging materials in contact with food and etc. (Alli, 2004).

Food quality management aim at ensuring the food safety and suitability for human consumption (Achilleas & Anastasios, 2008). In conjunction with this purpose, the scope of food quality management shall cover the whole food supply chain, starting from the raw materials, in process manufacturing and surfaces in contact with food (Alli, 2004; DSM, 2007; DSM, 2009a).

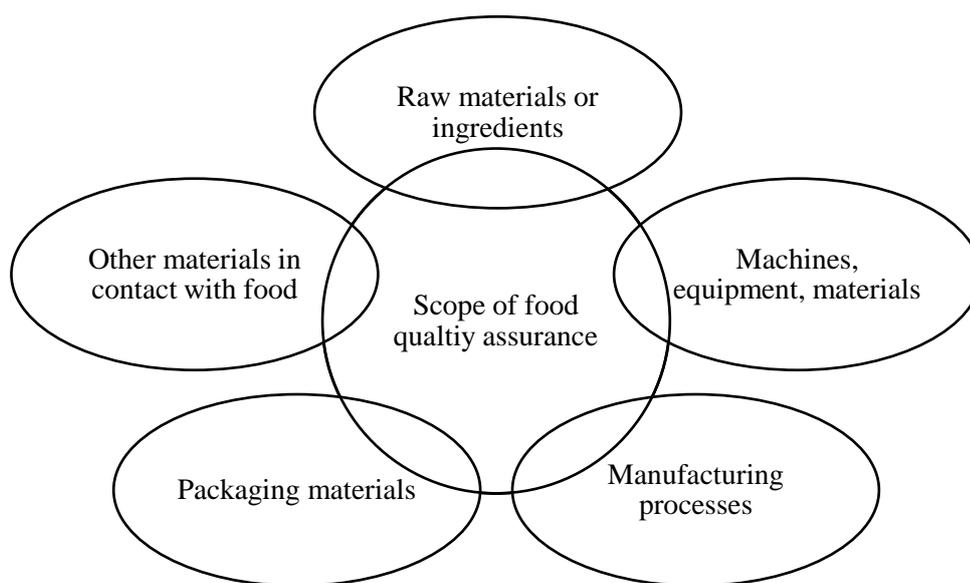


Figure 2.3: The scope of food quality management (own source summarized from previous literature)

2.5 Quality management in food manufacturing industry

In the context of food manufacturing industry, quality systems are comprised of three distinct entities responsible for the management of food hygiene, food safety and food quality (Sikora & Strada, 2006; Rotaru et al., 2005).



Figure 2.4: Different entities of quality system in food manufacturing industry (own source summarized from previous literature)

Food hygiene is the basic requirement essential for a food manufacturing company. It can be achieved with the implementation of Good Manufacturing Practices (GMP) or the Good Hygiene Practices (GHP) in which they provide a series of food hygiene principles. These systems serve as a pre-requisite program prior to the implementation of Hazard Analysis Critical Control Point (HACCP) system (Manning, 2013; Milios, 2013; Sikora & Strada, 2006). Therefore, by implementing the GMP or GHP, a food manufacturing company is prepared for the HACCP implementation.

The HACCP system is a food safety system emphasized on hazard control (Alli, 2004). This system focused on hazard analysis to identify the potential hazards and subsequently, minimizing or eliminating the hazards identified (Alli, 2004). Food hygiene and food safety are the fundamental aspects of food; thus, causes the GMP, GHP and HACCP systems, as an obligatory system which are compulsory to be fulfilled by a food manufacturing company (Sikora & Strada, 2006).

In contrast of the food hygiene and safety, food quality such as the sensory properties is an additional criteria expected by consumers (Sikora & Strada, 2006). Instead of the obligatory systems, food quality can be assured by implementing the voluntary system such as Quality Assurance Control Points (QACP), ISO 9001 quality management system or Total Quality Management (TQM) (Sikora & Strada, 2006; Rotaru et al., 2005). All these systems significantly related with the food quality. Researchers mapping out the relationship between different quality systems in the food manufacturing industry as shown in Figure 2.5 (Sikora & Strada, 2006; Rotaru et al., 2005).

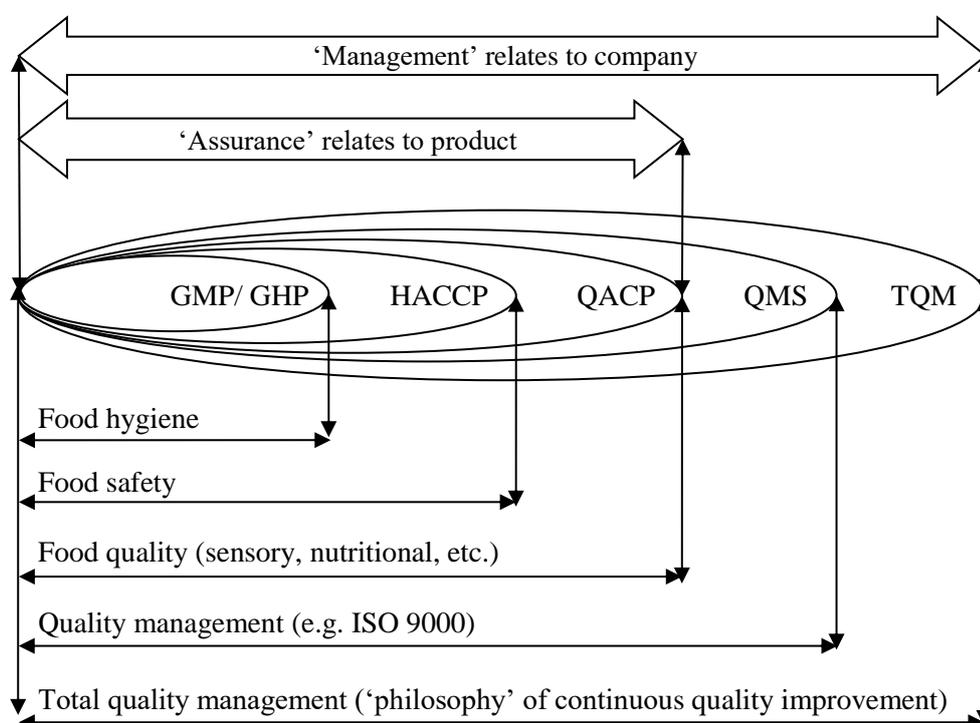


Figure 2.5: Relationship between different quality management systems in food manufacturing industry (Sikora & Strada, 2006)

2.5.1 Quality control program

The quality control program is a series of activities to support the whole food production line starting from the incoming raw materials, in process control and finished products via checking, monitoring and controlling processes (Alli, 2004; Patel, 1994). The core value is to identify the degree of fulfillment of a food product to the requirements of food quality and food safety (Alli, 2004; Patel, 1994). The purpose of quality control is to achieve a specific quality level which is considered acceptable by the public (Alli, 2004).

2.5.2 Quality assurance program

Quality assurance as a part of quality management is a systematic procedure essential in assuring the product quality (Schütz et al., 2014). In contrast with the quality control program, a quality assurance program is more comprehensive and complex (Alli, 2004). It consists of the quality control program, covering the inspection activities, monitoring and control, with the additional practices focused on hazards minimization and prevention (Alli, 2004). The objective of a quality control program is to ensure for the product conformity with respect to the intended specification. At the same time, providing the relevant parties with a degree of confidence (Vasconcellos, 2003; Alli, 2004).

Table 2.2: Comparison between quality assurance and quality control

Factor	Quality Assurance	Quality Control
Approach	<ul style="list-style-type: none"> ▪ Proactive approach for problem prevention. ▪ Action taken before problem was arose. 	<ul style="list-style-type: none"> ▪ Reactive approach. ▪ Action taken upon problem occur.
Point of emphasis	<ul style="list-style-type: none"> ▪ Emphasis on operational process from the raw materials, in process manufacturing to delivery to customers. 	<ul style="list-style-type: none"> ▪ Emphasis on measurement, which maintaining the production line based on set specification.
Point of focus	<ul style="list-style-type: none"> ▪ Customers' needs and requirement 	<ul style="list-style-type: none"> ▪ Legal requirement

(Source: Summarized from Alli, 2004; Vasconcellos, 2003; Patel, 1994)

2.6 Quality management system in food manufacturing industry

The quality management system is a systematic framework of processes, procedures and system for quality management implementation (Manghani, 2011). It is a management technique to assure, to control and to monitor the product quality in order to ensure that the end product was manufactured with high quality. In the food manufacturing industry, quality management systems consist of the food quality management systems (FQMS) (Kafetzopoloulos et al., 2013; Kheradia & Warriner, 2013; Psomas & Fotopoulos, 2010) and the food safety management systems (FSMS) (Kheradia & Warriner, 2013; Kafetzopoloulos et al., 2013). The food quality management systems such as the ISO 9001 (Kafetzopoloulos et al., 2013), and the food safety management system such as the HACCP system (Psomas & Fotopoulos, 2010) are widely implemented in the food manufacturing companies.

Prior to the implementation of these systems, a pre-requisite program (PRP) needs to be in place for effective food safety management system (Manning, 2013). The Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) are the two commonly practiced pre-requisite program in the food manufacturing industry (Manning, 2013; Milios, 2013).

In the study conducted by Idris and co-workers (2011), ISO 9001 was discovered implemented widely among the Malaysia companies, and it was expected that the Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP), and Halal Assurance System (HAS) are getting more and more popular to be implemented among the food manufacturing companies in Malaysia (Idris *et al.*, 2011).

2.6.1 Good Manufacturing Practices (GMP) for Food

The Good Manufacturing Practices (GMP) in food is a series of guideline focuses on safe food manufacturing via systematic control of the operational conditions of a food premise (DSM, 2009a). It provides a guideline for food sector, covering principles which are essentially needed for the incoming materials, in-process semi-goods, and the finished product control. GMP focuses on the plant layout designing and construction, equipment and the maintaining process (Blackburn & McClure, 2002; Clute, 2009). Table 2.3 summarized the Malaysia standard of GMP practices.

Clause 4: Design and facilities

This clause concern about the food premises. Food premises shall be located, designed and constructed in a way that minimize the contamination, enable cleaning and maintenance, protected against pest invasion and hazards. Appropriate equipment and facilities which support the good hygiene practices shall be in place.

Clause 5: Control of operation

The operation shall be controlled to produce food which is safe and suitable for human consumption via a systematic control from the incoming, in process, and out-going handling. This is a preventive measure taken to assure for food safety and suitability by controlling the potential food hazards and contamination. The non-conforming product shall be controlled to prevent cross-contamination. Traceability and product recall system shall be established for an effective recall system.

Clause 6: Maintenance, cleaning and sanitation

An effective system shall be established for systematic maintenance, cleaning, and sanitizing purposes. Monitoring activities shall be in place to verify the effectiveness of this system. The purpose of this clause is to ensure for an effective control of food safety hazards. Pest control program shall be established to prevent pest invasion.

Clause 7: Personal hygiene

Personal hygiene and personal cleanliness shall be maintained to minimize or prevent cross contamination via direct or indirect contact with food. Personal cleanliness and personal behavior shall be maintained to prevent cross contamination. Protective clothing such as hand glove shall be provided. Food handlers with illness or injuries shall be excluded from food handling.

Clause 8: Transportation and distribution

An appropriate system for transportation and distribution process shall be established to protect the food from contaminated, damaged and from pathogen growth. Containers used for food transporting shall be cleaned, and designed in a way that provides appropriate protection against pest.

Clause 9: Product information

All food products manufactured shall carry appropriate information for handling and distribution; and identified for traceability purpose. Lot or batch identification, product information and product labeling shall be available to enable traceability or product recall.

Clause 10: Training

Training shall be provided for all food handles to ensure that they handle the food safely. The training program shall be updated and reviewed to ensure for the effectiveness of the training program.

Clause 11: Internal inspection

Internal inspection shall be conducted periodically to assess the effectiveness of the system.

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